Enclosure 4 to AAL-2021-010

Topical Report AA0-VIPR-21-SRP-02 (NP) Rev. 2

Standard Review Plan Conformance for Atomic Alchemy's Non-power Production and Utilization Facility

Non-Proprietary

ATOMIC ALCHEMY INC.

January 21, 2022

CONTENTS

ATOMIC ALCHEMY SYSTEM ACRONYM LIST

ASM	Administration and Service Module Building
CAS	Plant Compressed Air System
CHW	Chiller Evaporator Water System
CIS	Plant Instrument Air System
CRD	Control Rod Drive Mechanism System
CRE	Control Room Emergency Habitability System
CRF	Control Room Emergency Ventilation and Filtration System
CRV	Control Room HVAC System
CRX	Control Room Re-Circulating Sensible Cooling/Heating System
CSA	Plant Safety Related Compressed Air System
CVC	Chemical Volume and Control System and Subsystems
CWS	Chiller Condenser Water System
DGM	Diesel Generator Module Building
DHR	Reactor Decay Heat Removal System
EFS	Communication and Data Systems
EOM	Emergency Operations Center Module Building (offsite)
ERW	Rad-Worker Radiation Permit System (Dosimetry Control)
FDS	Equipment and Floor Drainage System (Non-Radioactive)
FHR	Fuel Handling and Refueling System
FPW	Fire Protection Water System
FSR	Fuel Storage Racks System
HCF	Miscellaneous Hot Cell Air Filtration Systems and Subsystems
IAM	Continuous Air Monitoring System
ICA	Criticality Area Detection and Alarm System
ICC	Hot Cell Criticality Detection System
ICR	Control Rod Drive Management System
IDA	Diverse Actuation System
IDD	Data Display and Processing System
IES	Engineered Safety Features System
IFP	Fire Protection System
IIC	In-Core Instrumentation System
IMS	Protection and Safety Monitoring System
IDA	Diverse Actuation System
IOC	Operation and Control System
IPA	Post-Accident Monitoring and Sampling System
IPC	Plant Control System
IQD	Qualified Data Processing System
IRM	Radiation Monitoring and Alarm System
IRP	Reactor Protection System

IRT	Reactor Trip System
ISM	Seismic Monitoring System
ISP	Safety Parameter Display System
LWP	Light Water Pool System
MCF	Mo-99 Hot Cell Air Filtration Systems
MHS	Material Handling System
NSS	NO_x Treatment System
OSC	Operational Support Center
PAS	Post Accident Sampling System
PCF	Pneumatic Capsule Room Air Filtration System
PMF	Process Production Module Air Filtration Systems
PWS	Potable Water System
RAE	Reactor Auxiliary Module Cascade Exhaust System
RAV	Reactor Auxiliary Module HVAC System
RCF	Reactor Confinement Air Filtration System
RCM	Reactor Confinement Module Building
RCS	Reactor Coolant System
RCV	Reactor Confinement Module HVAC System
RCX	Reactor Confinement Module Re-Circulating Sensible Cooling/Heating System
RGW	Radioactive Gaseous Waste Collection System and Sub-systems
RLC	Reactor Coolant/Light Water Pool Leak Collection System
RLD	Reactor Coolant Leak Monitoring and Detection System
RLW	Radioactive Liquid Waste Collection System
RSW	Radioactive Solid Waste Collection & Packaging System
SFP	Spent Fuel Pool Cooling Water System
SSD	Sanitary Sewer Drain System
SWS	Service Water System
TPF	Mo-99 Target, Production, Processing Module Air Filtration System
TSC	Technical Support Center
TTW	Molybdenum Target Transfer Light Water Canal System
UPF	Class 1E DC and UPS Rooms Emergency Ventilation and Filtration System
VIPR	Versatile Isotope Production Reactor
WHF	Radwaste Module Air Filtration system
WHV	Rad Waste Handling Module HVAC System
ZAC	Main AC Power System
ZDC	DC and UPS System (non 1E)
ZIE	Class 1E Power System
ZOS	Onsite Stand-by Power System

INTRODUCTION TO TOPICAL REPORT

Atomic Alchemy is pursuing the design, licensing, and construction of a Non-power Production and Utilization Facility (NPUF). This Enclosure describes Atomic Alchemy's conformance with the NUREG-1537 Part 2, Standard Review Plan (SRP) for its Versatile Isotope Production Reactor (VIPR) and radioisotope production process' safety-related structures, systems, and components (SSC).

The primary objective of this topical report is to provide the NRC with Atomic Alchemy's conformance to the acceptance criterion identified in NUREG-1537 Part 2 Standard Review Plan. The secondary objective of this Topical Report is to provide the NRC with another component of Atomic Alchemy's preliminary regulatory GAP analysis.

ATOMIC ALCHEMY SRP FORMATTING APPROACH

Atomic Alchemy has chosen to utilize the formatting of NUREG-0800 SRP for the following reasons:

1) The Atomic Alchemy SAR format is based on Regulatory Guide 1.70 which easily aligns with the NUREG-0800 Sections.
2) The secondary objective of this Topical Report is to provide the NRC with another component of Atomic Alchemy's preliminary Regulatory GAP Analysis[1], with respect to light-water reactor (LWR) based Title 10, Parts 1 through 171 regulations. In Section II of each NUREG-0800 SRP, the specific LWR-based Title 10 regulations are provided along with the NRC's accepted methods of demonstrating compliance with the regulations. Conversely, NUREG-1537, Part 2 SRP does not provide a licensee with guidance as to what the corresponding Title 10 regulations are to each SRP, nor does it provide the standards the NRC would deem acceptable to satisfactorily comply with the identified NUREG-1537, Part 2 acceptance criteria. This could lead to significant misunderstandings and delays to the design process and review of the PSAR and CL application.

To simplify the NRC review process of this TR, Atomic Alchemy has provided the corresponding NUREG-1537 Part 2 SRP sections to the NUREG-0800 sections in Appendix A of this TR. Because of the broad nature of the NUREG-1537 respective descriptions, elements of NUREG-1537 Part 2 SRP's may be found in multiple sections of the NUREG-0800 SRPs. The list of corresponding NUREG-1537 Part 2 SRP's is not meant to be an all-inclusive list.

In instances where the NUREG-1537 SRP have been determined to be applicable to Atomic Alchemy, (as identified in Appendix A) all accompanying respective acceptance criterion bullets are also presumed to be applicable to the corresponding Atomic Alchemy design element.

Elements of Interim Staff Guidance NUREG-1537 Part 2 and NUREG-1537 Part 2 that were not originally derived from NUREG-0800 will be addressed separately in the PSAR submittal.

[1] The final Atomic Alchemy Gap Analysis results will be subdivided into Appendices in FSAR Chapter 1 and Chapter 3, with an overall summary in Chapter 1 Appendix G, there will be separate appendices for NUREG-0800, NUREG-1537 Part 2, NUREG-0737, NUREG-0933, and 10 CFR 50 Appendix A.

Elements of relevant NRC regulations that were outside the scope of NUREG-0800 will be included in a Final Regulatory GAP Analysis[2] submitted with the Title 10 Part 50 construction license application.

To minimize redundancy, industry codes and standards that may be referenced in the acceptance criteria of each SRP in NUREG-0800 are addressed in the summary description of compliance on a case-by-case basis depending on their significance or relevance to the intent of compliance with the SRP and/or Title 10 regulation, as well as whether they are previously captured in the compliance summary of a regulatory guide.

Atomic Alchemy intends to comply with the requirements of the specified revisions of industry codes and standards that have been incorporated by reference into the Title 10 regulations and/or endorsed in the regulatory guides. In some instances, Atomic Alchemy may choose to comply with a later revision. In these instances, Atomic Alchemy will submit an alternative under 10 CFR 50.55a(z).

SUMMARY OF THE ANALYSIS

The regulatory gap analysis assessment of NRC regulations for applicability to the Atomic Alchemy design also included a detailed review of 10 CFR 50, Appendix A General Design Criteria. This analysis was performed separately as part of the development of the Atomic Alchemy Principal Design Criteria (PDC) and submitted to the NRC as a Topical Report (TR) in Atomic Alchemy Inc. Letter AAL-2020-004, “Principal Design Criteria for Atomic Alchemy’s Non-Power Production and Utilization Facility,” Agencywide Documents Access and Management System (ADAMS) Accession No. ML21169A044, dated June 18, 2021.

The evaluation of the sets of regulatory documents considered in the Atomic Alchemy SRP Compliance (Regulatory Gap Analysis) TR and its PDC TR has been performed based on the present preliminary state of engineering design. As detailed design proceeds, should fundamental changes occur to key design features or characteristics that are not bounded by the present Atomic Alchemy regulatory GAP analysis, or should new or revised NRC regulations be established in NUREG-1537 that might affect the Atomic Alchemy facility, such changes would be resolved and addressed in the construction license application.

Some Atomic Alchemy design features are deemed to be significantly different in specific areas from power reactor design features that were originally developed under Title 10 regulations. If Atomic Alchemy feels that a strict adherence to the power plant-based acceptance criteria is not warranted for its NPUF facility license application, the non-applicability of (or exceptions to) certain NRC regulations and their underlying SRP is indicated in the applicable Summary column below.

The identified gaps in the power LWR-based regulations that are not relevant or would be inappropriate to apply, either in whole or in part, to the Atomic Alchemy NPUF design will therefore require some form of NRC approval and/or concurrence presumably by a Safety Evaluation.

The overall purpose of the GAP analysis is to identify existing LWR-based regulations and guidance that are not technically relevant and thus would be inappropriate to apply to the Atomic Alchemy NPUF design due to design characteristics, functions, and capabilities unique to the Atomic Alchemy facility.

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[2] A regulatory GAP analysis summary will be provided in FSAR Chapter 1, Appendix G

Atomic Alchemy is presently performing a detailed review of existing LWR-based regulations and guidance for applicability and technical relevance to the Atomic Alchemy's NPR/NPUF plant design. The scope of the preliminary regulatory GAP review contained within this Topical Report (TR) includes the following:

The NRC Standard Review Plan (NUREG-0800) for nuclear power plants, including branch technical positions (BTPs) and related Title 10, Part 1 through Part 171 regulations.

Sub-tier guidance to the NUREG-0800 Standard Review Plan, including the following:

- Regulatory Guides
- NUREG Reports
- Unresolved and Generic Safety Issues
- Three Mile Island (TMI) Requirements
- Industry Codes and Standards

By using the LWR Title 10 based acceptance criteria and regulations identified in these NUREG-0800 SRP Sections, and Atomic Alchemy's intended conformance, the NRC staff should be more readily able to provide their concurrence or variance to the applicability of the LWR based Title 10 regulations necessary for Atomic Alchemy's Class 103 construction license application.

A modified version of this Topical Report's Appendix A will be incorporated into the FSAR as Chapter 1, Appendix B.

APPENDIX A
CONFORMANCE TO THE STANDARD REVIEW PLAN

1. INTRODUCTION AND INTERFACES

NUREG-0800 SRP 1.0 Rev 2 Introduction and Interfaces

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.1, SRP 12.12	10 CFR 50.33, 10 CFR 50.34, 10 CFR 52.16, 10 CFR 52.17, 10 CFR 52.46, 10 CFR 52.47, 10 CFR 52.77, 10 CFR 52.79,	Acceptable

Summary Description of Compliance/Exceptions

SRP 1.0 – This is a general chapter for an application for a construction permit (CP) or an operating license (OL) submitted in accordance with 10 CFR Part 50, or an early site permit (ESP), a design certification (DC), or combined license (COL) submitted in accordance with 10 CFR Part 52. This chapter is also applicable to a standard design approval (SDA), or a manufacturing license (ML) application submitted in accordance with 10 CFR Part 52. There are no specific SRP acceptance criteria associated with these general requirements.

Atomic Alchemy intends to apply for a Class 103 License for a non-power production and utilization facility (NPUF) under Title 10 Code of Federal Regulations (CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities."

The construction license application will comply with the applicable requirements of 10 CFR Part 50 and Part 70. The scope of compliance will also include the applicable conformance to 10 CFR Part 50 Appendix A, 10 CFR Part 50 Appendix B, and the Regulatory Guides necessary to comply with Title 10 regulations. The general and technical content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR 70.22. The regulations require that the construction permit application contain a Preliminary Safety Analysis Report (PSAR) and an Environmental Report as addressed in 10 CFR 51.50 and NUREG-1555.

Conformance with applicable Regulatory Guidance will be addressed in FSAR Chapter 1, Appendix A.

The Atomic Alchemy Principal Design Criteria will be established by a comparative review and subsequent demonstrated compliance with applicable 10 CFR Part 50 Appendix A, General Design Criterion and applicable 10 CFR 70.64(a) Baseline Design Criterion. This will be addressed in FSAR Chapter 3, Appendix F, also submitted as a Topical Report to the NRC.

Sufficient detail of the SAR to permit the staff to determine whether the Atomic Alchemy facility can be built and operated without undue risk to the health and safety of the public will be demonstrated by compliance with the NUREG-1537 Part 2 Standard Review Plan (SRP), written with a level of detail that would satisfy comparable NUREG-0800 SRP elements. This will be addressed in FSAR Chapter 1, Appendix B, also submitted as a topical report to the NRC.

Materials and other topical reports to be referenced will include Atomic Alchemy's Quality Assurance Program Description (QAPD), the aforementioned General Design Criteria (GDC) and SRP Appendices, related nuclear fuel design reports by [ ] PROP and Architect/Engineer related I&C Architecture topical reports.

Resolutions addressing applicable Generic Issues and Three Mile Island (TMI) Action Item Requirements will be provided in FSAR Chapter 1, Appendix C and D, respectively.

The additional analyses of potential hazards to the structures, systems, and components (SSCs) important to safety of operating units resulting from phased construction activities and to provide assurance that the limiting conditions for operation are not exceeded as a result of these phased construction activities at multi-unit site will be provided in FSAR Chapter 1, Appendix F.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

2. SITE CHARACTERISTICS AND PARAMETERS

NUREG-0800 SRP 2.0, Rev 1 Site Characteristics and Parameters

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This section is not applicable to construction permit (CP) and operating license (OL) applications submitted in accordance with 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."		

NUREG-0800 SRP 2.1.1, Rev 3 Site Location and Description

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 2.1, SRP 12, Appendix 12.1	10 CFR 50.34(a)(1), 10 CFR 52.17(a)(1), 10 CFR 52.79(a)(1), 10 CFR 100.3, 10 CFR 100.20(b), 10 CFR 100.21	Acceptable

Summary Description of Compliance/Exceptions
SRP 2.1.1– General description: this standard review plan (SRP) applies to the applicant's legal authority to determine and control activities within the designated exclusion area, as provided in the application, are sufficient to assess the acceptability of the reactor site. 10 CFR 50.33, 10 CFR 50.34(a)(i) and 10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [ ] PROP. Atomic Alchemy is in the process of obtaining a Site Use Permit from the Department of Energy which would grant it legal authority to control and operate a facility within its fence. 10 CFR Part 52 criterion – Combined operating license (COL) and design certification (DC) license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 2.1.2, Rev 3 Exclusion Area Authority and Control

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 2.1	10 CFR 50.33, 10 CFR 50.34(a)(1), 10 CFR 52.17(a)(1), 10 CFR 52.79(a)(1), 10 CFR 100.3, 10 CFR 100.20(b), 10 CFR 100.21	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.1.2 – General Description: this SRP applies to the applicant's legal authority to determine and control activities within the designated exclusion area, as provided in the application, are sufficient to assess the acceptability of the reactor site. 10 CFR 50.33, 10 CFR 50.34(a)(i) and 10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [ ] PROP 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.		

NUREG-0800 SRP 2.1.3, Rev 3 Population Distribution

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.1, SRP 12, Appendix 12.1	10 CFR 50.34(a)(1), 10 CFR 52.17(a)(1), 10 CFR 52.79(a)(1), 10 CFR 100.3, R.G. 1.70, R.G. 4.7	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.1.3– General description: this SRP addresses the data about the population in the site vicinity, including transient populations with respect to ensuring the health and welfare of the public from radiological consequences of a design-basis accident in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs as it affects the outer boundaries of the exclusion zone and the Low Population Zone (LPZ). In instances where the Non-power Utilization Facility (NPUF) has similar types of accidental atmospheric releases to PWRs or BWRs, the difference in the level of risk and challenges to the facility's safety limits and the population in the site vicinity are significantly less than either a PWR or BWR.

10 CFR 50.34(a)(i) and 10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis and will be better able to analyze potential specific hazards.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

Regulatory Guide 1.70 – Acceptable; Atomic Alchemy follows the formatting of the FSAR based on this R.G. With respect to FSAR section 2.1.3. Atomic Alchemy will present population data accordingly.

Regulatory Guide 4.7, positions C.3 and C.4 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

NUREG-0800 SRP 2.2.1 – 2.2.2, Rev 3 Identification of Potential Hazards in the Site Vicinity

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 2.2, SRP 12, Appendix 12.1	10 CFR 100.20(b), 10 CFR 52.17(a)(vii), 10 CFR 52.79(a)(1)(iv)	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.2.1 and 2.2.2– General description: these two SRPs focus on potential external hazards or hazardous materials that are present or may reasonably be expected to be present during the projected lifetime of the proposed plant.

10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

][PROP] When the exact site is determined, Atomic Alchemy will do a complete environmental analysis and will be better able to analyze potential specific site area hazards.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 2.2.3, Rev 3 Evaluation of Potential Accidents

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 2.2, SRP 3.2, SRP 3.3, SRP 3.4, SRP 13	10 CFR 50.34(a)(1)(i), 10 CFR Part 100, 10 CFR 52.17(a)(vii), 10 CFR 52.17(a)(ix), 10 CFR 52.79(a)(1)(iv) R.G. 1.70	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.2.3– General description: this SRP concerns an applicant's identification and evaluation of potential accident situations in the vicinity of the facility, to verify that the design did or did not accommodate these potential accidents.

10 CFR 50.34(a)(1)(i) and 10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis and will be better able to analyze potential specific site area hazards. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 2.3.1, Rev 3 Regional Climatology

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 2.3	10 CFR Part 100, 10 CFR 100.10(c)(2), 10 CFR 100.20(c)(2), 10 CFR 100.21(d), 10 CFR 52.79(a)(iii), 10 CFR 52.47(a)(1), GDC 2, GDC 4, R.G. 1.27, R.G. 1.76	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.3.1– General description: this SRP addresses how the averages and extremes of climatic conditions and regional meteorological phenomena potentially could affect the safe design and siting of the plant. 10 CFR 100 subpart A – Not applicable; only applies to facilities license applications before January 10, 1997. 10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [ ] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis and will be better able to analyze potential specific site area hazards. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 4 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the general design criteria (GDCs). Regulatory Guide 1.27 – Not applicable; with respect to this SRP, the Atomic Alchemy NPUF does not rely upon an external ultimate heat sink that would be impacted by regional climatology. The reactor		

light water pool is the UHS; it shares a common light water transfer canal with one other reactor core light water pool. The volume of water in the transfer canal acts as the passive "emergency core cooling" system for both light water pools. Regulatory Guide 1.76, position C.1 and C.2 – Acceptable. The following parameter values will be applied to the analysis for the Atomic Alchemy facility (Region III): • Maximum wind speed – 160 mph • Translational speed – Maximum 32 mph • Maximum rotational speed – 128 mph • Radius of maximum rotational speed – 150 feet • Atmospheric pressure drop – 0.6 psi • Rotational speed - Maximum 240 mph • Rate of pressure drop - 0.2 psi/sec. Atomic Alchemy will use the design basis missiles presented in Table 2 from this regulatory guide in analyses.

NUREG-0800 SRP 2.3.2, Rev 3 Local Meteorology

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 2.3	10 CFR 100.10(c)(2), 10 CFR 100.20(c)(2), 10 CFR 100.21(d), 10 CFR 52.17(a)(1)(vi), GDC 2, R.G. 1.23, R.G. 1.70	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.3.2– General description: this SRP addresses how the averages and extremes of local meteorological conditions phenomena potentially could affect the safe design and siting of the plant and an assessment of the facility's impact on the local site topographical and its environs. 10 CFR 100 subpart A – Not applicable; only applies to power facilities before January 10, 1997. 10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [ ]PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area meteorological conditions.		

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.70 – Acceptable; Atomic Alchemy follows the formatting of the FSAR based on this R.G. With respect to FSAR section 2.3.2, Atomic Alchemy will present local summaries of meteorological data based on onsite measurements as specified in this regulatory guide. Regulatory Guide 1.23, positions C.1 through C.9 – Acceptable; Atomic Alchemy will implement a suitable onsite program to collect the basic meteorological data needed to determine the environmental impacts of the facility through the Technical Requirements Manual 5.6.5 Meteorological and Environmental Monitoring Program.

NUREG-0800 SRP 2.3.3, Rev 3 Onsite Meteorological Measurement Programs

NUREG-1537 part 2 SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.3	10 CFR 20 Subpart D, 10 CFR 50.34(a)(1)(ii)(D), 10 CFR 50.47(b)(4), 10 CFR 50.47(b)(8), 10 CFR 50.47(b)(9), 10 CFR 50 Appendix E, 10 CFR 52.17(a)(1)(ix), 10 CFR 52.79(a)(1)(vi), 10 CFR Part 100.10(c)(2), 10 CFR Part 100.11(c), 10 CFR Part 100.20(c)(2), 10 CFR Part 100.21(c), GDC 19	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.3.3– General description: this SRP addresses a licensee's onsite meteorological monitoring program. Atomic Alchemy intends to provide an onsite meteorological and environmental monitoring (MEM) program that is capable of analyzing the resulting data through a Technical Requirements Manual level program, 5.6.5. The Atomic Alchemy MEM program will meet the requirements of Appendix A of Regulatory Guide 1.23 and is used in estimating atmospheric dispersion conditions for accidental and routine releases of radioactive material to the atmosphere. Some characteristics of this monitoring program, include:		

- Siting of the meteorological tower with respect to potential obstructions to air flow (e.g., containment structures, cooling towers, tree lines)
- Descriptions of the meteorological instrumentation (e.g., performance specifications, methods and equipment for recording sensor output, QA program for sensors and recorders, and data acquisition and reduction procedures), and
- Operation, maintenance, and calibration procedures

At least one annual cycle of meteorological data from the pre-operational onsite meteorological measurements program will be included in the Construction License application.

The maximum annual average atmospheric dispersion factor (χ/Q value) at or beyond the site boundary and the annual average atmospheric dispersion and deposition factors (χ/Q and D/Q values) at specific locations demonstrate that radiological effluent release limits associated with normal operation can be met for any individual located off site are provided in FSAR Chapter 15, Appendix A, "Evaluation Models and Parameters for Analysis of Radiological Consequences of Accidents", Tables 15.A-04 and 15.A-12 respectively.

10 CFR 20 Subpart D – Acceptable; the Atomic Alchemy will provide administrative control and procedural programs to monitor public exposures. The Offsite Dose Calculator Manual program "Radioactive Process Effluent Control Program" will conform to 10 CFR 50.36a and Regulatory Guide 1.21 for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents within the limits of 10 CFR Part 20.

10 CFR 50.34(a)(1)(ii)(D) – Acceptable; with respect to Atomic Alchemy's Technical Requirement Manual (TRM) 5.6.5 program. The program will be capable of evaluating and analyzing the postulated fission product releases using the site meteorology, to evaluate the offsite radiological consequences.

10 CFR 50 Appendix E, 10 CFR 50.47(b)(4), (8), and (9) – Acceptable; NUREG-1537, Appendix A invokes the criterion of Part 50 Appendix E. The Atomic Alchemy Emergency Plan will be based upon NRC and Federal Emergency Management Agency (FEMA) guidance as contained in NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", and EPA guidance as contained in EPA 400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents". The Atomic Alchemy TRM 5.6.5 program supports the EP by including capabilities for dose projection using real-time meteorological information in conformance to Part II, and Part IV of Appendix E) and for dispatch of radiological monitoring teams within the EPZs.

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on
[

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly

assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area meteorological conditions. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 19 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 2.3.4, Rev 3 Short-Term Atmospheric Dispersion Estimates for Accident Releases

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.3, SRP 13	10 CFR 50.34(a)(1)(ii)(d), 10 CFR 52.17(a)(1)(ix), 10 CFR 52.47(a)(2)(iv), 10 CFR 52.79(a)(1)(vi), 10 CFR 100.11(a), 10 CFR 100.21(c)(2), GDC 19, R.G. 1.3, R.G. 1.23, R.G. 1.24, R.G. 1.70, R.G. 1.77, R.G. 1.78, R.G. 1.98, R.G. 1.145, R.G. 1.194,	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 2.3.4– General description: this SRP addresses conservative atmospheric dispersion factor (χ/Q value) estimates at the exclusion area boundary (EAB), the outer boundary of the low population zone (LPZ), and at the control room for postulated design-basis accidental radioactive airborne releases and at the control room from the onsite and/or offsite airborne releases of hazardous materials such as flammable vapor clouds, toxic chemicals, and smoke from fires in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. This SRP contains examples of accidental dispersions in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Most of these accidental atmospheric releases are not applicable to Atomic Alchemy's reactor design. In instances where the reactors have similar accidental atmospheric release scenarios to PWRs or BWRs the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. [ ] PROP The values are appropriate for analyses to determine the radiological consequences of accidents.		

10 CFR 50.34(a)(1)(ii)(D) – Acceptable; with respect to the Atomic Alchemy Technical Requirements Manual (TRM) 5.6.5 program. The program will be capable of evaluating and analyzing the postulated fission product releases using the site meteorology, to evaluate the offsite radiological consequences.

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area meteorological conditions.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 19 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guides 1.3, 1.24, 1.77 and 1.98 – Not applicable; these regulatory guides address issues that are specific to PWR or BWR power reactors.

Regulatory Guide 1.23, positions C.1 through C.9 – Acceptable; Atomic Alchemy will implement a suitable onsite program to collect the basic meteorological data needed to determine the environmental impacts of the facility through the Technical Requirements Manual TRM 5.6.5 Meteorological and Environmental Monitoring Program.

Regulatory Guide 1.70 – Acceptable; Atomic Alchemy follows the formatting of the FSAR based on this R.G. With respect to FSAR section 2.3.4.2, Atomic Alchemy will present cumulative frequency distributions of χ/Q values presented for appropriate distances (e.g., the EAB distance and the outer boundary of the LPZ) and time periods as specified in this regulatory guide. Atomic Alchemy utilizes distances to applicable receptors (e.g., control room, exclusion boundary, and LPZ) χ/Qs at control room, exclusion boundary, and LPZ (for time intervals of 2 hours, 8 hours, 24 hours, 4 days, 30 days) in its determination of representative parameters to be tabulated for postulated accidents in FSAR Chapter 15, Table 15.08-01.

Regulatory Guide 1.78, position C.1 and C.2 – Acceptable; Atomic Alchemy evaluates and manages potential risks from chemical releases programmatically, see Technical Specification program 5.6.7, "Chemical Process Safety and Surveillance Program".

Regulatory Guide 1.78, position C.3 and C.4 – Acceptable; Atomic Alchemy evaluates toxic gas hazards by analysis, summarized in FSAR Chapter 6, Section 8, subsection "Toxic Gas Hazards". The analysis uses the methodology described in NUREG-0570, "Toxic Vapor Concentrations in the Control Room Following a Postulated Accidental Release." The Main Control Room (MCR) will be designed with habitability systems which provide the capability to detect and protect main control room

personnel from external fire, smoke, toxic chemicals, and airborne radioactivity. Automatic actuation of the individual systems that perform these habitability systems functions is also provided. See FSAR Chapter 6, Section 8, subsections “Control Room Emergency Zone (CREZ)” and “System Design”.

Regulatory Guide 1.78, position C.5 – Acceptable; Atomic Alchemy’s Emergency Plan is provided in FSAR Chapter 13, Appendix B.

Regulatory Guide 1.145 , positions C.1 through C.4 – Acceptable; the maximum annual average atmospheric dispersion factor (χ/Q value) at or beyond the site boundary at specific locations that are a significant input to the assessment performed to demonstrate that radiological effluent release limits associated with normal operation from the type of facility proposed to be located at the site can be met for any individual located off site are provided in FSAR Chapter 15, Appendix A, “Evaluation Models and Parameters for Analysis of Radiological Consequences of Accidents”, Tables 15.A-04.

Regulatory Guide 1.194, position C.1 – Acceptable; Atomic Alchemy agrees with the definitions of this position.

Regulatory Guide 1.194, position C.2 and C.3 – Not applicable; ARCON96 is an obsolete computer code which cannot be run on any modern computer system. Because Atomic Alchemy’s NPUF is still in the preliminary design phase, either the AEOLUS-3, a computer code for “the Determination of Atmospheric Dispersion and Deposition of Nuclear Power Plant Effluents During Continuous, Intermittent and Accident Conditions”, or the K.G. Murphy and K.W. Campe methodology will be used. Atomic Alchemy will also consider site specific experimental data.

Regulatory Guide 1.194, position C.5 and C.6 – Not applicable; the amount of buoyant plume rise associated with energetic releases from steam relief valves or atmospheric dump valves are not credible sources in the VIPR design.

Regulatory Guide 1.194, position C.4 and C.7 – Acceptable; Atomic Alchemy’s NPUF is still in the preliminary design, either AEOLUS3, site specific experimental data, or the K.G. Murphy and K.W. Campe methodology will be used.

NUREG-0800 SRP 2.3.5, Rev 3 Long-Term Atmospheric Dispersion Estimates for Routine Releases

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.3	10 CFR 20 Subpart D, 10 CFR 50, Appendix I, 10 CFR 100.21(c)(2), R.G. 1.23, R.G. 1.70, R.G. 1.109, R.G. 1.111, R.G. 1.112, R.G. 1.206	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 2.3.5– General description: this SRP addresses site characteristics that could affect the safe design and siting of the plant with respect to the amount of material deposited as the result of routine releases of radioactive material to the atmosphere in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

In instances where the Atomic Alchemy NPUF reactors have routine releases of radiological effluents to the atmosphere similar to the types in PWRs or BWRs the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

10 CFR 20 Subpart D – Acceptable; the Atomic Alchemy will provide administrative control and procedural programs to monitor public exposures. The Offsite Dose Calculator Manual program "Radioactive Process Effluent Control Program" will conform to 10 CFR 50.36a and Regulatory Guide 1.21 for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents within the limits of 10 CFR Part 20.

10 CFR 50 Appendix I, Section II.B and II.C and Section III – Acceptable; Atomic Alchemy offsite calculated annual total quantity of all radioactive material above background to be released from each VIPR and radioisotope related processes to unrestricted areas are well within the code's minimum quantities established for power nuclear reactors. Atomic Alchemy establishes the "Radioactive Waste Control Program", a QAPD-level program, in accordance with NQA-1 and the "Radioactive Process and Effluent Control Program" which is an Offsite Dose Calculation Manual-level program to conform to the applicable requirements for guides and implementation.

10 CFR 50 Appendix I, Section II.D – Exceptions as noted; the Atomic Alchemy offsite quantities are extremely low such that any further cost benefit analysis was determined not necessary.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area meteorological conditions.

Regulatory Guide 1.23, positions C.1 through C.9 – Acceptable; Atomic Alchemy implements a suitable onsite program to collect the basic meteorological data needed to determine the

environmental impacts of the facility through the Technical Requirements Manual 5.6.5 Meteorological and Environmental Monitoring Program.

Regulatory Guide 1.70 – Acceptable; Atomic Alchemy follows the formatting of the FSAR based on this R.G. With respect to FSAR section 2.3.5.2, Atomic Alchemy will present a detailed description of the model used to calculate realistic annual average x/Q values using guidance on acceptable atmospheric transport and diffusion models as presented in Regulatory Guide 1.111. Atomic Alchemy will also provide estimates of annual average χ/Q values for 16 radial sectors to a distance of 50 miles from the facility.

Regulatory Guide 1.109, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy utilizes methods and data from 10 CFR Part 20, Appendix B, NUREG 1887 for the core inventory, RG 1.183 for the pool release rates, and RG 1.111 for the plume model from the stack.

Regulatory Guide 1.111, positions C.1 through C.4 – Acceptable; Atomic Alchemy uses the "mean wind direction model" for determining the atmospheric transport and diffusion of effluents. See FSAR Chapter 15, Table 15.08-01 for representative parameters to be tabulated for postulated accidents for dispersion data and factors.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of Appendix I to 10 CFR Part 50.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLA, DC, and ESP applications. Atomic Alchemy is applying for a construction and operating permit under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy's QAPD (was submitted as topical report AA0-VIPR-20-QAPD(NP)) is based on the NQA-1 standard.

NUREG-0800 SRP 2.4.1, Rev 3 Hydrologic Description

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4	10 CFR 100, 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79 (a)(1)(iii), GDC 2, R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 2.4.1 – General description: this SRP addresses the interface of the plant with the hydrosphere and includes descriptions of site location, major hydrological features in site vicinity, surface and ground water-related characteristics, and the proposed water supply to the plant with respect to pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The location of the Atomic Alchemy facility will be situated on [

] PROP Flooding does not occur from the probable maximum precipitation. The roofs of the Atomic Alchemy module buildings do not have internal roof drains. The reactor confinement module, reactor auxiliary module, radioisotope process modules and radwaste module buildings are sloped such that rainfall is directed off the roof and/or they have parapets with large openings to drain to scuppers/drains to preclude accumulation of water on the roofs. Therefore, ponding of water on the roofs is precluded. Water from roof drains and/or scuppers, as well as runoff from the plant site and adjacent areas, is conveyed to catch basins, underground storm pipes, or directly to open ditches by sloping the tributary surface area. The site is graded to offer protection to the seismic Category I structures. A waterproof membrane or waterproofing system for the seismic Category I structures below grade will be installed as an architectural aide to limit the infiltration of subsurface water. Atomic Alchemy will use a waterproofing system for foundation mat (mud mat) and the below grade exterior walls exposed to flood and groundwater.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.27, position C.1 through C.6 – Exceptions as noted; the light water reactor and spent fuel pools are the UHS. The Atomic Alchemy Facility utilizes the volume of light water contained in the Molybdenum Target Transfer Light Water Canal System (TTW) as its "emergency core cooling" type system (designated as Reactor Decay Heat Removal – DHR). Components of the

TTW system that provide the ECC function are designated as a safety related DHR component. The volume of water stored in the transfer canal is sufficient for decay heat removal for 72 hours should it be needed. After 72 hours the remaining volume of the light water pools are capable of dissipating decay heat of both the reactor and the spent fuel pools for 30 days. Atomic Alchemy takes an exception to full functional testing—see the response to GDC 46, in FSAR Chapter 3, Appendix F. Nevertheless, Atomic Alchemy meets the intent of this regulatory guide. Regulatory Guide 1.29 – Acceptable with respect to this SRP; the seismic Category I structures, systems, and components identified in the Atomic Alchemy FSAR are designed to withstand the effects of flooding due to natural phenomena or postulated component failures. Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable. Regulatory Guide 1.59, positions C.1 through C.4 – Acceptable. FSAR Chapter 3, Section 5, will describe the design considerations and evaluations for flooding. All safety-related structures, systems, and components identified in Regulatory Guide 1.29 are designed to withstand the flood conditions resulting from a Standard Project event. Changes to the site flood-producing characteristics, as they affect the design basis flood, will be periodically monitored as part of the Emergency Plan in accordance with NEI 16-05 guidelines, and used to modify emergency operating procedures as required. Regulatory Guide 1.102, positions C.1 through C.3 – Acceptable. Atomic Alchemy agrees with the definitions of position C.1. With regards to position C.2, all safety-related structures, systems, and components are designed to withstand the flood conditions resulting from a Standard Project event. Position C.3 is not applicable, flooding does not occur from the probable maximum precipitation. FSAR Chapter 3, Section 5, will describe the design considerations and evaluations for flooding.

NUREG-0800 SRP 2.4.2, Rev 4 Floods

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.3	10 CFR 100, 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79 (a)(1)(iii), GDC 2 R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 2.4.2– General description: this SRP addresses the analyses of historical flooding at the proposed site. The analysis should summarize and identify the individual types of flood-producing phenomena,		

and combinations of flood-producing phenomena, that was considered in establishing the flood design bases for safety-related plant features in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The design of the Atomic Alchemy base mat and exterior walls of seismic Category I structures are designed to resist upward, and lateral pressures caused by the probable maximum external flood and high ground water level. The horizontal hydrostatic pressure acting on the exterior walls varies with height, with the maximum at the bottom of the wall and zero at the maximum water level. Minimum factors of safety for overturning, sliding, and flotation are used in the external flood analysis. There are no dynamic water forces postulated to be associated with the probable maximum flood or high ground water level.

10 CFR 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.27, position C.1 through C.6 – Exceptions as noted; the light water reactor and spent fuel pools are the UHS. The Atomic Alchemy Facility utilizes the volume of light water contained in the transfer canal system (TTW) as its "emergency core cooling" type system (designated as Reactor Decay Heat Removal – DHR). Components of the TTW system that provide the ECC function are designated as a safety related DHR component. The volume of water stored in the transfer canal is sufficient for decay heat removal for 72 hours should it be needed. After 72 hours the remaining volume of the light water pools are capable of dissipating decay heat of both the reactor and the spent fuel pools for 30 days. Atomic Alchemy takes an exception to full functional testing—see response to GDC 46, in FSAR Chapter 3, Appendix F. Nevertheless, Atomic Alchemy meets the intent of this regulatory guide.

Regulatory Guide 1.29 – Acceptable with respect to this SRP; the seismic Category I structures, systems, and components identified in the Atomic Alchemy FSAR are designed to withstand the effects of flooding due to natural phenomena or postulated component failures. Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.59, positions C.1 through C.4 – Acceptable. FSAR Chapter 3, Section 5, will describe the design considerations and evaluations for flooding. All safety-related structures, systems, and components identified in Regulatory Guide 1.29 are designed to withstand the flood

conditions resulting from a Standard Project event. Changes to the site flood-producing characteristics, as they affect the design basis flood, will be periodically monitored as part of the Emergency Plan in accordance with NEI 16-05 guidelines, and used to modify emergency operating procedures as required.

Regulatory Guide 1.102, positions C.1 through C.3 – Acceptable. Atomic Alchemy agrees with the definitions of position C.1. With regards to position C.2, all safety-related structures, systems, and components are designed to withstand the flood conditions resulting from a Standard Project event. Position C.3 is not applicable, as flooding does not occur from the probable maximum precipitation. FSAR Chapter 3, Section 5, will describe the design considerations and evaluations for flooding.

NUREG-0800 SRP 2.4.3, Rev 4 Probable Maximum Flood (PMF) On Streams and Rivers

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.2, SRP 3.3,	10 CFR 100.23(d), 10 CFR 100, 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79 (a)(1)(iii), GDC 2 R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 2.4.3– General description: this SRP addresses the analyses of the hydrometeorological flooding at the proposed site. The analysis should summarize and identify the individual types of flood-producing phenomena, and combinations of flood-producing phenomena, that was considered in establishing the flood design bases for safety-related plant features in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

10 CFR 100.23(d) – Acceptable; with respect to the design of the Atomic Alchemy base mat and exterior walls of seismic Category I structures. These structures are designed to resist upward, and lateral pressures caused by the probable maximum external flood and high ground water level. The horizontal hydrostatic pressure acting on the exterior walls varies with height, with the maximum at the bottom of the wall and zero at the maximum water level. Minimum factors of safety for overturning, sliding, and flotation are used in the external flood analysis. There are no dynamic water forces caused by seismic effects postulated to be associated with the probable maximum flood or high ground water level.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.27, position C.1 through C.6 – Exceptions as noted; the light water reactor and spent fuel pools are the UHS. The Atomic Alchemy Facility utilizes the volume of light water contained in the transfer canal system (TTW) as its "emergency core cooling" type system (designated as Reactor Decay Heat Removal – DHR). Components of the TTW system that provide the ECC function are designated as a safety related DHR component. The volume of water stored in the transfer canal is sufficient for decay heat removal for 72 hours should it be needed. After 72 hours the remaining volume of the light water pool is capable of dissipating the decay heat of both the reactor and the spent fuel pool for 30 days. Atomic Alchemy takes an exception to full functional testing—see response to GDC 46, in FSAR Chapter 3, Appendix F. Nevertheless, Atomic Alchemy meets the intent of this regulatory guide. Regulatory Guide 1.29 – Acceptable with respect to this SRP; the seismic Category I structures, systems, and components identified in the Atomic Alchemy FSAR are designed to withstand the effects of flooding due to natural phenomena or postulated component failures. Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable. Regulatory Guide 1.59, positions C.1 through C.4 – Acceptable. FSAR Chapter 3, Section 5, will describe the design considerations and evaluations for flooding. All safety-related structures, systems, and components identified in Regulatory Guide 1.29 are designed to withstand the flood conditions resulting from a Standard Project event. Changes to the site flood-producing characteristics, as they affect the design basis flood, will be periodically monitored as part of the Emergency Plan in accordance with NEI 16-05 guidelines, and used to modify emergency operating procedures as required. Regulatory Guide 1.102, positions C.1 through C.3 – Acceptable. Atomic Alchemy agrees with the definitions of position C.1. With regard to position C.2, all safety-related structures, systems, and components are designed to withstand the flood conditions resulting from a Standard Project event. Position C.3 is not applicable, as flooding does not occur from the probable maximum precipitation. FSAR Chapter 3, Section 5, will describe the design considerations and evaluations for flooding.

NUREG-0800 SRP 2.4.4, Rev 3 Potential Dam Failures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.2, SRP 3.3	N/A	N/A

Summary Description of Compliance/Exceptions
The Atomic Alchemy design does not postulate the effects of dam failures in the standard site envelope. Flooding is accounted for in evaluations against the site envelope for flood level. The location of the Atomic Alchemy facility will be situated on [ ] PROP.

NUREG-0800 SRP 2.4.5, Rev 3 Probable Maximum Surge and Seiche Flooding

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.2, SRP 3.3	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 100.23(d), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, GDC 44, R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Acceptable

Summary Description of Compliance/Exceptions
SRP 2.4.5– General description: this SRP addresses the analyses of potential hazards from the effects of maximum surge and seiche flooding in establishing the flood design bases for safety-related plant features in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. 10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997. 10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [ ] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental and seismic analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area hydrometeorological flooding and seismic conditions. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 44 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

R.G. 1.27, 1.29, R.G. 1.59, R.G. 1.102 have been previously addressed with respect to flooding in Atomic Alchemy's response to SRP 2.4.3.

NUREG-0800 SRP 2.4.6, Rev 3 Probable Maximum Tsunami Hazards

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.2, SRP 3.3	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy design does not postulate the effects of tsunami in the standard site envelope. Flooding is accounted for in evaluations against the site envelope for flood level. The location of the Atomic Alchemy facility will be situated on [ ] PROP.		

NUREG-0800 SRP 2.4.7, Rev 3 Ice Effect

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.2	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.4.7– General description: this SRP addresses the analyses of potential of ice-induced hazards on safety-related plant features in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy design incorporates the use of safety-related equipment that do not rely on the availability of water supplies that could be iced. The effects of ice loading and other icing phenomena are evaluated for the potential to result in adverse effects to the intake structure or other safety-related facilities. This is addressed in FSAR Chapter 2, Section 4.		

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area ice hazard conditions.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

R.G. 1.27, 1.29, R.G. 1.59, R.G. 1.102 have been previously addressed in Atomic Alchemy's response to SRP 2.4.3.

NUREG-0800 SRP 2.4.8, Rev 3 Cooling Water Canals and Reservoir

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.3	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 2.4.8– General description: this SRP addresses the analyses of the hydraulic design basis is developed for canal and reservoirs used to transport and impound water supplied to the SSC important to safety in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The ultimate heat sink for the Atomic Alchemy reactors do not rely on external natural cooling water canals and reservoirs.		

NUREG-0800 SRP 2.4.9, Draft Rev 4 Channel Migration or Diversion

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.3	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, GDC 44 R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.4.9– General description: this SRP addresses the analyses of potential flooding effects due to the migration or diversion of flowing water in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

Analysis of historical channel diversions and regional topographic evidence are identified in the Atomic Alchemy's Environmental Report in FSAR Chapter 20.

The ultimate heat sink for the Atomic Alchemy reactors do not rely on external natural cooling water canals and reservoirs, as such there would be no effect on the Ultimate Heat Sink for the facility.

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on
[

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze potential specific local area channel or diversion effects of flowing water conditions.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 44 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

R.G. 1.27, 1.29, R.G. 1.59, R.G. 1.102 have been previously addressed in Atomic Alchemy's response to SRP 2.4.3.

NUREG-0800 SRP 2.4.10, Rev 3 Flooding Protection Requirements

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.3	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, GDC 44, R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.4.10– General description: this SRP addresses the determination if flood effects need to be considered in plant design or in emergency procedures in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy Emergency Plan, PSAR Chapter 13, Appendix B, submitted as part of the 10 CFR Part 50 construction license application will address any flood protection emergency procedures required to meet the site parameter for flood level.

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze any potential additional flooding protection requirements.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 44 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

R.G. 1.27, 1.29, R.G. 1.59, R.G. 1.102 have been previously addressed in Atomic Alchemy's response to SRP 2.4.3.

NUREG-0800 SRP 2.4.11, Rev 3 Low Water Considerations

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions

SRP 2.4.11– General description: this SRP addresses the determination if an adequate water supply will exist to shut down the plant under conditions requiring safety-related cooling in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

For emergency operations, the Atomic Alchemy ultimate heat sink does not rely on any external natural sources of water and therefore this SRP is not applicable.

NUREG-0800 SRP 2.4.12, Rev 3 Groundwater

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.3	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, GDC 4,GDC 5,GDC 44, R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.4.12– General description: this SRP addresses the determination of the effects groundwater on plant foundations and reliability of safety-related water supply and dewatering systems in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

A waterproof membrane or waterproofing system for the seismic Category I structures below grade will be installed as an architectural aide to limit the infiltration of subsurface water. Atomic Alchemy will use a waterproofing system for foundation mat (mud mat) and the below grade exterior walls exposed to flood and groundwater. To prevent storm water on the ground from reaching buildings, grading around module buildings will be designed to direct the flow of water away from the module buildings. The design of the facility topography will cause any water that may accumulate under facility structures to drain away from the facility area.

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on
[

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze any potential additional flooding protection requirements.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 44 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

R.G. 1.27, 1.29, R.G. 1.59, R.G. 1.102 have been previously addressed in Atomic Alchemy's response to SRP 2.4.3.

NUREG-0800 SRP 2.4.13, Rev 3 Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 13 SRP 12, Appendix 12.1	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, R.G. 1.113, R.G. 1.27, R.G. 1.29, R.G. 1.59, R.G. 1.102	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.4.13– General description: this SRP addresses the effects of accidental releases of radioactive liquid effluents in ground and surface waters on existing uses and known and likely future uses of ground and surface water resources in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The postulated transient release scenarios are being developed based on FSAR Chapter 15 transients evaluating the accidental liquid release of effluents. The scenario assumes an instantaneous release of a large volume of liquid radiological waste from one of the liquid effluent holdup tanks located in the lowest level of the Radwaste Process Module Building. The actual pathway to ground and surface water will not be determined until the specific site is identified. The actual volume of the tanks as well as the radionuclide concentration contained within them also has not been determined. The assessment of a potential release of radioactive liquids following the postulated failure of a tank and its components, located outside of reactor confinement module building, and the impacts of the release of radioactive materials at the nearest potable water supply, located in an		

unrestricted area follows the guidance provided in Branch Technical Position 11-6. Atomic Alchemy's design and analysis takes credit for passive liquid retention design features that has the storage capacity to hold the expected volume of liquid wastes released by an accident and uses administrative controls (Technical Specifications) limiting the total amount of radioactivity contained in storage tanks. As part of the ODCM, Atomic Alchemy will confirm the identified uses of water resources are still valid and limiting in establishing the maximum total inventory of radioactivity in the tank(s) and components assumed to have failed in the consequence analysis. The postulated release will not result in radionuclide concentrations in useable surface water or groundwater exceeding the effluent concentration limits (ECLs) of 10 CFR Part 20.

10 CFR 100 subpart A – Not applicable; only applies to power reactor facilities whose license application was before January 10, 1997.

10 CFR 100 subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP When the exact site is determined, Atomic Alchemy will do a complete environmental analysis to properly assess the facility's location on the surrounding environs and will be better able to analyze any potential additional flooding protection requirements.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.113, positions C.1 through C.3 – Not applicable; there are no large bodies of water within [ ] PROP See FSAR Chapter 16, Appendix C; the Atomic Alchemy ODM 5.6.1 will describe the Radioactive Process Effluent Control Program and ODM 5.7.2 will describe the Radioactive Effluent Release Report.

R.G. 1.27, 1.29, R.G. 1.59, R.G. 1.102 have been previously addressed in Atomic Alchemy's response to SRP 2.4.3.

NUREG-0800 SRP 2.4.14, Rev 3 Technical Specifications and Emergency Operation Requirements

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 14, SRP 12, Appendix 12.1	10 CFR 100.10(c), 10 CFR 100.20(c), 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2,	Exceptions as noted.

	R.G. 1.29, R.G. 1.59, R.G. 1.102	
Summary Description of Compliance/Exceptions		
SRP 2.4.14– General description: this SRP addresses the identification of the bases for technical specifications and emergency procedures that are required to implement protection against floods for safety-related facilities and to ensure that an adequate supply of water for shutdown and cooldown purposes is available in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The hydrologic design bases developed in Atomic Alchemy FSAR Chapter 2, Section 4 do not indicate that technical specifications or emergency procedures are necessary to ensure safety-related facility functions are protected against flooding. The Atomic Alchemy NPUF will be located on a dry site. The safety-related systems, structures, and components for the Atomic Alchemy NPUF are protected against flooding as discussed in FSAR Chapter 3, Section 4. In instances where the Atomic Alchemy VIPRs and radioisotope processes experience transient flood events similar to the types of flood accidents in PWRs or BWRs described in the SRP 2.4 series, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. Regulatory Guide 1.29 – General description: Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.		

NUREG-0800 SRP 2.5.1, Rev 5 Basic Geologic and Seismic Information

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5	10 CFR 100.23, GDC 2, R.G. 1.206, R.G. 1.208, R.G. 4.7	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 2.5.1 – General description: this SRP addresses the results of the investigations used to determine geologic factors that could affect site suitability, design, and operation of the proposed facility, and to estimate, in SRP 2.5.2, the site-specific ground motion response spectrum (GMRS) and to support the probabilistic seismic hazard analysis in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.		

[

] PROP

10 CFR 100.23 - The Operating Basis Earthquake (OBE) has been eliminated as an Atomic Alchemy design requirement. The Atomic Alchemy seismic analysis design is based on a single earthquake, the safe shutdown earthquake (SSE). Cyclic stresses due to earthquakes are included in the design of those items sensitive to fatigue. Analysis methods and allowable stresses assure that there is margin above the SSE.

For safety related items, the Atomic Alchemy design earthquake is the Safe Shutdown Earthquake (SSE). Analysis methods and allowable stresses assure that there is margin above the SSE. See FSAR Chapter 3, Appendix G, “Atomic Alchemy Nuclear Island Seismic Analysis”.

For non-safety-related items, the design earthquake is that specified in the Uniform Building Code (UBC). The UBC provides seismic requirements for building structures and for anchorage of equipment. The Atomic Alchemy design will comply with the UBC and shows structures and equipment will survive an earthquake of significant size with minimal need for repairs.

GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.206 – Not applicable; Atomic Alchemy is submitting a 10 CFR Part 50 construction application.

Regulatory Guide 1.208, positions C.1 through C.1.5, positions C.2.1 through C.2.33, positions C.3.1 through C.3.5, positions C.4. through C.4.3, positions C.5 through C.5.4 – Exceptions as noted; Atomic Alchemy construction license is submitted under 10 CFR Part 50. A deterministic approach is used for the design of the facility; however, the location of the Atomic Alchemy facility will be situated on [

] PROP Regulatory Guide 4.7, regulatory guidance positions C.1 through C.15 – Acceptable; the location of the Atomic Alchemy facility will be situated on [ ] PROP

NUREG-0800 SRP 2.5.2, Rev 5 Vibratory Ground Motion

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.4	10 CFR 50 Appendix S, 10 CFR 100.23, 10 CFR 52.17(a)(1)(vi), 10 CFR 52.79(a)(1)(iii), GDC 2, R.G. 1.208, R.G. 1.132, R.G. 4.7, R.G. 1.60, R.G. 1.138, R.G. 1.198, R.G. 1.206	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 2.5.2– General description: this SRP addresses the determination of whether the site parameters postulated for the design, with respect to seismic ground motion, are correctly identified in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy FSAR Chapter 2, Section 5 presents information on the geological, seismological, and geotechnical characteristics of the Atomic Alchemy facility and the region surrounding the site. The data and analyses in this section documents [ ] PROP This FSAR section will provide sufficient information to support evaluations of the site-specific GRMS and provides information to permit adequate engineering solutions to geologic conditions and seismic effects at the site. 10 CFR 50, Appendix S – Acceptable with respect to applicability of this SRP; in accordance with 10 CFR 50, Appendix S, Paragraph IV(a)(1)(i), the Atomic Alchemy SSE is characterized by free-field GRMS at the free ground surface. The geological and seismological information presented in Atomic		

Alchemy FSAR Chapter 4, Section 5 was developed from a review of previous reports [

] PROP The Atomic Alchemy facility design will conform to the requirement to withstand the effects of natural phenomena, such as earthquakes, without loss of capability of SSCs to perform their safety functions. Thresholds are established in procedures for actions required of the plant operators after an earthquake has occurred. Recordings from the seismic monitoring system are evaluated against the SSE design basis for the safety related structures and equipment.

10 CFR 100.23 – Exceptions as noted; The Operating Basis Earthquake (OBE) has been eliminated as an Atomic Alchemy design requirement. The Atomic Alchemy seismic analysis design is based on a single earthquake, the safe shutdown earthquake (SSE).

For safety related items, the Atomic Alchemy design earthquake is the Safe Shutdown Earthquake (SSE). Analysis methods and allowable stresses assure that there is margin above the SSE.

For non-safety-related items, the design earthquake is that specified in the Uniform Building Code (UBC). The UBC provides seismic requirements for building structures and for anchorage of equipment. The Atomic Alchemy design will comply with the UBC and shows structures and equipment will survive an earthquake of significant size with minimal need for repairs.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.132, positions C.1 through C.7 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP The FSAR Chapter 4, Section 5 will provide an update of the geological, seismological, and geophysical information [
] PROP indicates a significant change to the seismic source model.

Regulatory Guide 1.138, positions C.1 through C.7 – Not applicable; the location of the Atomic Alchemy facility will be situated on [

] PROP It is presumed that all of the sites evaluated are based on soil or rock conditions with uniform properties within horizontal layers. This regulatory guide is used for developing the non-uniform soil characteristics, such as the location and profiles of soft and hard spots.

Regulatory Guide 1.198, positions C.1 through C.4 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP The regulatory guide's site characteristics development and screening techniques for evaluating liquefaction potential are followed. [

] PROP

Regulatory Guide 1.208, positions C.1 through C.1.5, positions C.2.1 through C.2.33, positions C.3.1 through C.3.5, positions C.4. through C.4.3, positions C.5 through C.5.4 – Exceptions as noted; Atomic Alchemy construction license is submitted under 10 CFR Part 50, a deterministic approach is used for the design, however, the location of the Atomic Alchemy facility will be situated on [

] PROP The FSAR Chapter 4, Section 5 will provide an update of the geological, seismological, and geophysical [

] PROP

Regulatory Guide 1.60, position C.1 and C.2 – Acceptable; see FSAR Chapter 3, Section 7 for Atomic Alchemy's design considerations and seismic analysis criteria. FSAR Chapter 3, Appendix 3-G will describe the nuclear island seismic models.

Regulatory Guide 4.7, regulatory guidance positions C.1 through C.15 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

NUREG-0800 SRP 2.5.3, Rev 6 Surface Deformation

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.4	10 CFR 100.23, 10 CFR 52.17(a)(1), 10 CFR 52.79(a)(1)(iii), GDC 2, R.G. 1.208, R.G. 4.7, R.G. 1.206	Acceptable
Summary Description of Compliance/Exceptions		
SRP 2.5.3 – General description: this SRP addresses the potential for tectonic and non-tectonic surface deformation with respect to whether there is a potential for future surface deformation that may affect the design and operation of the proposed pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The location of the Atomic Alchemy facility will be situated on [		

] PROP

10 CFR 100.23 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guides 1.206, 1.208 and 4.7 have been previously addressed by Atomic Alchemy's response to SRP 2.5.1.

NUREG-0800 SRP 2.5.4, Rev 5 Stability of Subsurface Materials and Foundations

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.4	10 CFR Part 50, Appendix B, 10 CFR Part 50, Appendix S, 10 CFR 52.17(a)(1), 10 CFR 52.47(a)(1), 10 CFR 52.79(a)(1)(iii), 10 CFR 100, 10 CFR 100.23, GDC 1, GDC 2, GDC 44, R.G. 1.27, R.G. 1.28, R.G. 1.132, R.G. 1.138, R.G. 1.198, R.G. 1.206, R.G. 1.208	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.5.4– General description: this SRP addresses the information used to determine if the postulated site parameters for the design, with respect to stability of the soil and rock underlying the site, are correctly identified for pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

10 CFR 50, Appendix S, 10 CFR Part 100, and Subpart B – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 44 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.27 – Not applicable; with respect to this SRP the Atomic Alchemy UHS does not have any cooling water intake structures that would be impacted by ground instability.

10 CFR 50, Appendix B, and Regulatory Guide 1.28 – Acceptable; with respect to this SRP, Atomic Alchemy implements a Quality Assurance Program based on NQA-1-2017.

Regulatory Guides 1.132, 1.138 and 1.198 have been previously addressed by Atomic Alchemy's response to SRP 2.5.2.

Regulatory Guides 1.206 and 1.208 have been previously addressed by Atomic Alchemy's response to SRP 2.5.1.

NUREG-0800 SRP 2.5.5, Rev 5 Stability of Slopes

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.4	10 CFR Part 50, Appendix B, 10 CFR Part 50, Appendix S, 10 CFR 52.17(a)(1), 10 CFR 52.47(a)(1), 10 CFR 52.79(a)(1)(iii), 10 CFR 100, 10 CFR 100.23, GDC 1, GDC 2, GDC 44, R.G. 1.27, R.G. 1.28, R.G. 1.132, R.G. 1.138, R.G. 1.198, R.G. 1.206, R.G. 1.208	Acceptable

Summary Description of Compliance/Exceptions

SRP 2.5.5– General description: this SRP addresses the concern that postulated site parameters for the design, with respect to stability of slopes, are correctly identified in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The location of the Atomic Alchemy facility will be situated on [ ] PROP Any permanent perimeter slopes constructed around the facility will be located at least 600 feet away from the nearest point on the nuclear facility island. Thus, failure of these slopes, under any of the conditions to which they could be exposed during the life of the facility will not adversely affect the safety of the NPUF facilities. Any temporary slopes that will be installed for plant construction will not adversely affect the safety of the NPUF facilities. Temporary and phased construction related activities' impact on the operational NPUF are evaluated in FSAR Chapter 1, Appendix F.

10 CFR 50, Appendix B, and Regulatory Guide 1.28 – Acceptable; with respect to this SRP, Atomic Alchemy implements a Quality Assurance Program based on NQA-1-2017.

10 CFR 50, Appendix S – Acceptable with respect to applicability of this SRP; the geological and seismological information presented in Atomic Alchemy FSAR Chapter 3, Appendix 3.G will be developed from a review of previous reports prepared by [ ] PROP The Atomic Alchemy facility design will conform to the requirement to withstand the effects of natural phenomena, such as earthquakes, without loss of capability of SSCs to perform their safety functions.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 1, 2, 44 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guides 1.27, 1.28, 1.132, 1.138, 1.198, 1.206, and 1.208 have been previously addressed by Atomic Alchemy's response to SRP 2.5.4.

3. DESIGN OF STRUCTURES, COMPONENTS, EQUIPMENT, AND SYSTEMS

NUREG-0800 SRP 3.2.1 Seismic Classification

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 1.3, SRP 2.4, SRP 2.5, SRP 3.4, SRP 3.5	10 CFR 50, Appendix S, 10 CFR 100, Appendix A, GDC 1, GDC 2, GDC 60, R.G. 1.143, R.G. 1.151, R.G. 1.189, R.G. 1.29	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.2.1 – General description: Atomic Alchemy follows the seismic classification of SSCs in regulatory guide 1.29. This SRP and the regulatory guide contains examples of systems, structures, and components typically found in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs, some of which are not applicable to the Atomic Alchemy reactor design. 10 CFR 50, Appendix S – Exceptions as noted with respect to this SRP; the Operating Basis Earthquake (OBE) is not selected by Atomic Alchemy as a design input per Staff Requirement Memorandum to SECY-93-087. Atomic Alchemy FSAR Chapter 3, Appendix G summarizes the seismic analyses of the nuclear island modular building structures performed to support the Atomic Alchemy construction license application. FSAR Chapter 3, Section 10, "Seismic Qualifications of Seismic Category I Mechanical and Electrical Equipment" will describe the design criteria and information necessary to demonstrate that mechanical equipment, electrical equipment, instrumentation, and, where applicable, their supports classified as seismic Category I, can perform their designated safety-related functions under the full range of normal and accident (including seismic) loadings. Equipment qualification data packages (EQDP) are prepared for Seismic Cat I mechanical electrical components which includes a description of the safety-related functional requirements of the equipment to be demonstrated during and after a seismic event. FSAR Chapter 3, Appendix A and B will provide the design criteria for seismic Category I and II HVAC ducts and their supports and seismic Category I cable trays and their supports, respectively.		

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

10 CFR 100, Appendix A – Exceptions as noted; the Operating Basis Earthquake (OBE) has been eliminated as a design requirement of the Atomic Alchemy facility. For safety related items, the design earthquake is the Safe Shutdown Earthquake (SSE). In specifying design criteria for this earthquake, cyclic stresses due to earthquakes will be included in the design of those systems, structures, and components that are sensitive to fatigue. Analysis methods and allowable stresses will assure that there is sufficient margin above the SSE. For non-safety-related systems, structures, and components, the design earthquake is that specified in the Uniform Building Code (UBC). This is intended to protect Atomic Alchemy's investment and to provide reasonable assurance for subsequent post-earthquake recovery and operation of the plant. Experience data for structures and equipment has demonstrated that designs complying with the UBC will survive an earthquake of significant size with minimal need for repairs.

GDC 1, 2, 60 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.29 – General; Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary as defined by Atomic Alchemy for an NPUF reactor located within an open light water pool rather than 10 CFR 50.2 definition.

Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic Category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis".

Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR-related components are not applicable to the Versatile Isotope Production Reactor (VIPR) seismic Category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does the VIPR require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. The VIPR does not have a feedwater system. Atomic Alchemy's NPUF does not have safety related diesel generators. The standby diesel generator is not required for safe shutdown to mitigate and accident or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports".

Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i – Safety class instrumentation seismic Category I supports are addressed in FSAR Chapter 3, Appendix B for “Seismic Cable Trays and Tray Supports”.

Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, “Design of Seismic Category I Structures” for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building. See FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 1.151, Guidance positions C.1 and C.2 – Acceptable; this regulatory guide addresses the use of ISA-S67.02, “Nuclear-Safety-Related Instrument Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants,” 1980, to provide a basis for the design and installation of instrument sensing lines. The Atomic Alchemy I&C instrument design will be depicted on P&ID drawings, delineating pressure, class, and specification breaks. Where there is a conflict between the ISA standard and the ASME Code, Section III, the ASME Code requirements are followed.

Regulatory Guide 1.189, positions C.1 through C.7 – Acceptable; Atomic Alchemy will provide its Fire Protection Plan as FSAR Chapter 9, Appendix A. the plan will conform to the requirements of 10 CFR 50.48(a)(1)-(3).

Regulatory Guide 1.189, positions C.8 – Acceptable; the Atomic Alchemy fire protection plan will conform to the requirements for enhanced fire protection criteria and the safe shutdown of a passively designed ALWR.

Regulatory Guide 1.189, position C.9 – Not applicable currently; this guide addresses license renewal.

The Atomic Alchemy facility does not require any active safety related decay heat removal systems.

The spent fuel cavity is located in the same light-water pool as the VIPR core. Additionally, each pool shares a common transfer canal (Molybdenum Target Transfer Light Water Canal System (TTW)) with one other VIPR pool. The sharing of this water does not impair the capability of either VIPR’s safety related systems to perform intended safety functions. The volume of water stored in the transfer canal (TTW system) is sufficient for both core and spent fuel decay heat removal for 72 hours following a loss of A/C power sources. After 72 hours the light water pools are capable of dissipating decay heat of both the reactor and the spent fuel pools for 30 days.

Additionally, the TTW system also includes a non-safety-related makeup water storage tank with the capacity to refill the transfer canal by operator action if needed.

The Atomic Alchemy facility does not have feedwater or component cooling piping systems.

The diesel-generators are non-safety-related.

Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 3.2.2, Rev 3 System Quality Group Classification

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 1.3, SRP 3.1, SRP 3.5	GDC 1, R.G. 1.26, R.G. 1.143	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 3.2.2 – General description: Atomic Alchemy follows the quality classification of SSCs in regulatory guide 1.26. This SRP and the regulatory guide contains examples of systems, structures, and components typically found in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs, some of these are not applicable to the Atomic Alchemy reactor design.

GDC 1 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

10 CFR 50.55a, and Regulatory Guide 1.26, positions C.1 through C.3 – Acceptable; for mechanical equipment Atomic Alchemy Classes A, B, and C are equivalent to ANS Safety Class 1, 2, and 3. For electrical equipment Atomic Alchemy Class C is equivalent to IEEE Class 1E. The non-safety-related electrical equipment and instrumentation (Class D) is constructed to National Electrical Manufacturers Association (NEMA) standards. Structures, systems, and components classified Class A, B, or C or Seismic Category I are basic components as defined in 10 CFR 21. Atomic Alchemy Equipment Class D is a non-safety-related class. Atomic Alchemy Equipment Class E is used for non-safety-related structures, systems, and components that do not have a specialized industry standard or classification. Atomic Alchemy Equipment Class F is used for Fire Protection Systems, this will comply with National Fire Protection Association Codes which invoke ANSI B31.1. Atomic Alchemy Equipment Class L is used in heating, ventilation, and air-conditioning systems, this will comply with SMACNA, AMCA and ASHRAE industrial standards. Atomic Alchemy Equipment Class R is for air cleaning units and components that may be required to contain, clean, or exclude radioactively contaminated air, this will comply with ASME N509 and N510. Atomic Alchemy Equipment Class W will comply with American Water Works Association guidelines with no specific quality assurance requirement. Service water systems are Quality Group D since they perform no safety-related functions.

Systems that are normally radioactive are classified as Quality Group D. Atomic Alchemy will classify as Quality Group D some important non-safety-related systems and components which may function in reducing the challenges to safety-related systems. See FSAR Chapter 3, Table 3.02-02.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building, see FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Requirements applicable to BWR's do not apply to the Atomic Alchemy VIPRs.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 3.3.1, Rev 3 Wind Loadings

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.3, SRP 3.1, SRP 3.2, SRP 13a2.1.6	N/A	Acceptable
Summary Description of Compliance/Exceptions		
See Atomic Alchemy's response to SRP 2.3.1 for the specification of the Design Wind velocity and its recurrence interval. See also FSAR Chapter 3, Section 3.		

NUREG-0800 SRP 3.3.2, Rev 3 Tornado Loadings

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.3, SRP 3.1, SRP 3.2 SRP 13a2.1.6	N/A	Acceptable

Summary Description of Compliance/Exceptions
See Atomic Alchemy's response to SRP 2.3.1 for the specification of the Design Wind velocity and its recurrence interval. See FSAR Chapter 3, Section 3.

NUREG-0800 SRP 3.4.1, Rev 3 Internal Flood Protection for Onsite Equipment Failures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.3, SRP 4.5.1	GDC 2, GDC 4, R.G. 1.29, R.G. 1.59, R.G. 1.102	Exceptions as noted.

Summary Description of Compliance/Exceptions
SRP 3.4.1 – General description: This SRP addresses the design of seismic Category I structures to withstand the effects of internal flooding in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs (some of the components that can cause these transients are not applicable to the Atomic Alchemy VIPR design). The seismic Category I structures, systems, and components identified in Atomic Alchemy FSAR Chapter 3 Table 3.02-02 are designed to withstand the effects of flooding due to postulated component failures. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.29, general, Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable. Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary as defined by Atomic Alchemy for an VIPR located within an open light water pool rather than 10 CFR 50.2 definition. Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis". Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR-related components are not applicable to the VIPR seismic Category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does the VIPR require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. The VIPR does not

have a feedwater system. Atomic Alchemy's NPUF does not have safety related diesel generators. The standby diesel generator is not required for safe shutdown to mitigate and accident or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports".

Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i – Acceptable; Safety class instrumentation seismic category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports".

Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

Regulatory Guide 1.59, positions C.1 through C.4 – Acceptable. FSAR Chapter 3, Section 4, will describe the design considerations and evaluations for flooding.

Regulatory Guide 1.102, positions C.1 through C.3 – Acceptable. The maximum water level due to the Probable Maximum Flood is used in the selection of design criteria for the Atomic Alchemy facility. See FSAR Chapter 3, Section 4.

NUREG-0800 SRP 3.4.2, Rev 3 Analysis Procedures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.3, SRP 3.4 SRP 13a2.1.6	GDC 2	Acceptable
Summary Description of Compliance/Exceptions		

SRP 3.4.2 – General description: This SRP addresses the design of seismic Category I structures to withstand the effects of external flooding, with respect to the highest flood and groundwater levels specified for the facility. The seismic Category I structures, systems, and components (both reactor and radioisotope process) identified in Atomic Alchemy FSAR Chapter 3 Table 3.02-02 are designed to withstand the effects of flooding due to natural phenomena.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 3.5.1.1, Rev 3 Internally Generated Missiles (Outside Containment)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.4 SRP 13a2.1.7	GDC 4, R.G. 1.115, R.G. 1.117	Acceptable

Summary Description of Compliance/Exceptions

SRP 3.5.1.1 – General description: this SRP addresses internally generated missiles from component overspeed failures, missiles that could originate from high-energy fluid systems failures, and missiles caused by or as a consequence of gravitational effects occurring in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The VIPR core is located at the bottom of a light water pool, inside a confinement module building; it does not have an exterior containment structure. The reactor confinement structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards. In other instances where the VIPRs or radioisotope processes may experience similar internal missile transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.115, positions C.1 C.2, and C.5 – Not applicable; the VIPR is a non-power reactor, therefore it does not have a turbine generator.

Regulatory Guide 1.115, positions C3 and C.4 – Acceptable. Atomic Alchemy FSAR Appendix 3.D, "Structures Monitoring Program" was developed from guidance from ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures". The program includes periodic visual inspection of structures and structural components for the detection of aging effects specific for that type of structure. Therefore, barriers protecting essential SSCs are also periodically examined for any degradation mechanisms of comparable significance such as high-cycle fatigue, low-cycle fatigue, and stress-corrosion cracking.

Regulatory Guide 1.117, positions C.1 through C.3 – Acceptable; the VIPR coolant system is open to the atmosphere, and the only coolant boundary is the piping itself, which is ASME III Class 1. The reactor is located at the bottom of a pool and the decay heat removal is passive. The reactor confinement module building structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards.

See FSAR Chapter 3, Section 5 for a description of missile protection design features and analysis.

NUREG-0800 SRP 3.5.1.2, Rev 3 Internally Generated Missiles (Inside Containment)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.4 SRP 13a2.1.7	GDC 4	Acceptable
Summary Description of Compliance/Exceptions		
SRP 3.5.1.2 – General description: this SRP addresses internally generated missiles from component overspeed failures, missiles that could originate from high-energy fluid systems failures, and missiles caused by or as a consequence of gravitational effects occurring in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy reactor core confinement does not have an interior or exterior containment structure. In other instances where the VIPR reactors or radioisotope processes may experience similar type internal missile transients the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. Atomic Alchemy analyzes potential missiles inside the confinement module deterministically using industrial lessons learned. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. See FSAR Chapter 3, Section 5 for a description of missile protection design features and analysis.		

NUREG-0800 SRP 3.5.1.3, Rev 3 Turbine Missiles

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	R.G. 1.115	N/A
Summary Description of Compliance/Exceptions		
SRP 3.5.1.3 – General description: this SRP addresses internally generated missiles from turbine operations only in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The VIPR is a non-power reactor which does not have a turbine; therefore, this SRP is not applicable.		

NUREG-0800 SRP 3.5.1.4, Rev 4 Missiles Generated by Tornados and Extreme Winds

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.1, SRP 2.3, SRP 3.2,	GDC 2, GDC 4, R.G. 1.76, R.G. 1.117, R.G. 1.221	Acceptable

SRP 13a2.1.6		

Summary Description of Compliance/Exceptions

SRP 3.5.1.4 – General description: this SRP addresses missiles from extreme winds and tornados occurring in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPRs and radioisotope process building structures may experience similar type extreme wind or tornado driven missile transients the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. The reactor cores are located in light water pools which are situated partially below grade. The radioisotope processes take place in building structures that are partially shielding by other building structures. The reactor and process module buildings are Seismic Cat-I, built to ACI 349, and AISC-N690 standards. Because the Atomic Alchemy facility is built in phases, additional potential missiles from construction evolutions are factored into the analysis and design of the safety related module buildings.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, GDC 4, – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.76, position C.1 and C.2 – Acceptable. The following parameter values are applied to the analysis for the Atomic Alchemy facility (region III):

- Maximum wind speed - 160 mph
- Translational speed - Maximum 32 mph
- Maximum rotational speed – 128 mph
- Radius of maximum rotational speed – 150 feet
- Atmospheric pressure drop – 0.6 psi
- Rotational speed - Maximum 240 mph
- Rate of pressure drop - 0.2 psi/sec.

Atomic Alchemy uses the design basis missiles presented in table 2 from this regulatory guide in analyses.

Regulatory Guide 1.117, positions C.1 through C.3 – Acceptable; the VIPR coolant system is open to the atmosphere and the only coolant boundary is the piping itself, which is ASME III Class 1. The reactor is located at the bottom of a pool and the decay heat removal is passive. The reactor confinement module building structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards.

Regulatory Guide 1.221, guidance positions C.1 and C.2 – Not applicable; the location of the Atomic Alchemy facility is not postulated to be subjected to hurricane conditions, any migrating hurricane into the interior areas of the United States would become tropical storms at best with wind speeds less than 75 mph, while tornados may form from these tropical storms, Atomic Alchemy addresses missiles created by extreme winds and tornados based on the criteria in regulatory guide 1.76.

See FSAR Chapter 3, Section 5 for a description of missile protection design features and analysis.

NUREG-0800 SRP 3.5.1.5, Rev 4 Site Proximity Missiles (Except Aircraft)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.2	GDC 4	Acceptable
Summary Description of Compliance/Exceptions		
SRP 3.5.1.5 – General description: this SRP addresses missiles from other sources occurring in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The location of the Atomic Alchemy facility will be situated on [ ] PROP Additionally, the difference in the level of risk and challenges to the Atomic Alchemy facility's safety limits are significantly less than either a PWR or BWR. Because the Atomic Alchemy facility is built in phases, additional potential missiles from construction evolutions are factored into the analysis and design of site proximity missiles in the safety related module buildings. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.		

NUREG-0800 SRP 3.5.1.6, Rev 4 Aircraft Hazards

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.2	GDC 3, GDC 4, R.G. 1.117	Acceptable
Summary Description of Compliance/Exceptions		
SRP 3.5.1.6 – General description: this SRP addresses the potential hazards from aircraft impacts occurring in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. At this point in the development of the design basis accidents of the Atomic Alchemy facility, it is being conservatively assumed that while it is extremely low, there could be a potential risk from aircraft impact, and appropriate analyses will be conducted. In instances where the VIPRs and radioisotope process building structures may experience similar type of risk from aircraft impact transients the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.		

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 3 and 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. SRP 3.5.1.6, Acceptance Criteria II.1.A, B, and C – Acceptable; [ ] PROP SRP 3.5.1.6, Acceptance Criteria II.2 – Acceptable; Atomic Alchemy will perform an Aircraft Impact Analysis. Regulatory Guide 1.117, positions C.1 through C.3 – Acceptable; the VIPR coolant system is open to the atmosphere and the only coolant boundary is the piping itself, which is ASME III Class 1. The reactor is located at the bottom of a pool and the decay heat removal is passive. The reactor confinement module building structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards.

NUREG-0800 SRP 3.5.2, Rev 3 Structures, Systems, and Components to be Protected from Externally Generated Missiles

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.2, SRP 3.2, SRP 3.4, SRP 3.5 SRP 13a2.1.6	GDC 2, GDC 4, R.G. 1.13, R.G. 1.27, R.G. 1.115, R.G. 1.117	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.5.2 – General description: this SRP addresses externally generated missiles from other sources (in addition to any evaluated in SRP 3.5.1.4 and SRP 3.5.1.5) for potential impact on SSCs which occur in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPR and radioisotope process systems, structures, and components may experience similar missile transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. Because the Atomic Alchemy facility is built in phases, additional potential missiles from construction evolutions are factored into the analysis and design		

of the safety related structures, systems, and components in both the reactor modules and radioisotope process related modules.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.13, position C.2 – Acceptable; with respect to this SRP, only position C.2 is applicable and will be addressed. Each NPUF reactor core and its respective spent fuel are located in a common light water pool. The spent fuel sits in a lower cavity below the level of the core at the opposite end of the pool. The spent fuel pool is therefore located in the same confinement building module as the reactor which is classified as a Seismic Category I structure conforming to Regulatory Guide 1.29.

Regulatory Guide 1.27 – Exceptions as noted; the light water reactor and spent fuel pools are the UHS. The Atomic Alchemy Facility can also utilize the volume of light water contained in the transfer canal system (TTW) as its "emergency core cooling" type system (designated as Reactor Decay Heat Removal – DHR). Components of the TTW system that provide the ECC function are designated as a safety related DHR component. The volume of water stored in the transfer canal is sufficient for decay heat removal for 72 hours should it be needed. After 72 hours the remaining volume of the light water pools can dissipate the decay heat of both the reactor and the spent fuel pools for 30 days. Atomic Alchemy takes an exception to full functional testing—see response to GDC 46, in FSAR Chapter 3, Appendix F. Nevertheless, Atomic Alchemy meets the intent of this regulatory guide.

Additionally, the TTW system also includes a non-safety-related makeup water storage tank with the capacity to refill the transfer canal by operator action if needed.

Regulatory Guide 1.115 – the Atomic Alchemy facility is a nonpower reactor, therefore it does not have a turbine generator.

Regulatory Guide 1.117, positions C.1 through C.3 – Acceptable; the VIPR coolant system is open to the atmosphere and the only coolant boundary is the piping itself, which is ASME III Class 1. The reactor is located at the bottom of a pool and the decay heat removal is passive. The reactor confinement module building structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards.

<u>NUREG-0800 SRP 3.5.3, Rev 3 Barrier Design Procedures</u>

<u>NUREG-1537 part 2, SRP Number</u>	<u>Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs</u>	<u>Atomic Alchemy Position</u>
SRP 3.4, SRP 3.5	GDC 2, GDC 4, R.G. 1.69, R.G. 1.76, R.G. 1.142	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 3.5.3 – General description: this SRP addresses the design of seismic Category I structures, shields, and barriers to withstand the effects of missile impact occurring in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The thicknesses of the exterior walls above grade and of the roof of the Atomic Alchemy reactor, reactor auxiliary, and radioisotope process module buildings are 15-18 inches and 10-12 inches, respectively. The roof is constructed using left-in-place metal deck. These thicknesses conservatively exceed the minimum thicknesses for Region III tornado missiles specified in Standard Review Plan 3.5.3.

The Atomic Alchemy facility will comply with this SRP's acceptance criteria with the exception that the operating basis earthquake (OBE) is excluded from the design basis.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

SRP 3.5.3, Acceptance Criteria II.1.A, II.1.B, and II.1.C – Acceptable; the Atomic Alchemy structural and barrier design uses the latest version of industry standards N-690 for maximum allowable ductility ratios for steel and reinforced concrete barriers. This version is not endorsed by a regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in SRP 3.5.3.

SRP 3.5.3, Acceptance Criteria II.2 – Acceptable; see Atomic Alchemy's conformance to regulatory guide 1.142 below.

Regulatory Guide 1.76, position C.1 and C.2 – Acceptable. The following parameter values are applied to the analysis for the Atomic Alchemy facility (Region III):

- Maximum wind speed - 160 mph
- Translational speed - Maximum 32 mph
- Maximum rotational speed – 128 mph
- Radius of maximum rotational speed – 150 feet
- Atmospheric pressure drop – 0.6 psi
- Rotational speed - Maximum 240 mph
- Rate of pressure drop - 0.2 psi/sec.

Atomic Alchemy uses the design basis missiles presented in Table 2 from this regulatory guide in accident analyses.

Regulatory Guide 1.142, position C.1 through C.7 – Exceptions as noted; the Atomic Alchemy design uses the latest version of industry standards ACI-318, ACI-349 and ACI-359. These versions are not endorsed by a regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide 1.142. Some portions of the regulatory guide are not applicable, for example criteria for the sizing of drywell containments, divider barrier of ice-condenser containments, or the drywell floor thicknesses. Atomic Alchemy will use good engineering

judgment and conservative assumptions in applying the standard to the design of the safety related structure module buildings. Because the Atomic Alchemy facility is built in phases, additional hydrodynamic, seismic, and other construction loads are factored into the design of the safety related module buildings.

NUREG-0800 SRP 3.6.1, Rev 3 Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.2, SRP 3.1, SRP 3.4, SRP 3.5, SRP 5.2, SRP 13a2.1.7	GDC 2, GDC 4	Exceptions as noted
Summary Description of Compliance/Exceptions		

SRP 3.6.1 – General description: this SRP addresses the failure of high energy and moderate energy fluid system piping located outside of containment that are postulated to occur in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPRs and radioisotope process systems, structures, and components may experience similar piping rupture transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

The tables in this SRP section contain lists of systems typically required for safe shutdown as well as typical high and moderate energy systems outside containment in a PWR or BWR. The Atomic Alchemy NUPF does not have most of the systems included in the SRP table. Safe Shutdown for the VIPR is achieved passively. No active pressurized systems that could experience a postulated failure are necessary for the safe shutdown of the VIPR. For those systems identified in the Table that are similar to the Atomic Alchemy design that are located outside the confinement building, a leak before break analysis is performed on all ASME Class 1 and 2 systems and a pipe break hazards evaluation is part of the Atomic Alchemy piping design for all other high and moderate energy systems (as defined in the FSAR Chapter 3, Table 3.09-01).

The design of the confinement module building prevents the rapid, uncontrolled release of radioactive material to the environment. The reactor confinement module building establishes an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and assures that the design conditions important to safety are not exceeded for as long as postulated accident conditions require.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 3.6.2, Rev 3 Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.4, SRP 3.5, SRP 5.2, SRP 13a2.1.7	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 4	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 3.6.2 – General description: this SRP addresses the criteria used to define break and crack locations and configurations in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPRs and radioisotope process related piping may be susceptible to similar rupture criteria the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

The Atomic Alchemy facility has only a few piping systems that are determined to be high energy or moderate energy (See FSAR Table 3.06-01 for a list). High energy and moderate energy piping are also analyzed for breaks, with a pipe break hazards evaluation as part of the piping design. The evaluation was performed for high and moderate energy piping to confirm the protection of systems, structures, and components which are required to be functional during and following a design basis event. The locations of the postulated ruptures and essential targets will be established along with determining if any pipe whip restraints and jet shield designs are needed.

Dynamic effects need not be considered for those segments of piping that are shown mechanistically, within a large margin, not to be susceptible to a pipe rupture.

The methodology for this determination is called leak-before-break (LBB). Atomic Alchemy has incorporated this evaluation methodology into its ASME III, Class 1 and Class 2 piping design.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 4 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 3.6.3, Rev 1 Leak-Before-Break Evaluation Procedures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5, SRP 5.2	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 4, GDC 14, R.G. 1.45, R.G. 1.89	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 3.6.3 – General description: this SRP addresses the use of analyses to eliminate from the design basis the dynamic effects of the pipe ruptures postulated in SRP 3.6.2. The use of mechanistic pipe break criteria permits the elimination of the evaluation of dynamic effects of sudden circumferential and longitudinal pipe breaks in the design basis analysis of structures, systems, and components. General Design Criterion 4 of Appendix A, 10 CFR Part 50 allows the use of analyses to eliminate from the design basis the dynamic effects of pipe ruptures. Piping systems are designed and analyzed for Levels A, B, and C service conditions and corresponding service level requirements to the rules of the ASME Code, Section III. Atomic Alchemy adopts this allowance in its Principal Design Criteria 4. The mathematical models used in the seismic analyses of the ASME Code, Section III Class 1, 2, and 3 piping systems lines are also used for pipe rupture effect analysis. Most of the equipment required for plant safety or safety-related shutdown is located inside the reactor confinement module or the reactor auxiliary module. This piping represents the most significant piping relative to plant safety and, therefore, is subject to the most stringent design and analysis requirements.

The Atomic Alchemy facility has only a few piping systems that are determined to be high energy (See FSAR Table 3.06-01 for a list). Atomic Alchemy high energy and moderate energy piping is also analyzed for breaks. A pipe break hazards evaluation is part of the Atomic Alchemy piping design. The evaluation was performed for high and moderate energy piping to confirm the protection of systems, structures, and components which are required to be functional during and following a design basis event. The locations of the postulated ruptures and essential targets will be established along with determining if any pipe whip restraints and jet shield designs are needed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 4, 14 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.45, positions C.1.1 through C.2.5 – Acceptable. The Atomic Alchemy NPUF reactor coolant boundary leakage detection systems are selected and designed in accordance with the guidelines of this regulatory guide.

Regulatory Guide 1.45, positions C.3.1 through C.3.4 – Acceptable; see FSAR Chapter 13, Appendix A, RCS System Leak Detection Program.

Regulatory Guide 1.45, position C.4 – Acceptable; see Technical Specifications LCO 3.4.6 "RCS Operational Leakage". For application to ASME Class 3 and non-ASME piping, the piping, supports, and structures have been designed with sufficient margins against failure for SSE transients, with adequate preservice and in-service inspection requirements to be specified either in the Atomic Alchemy ISI/IST program or the Maintenance Rule program (see FSAR Chapter 13, Appendix A). Adjacent structures and components where failure could lead to an indirect piping failure of a system important to safety are also designed as Seismic Cat-II. Regulatory Guide 1.89, position C.1 – Exceptions as noted; this guide has not been revised since 1984 and endorses a 1970's version of an industry standard. See FSAR Chapter 3, Table 3.11-01 "Environmentally Qualified Electrical and Mechanical Equipment". Atomic Alchemy mechanical and electrical components identified in Table 3.11-01 are qualified by design to perform their required functions under the appropriate environmental effects of normal, abnormal, accident, and post-accident conditions as required by Principal Design Criterion 4 and as discussed in FSAR Chapter 3, Appendix 3E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment". For mild environments, the area conditions are postulated not to change as a result of a transient identified in the Chapter 15 accident analysis. There are no degrading environmental effects that lead to common mode failure of equipment in mild environments. Mechanical and electrical equipment located in harsh environmental zones are designed to perform under the appropriate environmental conditions defined for those area. Regulatory Guide 1.89, position C.2, C.3, C.4, C.5 – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-323. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide. Regulatory Guide 1.89, position C.6, C.7 – Acceptable; Atomic Alchemy QAPD, Criterion VII, Section 7.9, addresses like for like replacements of components. Sub compartment pressurization loads are not a design consideration of the reactor confinement building. A compartment or room over-pressurization event is not a credible transient in the Atomic Alchemy FSAR chapter 15 accident analysis.

NUREG-0800 SRP 3.7.1, Rev 4 Seismic Design Parameters

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.1, SRP 3.4, SRP 3.5, SRP 13a2.1.6	10 CFR 50, Appendix S, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), R.G. 1.60, R.G. 1.61, R.G. 1.208	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.7.1 – General description: this SRP addresses the criteria used to specify earthquake design ground motions that are exerted on the plant structures and used in soil-structure interaction (SSI)		

analyses in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Some of the SRP's acceptance criteria is not applicable to the Atomic Alchemy facility, as its license application is not a DC, ESP or COL and only the criteria of 10 CFR Part 50 Appendix S is applicable to Atomic Alchemy's design. The Ground Motion Response Spectra (GMRS) are site-specific. The location of the Atomic Alchemy facility will be situated on [

] PROP The specific location has not been determined. For preliminary design, the operating basis earthquake is selected to be one-third the safe shutdown earthquake. Since this option is selected, explicit design and analysis of the facility structure for the operating basis earthquake ground-motion is not required. The OBE therefore is not a design input and only the SSE is used. For preliminary design, the safe-shutdown earthquake response spectrum is developed using the procedures of ASCE 7, "Minimum Design Loads for Buildings and Other Structures". See FSAR Figures 3.07-01 and 3.07-02 for the Horizontal Design Response Spectra Safe Shutdown Earthquake and Vertical Design Response Spectra Safe Shutdown Earthquake, respectively.

10 CFR 50, Appendix S – Acceptable; with respect to this SRP applicability, the Atomic Alchemy facility design will conform to the requirement to withstand the effects of natural phenomena, such as earthquakes, without loss of capability of SSCs to perform their safety functions. Thresholds are established in procedures for actions required of the plant operators after an earthquake has occurred. Recordings from the seismic monitoring system are evaluated against the SSE design basis for the safety related structures and equipment. See FSAR Chapter 3, Appendix 3.G, "Atomic Alchemy Nuclear Island Seismic Analysis".

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.60, position C.1 and C.2 – Acceptable; see FSAR Chapter 3, Section 7 for Atomic Alchemy's design considerations and seismic analysis criteria. FSAR Chapter 3, Appendix 3-G will describe the nuclear island seismic models.

Regulatory Guide 1.61, positions C.1 through C.5 – Acceptable; damping values used in the Atomic Alchemy SSE analyses are shown in FSAR Chapter 3, Sections 7 "Seismic Design and Qualifications".

Regulatory Guide 1.208, positions C.1 through C.1.5, positions C.2.1 through C.2.33, positions C.3.1 through C.3.5, positions C.4. through C.4.3, positions C.5 through C.5.4 – Exceptions as noted; Atomic Alchemy construction license is submitted under 10 CFR Part 50, a deterministic approach is used for the design of the reactors. However, the location of the Atomic Alchemy facility will be situated on [

] PROP See FSAR Chapter 2, Section 5 for a description of the seismology geology of the site.

NUREG-0800 SRP 3.7.2, Rev 4 Seismic System Analysis

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.1, SRP 3.4	10 CFR 50, Appendix S, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, R.G. 1.92, R.G. 1.122	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.7.2 – General description: this SRP addresses the criteria used to specify earthquake design ground motions that are exerted on the plant structures and used in soil-structure interaction (SSI) analyses in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy's seismic analysis of structures and analytical modeling will follow the requirements of ASCE 4-98, "Seismic Analysis of Safety-Related Nuclear Structures and Commentary" and ASCE 43, "Seismic Design Criteria for Structures, Systems, And Components in Nuclear Facilities". FSAR Chapter 3, Section 8 "Design of Seismic Category I Structures" will describe the procedures used for analytical modeling Atomic Alchemy Seismic Category I SSCs. Also see FSAR Chapter 3, Appendix G, "Atomic Alchemy Nuclear Island Seismic Analysis". 10 CFR 50, Appendix S – Acceptable; with respect to the applicability of this SRP, the Atomic Alchemy facility design will conform to the requirement to withstand the effects of natural phenomena, such as earthquakes, without loss of capability of SSCs to perform their safety functions. Thresholds are established in procedures for actions required of the plant operators after an earthquake has occurred. Recordings from the seismic monitoring system are evaluated against the SSE design basis for the safety related structures and equipment. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.92, guidance positions C.1, C.2 and C.3 – Acceptable; for preliminary design, for the safe-shutdown earthquake the response spectrum method is used, using the procedures of ASCE 7.		

Regulatory Guide 1.122, positions C.1 and C.2 – Acceptable; In-structure response spectra are determined using ASCE 4 and the guidance in this regulatory guide.

NUREG-0800 SRP 3.7.3, Rev 4 Seismic Subsystem Analysis

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.1, SRP 3.4	10 CFR 50 Appendix S, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.7.3 – General description: this SRP addresses the criteria used to analyze all seismic Category I substructures in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Exceptions to this SRP are as noted: Seismic analysis of structures and analytical modeling will follow the requirements of ASCE 4-98, “Seismic Analysis of Safety-Related Nuclear Structures and Commentary” and ASCE 43, “Seismic Design Criteria for Structures, Systems, And Components in Nuclear Facilities”. FSAR Chapter 3, Section 8 “Design of Seismic Category I Structures” will describe the procedures used for analytical modeling Atomic Alchemy Seismic Category I SSCs. The Operating Basis Earthquake (OBE) has been eliminated as a design requirement. Adjacent non-Category I seismic systems are evaluated to assure that the required functions of Category I seismic systems are maintained. This includes integrity or operability or both for the Category I systems. Cyclic stresses due to earthquakes are included in the design of those items sensitive to fatigue. Analysis methods and allowable stresses assure that there is margin above the SSE. The number of fractional vibratory cycles are derived from IEEE-344-2004. The Atomic Alchemy facility does not have any direct buried Seismic Category I piping, conduit, or tunnels. Above ground tanks are analyzed using ASCE 4. See FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933) for any design issues that are technically relevant to the seismic design of the Atomic Alchemy facility. See FSAR Chapter 3, Section 10, “Seismic and Dynamic Qualifications of Seismic Category I Mechanical and Electrical Equipment” for descriptions of how seismic Category I items are capable of performing their designated safety-related functions under the full range of normal and accident (including seismic) loadings. 10 CFR 50, Appendix S – Acceptable; with respect to the applicability of this SRP, the Atomic Alchemy facility design will conform to the requirement to withstand the effects of natural phenomena, such as earthquakes, without loss of capability of SSCs to perform their safety functions. Thresholds are		

established in procedures for actions required of the plant operators after an earthquake has occurred. Recordings from the seismic monitoring system are evaluated against the SSE design basis for the safety related structures and equipment. GDC 2 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 3.7.4, Rev 3 Seismic Instrumentation

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.4, SRP 3.5, SRP 7.1, SRP 7.6	10 CFR 50 Appendix S, Paragraph IV(a)(3), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), R.G. 1.12, R.G. 1.166	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 3.7.4– General description: this SRP addresses seismic instrumentation to determine that the seismic instrumentation system provided for the plant is acceptable in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy mechanical and electrical components identified in FSAR Table 3.11-01 are qualified by design to perform their required functions under the appropriate environmental effects of normal, abnormal, accident, and post-accident conditions as required by Principal Design Criterion 4 and as discussed in FSAR Chapter 3, Appendix E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment". Atomic Alchemy takes exceptions to the placement of seismic instrumentation of regulatory guide 1.12, in that there is no containment structure for the Atomic Alchemy reactors. Instead, instrumentation is located within the reactor confinement and auxiliary reactor module buildings. Additional seismic instrumentation is also located in radioisotope process module buildings. The placement of these instruments is consistent with maintaining occupational radiation exposures as low as reasonably achievable (ALARA) for these locations. Atomic Alchemy will provide administrative controls for the operation, maintenance, testing and inspections for these instruments in Technical Requirements Manual Program 5.6.11, "Seismic Instrumentation Program". 10 CFR Part 50, Appendix S, Paragraph IV(a)(3), IV(a)(4) – Exceptions as noted; the OBE is not used in the design. The criterion for initiating a plant shutdown following a seismic event will be the exceedance of a specified response spectrum limit or a cumulative absolute velocity limit. The seismic instrumentation system is capable of computing the cumulative absolute velocity. Atomic Alchemy procedures for activities following an earthquake will be used to accurately determine both		

the response spectrum and the cumulative absolute velocity of the recorded earthquake ground motion from the seismic instrumentation system. The procedures and the data from the seismic instrumentation system will provide sufficient information to guide the operator on a timely basis to determine if the level of earthquake ground motion requiring shutdown has been exceeded. Regulatory Guide 1.12, position C.1 through C.9 – Exceptions as noted above; See FSAR Chapter 7, Section 3 for a description of the Atomic Alchemy Seismic Instrumentation Monitoring System (ISM). See Atomic Alchemy seismic instrumentation program in Technical Requirements Manual section 5.6.11 and FSAR Chapter 3, Appendix B. Regulatory Guide 1.166, regulatory guidance positions C.1 through C.8 – Acceptable; see Atomic Alchemy seismic instrumentation program in Technical Requirements Manual section 5.6.11 and FSAR Chapter 3, Appendix B. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 3.8.1, Rev 4 Concrete Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy NPUF does not have a concrete containment structure. It has a confinement building and therefore this is not applicable to the Atomic Alchemy facility.		

NUREG-0800 SRP 3.8.2, Rev 3 Steel Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 3.8.2– General description: this SRP addresses steel containments or to other Class MC steel portions of steel/concrete containments in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy NPUF does not have a steel containment structure. It has a confinement module building and therefore this is not applicable to the Atomic Alchemy facility. Atomic Alchemy VIPRs are not located within a metal containment shell. Other component requirements that have been determined to be required to conform with ASME Code Class MC will be identified in FSAR Chapter 3, Section 9, “Mechanical Systems and Components” which addresses the five operating conditions, (as defined in ASME Code, Section III), that are considered in the		

design of the Atomic Alchemy Quality Assurance Class A, B, and C components, their supports, reactor confinement module building, reactor auxiliary module building, reactor core and light water pool internals.

Atomic Alchemy FSAR Chapter 3, Appendix D, "Structures Monitoring Program" was developed from guidance from ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures". The program includes periodic visual inspection of structures and structural components for the detection of aging effects specific for that type of structure. Therefore, barriers protecting essential SSCs are also periodically examined for any degradation mechanisms of comparable significance such as high-cycle fatigue, low-cycle fatigue, and stress-corrosion cracking. These periodic surveillances for structural components relied upon for confinement structural integrity are based on ASME Code, Section XI, Subsection IWE criterion.

NUREG-0800 SRP 3.8.3, Rev 4 Concrete and Steel Internal Structures of Steel or Concrete Containments

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.4, SRP 3.5, SRP 4.4,	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 50, R.G. 1.57, R.G. 1.94, R.G. 1.142, R.G. 1.199	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 3.8.3– General description: this SRP addresses major containment internal structures in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. PWR and BWR internal structures are not similar to the Atomic Alchemy reactor confinement module structures. Components like Weir Walls, Drywells, Secondary Shield Walls do not exist in the Atomic Alchemy design. In instances where the reactor module and radioisotope process module buildings have similar or related structures, the difference in the level of risk and challenges to these structures and the facility's safety limits are significantly less than either a PWR or BWR.

The VIPR core is located at the bottom of a light water pool, inside a confinement module building structure. It does not have an exterior containment structure; the reactor confinement module building structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards. Other component requirements that have been determined required to conform with ASME Code Class MC are identified in FSAR Chapter 3, Section 9, "Mechanical Systems and Components."

The Atomic Alchemy seismic analysis does not use an OBE, only the SSE. All loads and load combinations on concrete structures are to be in accordance with the latest revision of ACI 349. Cyclic stresses due to earthquakes are included in the design of those items sensitive to fatigue.

Analysis methods and allowable stresses assure that there is margin above the SSE. All loads and load combinations on steel structures are to be in accordance with the latest revision of N690.

The seismic analysis of structures and analytical modeling will follow the requirements of ASCE 43, "Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities." FSAR Chapter 3, Section 8 "Design of Seismic Category I Structures" will describe the procedures used for analytical modeling Atomic Alchemy Seismic Category I SSCs like the reactor core pedestal, reactor coolant plenum, and supports.

The Atomic Alchemy QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1-2017 standard.

10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect that SSCs be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 5, 50 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.57, Guidance Position C.I.A through C.I.C – Exceptions as noted; VIPRs are not located within a metal containment shell. Other component requirements that have been determined to conform with ASME Code Class MC are identified in FSAR Chapter 3, Section 9, "Mechanical Systems and Components" which addresses the five operating conditions, (as defined in ASME Code, Section III), that are considered in the design of the Atomic Alchemy Quality Assurance Class A, B, and C components, their supports, and reactor core and light water pool internals.

Regulatory Guide 1.57, Guidance Position C.I.D – Not applicable; Atomic Alchemy NPUF reactors are not located within a metal containment shell.

Regulatory Guide 1.57, Guidance Position C.II – Not applicable; Atomic Alchemy does not use bellow type expansion joints in the design.

Regulatory Guide 1.57, Guidance Position C.III, A, B, C, D – Not applicable; the Atomic Alchemy core is located in an open light water pool inside a confinement building. There is no cylindrical or other shaped steel containment structure.

Regulatory Guide 1.69, positions C.1 through C.3 – Acceptable. See FSAR chapter 12, Section 3 for radiation protection design features and shielding design methodology.

Regulatory Guide 1.94, positions C.1 through C.4 – Acceptable; Category I concrete structures will be designed to ACI-349. ACI-349 includes Appendix B which will be used for anchorage to concrete. Category I steel structures will be designed to AISC-N690. Where appropriate the design of steel structures will incorporate provisions from the more recent AISC codes. These codes are generally similar to those in the SRP but have not been endorsed by NRC.

Regulatory Guide 1.136, guidance positions C.1 through C.17 – Not applicable; this regulatory guide addresses loading, construction, and testing of concrete reactor containments. The Atomic alchemy reactor core is located within a reinforced concrete light water pool that is aluminum lined. The Atomic Alchemy light water pool is a safety class A, seismic Category I component. Inservice inspection of the light water pool will be performed. The pool is constructed to latest revision of American Concrete Institute (ACI), "Code Requirements for Nuclear Safety Related Structures", ACI-349-01. Related reactor confinement module and reactor auxiliary module steel structures are constructed to latest revision of American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication and Erection of Steel Safety Related Structures for Nuclear Facilities", AISC-N690. Deterministic severe accident loading is evaluated in the design of the light water pool.

Regulatory Guide 1.142, position C.1 through C.7 – Exceptions as noted; the Atomic Alchemy design uses the latest version of industry standards ACI-318, ACI-349 and ACI-359. These versions are not endorsed by a regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide 1.142. Some portions of the standards are not applicable, such as criteria for the sizing of drywell containments, divider barrier of ice-condenser containments, or the drywell floor thicknesses. Atomic Alchemy will use good engineering judgment and conservative assumptions in applying the standard to the design of the safety related structure module buildings. Because the Atomic Alchemy facility is built in phases, additional hydrodynamic, seismic, and other construction loads are factored into the design of the safety related module buildings.

Regulatory Guide 1.160, positions C.1 through C.4 – Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance.

Regulatory Guide 1.199, regulatory guidance position C.1 through C.4 – Acceptable. the Atomic Alchemy design uses the latest version of industry standards referenced in the R.G. These versions are not endorsed by a regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide 1.199.

Regulatory Guide 1.221, guidance positions C.1 and C.2 – Not applicable; the location of the Atomic Alchemy facility is not postulated to be subjected to hurricane conditions, any migrating hurricane into the interior areas of the United States would become tropical storms at best with wind speeds less than 75 mph, while tornados may form from these tropical storms, Atomic Alchemy addresses missiles created by extreme winds and tornados based on the criteria in regulatory guide 1.76.

The Atomic Alchemy will comply with the SRP Acceptance Criteria with the exception that the operating basis earthquake is excluded.

NUREG-0800 SRP 3.8.4, Rev 4 Other Seismic Category I Structures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.4, SRP 3.5, SRP 4.2, SRP 4.2.2 SRP 4.4	10 CFR 50.55a, 10 CFR 50.65, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1,GDC 2, GDC 4, GDC 5, R.G. 1.69, R.G. 1.91, R.G. 1.115, R.G. 1.127, R.G. 1.136, R.G. 1.142, R.G. 1.143, R.G. 1.160, R.G. 1.199, R.G. 1.221 NUREG/CR-6486	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 3.8.4– General description: this SRP addresses all seismic Category I structures other than the reactor containment and its interior structures, and other structures important to safety that may not be classified as seismic Category I. Structures described in this SRP such as the containment enclosure building, control building, reactor auxiliary building would be similar to the Atomic Alchemy reactor confinement module, reactor auxiliary module, radioisotope process module, and the administration & support module buildings.

The Atomic Alchemy complies with the SRP Acceptance Criteria with the exception that the operating basis earthquake is excluded.

10 CFR 50.55a – Acceptable; Atomic Alchemy's conformance to the inspection requirements of 10 CFR 50.55a, as detailed in Section XI of the ASME Code, is met for all ASME Class pressure-containing components (and their supports). See FSAR Chapter 5, Section 2, "Integrity of Reactor Coolant System Boundary" for a description of the functional design and in-service testing & inspection requirements of the RCS components that comprise the reactor coolant boundary.

10 CFR 50.65, Regulatory Guide 1.160, positions C.1 through C.4 - acceptable, the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part X, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance. Atomic Alchemy will assemble an Expert Panel (QAPD Section 2.1.10) that will determine the SSCs to be included in its Maintenance Rule program. The program applies to safety-related and non-safety-related SSCs identified as being significant to safety. A deterministic approach and industry lessons learned is used as the guide in the analysis to determine the safety significance of non-safety-related components and systems.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 5 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.69, positions C.1 through C.3 – Acceptable. See FSAR chapter 12, Section 3 for radiation protection design features and shielding design methodology.

Regulatory Guide 1.91, guidance C.1 through C.3 – the analysis of potential nearby explosive materials will conform to the guidance in this regulatory guide. The location of the Atomic Alchemy facility will be situated on [ ]^{PROP} (which has evaluated the potential effects of all site-related consequences of radiological effluent release limits, seismology, meteorology, geology, hydrology, and other hazards identified in 10 CFR 100.20(b)).

Regulatory Guide 1.94, positions C.1 through C.4 – Acceptable; Category I concrete structures will be designed to the latest revision of ACI-349. ACI-349 includes Appendix B which will be used for anchorage to concrete. Category I steel structures will be designed to the latest revision of AISC-N690. Where appropriate the design of steel structures will incorporate provisions from the more recent AISC codes. These codes are generally similar to those in the relevant regulatory guides but have not been endorsed by NRC.

Regulatory Guide 1.115, positions C.1 C.2, and C.5 – Not applicable; the VIPR is a non-power reactor and therefore does not have a turbine generator.

Regulatory Guide 1.115, positions C3 and C.4 – Acceptable. Atomic Alchemy FSAR Appendix 3.D, "Structures Monitoring Program" is being developed from guidance from ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures". The program includes periodic visual inspection of structures and structural components for the detection of aging effects specific for that type of structure. Therefore, barriers protecting essential SSCs are also periodically examined for any degradation mechanisms of comparable significance such as high-cycle fatigue, low-cycle fatigue, and stress-corrosion cracking.

Regulatory Guide 1.127, positions C.1 through C.10 – Not applicable; Atomic Alchemy does not use dams, slopes, canals, and other water control structures and associated facilities, to impound, retain, and divert water sources for the reliable operation of emergency cooling systems. The ultimate heat sink is the light water pool located within the reactor confinement building.

Regulatory Guide 1.136, guidance positions C.1 through C.17 – Not applicable; this regulatory guide addresses loading, construction, and testing of concrete reactor containments. The VIPR core is located within a reinforced concrete light water pool that is aluminum lined. The light water pool is a safety class A, seismic Category I component. In-service inspection of the light water pool will be performed. The pool is constructed to latest revision of American Concrete Institute (ACI), "Code Requirements for Nuclear Safety Related Structures", ACI-349-01. Related reactor confinement module and reactor auxiliary module steel structures are constructed to latest revision of American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication and Erection of Steel

Safety Related Structures for Nuclear Facilities", AISC-N690. Deterministic severe accident loading is evaluated in the design of the light water pool. Severe Accidents will be addressed in FSAR Chapter 19.

Regulatory Guide 1.142, position C.1 through C.7 - The Atomic Alchemy design uses the latest version of industry standards. These versions are not endorsed by a regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide 1.142. Radwaste module building structures will be designed to ACI-318 for concrete structures and AISC-S326 for steel structures.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" will provide a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building, see FSAR Chapter 11, Sections 3-5, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. FSAR Chapter 13, Appendix A will present the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 1.199, guidance positions C.1 through C.4 – Acceptable; Atomic Alchemy uses the latest version of the ACI 349 (ACI 349-13) for the design, installation, testing, evaluation, and quality assurance of anchors used for component and structural supports in concrete.

Regulatory Guide 1.221, guidance positions C.1 and C.2 – Not applicable; the location of the Atomic Alchemy facility is not postulated to be subjected to hurricane conditions, any migrating hurricane into the interior areas of the United States would become tropical storms at best with wind speeds less than 75 mph, while tornados may form from these tropical storms, Atomic Alchemy addresses missiles created by extreme winds and tornados based on the criteria in regulatory guide 1.76.

NUREG/CR-6486 – Not applicable; while the Atomic Alchemy facility is of a modular construction type, that does not imply that portions of the module structures will be constructed elsewhere and transported to the facility. Significant loads and load combinations that may develop due to prefabrication, handling, transportation, storage, and erection of structural modules constructed elsewhere and shipped to a site are not applicable to the design, fabrication, and erection of the Atomic Alchemy facility. Likewise, related QA/QC issues are also not applicable.

NUREG-0800 SRP 3.8.5, Rev 4 Foundations

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.5, SRP 3.5	10 CFR 50.55a 10 CFR 52.47(b)(1), 10 CFR 52.80(a),	Exceptions as noted

	GDC 1, GDC 2, GDC 4, GDC 5, R.G. 1.142, R.G. 1.160, R.G. 1.206	

Summary Description of Compliance/Exceptions

SRP 3.8.5– General description: this SRP addresses the foundations of all seismic Category I structures in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy Seismic Category I structures are concrete, shear-wall structures consisting of vertical shear/bearing walls and horizontal floor slabs. The walls carry the vertical loads from the structure to the base mat. Lateral loads are transferred to the walls by the roof and floor slabs. The walls then transmit the loads to the base mat. The walls also provide stiffness to the base mat and distribute the foundation loads between them. The analyses of the base mat use finite element models of the reactor confinement module reactor, auxiliary module, radioisotope module building, and internal structures. Normal and extreme environmental loads are considered in the analysis. The normal loads include dead loads and live loads. Extreme environmental loads include the safe shutdown earthquake. Radioactive Waste module and Radioisotope Target fabrication module building structures will be designed to ACI-318-99 for concrete structures and either AISC-S326 or AISC-LRFD-1999 for steel structures.

The location of the Atomic Alchemy facility will be situated on [

] PROP

10 CFR Part 50, Appendix B, and 10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect that SSCs be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 5 -Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.206, position C.1 through C.2.20 – Not applicable; Atomic Alchemy is submitting a construction license under 10 CFR Part 50 and in accordance with Regulatory Guide 1.70.

Regulatory Guide 1.142, position C.1 through C.7 – Acceptable; the Atomic Alchemy design uses the latest version of industry standards. These versions are not endorsed by a regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide 1.142.

Regulatory Guide 1.160, positions C.1 through C.4 – Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A

and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance.

The Operating Basis Earthquake (OBE) has been eliminated as an Atomic Alchemy design requirement. The Atomic Alchemy seismic analysis design is based on a single earthquake, the safe shutdown earthquake (SSE). Cyclic stresses due to earthquakes that are less in magnitude than the SSE are included in the design of those items sensitive to fatigue. Analysis methods and allowable stresses assure that there is margin above the SSE.

See FSAR Chapter 3, Appendix 3.G, “Atomic Alchemy Nuclear Island Seismic Analysis”.

Atomic Alchemy does not include a pressure suppression containment structure.

NUREG-0800 SRP 3.9.1, Rev 4 Special Topics for Mechanical Components

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5 SRP 13a2.1.7	10 CFR Part 50 Appendix S, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 14, GDC 15, GDC 10	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 3.9.1– General description: this SRP addresses the methods of analysis and other aspects of dynamic system analysis for seismic Category I components and supports, including both those designated as American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPV Code), Section III Class 1, 2, 3, or core support and those not covered by the ASME Code in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

Atomic Alchemy will provide a high degree of integrity for safety related components and components determined to be of high value by evaluating them for design, service, and test conditions as well as including an evaluation of fatigue due to cyclic stresses. The five operating conditions, (as defined in ASME Code, Section III), are considered in the design of the Atomic Alchemy Safety Class A, B, and C components, their supports, the reactor core, and the light water pool internals. Atomic Alchemy provides the transients that are used in the design and fatigue analysis of ASME III Code Class 1 components, component supports, reactor core support structures, and reactor light water pool internal components and components that make up the reactor coolant system boundary. The majority of plant condition (PC) categorizations defined in ANS N51.1, which categorizes transients on the basis of expected frequency, are not applicable to the VIPR analyses (e.g. Boron concentration equalization, Feedwater cycling, Turbine roll test, Excessive feedwater flow, Inadvertent opening of automatic depressurization system valves, etc.). The specific transients to be considered for equipment fatigue analyses are based upon conservative engineering judgment and industry operating experience. The transients selected provide confidence that the component is appropriate for its application for a 40-year design objective.

Thermal stratification, cycling, and striping (TASCS) are phenomena that generally occur in nuclear power plants, in systems such as: feedwater piping, pressurizer spray piping, residual heat removal piping, core makeup water piping, refueling water piping, and chemical volume and control piping. The VIPR does not utilize these systems and this phenomenon is not postulated to occur in the piping systems used in the VIPR design. The stress analysis, including analysis of fatigue of the RCS piping, applicable component connections, and RCS piping and component supports, does not include the effect of thermal stratification and thermal cycling. Thermal stratification and cycling are excluded since the pressure and temperatures of the RCS system is orders of magnitude less than that of PWR or BWR system.

FSAR Chapter 3 Table 3.09-01 will provide the event and cycles for RCS system service conditions A, B, C, D, and testing. FSAR Table 3.09-02 will provide RCS pump starting/stopping conditions. FSAR Chapter 3, Table 3.09-03 will provide the minimum design loading conditions for ASME III, Class A, B, and C components under service conditions Design, A, B, C and D.

10 CFR Part 50, Appendix S – Acceptable; with respect to the applicability of this SRP, the Atomic Alchemy facility design will conform to the requirement to withstand the effects of natural phenomena, such as earthquakes, without loss of capability of SSCs to perform their safety functions. Thresholds will be established in procedures for actions required of the plant operators after an earthquake has occurred. Recordings from the seismic monitoring system will be evaluated against the SSE design basis for the safety related structures and equipment.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 14, 15 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 3.9.2, Rev 4 Dynamic Testing and Analysis of Systems, Components and Equipment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 14, GDC 15, R.G. 1.20, R.G. 1.61, R.G. 1.68, R.G. 1.92	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.9.2– General description: this SRP addresses the criteria, testing procedures, and dynamic analyses employed to ensure the structural and functional integrity of piping systems, mechanical equipment, reactor internals, and their supports under vibratory loadings, including those due to		

flow-induced excitations and postulated seismic events in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

A large majority of components specified in this SRP are not applicable to the VIPR. For example, reactor “vessel” internals, steam generator, pressurizer, feedwater piping, etc. do not comprise the design of the reactor. In instances where the reactor module and radioisotope process module buildings have similar or related piping and support structures, the difference in the level of risk and challenges to these structures by flow-induced vibration (FIV), acoustic resonance (AR), acoustic-induced vibration (AIV), mechanical-induced vibration (MIV), and the facility’s safety limits are significantly less than either a PWR or BWR.

The piping systems to be tested at the Atomic Alchemy facility include ASME Code, Section III, Class 1, 2, and 3 systems, high energy systems inside seismic Category I structures, high energy portions of systems whose failure could reduce the functioning of seismic Category I features to an unacceptable level, and the seismic Category I portions of moderate-energy piping systems. This includes ASME related instrumentation lines.

As part of pre-operational testing, Atomic Alchemy includes a Comprehensive Vibration Assessment Program (FSAR Chapter 13, Appendix A). Vibration, thermal, expansion, and dynamic effects testing will be conducted during startup functional testing for the specified high and moderate-energy piping and their supports and restraints.

The preoperational vibration testing will include measurement of responses over the range of hot functional test reactor coolant temperatures and measurement of responses for one and two reactor coolant pumps in steady state operation and during pump startup and shutdown transients.

A preservice test program, which identifies the required functional testing, will be submitted to the NRC prior to performing the tests and following the start of construction.

There are no buried Seismic Category 1 piping systems in the Atomic Alchemy facility.

10 CFR 50.55a – Acceptable; with respect to this SRP, Atomic Alchemy’s conformance to the inspection requirements of 10 CFR 50.55a, as detailed in Section XI of the ASME Code, is met for all ASME Class pressure-containing components (and their supports). See FSAR Chapter 5, Section 2, “Integrity of Reactor Coolant System Boundary” for a description of the functional design and in-service testing & inspection requirements of the RCS components that comprise the reactor coolant boundary.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 14, 15 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.20, position C.1 through C.4 – Acceptable; See FSAR Chapter 14, Section 4 “Reactor Pre-operational Testing” and FSAR Chapter 4a, Section 2 “Reactor Core and Fuel Design”.

Regulatory Guide 1.61, position C.1, through C.5 – Exceptions as noted; FSAR Chapter 3, Section 7 will provide the Atomic Alchemy damping values. The OBE is not a design input in the Atomic

Alchemy analysis, only the SSE. FSAR Table 3.07-01, "Safe Shutdown Earthquake Damping Values" provides the structural, piping, HVAC, electrical, and mechanical electrical damping values used. Atomic Alchemy will conform to the guidance in NUREG/CR-6919 for the selection of damping values.

Regulatory Guide 1.68, positions C.1 through C.9 – Exceptions as noted; 10 CFR Part 52 criterion is not applicable to the Atomic Alchemy facility, tests identified in Appendix A and Appendix C that are specific to BWR, PWR, ABWR, ESBWR, APWR or other power reactor designs and are not applicable to the Atomic Alchemy facility. Tests identified in Appendix B as pertaining to ITAAC are not applicable to the Atomic Alchemy facility. The scope of the testing performed under the Atomic Alchemy QAPD Criterion XI, Section 11.7 "Start-Up Test Program" and the "Operational Readiness Assessment Program" will demonstrate, insofar as practicable, that the overall facility can withstand the design transients and accidents.

A pre-service test program, which identifies the required functional testing for both the reactor and radioisotope processes, will be submitted to the NRC prior to performing the tests and following the start of construction. FSAR Chapter 14, Section 4 (Reactor pre-operational testing) and Section 5 (Radioisotope Process Production Pre-Operational Testing) will describe these pre-service tests. The pre-operational tests (which includes test and acceptance plans for First of a Kind (FOAK), safety related systems and components, and other systems that meet the criteria of 10 CFR 50.43(e)), will be described in these FSAR Chapter 14 sections.

The reactor startup test program begins with initial fuel loading after the preoperational testing has been successfully completed. Startup reactor testing will be grouped into four broad categories:

- Tests related to initial fuel loading.
- Tests performed after initial fuel loading but prior to initial criticality.
- Tests related to initial criticality and those performed at low power (less than 5 percent)
- Tests performed at power levels greater than 5 percent.

Each Start-Up Test described within the FSAR will contain at a minimum a description of the "Objective", "Prerequisites", "Test Methodology" and "Performance Criteria".

Atomic Alchemy will prepare "Functional Area and Baseline Inspection Readiness Reports" for the reactor and radioisotope process SSCs. These reports will form the basis for supporting the conclusion that 10 CFR 50.57(a)(1), 10 CFR 50.57(a)(2) and 10 CFR 50.57(a)(3)(ii) have been satisfied and that the applicable inspections identified in IP 69020, IP 69021, and IP 69023 have been completed and there are no outstanding issues for which Atomic Alchemy has not developed adequate corrective actions for.

Regulatory Guide 1.92, guidance positions C.1, C.2 and C.3 – Acceptable; for preliminary design, for the safe-shutdown earthquake the response spectrum method is used, using the procedures of ASCE 7.

The double end pipe rupture of the reactor coolant loop piping will not be considered in the Atomic Alchemy design basis accidents based on the application of leak-before-break analysis. See Atomic Alchemy's response to SRP 3.6.3.

Adjacent non-Category Seismic I piping systems are evaluated to assure that the required functions of Category Seismic I systems are maintained. This includes integrity or operability or both for the Category Seismic I systems. Non-Category I Seismic piping attached to Category I Seismic systems satisfy the SRP 3.9.2 guidelines.

NUREG-0800 SRP 3.9.3, Rev 3 ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5, SRP 4.2, SRP 4.2.2, SRP 4.2.5, SRP 6.2.3	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2,GDC 4, GDC 14, GDC 15, R.G. 1.124, R.G. 1.130	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.9.3– General description: this SRP addresses the structural integrity of pressure retaining components, their supports, and core support structures which are designed in accordance with the rules of the ASME BPVC Section III, Division 1 in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. A large majority of components specified in this SRP are not applicable to the VIPR. For example, reactor "vessel" internals, steam generator, pressurizer, feedwater piping, etc., do not comprise the design of the reactor. In instances where the reactor module and radioisotope process module buildings have similar or related ASME piping and support structures, the difference in the level of risk and challenges from the design and service loading combinations and the facility's safety limits are significantly less than either a PWR or BWR. Atomic Alchemy does not use any type of safety related pressure relief devices, snubbers, etc. The specific design criteria for the proper loading combinations, system operating transient, and corresponding stress limits are being utilized in the analyses. 10 CFR 50.55a – Acceptable; in the context of this SRP, Atomic Alchemy will comply with this regulation with respect to the design and service load combinations and associated stress and deformation limits specified for ASME Code Class 1, 2, and 3 components by performing the applicable analyses that ensures those systems and components important to safety are designed to the quality standards that commensurate with their importance to safety. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.		

GDC 1, 2, 4, 14, 15 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

The recommendations of Regulatory Guides 1.124 and 1.130 have been incorporated into the ASME Section III Code, Editions and Addenda. The Atomic Alchemy facility design will conform to this regulatory guide with interpretations as to maintain consistency with the ASME Code.

Regulatory Guide 1.124, positions C.1 through C.7 – Exceptions as noted above; A three-level seismic classification system is used for the Atomic Alchemy facility, seismic Category I, seismic Category II, and non-seismic. The definitions of the seismic classifications and a seismic classification listing of structures, systems, equipment, and components are presented in FSAR Chapter 3, Section 7, "Seismic Design". The component or piping and their respective supports have the same ASME Code classification. The safe shutdown earthquake damping values are used in the dynamic analysis of various structures, supports, and equipment. Atomic Alchemy will use a time history / dynamic analysis method for evaluation. This method is also used for dynamic analyses of piping systems subjected to time history hydraulic transient loadings or forcing functions induced by postulated pipe breaks. The stress limits in ASME code of any four methods of analysis (Subsection NF of Section III (1) linear elastic analysis, (2) load rating, (3) experimental stress analysis, and (4) limit analysis) are degrees of magnitude above what the Atomic Alchemy ASME III piping or components will experience. At this phase in the preliminary design (excluding I&C), only the Reactor Coolant system (RCS), Light Water Pool system (LWP), Spent Fuel system (SFP), Decay Heat Removal (DHR), Control Rod Drive Mechanism System (CRD) and the Transfer canal system (TTW) are anticipated to fall under the ASME Section III code.

Regulatory Guide 1.130 - Many of the items addressed in Regulatory Guide 1.130 have since been incorporated into later ASME Code, Section III, Editions and Addenda. The plant design will conform to this regulatory guide with interpretations as to maintain consistency with the ASME III code.

Regulatory Guide 1.130, guidance positions C.1 through C.7– Exceptions as noted above; FSAR Chapter 3, Section 10, "Seismic Design and Qualification" will describe methods and procedures for analyzing supports for Electrical and Mechanical Components, Piping, Raceway and Conduits.

Regulatory Guide 1.130 – general, the Reg. Guide recommends that design stress limits be used in conjunction with a loading combination that includes operating basis earthquake. The ASME Code rules provide a conservative design basis. The Operating Basis Earthquake (OBE) has been eliminated as an Atomic Alchemy design requirement. The Atomic Alchemy seismic analysis design is based on a single earthquake, called the safe shutdown earthquake (SSE). Cyclic stresses due to earthquakes are included in the design of those SSCs that would be sensitive to fatigue. Analysis methods and allowable stresses assure that there is margin above the SSE.

The Atomic Alchemy design uses the provisions of the ASME Code, Section III, Appendix F to determine faulted condition allowable loads for supports designed by the load rating method.

NUREG-0800 SRP 3.9.4, Rev 4 Control Rod Drive Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2, SRP 4.2.2, SRP 4.2.2.1, SRP 4.2.5, SRP 4.5.1, SRP 4.5.3, SRP 7.0, SRP 12.11	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2,GDC 14, GDC 26, GDC 27, GDC 29, R.G. 1.70, ASME B&PV Code, Section III, NB-3113	Exceptions as noted.
Summary Description of Compliance/Exceptions		

SRP 3.9.3– General description: this SRP addresses the structural integrity of pressure retaining components, their supports, and core support structures which are designed in accordance with the rules of the ASME BPVC Section III, Division 1 in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. A large majority of components specified in this SRP are not applicable to the VIPR. For example, reactor "vessel" internals, steam generator, pressurizer, feedwater piping, etc, do not comprise the design of the reactor. In instances where the reactor module and radioisotope process module buildings have similar or related ASME piping and support structures, the difference in the level of risk and challenges from the design and service loading combinations and the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy does not use any type of safety related pressure relief devices, snubbers, etc. The specific design criteria for the proper loading combinations, system operating transient, and corresponding stress limits are being utilized in the analyses.

10 CFR 50.55a – Acceptable; in the context of this SRP, Atomic Alchemy will comply with this regulation with respect to the design and service load combinations and associated stress and deformation limits specified for ASME Code Class 1, 2, and 3 components by performing the applicable analyses that ensures those systems and components important to safety are designed to the quality standards that commensurate with their importance to safety.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 14, 15 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

The recommendations of Regulatory Guides 1.124 and 1.130 have been incorporated into the ASME Section III Code, Editions and Addenda. The Atomic Alchemy facility design will conform to this regulatory guide with interpretations as to maintain consistency with the ASME Code.

Regulatory Guide 1.124, positions C.1 through C.7 – Exceptions as noted above; A three-level seismic classification system is used for the Atomic Alchemy facility, seismic Category I, seismic Category II, and non-seismic. The definitions of the seismic classifications and a seismic classification listing of structures, systems, equipment, and components are presented in FSAR Chapter 3, Section 7, "Seismic Design". The component or piping and their respective supports have the same ASME Code classification. The safe shutdown earthquake damping values used in the dynamic analysis of various structures, supports, and equipment. Atomic Alchemy will use a time history / dynamic analysis method for evaluation. This method is also used for dynamic analyses of piping systems subjected to time history hydraulic transient loadings or forcing functions induced by postulated pipe breaks. The stress limits in ASME code of any four methods of analysis (Subsection NF of Section III (1) linear elastic analysis, (2) load rating, (3) experimental stress analysis, and (4) limit analysis) are degrees of magnitude above what the Atomic Alchemy ASME III piping or components will experience. At this phase in the preliminary design (excluding I&C), only the Reactor Coolant system (RCS), Light Water Pool system (LWP), Spent Fuel system (SFP), Decay Heat Removal (DHR), Control Rod Drive Mechanism System (CRD) and the Transfer canal system (TTW) are anticipated to fall under the ASME Section III code.

Regulatory Guide 1.130 - Many of the items addressed in Regulatory Guide 1.130 have since been incorporated into later ASME Code, Section III, Editions and Addenda. The plant design will conform to this regulatory guide with interpretations as to maintain consistency with the ASME III code.

Regulatory Guide 1.130, guidance positions C.1 through C.7– Exceptions as noted above; FSAR Chapter 3, Section 10, "Seismic Design and Qualification" will describe methods and procedures for analyzing supports for Electrical and Mechanical Components, Piping, Raceway and Conduits.

Regulatory Guide 1.130 – general, the Regulatory Guide recommends that design stress limits be used in conjunction with a loading combination that includes operating basis earthquake. The ASME Code rules provide a conservative design basis. The Operating Basis Earthquake (OBE) has been eliminated as an Atomic Alchemy design requirement. The Atomic Alchemy seismic analysis design is based on a single earthquake, called the safe shutdown earthquake (SSE). Cyclic stresses due to earthquakes are included in the design of those SSCs that would be sensitive to fatigue. Analysis methods and allowable stresses assure that there is margin above the SSE.

The Atomic Alchemy design uses the provisions of the ASME Code, Section III, Appendix F to determine faulted condition allowable loads for supports designed by the load rating method.

NUREG-0800 SRP 3.9.5, Rev 4 Reactor Pressure Vessel Internals

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.3	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1,GDC 2, GDC 4, GDC 10,	Exceptions as noted

	ASME B&PV Code, Section III Subsections NG-1122 & NG-3000	

Summary Description of Compliance/Exceptions

SRP 3.9.5– General description: this SRP addresses the Reactor pressure vessel (RPV) internals which consist of all structural and mechanical elements inside the reactor vessel in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The VIPR core is not located within a vessel, but at the bottom of a light water pool. Because the reactor is located in the open light water pool, it is not postulated that any transient involving high energy primary reactor coolant piping (all of which is located outside of the pool) would result in any damage to the light water pool internal components or reactor core structure. For the purpose of this Standard Review Plan section, the term "reactor internals" will instead be applied to include the reactor core supports and other internal structures located within the light water pool. This would also include the RCS plenum, in-core Instrumentation, and CRD components.

10 CFR 50.55a, ASME B&PV Code, Section III Subsections NG – Acceptable; the reactor light water pool internals components designated as ASME III Class CS core support structures are designed, fabricated, and examined in accordance with the requirements of ASME III, Subsection NG for Core Support Structures. The basis used for design, construction, and examination, for those reactor light water internals components not designated ASME III Class CS core support structures, is defined by Atomic Alchemy as provided in the ASME Code, Subsection NG. The core internals are designed to withstand mechanical loads arising from the safe shutdown earthquake and to meet the requirements of the following item. Following a design basis accident, the plant is capable of being shut down and cooled passively by convection alone, so that the fuel cladding temperature is kept within specified limits. Therefore, the deformation of certain critical reactor light water pool internals is kept sufficiently small to allow continued core cooling.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 10 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 3.9.6, Rev 4 Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.55a(c)-(e), 10 CFR 50.55a(f),	Exceptions as noted

	10 CFR 50.55a(g), 10 CFR 50.55a(b)(3), 10 CFR 52.47(b)(1), 10 CFR 52.79(a)(11), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 4, GDC 14, GDC 15, GDC 37, GDC 40, GDC 43, GDC 46, GDC 54, R.G. 1.100, R.G. 1.206, R.G. 1.192,	

Summary Description of Compliance/Exceptions

SRP 3.9.6– General description: this SRP addresses the FSAR only content, with respect to the functional design and qualification provisions and in-service testing (IST) programs for safety-related pumps, valves, and dynamic restraints (snubbers) designated as Class 1, 2, or 3 under ASME BPVC Section III in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy summarizes its intended conformance to this SRP.

The Atomic Alchemy QAPD is based on ASME NQA-1-2017, which includes provisions for the functional design and qualification of active mechanical equipment in nuclear power plants.

The Atomic Alchemy NPUF design includes a passive decay heat removal system. The safety related SSCs associated with the passive decay heat removal system adequately provides assurance that they can accomplish their safety related tasks, as defined by a deterministic analysis. The Atomic Alchemy facility does not identify any RTNSS pumps, valves, components, or systems in its design scope, therefore any RTNSS related functional design and qualification requirements of this SRP are not applicable.

Atomic Alchemy does not have safety related MOV type, power operated type, or explosive actuated type ASME Section III valves; therefore, any related functional design and qualification requirements of this SRP with regard to those types of components are not applicable.

The Atomic Alchemy design does not use dynamic supports or snubbers, therefore the in-service examination and testing plans for all such components under ASME OM Code, Subsection ISTD or as described in this SRP is not applicable.

Atomic Alchemy will develop a deterministic IST program conforming to the ASME OM 2017 edition as incorporated by reference into 10 CFR 50.55a. Preservice and in-service inspection and testing of ASME Code Class components (including vessels, piping, pumps, valves, bolting, and supports) within the reactor coolant piping boundary are performed in accordance with Section XI of the ASME Code including addenda according to 10 CFR 50.55a. This includes all ASME Code Section XI mandatory appendices.

The specific edition and addenda of the Code used to determine the requirements for the inspection and testing plan for the initial and subsequent inspection intervals will be delineated in the respective inspection programs. The Code includes requirements for system pressure tests and

functional tests for active components (the RCS check valves are considered active components, safety-related check valves with safety function to open or with a safety function to close or remain closed to prevent reverse flow are exercised to both the open and closed positions regardless of safety function position in accordance with the ASME OM Code). The preservice program provides details of areas subject to examination, as well as the method and extent of preservice examinations. The in-service program details the areas subject to examination and the method, extent, and frequency of examinations. Additionally, component supports, and examination requirements are included in the inspection programs.

ASME Code Class components are designed so that access is provided in the installed condition for visual, surface, and volumetric examinations specified by the ASME Code Section XI. The reactor coolant piping design includes compliance with the requirements of the Atomic Alchemy QAPD “ISI/IST design for inspectability program” (See FSAR Chapter 13, Appendix A). Also, see Technical Specifications 5.6.2 for a further description of the Atomic Alchemy In-Service Testing program and compliance with the ASME OM standard.

The supports for ASME Code, Section III, Class 1, 2, and 3 components (including pipe supports) are designed and analyzed for design condition, and Level A, B, C, and D service conditions to the rules and requirements of ASME Section III, Subsection NF, and Appendix F.

10 CFR 50 Part 55a and 10 CFR 50.54(jj) – Acceptable; Atomic Alchemy’s conformance to the inspection requirements of 10 CFR 50.55a, as detailed in Section XI of the ASME Code, is met for all ASME Class components (and their supports). In the context of this SRP Atomic Alchemy will comply with this regulation with respect that SSCs be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR 50.55(i) – Acceptable; Atomic Alchemy’s QAPD is based on NQA-1-2017.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 14, 15, 37, 40, 43, 46, 54 – Exceptions as noted; FSAR Chapter 3, Appendix F will detail Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.100, position C.1 – Acceptable; for equipment that must perform a safety related function, the recommendations concerning methods to be employed for seismic qualification of electrical and mechanical equipment are contained in Regulatory Guide 1.100, "Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants," which endorses IEEE 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class E Equipment for Nuclear Power Generating Stations," for the qualification of both electrical and mechanical equipment. The design will meet these requirements by either type testing, analysis, or a combination of both. The qualification program for valves that are part of the reactor coolant boundary shall include testing or analysis that demonstrate that these valves will not experience leakage beyond the design criteria when subjected to design loading.

Regulatory Guide 1.100, position C.2 – Acceptable; Atomic Alchemy will comply with ASME QME-1-2017. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide. Regulatory Guide 1.206 – Not applicable; Atomic Alchemy is submitting a 10 CFR Part 50 construction application. Regulatory Guide 1.192, positions C.1 through C.4 – Acceptable; Atomic Alchemy ASME OM code cases will conform to these lists as applicable; see Technical Specifications 5.6.2 for a description.

NUREG-0800 SRP 3.9.7, Rev 0 Risk-Informed Inservice Testing

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	R.G. 1.174, R.G. 1.175	N/A
Summary Description of Compliance/Exceptions		
Atomic Alchemy IST / NDE program is based on a deterministic qualitative approach rather than a probabilistic quantitative approach therefore this SRP is not applicable. See Technical Specifications 5.6.2 for a description of the Atomic Alchemy In-Service Inspection and Testing program.		

NUREG-0800 SRP 3.9.8, Rev 0 Risk-Informed Inservice Inspection of Piping

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	R.G. 1.174, R.G. 1.178	N/A
Summary Description of Compliance/Exceptions		
Atomic Alchemy IST / NDE program is based on a deterministic qualitative approach rather than a probabilistic quantitative approach therefore this SRP is not applicable. See Technical Specifications 5.6.2 for a description of the Atomic Alchemy In-Service Inspection and Testing program. See FSAR Chapter 3, Section 2, "Classification of Systems, Structures, and Components" for piping In-service Inspection requirements.		

NUREG-0800 SRP 3.10, Rev 4 Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1,	10 CFR 50.55a,	Exceptions as noted.

SRP 3.5, SRP 6.2.3, SRP 7.2	10 CFR 50, Appendix B 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 4, GDC 14, GDC 30, R.G. 1.61, R.G. 1.100	

Summary Description of Compliance/Exceptions

SRP 3.10– General description: this SRP addresses the methods of tests and analyses employed to ensure the functionality of mechanical and electrical equipment under the full range of normal and accident loadings in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy basic objectives of qualification of safety-related electrical and mechanical equipment is to reduce the potential for common cause failures due to specified seismic events and to demonstrate that safety-related electrical and mechanical equipment can perform their designated safety-related functions.

The Atomic Alchemy PSAR is included as part of the construction license submittal; it will include a preliminary FSAR Chapter 3, Appendix E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment" which will provide a detailed description of practices followed in qualification, including criteria, methods, and procedures used in conducting testing and analysis, which will demonstrate the extent of compliance with the criteria set forth in SRP 3.10, Subsections II.1 thru II.5. This methodology applies to safety-related, seismic Category I electrical and mechanical equipment and will also be used for certain I&C monitoring equipment. Seismic Category II equipment is also within this scope.

Atomic Alchemy safety related SSCs are classified as Seismic Category I; information to demonstrate that mechanical equipment, electrical equipment, instrumentation, and, where applicable, their supports classified as seismic Category I can perform their designated safety-related functions under the full range of normal and accident (including seismic) loadings are provided in FSAR Chapter 3, Section 10.

Atomic Alchemy FSAR Chapter 3, Section 10, will address equipment (other than piping) and includes the following types as safety related:

- Safety-related instrumentation and electrical equipment and certain monitoring equipment.
- Safety-related active mechanical equipment that performs a mechanical motion while accomplishing a system safety-related function. These devices include the control rod drive mechanisms, HVAC dampers and fluid system valves.
- Safety-related, nonactive mechanical equipment whose mechanical motion is not required while accomplishing a system safety-related function, but whose structural integrity must be maintained in order to fulfill its design safety-related function.

Atomic Alchemy meets IEEE 344-2004, as modified by Regulatory Guide 1.100, by either type testing or analysis or by an appropriate combination of these methods.

An equipment qualification data package (EQDP) is developed for the instrumentation and electrical equipment classified as seismic Category I. in the context of this SRP, the requirements of 10 CFR Part 50, Appendix B, and 10 CFR 50.55a are addressed in the EQDP. Each equipment qualification data package contains a section entitled “Performance Requirements.” This section establishes the safety-related functional requirements of the equipment to be demonstrated during and after a seismic event. For seismic Category I mechanical components, the performance requirements are defined in the appropriate design and equipment specifications.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 14, 30 – Exceptions as noted; FSAR Chapter 3, Appendix F will detail Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.100, position C.1 – Acceptable; for equipment that must perform a safety related function, the recommendations concerning methods to be employed for seismic qualification of electrical and mechanical equipment are contained in Regulatory Guide 1.100, "Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants," which endorses IEEE 344-2004, "IEE Recommended Practice for Seismic Qualification of Class E Equipment for Nuclear Power Generating Stations," for the qualification of both electrical and mechanical equipment. The design will meet these requirements by either type testing, analysis, or a combination of both.

The seismic and dynamic qualification program for valves that are part of the reactor coolant boundary shall include testing or analysis that demonstrate that these valves will not experience leakage beyond the design criteria when subjected to design loading.

Regulatory Guide 1.100, position C.2 – Atomic Alchemy will comply with ASME QME-1-2017 as denoted in the Atomic Alchemy QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)). This version of the ASME standard is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide 1.100.

Regulatory Guide 1.61, position C.1, through C.5 – Exceptions as noted; FSAR Chapter 3, Section 7 will provide the Atomic Alchemy damping values. The OBE is not a design input in the Atomic Alchemy analysis, only the SSE. FSAR Table 3.07-01, “Safe Shutdown Earthquake Damping Values” provides the structural, piping, HVAC, electrical, and mechanical electrical damping values used. Atomic Alchemy will conform to the guidance in NUREG/CR-6919 for the selection of damping values.

NUREG-0800 SRP 3.11, Rev 4 Environmental Qualification of Mechanical and Electrical Equipment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5, SRP 7.1,	10 CFR 50.49, 10 CFR Part 50 Appendix B, Criterion III, XI, XVII,	Exceptions as noted.

SRP 7.2	10 CFR 50.34(b)(3), 10 CFR 50.55a(h), 10 CFR 52.47(a)(5), 10 CFR 52.47(a)(13), 10 CFR 52.47(b)(1), 10 CFR 52.79(a)(3) 10 CFR 52.79(a)(10) 10 CFR 52.157(e), 10 CFR 52.80(a), GDC 1, 2, 4, 23, NUREG-0588, R.G. 1.40, R.G. 1.63, R.G. 1.73, R.G. 1.97, R.G. 1.156, R.G. 1.158, R.G. 1.180, R.G. 1.89, R.G. 1.183	

Summary Description of Compliance/Exceptions

SRP 3.11– General description: this SRP addresses the FSAR only content, with respect to the information presented in Section 3.11 of the Final Safety Analysis Report (FSAR). The information should be sufficient to support the conclusion that all items of equipment that are important to safety (mechanical, electrical, and instrumentation and control (I&C) equipment) are capable of performing their designed safety functions under all normal environmental conditions, anticipated operational occurrences, and accident and post-accident environmental conditions in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy follows the regulatory guide 1.70 format for the FSAR, and summarizes its intended FSAR Chapter 3, Section 11 conformance to this SRP below.

The Atomic Alchemy basic objectives of its environmental qualification of safety-related electrical and mechanical equipment is to reduce the potential for common cause failures due to specified environmental events and to demonstrate that safety-related electrical and mechanical equipment can perform their designated safety-related functions.

Atomic Alchemy will provide a complete list of environmentally qualified electrical and mechanical equipment that is essential to reactor shutdown, maintaining a safe shutdown condition, confinement isolation, reactor core decay cooling, or confinement module building heat removal, or that is otherwise essential in preventing significant release of radioactive material (including from radioisotope process related module buildings) to the environment, in FSAR Table 3.11-01. This table includes both automatic and operator actuated equipment. Atomic Alchemy FSAR Chapter 3, Appendix E identifies applicable normal, abnormal, and design basis accident environmental conditions conforming to General Design Criterion 4.

Design basis event (DBE) and post-design basis accident facility conditions resulting from various FSAR Chapter 15 postulated transients affecting equipment and piping are discussed in FSAR Chapter

3 Appendix E. The components identified in FSAR Table 3.11-01 must operate without impairment of their respective design function(s) and mission time(s).

As part of the Construction license application, the PSAR will be submitted. The Atomic Alchemy PSAR will contain the conceptual approach for meeting the environmental design and qualification requirements addressing the following areas:

- Identification of all mechanical, electrical, and I&C equipment required to perform the functions defined in SRP 3.11, Subsection I, Item 1.
- Identification of the environmental design bases for the equipment identified, including the definition of anticipated operational occurrences and normal, accident, and post-accident environments.
- Requirements for documentation of the qualification tests and analyses that have been or will be performed on the equipment to meet the design bases.
- Demonstration of the adequacy of the environmental design and qualification.
- Identification of the equipment that is required to remain functional during and following design basis events.

10 CFR 50.49 – Acceptable; Atomic Alchemy QAPD Section IX, "Electrical Equipment Qualification Program (EEQ)" (regulatory commitment AA0-RC-0007) conforms with 10 CFR 50.49, 10 CFR 50 Appendix B, Criteria III, XI, XVII, and R.G. 1.89 criterion.

10 CFR 50.34(b)(3) – Acceptable; while this is a power plant regulation, with respect to the intended context of this SRP (application of evaluating radiation aging mechanisms) Atomic Alchemy uses regulatory guide 1.183 to determine transient source terms, further, industry experience has shown that for Class 1E equipment subject to a lifetime gamma dose of up to 104 rads, it is not necessary to address radiation aging for qualification purposes.

10 CFR 50.55a(h) – Acceptable; Atomic Alchemy intends to comply with the requirements of IEEE-603-1991. In some instances, Atomic Alchemy may choose to comply with later revisions than what industry standard is incorporated by reference into the regulations. In these instances, Atomic Alchemy will submit an alternative under 10 CFR 50.55a(z) as procuring components from vendors along with a code reconciliation would result in a hardship and/or unusual difficulty without providing an increase in the level of quality and safety.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 23 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.40, position C – Exceptions as noted; Atomic Alchemy continuous-duty safety related pumps conform to latest edition of IEEE-334. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.63, position C – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-317. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.73, positions C.1 through C.10 – Acceptable; Atomic Alchemy will comply with IEEE-382-2006.

Regulatory Guide 1.89, position C.1 – Exceptions as noted; this guide has not been revised since 1984 and endorses a 1970s version of an industry standard. See FSAR Chapter 3, Table 3.11-01 "Environmentally Qualified Electrical and Mechanical Equipment". Atomic Alchemy mechanical and electrical components identified in Table 3.11-01 are qualified by design to perform their required functions under the appropriate environmental effects of normal, abnormal, accident, and post-accident conditions as required by General Design Criterion 4 and as discussed in FSAR Chapter 3, Appendix 3E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment". For mild environments, the area conditions are postulated not to change as a result of a transient identified in the Chapter 15 accident analysis. There are no degrading environmental effects that lead to common mode failure of equipment in mild environments. Mechanical and electrical equipment located in harsh environmental zones are designed to perform under the appropriate environmental conditions defined for those area.

Regulatory Guide 1.89, position C.2, C.3, C.4, C.5 – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-323. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.89, position C.6, C.7 – Acceptable; Atomic Alchemy QAPD, Criterion VII, Section 7.9, addresses like for like replacements of components.

Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in this Regulatory Guide.

The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, "Emergency Plan". See FSAR Chapter 7, Section 7, subsection, "Variable Categories, Classifications and Requirements" for a description of type F variables that are monitored by the Operations and Control Systems (IOC).

Regulatory Guide 1.156, position C.1 - Atomic Alchemy will comply with latest revision of IEEE-572. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.158, position C.1 - Atomic Alchemy will comply with latest revision of IEEE-308, IEEE-323, IEEE-344, IEEE-450, IEEE-484, IEEE-485, and IEEE-535. These versions are not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.180, guidance positions C.1 through C.7 -acceptable, this regulatory guidance addresses the effects of electromagnetic and radiofrequency interference (EMI/RFI), power surges, and electrostatic discharge on safety-related I&C systems. Atomic Alchemy FSAR Chapter 7, Section 2, "Identification of Safety Criteria", FSAR Chapter 3, Section 11, "Environmental Qualification of

Mechanical and Electrical Equipment, and Technical Requirements Manual TRM program 5.6.14, "Electromagnetic Compatibility and Radio Frequency Interference (EMC/RFI) Program" will describe the design and installation practices to limit and administrative control the impact of electromagnetic effects and testing practices to assess the emissions and susceptibility of safety related systems and components.

Regulatory Guide 1.183, positions C.1 through C.6 – Exceptions as noted; the values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the Atomic Alchemy NPUF design, the parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the Atomic Alchemy AST. FSAR Chapter 15, Appendix B, "Removal of Airborne Activity from the Reactor Confinement Module Atmosphere Following Severe / Beyond Design Basis Accident" and FSAR Chapter 15 Appendix C, "Removal of Airborne Activity from the Radioisotope Process Production Module, Target Fabrication Module, and Radwaste Processing Module Atmosphere Following Severe / Beyond Design Basis" address the dispersion of radionuclides from the reactor cores, spent fuels, and radioisotope processes under various postulated transients.

Regulatory Guide 1.183, Appendix A, position 1 through 6 – Not applicable; the VIPR design does not have "dual containment," "primary containment sump water (in PWRs) or a suppression pool (in BWRs)," nor "main steam isolation valves."

Regulatory Guide 1.183, Appendix A, position 7 - Not applicable to the VIPR as there is no potential for a post-accident LOCA hydrogen or combustible gas buildup. However, a non-safety combustion gas monitoring system is employed, and the non-safety-related fire protection smoke exhaust system can be utilized to purge any combustible gases. Natural convection will minimize any accumulation of combustible gases inside the confinement building module.

Regulatory Guide 1.183, Appendix B, positions 1 through 5 – Exceptions as noted; Atomic Alchemy will utilize the methodology described in the guide. The VIPR design does not include a separate Spent Fuel building, nor does it include a containment structure. Both the reactor core and spent fuel are located in the same light water pool open to the atmosphere of the confinement building. The reactor confinement module building is presumed to be isolated at all times (through the use of airlocks). An ESF filtration system is not part of the design, and a non-safety-related filtration system is used for normal releases.

Regulatory Guide 1,183, Appendix C through H – Not applicable; the postulated accidents are not credible transients in the Atomic Alchemy FSAR chapter 15 analysis.

Regulatory guide 1.183, Appendix I – Exceptions as noted; basic assumptions and dose models will be conservatively applied to the evaluation of the aging effects by radiation on Atomic Alchemy EEQ components. See FSAR Chapter 3, Appendix E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment". For mechanical and electrical components, a lifetime gamma dose of up to 104 rads, it is not necessary to address radiation aging for qualification purposes.

NUREG-0588 – Exceptions as noted; Atomic Alchemy will conform to RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety in Nuclear Power Plants," (in lieu of NUREG-0588) which provides the principal guidance for implementing the requirements and criteria

of 10 CFR 50.49 for environmental qualification of electrical equipment that is important to safety and located in a harsh environment. Category I of NUREG-0588 endorses IEEE-323-1974. Atomic Alchemy intends to comply with the latest revision of IEEE-323 (2003). NUREG-0588 Appendices A, B, and C are not applicable to the VIPR, methods of calculation environments inside or outside of containment, main steam line breaks etc. are not design features of a non-power reactor. Appendix D is not applicable, because 1) it provides guidance for determining power reactor doses and 2) Atomic Alchemy uses R.G. 1.183 to determine source terms from design basis accidents. For Class 1E equipment subject to a lifetime gamma dose of up to 104 rads, it is not necessary to address radiation aging for qualification purposes.

NUREG-0800 SRP 3.12, Rev 1 ASME Code Class 1, 2, and 3 Piping Systems, Piping Components, and their Associated Supports

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5, SRP 5.2, SRP 5.4, SRP 5.6, SRP 5.7	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 4, GDC 14, GDC 15, R.G. 1.207	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 3.12– General description: this SRP addresses the FSAR only content, with respect to the design and analyses of piping systems, the specific areas of review for piping systems and support design are divided into four subheadings:

- Piping Analysis Methods
- Piping Modeling Techniques
- Piping Stress Analyses Criteria
- Piping Support Design

The information should be sufficient to support the conclusion that piping systems that are important to safety are capable of performing their design safety functions under all normal environmental conditions, anticipated operational occurrences, and accident and post-accident environmental conditions in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

Not all acceptance criterion of this SRP is applicable to the Atomic Alchemy NPUF design. There are no buried Seismic Cat I piping, there are no snubbers or dynamic supports, and the OBE is omitted as a design input, the reactor coolant system is open to the atmosphere of the light water pool. Therefore, there is no RCPB in the context of equivalency of a PWR or BWR coolant system. Likewise, over pressurization effects of a LOCA are not postulated to occur and therefore not considered. There are no ASME Code III safety relief valves in the NPUF design and therefore the effects of safety

relief valves opening are not considered. Thermal stratification, oscillations, cycling and striping (TASCS) are phenomena that generally occur in nuclear power plants in systems such as feedwater piping, pressurizer spray piping, residual heat removal piping, core makeup water piping, refueling water piping, and chemical volume and control piping. The VIPR is a non-power design that does not utilize most of these systems and this phenomenon is not postulated to occur in the piping systems used in the VIPR design. Thermal stratification and cycling is excluded since the pressure and temperatures of the RCS system are orders of magnitude less than that of PWR or BWR system.

Atomic Alchemy follows the regulatory guide 1.70 format for the FSAR so information pertaining this SRP 3.12 is located in several sections of the Atomic Alchemy FSAR.

See FSAR Chapter 3, Section 6, “Protection Against Dynamic Affects Associated with Postulated Pipe Ruptures,” summarizes information on pipe break analysis methods. FSAR Chapter 3, Section 9, “Mechanical Systems and Components” summarizes information on dynamic testing and stress analysis methods for ASME Code Section III, Class 1, 2, and 3 components, piping, and piping support designs. FSAR Chapter 3, Section 10, “Seismic and Dynamic Qualifications of Seismic Category I Mechanical and Electrical Equipment” will summarize information on seismic analysis methods and modeling techniques for Category I components, piping and supports. Atomic Alchemy summarizes its intended SRP 3.12 conformance below.

Pre-operational inspection and test programs as described in Technical Requirements Manual TRM 5.6.9, and TRM 5.6.10 implements the required tests of NB-3622, NC-3622, and ND-3622 of the ASME Code, Section III to verify that the piping and piping restraints will withstand dynamic effects due to transients and that piping vibrations are within acceptable levels. The piping systems to be tested under pre-operational programs include: ASME Code, Section III, Class 1, 2, and 3 systems, high energy and moderate energy systems inside seismic Category I structures, high energy portions of systems whose failure could reduce the functioning of seismic Category I features to an unacceptable level, and the seismic Category I portions of moderate-energy piping systems located outside the reactor confinement module and reactor auxiliary module buildings. Additionally, high energy and moderate energy piping located in radioisotope process modules are also tested and inspected. FSAR Chapter 13, Appendix A, “Comprehensive Vibration Assessment Program” will describe the vibration program.

10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect that SSCs be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 4, 14, 15 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.207, positions C.1 through C.3 – Acceptable; Atomic Alchemy will comply with the 10 CFR 50.55a regulation that ASME section III, class 1, 2, and 3 components are also evaluated

to determine the acceptable fatigue lives of components by a cumulative usage factor (CUF) calculation to account for the effects of LWR water environments. The integrated reactor coolant loop piping and supports system model is the basic system model used to compute loadings on components, component supports, and piping. The reactor coolant loop piping satisfies the leak-before-break requirements for the elimination of non-mechanistic pipe breaks. Fatigue reduction factors and cumulative usage factors are also calculated.

NUREG-0800 SRP 3.13, Rev 0 Threaded Fasteners - ASME Code Class 1, 2, and 3

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5	10 CFR 50, Appendix G, 10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 4, GDC 14, GDC 15, GDC 30, GDC 31, GDC 32	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 3.13– General description: this SRP addresses the adequacy of an applicant's criteria regarding selection of materials, design, inspection, and testing of its threaded fasteners (i.e., threaded bolts, studs, etc.) prior to initial service and during service in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. As an NPUF, Atomic Alchemy re-defines the reactor coolant pressure boundary for the NPUF reactor as described in PDC 14 in FSAR Chapter 3, Appendix F. Atomic Alchemy RCS reactor coolant system piping will be designed and fabricated in accordance with ASME BPVC Section III and meets the requirements of fracture toughness of ferritic materials in Section III of the ASME Code. The reactor coolant boundary piping materials exposed to the coolant are corrosion-resistant stainless steel or nickel-chromium-iron alloy. Allowable pressure-temperature relationships for plant heatup and cooldown rates are calculated using methods derived from the ASME Code, Section III, Appendix G. The VIPR design pressures and temperatures are degrees of magnitude less than a PWR or BWR design reactor. Atomic Alchemy does not have a reactor vessel; therefore, any other fracture toughness requirements of 10 CFR Part 50 Appendix G and 10 CFR Part 50 Appendix H do not apply to the reactor RCS boundary. The reactor core is in an open to atmosphere light water pool that has an aluminum liner. 10 CFR 50.55a – Acceptable; in the context related to this SRP, ASME III Class 1, 2, and 3 fasteners, mechanical joints, etc. will be tested in accordance with the requirements of the incorporated by reference industry code or approved code cases. The VIPR design does not have a "vessel." See Technical Specifications 5.6.2, "In-service Inspection and Testing Program." The T/S program defines the applicable ASME Code, Section XI Division 1 criteria for inspections for bolting, studs and nuts used in ASME Code Class 1, 2, or 3 applications. The T/S program defines the applicable compliance		

with the criteria of Section III of the ASME Code, Division 1 regarding preparation of certified material test reports (CMTRs) and this program defines ASME Section Xl Code Class 1, 2, and 3 (equivalent) boundaries in accordance with 10 CFR 50.55a (c), (d), and (e). 10 CFR Part 50, Appendix G – Acceptable; Atomic Alchemy does not have a reactor vessel; the reactor coolant system is open to the atmosphere of the light water pool and therefore there is no RCPB in the context of what pressures and temperatures a RCPB would be subjected to in a PWR or BWR coolant system design. Therefore, the fracture toughness requirements for reactor vessels of 10 CFR Part 50 Appendix G do not apply. Atomic Alchemy applies the ASME Section III, Division 1, Class MC (Metal Containment) and/or ASME Section III, Division 2, Class CC (concrete containment) fracture toughness testing requirements to the reactor confinement module and radioisotope processes related module buildings material as appropriate. See FSAR Chapter 14, Section 3, "Reactor Pre-Operational Testing" for ASME Code, Section XI Criteria for Pre-Service Inspection of ASME Code Section III Class 1, 2 and 3 components. See Technical Specification 5.6.2 for the ISI/IST program. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 1, 2, 4, 14, 15, 30, 31, 32 – Exceptions as noted; FSAR Chapter 3, Appendix F will detail Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 BTP 3-1, Rev 2 Classification of Main Steam Components Other than the Reactor Coolant Pressure Boundary for BWR

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR design.		

NUREG-0800 BTP 3-2, Rev 2 Classification of BWR/6 Main Steam and Feedwater Components Other than the Reactor Coolant Pressure Boundary

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR design.		

NUREG-0800 BTP 3-3, Rev 3 Protection Against Postulated Piping Failures in Fluid Systems Outside Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
BTP 3.3– General description: this SRP addresses the functional or structural integrity of systems and components required for safe shutdown of the reactor and maintenance of cold shutdown conditions that could be endangered by fluid system piping failures at locations outside containment in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. As an NPUF, Atomic Alchemy does not have Feedwater, Steam, or Main Steam piping systems. With respect to the high energy or moderate energy piping systems in the Atomic Alchemy design there is not a large magnitude of potential energy stored in them. Likewise, very little, if any, environment effects would be created by failures of these piping systems. This SRP is not applicable to the Atomic Alchemy Facility. The Atomic Alchemy piping design analysis for the "Protection Against Dynamic Affects Associated with Postulated Pipe Ruptures" in FSAR Chapter 3, Section 6, does not differentiate between inside or outside a "containment" structure. In an NPUF reactor design a containment structure is unnecessary. See Atomic Alchemy's response to SRP 3.6.1, 3.6.2 and SRP 3.6.3 for analyses and methods used for protecting essential equipment from the effects of postulated failures in these systems. As part of the Atomic Alchemy piping design process, a review of the piping layout and plant arrangement drawings are made to evaluate the effects of postulated piping breaks to assure that they are physically remote from essential systems and components required for safe shutdown. Atomic Alchemy potential high energy and moderate energy piping located in radioisotope process related module buildings (non-reactor related systems) will also be analyzed for breaks. A pipe break hazards evaluation is part of the Atomic Alchemy overall piping design. The evaluation will be performed for high and moderate energy piping to confirm the protection of systems, structures, and components which are required to be functional during and following a design basis event.		

NUREG-0800 BTP 3-4, Rev 3 Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.5	N/A	N/A
Summary Description of Compliance/Exceptions		
BTP 3.3– General description: this SRP addresses the functional or structural integrity of systems and components required for safe shutdown of the reactor and maintenance of cold shutdown		

conditions that could be endangered by fluid system piping failures at locations outside containment in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. As an NPUF, Atomic Alchemy does not have Feedwater, Steam, or Main Steam piping systems. With respect to the high energy or moderate energy piping systems in the Atomic Alchemy design there is not a large magnitude of potential energy stored in them. Likewise, very little, if any, environment effects would be created by failures of these piping systems. This SRP is not applicable to the Atomic Alchemy Facility. The Atomic Alchemy piping design analysis for the "Protection Against Dynamic Affects Associated with Postulated Pipe Ruptures" in FSAR Chapter 3, Section 6, does not differentiate between inside or outside a "containment" structure. In an NPUF reactor design a containment structure is unnecessary. See Atomic Alchemy's response to SRP 3.6.1, 3.6.2 and SRP 3.6.3 for analyses and methods used for protecting essential equipment from the effects of postulated failures in these systems. As part of the Atomic Alchemy piping design process, a review of the piping layout and plant arrangement drawings are made to evaluate the effects of postulated piping breaks to assure that they are physically remote from essential systems and components required for safe shutdown. Atomic Alchemy potential high energy and moderate energy piping located in radioisotope process related module buildings (non-reactor related systems) will also be analyzed for breaks. A pipe break hazards evaluation is part of the Atomic Alchemy overall piping design. The evaluation will be performed for high and moderate energy piping to confirm the protection of systems, structures, and components which are required to be functional during and following a design basis event.

4. REACTOR

NUREG-0800 SRP 4.2, Rev 3 Fuel System Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.1, SRP 4.1, SRP 4.2.1, SRP 4.5.2	10 CFR 50.46, 10 CFR 50.34, 10 CFR 50.67, 10 CFR 100, 10 CFR Part 50 Appendix K, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 10, GDC 27, GDC 35, R.G. 1.3, R.G. 1.4, R.G . 1.60, R.G. 1.77, R.G. 1.126, R.G. 1.157, R.G. 1.183, R.G. 1.195, R.G. 1.196.	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 4.2 – General description: this SRP addresses all fuel damage criteria in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the NPUF fuel systems may experience similar transients the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

The mechanical design and physical arrangement of the Versatile Isotope Production Reactor (VIPR) core components within the light water pool, together with the reactor control, protection, and emergency cooling systems, demonstrate that fuel damage, (that is, breach of fuel rod clad boundary) is not expected during Condition I and Condition II events. The Reactor can be taken to a safe shutdown state following a Condition III event with only the potential for a small fraction of fuel being damaged. The fraction of fuel damage that might occur meets the dose guidelines identified in FSAR Chapter 15. Condition III events might be of a type to preclude immediate resumption of operation. The reactor can be taken to a safe shutdown state and the reactor core kept subcritical by convection alone with acceptable heat transfer following transients arising from Condition IV events.

The VIPR fuel assemblies are provided by [ ] PROP Their design considers effects such as fuel density changes, fission gas release, clad creep, and other physical properties which vary with burnup. The integrity of the fuel is provided by engineering design to prevent excessive fuel temperatures.

The VIPR uses a uranium dioxide, zircaloy-clad fuel assembly. The assembly is a shortened [ ] PROP which has a negative fuel temperature coefficient of reactivity. Topical report table 3-1 provides a matrix of SRP 4.2 acceptance criteria.

The [ ] PROP fuel assemblies are designed so that the conservative design bases of the postulated transient events envelope the lifetime operating conditions of the fuel. For each design basis transient, the performance of the limiting fuel rod, with appropriate consideration for uncertainties, does not exceed the limits specified by the design basis.

Atomic Alchemy Technical Requirements TRM 5.6.12 Fuel Inspection and Testing Program verifies cladding integrity, fuel system dimensions, fuel enrichment, burnable poison concentration, and absorber composition. Quality control reports should document the details of the manufacturer's testing and inspection programs. The program will include procedures and administrative controls to perform post-irradiation fuel surveillances.

10 CFR 50.46 – Exceptions as noted; The VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on convection cooling for decay heat or residual heat removal. The Atomic Alchemy design, however, will provide an additional "emergency core cooling" type safety related system (designated as Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy passive "emergency core cooling" system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components. See FSAR Chapter 6, Section 3, "Reactor Decay Heat Removal System (DHR)".

10 CFR 50.34 – Acceptable; the general and technical information content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR 70.22. The regulations require that the construction permit application contain a PSAR, an Environmental Report, and an Emergency Plan.

10 CFR Part 50 Appendix K – Exceptions as noted; also see Atomic Alchemy description of compliance and exceptions for Appendix K in response to SRP 6.2.1.3.

The accident analyses flow rates and heat removal rates are calculated by assuming a range of component parameters, including best estimate and conservatively high and low values. Atomic Alchemy will comply with 10 CFR 50 Appendix K to the extent that sections are applicable to the Atomic Alchemy design, e.g., Atomic Alchemy does not have a pressurizer, or torus, containment spray, or pressurized core vessel.

10 CFR 100 Subpart A – Acceptable; with respect to the acceptability of the site location. The location of the Atomic Alchemy facility will be situated on [

] PROP

10 CFR 50.67 – Exceptions as noted; Atomic Alchemy utilizes the AST as described in 10 CFR 50.67, to the extent of applicability to the functionality and performance of an "ECCS" system. The DHR system performance analyses show that the design basis performance requirements of the DHR system is sufficient to meet the core cooling requirements following the postulated LOCA transient event. This engineered safety feature component is passively designed and does not require any activation of equipment.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 10, 27, 35 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Atomic Alchemy will do a line-by-line comparison of the acceptance criteria of this SRP to provide a better understanding of its intended compliance:

SRP 4.2, Acceptance Criteria 1.A.i through 1.A.viii – Acceptable; Specified Acceptable Fuel Design Limits (SAFDL) will be provided in Atomic Alchemy FSAR Chapter 15, Table 15.08-03.

SRP 4.2, Acceptance Criteria 1.B.i through 1.B.viii – Acceptable; FSAR Chapter 15, Section 7 will describe fuel rod mechanism failures.

SRP 4.2, Acceptance Criteria 1.C.i – Acceptable; FSAR Chapter 15, Section 7 will describe fuel rod temperature related failures.

SRP 4.2, Acceptance Criteria 1.C.ii – Exception; not applicable, a fuel rod ejection is not a credible accident in the Atomic Alchemy FSAR Chapter 15 accident analysis.

SRP 4.2, Acceptance Criteria 1.C.iii through 1.C.v – Acceptable; FSAR Chapter 15, Section 7 will describe additional fuel rod failure mechanisms.

SRP 4.2, Acceptance Criteria 2 – Acceptable; fuel is provided by [ ] PROP. Topical reports written by [ ] PROP and accepted by the NRC on the fuel design will be referenced in the FSAR.

SRP 4.2, Acceptance Criteria 3.A through 3.B – Acceptable; FSAR Chapter 4a, Section 3 will describe the design of the fuel.

SRP 4.2, Acceptance Criteria 3.C.i through 3.C.viii – Acceptable; FSAR Chapter 4a, Section 3 will describe the design of the fuel.

SRP 4.2, Acceptance Criteria 3.C.ix – the Atomic Alchemy facility-wide available radioactive fission product inventory is not just the quantities in the fuel assemblies. The FSAR Chapter 15 accident analysis addresses potential accidents involving fission products located in the radioisotope module and the radwaste module.

SRP 4.2, Acceptance Criteria 4.A, 4.B, 4.C – Acceptable; See Technical Requirements Manual section 5.6.12 for the Atomic Alchemy Nuclear Fuel Inspection and Testing program.

Regulatory Guide 1.3 - Not applicable to the VIPR. Applies to boiling water reactors only.

Regulatory Guide 1.4 - Not applicable to the VIPR. Applies to pressurized water reactors only.

Regulatory Guide 1.60, position C.1 and C.2 – Acceptable; see FSAR Chapter 3, Section 7 for Atomic Alchemy's design considerations and seismic analysis criteria. The nuclear island seismic models will be described in FSAR Chapter 3, Appendix G.

Regulatory Guide 1.77, positions C.1 through C.3 – Not applicable; Appendix A, Appendix B contain acceptable assumptions and evaluation models for analyzing a rod ejection accident in a PWR reactor. In the Atomic Alchemy Reactor design, the RCS is not pressurized, therefore a rod ejection accident is not a credible accident described in the Atomic Alchemy Chapter 15 analysis in the FSAR.

Regulatory Guide 1.126, positions C.1 through C.4 – Acceptable; Fuel is provided by [ ] PROP Topical reports written by [ ] PROP and accepted by the NRC on the fuel design will be referenced in the FSAR.

Regulatory Guide 1.195, positions C.1 through C.5 – Acceptable; a LB LOCA is not a design basis credible transient in the Reactor model. The effects of a hypothetical transient have been analyzed, see Atomic Alchemy response to SRP 15.6.5. Conservative assumptions have been made in considering radioactive releases from the Reactor confinement building module and radioisotope process building module.

Regulatory Guide 1.196, positions C.1 and C.2 – Acceptable; a LB LOCA is not a design basis credible transient in the VIPR model. The effects of a hypothetical transient have been analyzed; see Atomic Alchemy response to SRP 15.6.5. Conservative assumptions have been made in considering radioactive releases from the VIPR confinement building module and radioisotope process building module. ASME Section III Class 1 and 2 piping are analyzed using leak-before-break criteria. See FSAR Chapter 15, Appendix A, subsection "Main Control Room Dose Models" and Table 15.A-05, "Control

Room Dispersion Factors (χ/Q)". The operability of the control room habitability is administratively controlled by Technical Specifications LCO 3.7.5, "Main Control Room Habitability Systems (CRV and CRF" and LCO 3.3.7, "Control Room Emergency Ventilation and Filtration System (CRF)". Regulatory Guide 1.157, positions C.1 through C.4 – Not applicable; a LB LOCA is not a credible accident in the Atomic Alchemy design basis. The effects of a hypothetical transient have been analyzed; see Atomic Alchemy response to SRP 15.6.5. Dynamic effects need not be considered for those segments of piping that are shown mechanistically, with a large margin, not to be susceptible to a pipe rupture. The Atomic Alchemy design employs a safety related "ECCS" type system (Reactor Decay Heat Removal - DHR) for conservatism. Should the reactor/spent fuel pool level drop due to a loss of coolant accident, the light water in the transfer canal will passively drain into the reactor core/spent fuel pool. However, there is not a LOCA postulated scenario where the pool level drops such that the core is uncovered. 10 CFR 50.46(b)(2) oxidation limits are not exceeded. Atomic Alchemy will comply with 10 CFR 50 Appendix K to the extent that sections are applicable to the Atomic Alchemy design, e.g., VIPR does not have a pressurizer, or torus, containment spray, or pressurized core vessel. For a full description of Atomic Alchemy's compliance to 10 CFR Part 50, Appendix K, see response in SRP 6.2.1.3.

NUREG-0800 SRP 4.2, Rev 3 Appendix A Evaluation of Fuel Assembly Structural Response to Externally Applied Forces

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.1, SRP 4.2.1, SRP 4.2.2, SRP 4.2.3, SRP 4.2.5, SRP 4.4	NUREG-0609, NUREG/CR-1018, NUREG/CR-1019, NUREG/CR-1020	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 4.2, Appendix A– General description: this SRP addresses the potential effects of earthquakes and postulated pipe breaks in the reactor coolant system that would result in external forces on the fuel assemblies in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy reactor core and fuel assembly structure sits in an open-to-atmosphere light water pool and as such, external additional seismic loads from a LOCA are not credible transients in the FSAR Reactor accident analysis. These only apply to "blowdown" loads in PWR reactors. In instances where the VIPR fuel assemblies have similar or related postulated transient seismic loads, the difference in the level of risk and challenges created from these loads to the facility's safety limits are significantly less than either a PWR or BWR.		

The Atomic Alchemy fuel assemblies are supplied by [ ] PROP The mechanical design limits, material properties, and grid component strength criteria are based on experimental tests by [ ] PROP The limit is established at the 95-percent confidence level on the true mean crush strength at the operating temperature. This limit is sufficient to provide that, under worst-case seismic transients, the reactor core will maintain a geometry conducive to cooling. The stress categories and strength theory presented in the ASME Code, Section III, are used as a general guide. The [ ] PROP fuel assembly response resulting from safe shutdown earthquake condition is analyzed using time-history numerical techniques.

NUREG-0800 SRP 4.2, Rev 3 Appendix B Interim Acceptance Criteria and Guidance for Reactivity Initiated Accidents

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2.2, SRP 4.2.3, SRP 4.5.2, SRP 13	R.G. 1.183	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 4.2, Appendix B– General description: this appendix provides the interim acceptance criteria and guidance for reactivity-initiated accidents (RIA) with respect to fuel design. RIAs consist of postulated accidents which involve a sudden and rapid insertion of positive reactivity in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy analyzes Reactivity Initiated Accidents (RIA) in FSAR Chapter 15, Section 7. In instances where the VIPR fuel has similar or related cladding failures or releases due to RIA's, the difference in the level of risk and challenges created from these cladding failures and fission product inventory releases to the facility's safety limits are significantly less than either a PWR or BWR. The reactor is assumed to trip on any RIA accident signal. There is no postulated RIA transient that results in a DNBR greater than the safety analysis limit value. Regulatory Guide 1.183 – Not applicable; with respect to this SRP appendix B, fission product inventories, and other values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the VIPR design. The parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the potential releases.		

NUREG-0800 SRP 4.3, Rev 3 Nuclear Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2.3, SRP 4.5,	10 CFR 52.47(b)(1), 10 CFR 52.80(a),	Exceptions as noted.

SRP 4.5.2, SRP 4.5.3	GDC 10, GDC 11, GDC 12, GDC 13, GDC 20, GDC 25, GDC 26, GDC 27, GDC 28, R.G. 1.126, R.G. 1.77, R.G 1.206	

Summary Description of Compliance/Exceptions

SRP 4.3– General description: this SRP addresses the design of the fuel assemblies, control systems, and reactor core to aid in confirming that fuel design limits will not be exceeded during normal operation or anticipated operational transients in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

Atomic Alchemy will provide the functional requirements used in the nuclear design of the fuel and reactivity control system design basis in FSAR Chapter 4a, Section 3, “Nuclear Design”. The design bases are the fundamental criteria that must be met using approved analytical techniques. The Analytical Techniques in Reactor Core Design will be provided in FSAR Table 4a.3-01. The core design power distribution limits related to fuel integrity are met for Condition I occurrences through the conservative design. The requirements for Condition II occurrences are met by providing an adequate protection system which monitors reactor parameters. FSAR Chapter 15 will describe the consequences of Condition II, III, and IV occurrences. The difference in the level of risk and challenges from the consequences of Condition IV events and the facility’s safety limits are significantly less than either a PWR or BWR.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 10, 11, 12, 13, 20, 25, 26, 27, and 28 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.126, positions C.1 through C.4 – Acceptable; fuel is provided by [ ] PROP. Topical reports written by [ ] PROP and accepted by the NRC on the fuel design will be referenced in the FSAR.

Regulatory Guide 1.77, positions C.1 through C.3, Appendix A, and Appendix B contain acceptable assumptions and evaluation models for analyzing a rod ejection accident in a PWR reactor. In the VIPR design, the RCS is not pressurized, therefore a rod ejection accident is not a credible transient described in FSAR Chapter 15 accident analysis.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLAs and DC and ESP applications. Atomic Alchemy is applying for a construction and operating permit under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy’s QAPD (was submitted as topical report AA0-VIPR-20-QAPD(NP)) is based on the NQA-1 standard.

NUREG-0800 SRP 4.4, Rev 2 Thermal and Hydraulic Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.4, SRP 4.5.2, SRP 4.5.3, SRP 4.6, SRP 5.2	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 10, GDC 12, R.G. 1.68, R.G. 1.133, NUREG-0718, NUREG-0737	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 4.4– General description: this SRP addresses the thermal and hydraulic design of the core and the reactor coolant system (RCS) use of acceptable analytical methods (or if the design is equivalent to or is a justified extrapolation from proven designs) to provide acceptable margins of safety from conditions that would lead to fuel damage during normal reactor operation and anticipated operational occurrences (AOOs) and is not susceptible to thermal-hydraulic instability. These analytical methods were developed for use in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The VIPR uses a uranium dioxide, zircaloy-clad fuel assembly. The assembly is a shortened [ ] PROP which has a negative fuel temperature coefficient of reactivity.

Atomic Alchemy FSAR Chapter 4a, Section 4, "Thermal Hydraulic Design" will provide the analysis of the thermal hydraulics of the reactor core to ensure that adequate heat transfer from the distribution of heat generation from the core is maintained within design basis levels by the light water pool and reactor coolant system.

The following performance and safety criteria design requirements are established for the thermal and hydraulic design of the fuel. Condition I, II, III, and IV transients and events throughout the Atomic Alchemy FSAR Chapter 4 are as defined in ANSI N18.2a-75.

a) Fuel damage is not expected during normal operation and operational transients (Condition I) or any transient conditions arising from faults of moderate frequency (Condition II).
b) The reactor can be brought to a safe state following a Condition III event with only a small fraction of fuel rods damaged.
c) The reactor can be brought to a safe state and the reactor core can be kept subcritical with acceptable heat transfer geometry following transients arising from Condition IV events.

The difference in the level of risk and challenges from the consequences of Condition III, and IV events and the facility's safety limits are significantly less than either a PWR or BWR.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 10, 12 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Atomic Alchemy will do a line-by-line comparison of the acceptance criteria of this SRP to provide a better understanding of its intended compliance:

SRP 4.4, Acceptance Criteria II.1 through II.3 – Acceptable; the values of process parameters (e.g., reactor power, coolant flow rate, core bypass flow, inlet temperature, nuclear and engineering hot channel factors), core design parameters, and calculational methods used in the assessment of thermal margin will be provided in FSAR Chapter 4a, Section 4.

SRP 4.4, Acceptance Criteria II.4 – Not applicable; the VIPR is located in an open-to-atmosphere light water pool and does not experience transitions from single-phase to two-phase fluid flow.

SRP 4.4, Acceptance Criteria II.5 through II.7 – Acceptable; Technical Specification LCO 3.1 provides safety limits for reactor process parameters described in this SRP. Pre-operational and startup testing is addressed in FSAR Chapter 14, and the Light Water Pool Loose Parts Monitoring Program will be described in FSAR Chapter 13, Appendix A. Pre-operational and start up reactivity testing is addressed in FSAR Chapter 14, Section 6, subsection "Safety-Related Systems and Components to be Tested as Part of Start-Up Testing".

SRP 4.4, Acceptance Criteria II.8 - acceptable, Inadequate Core Cooling (ICC) issues are addressed in FSAR Chapter 4a, Section 5. The buildup of crud is addressed in the RCS piping system hydraulic critical calculations. The piping design also includes design features to minimize any buildup of crud. Additionally, the vendor supplier of the fuel assemblies addresses this issue in the Critical Heat Flux analysis.

SRP 4.4, Acceptance Criteria II.9 – Acceptable; Atomic Alchemy's compliance with TMI Action Plan NUREG-0737 items are addressed in FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)". Compliance with the relevant SRP 4.4 is provided below:

Item II.F.2 - Exceptions as noted; the Atomic Alchemy Reactor is not a PWR or BWR, important safety related reactor and radioisotope process variables are defined in FSAR Chapter 16. Using the Common Q platform I&C architecture, Atomic Alchemy provides the In-Core Instrumentation System (IIC) (will be described in FSAR Chapter 7, Section 4) to monitor reactor core cooling.

SRP 4.4, Acceptance Criteria II.10 – Acceptable; analysis of thermal hydraulic stability during an ATWS will be described in FSAR Chapter 4a, Section 3.

Regulatory Guide 1.68, position C.1 through C.8 – Acceptable; Pre-operational and startup testing is addressed in FSAR Chapter 14.

Regulatory Guide 1.133, positions C.1 through C.6 – Acceptable; the Light Water Pool Loose Parts Monitoring Program will be described in FSAR Chapter 13, Appendix A.

NUREG-0718 – Exceptions as noted; this applies to NUREG-0737 TMI Item I.D.3, "Safety System Status Monitoring," regarding application of Regulatory Guide 1.47. Atomic Alchemy's conformance to the R.G. is as follows: There are no AC power safety related I&C systems in the Atomic Alchemy design therefore these I&C guidelines are applicable to the Class 1E D/C and UPS safety related I&C systems only. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital instrumentation will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the requirements of IEEE 603-1991, and the latest requirements of IEEE 379, and IEEE 338.

NUREG-0800 SRP 4.5.1, Rev 3 Control Rod Drive Structural Materials

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2.2	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 14, GDC 26, R.G. 1.44, ASME BPVC Section III, NB-2160, ASME BPVC, Section III, NB-3120	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 4.5.1– General description: this SRP addresses the design basis requirement that one of the reactivity control systems uses control rods, preferably with a positive means for inserting the rods, and be capable of reliably controlling reactivity changes for assurance that fuel design limits are not exceeded under conditions of normal operation, including anticipated operational occurrences in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Pressure-containing materials of the CRDM comply with the ASME Code, Section III. Unlike a PWR, the CRDM does not form a reactor coolant pressure boundary, but rather it forms a reactor coolant boundary (this is further described in Atomic Alchemy PDC 14). The Atomic Alchemy control drive material selection is based on the duty cycle specified for the control rod drive mechanisms and control rods. The materials are specified so that the components do not suffer adverse effects as a result of a maximum design basis number of trips from full power and a maximum design basis number of coupling and decoupling cycles of the drive rod coupling assembly. The material for the control rod drive mechanisms and the control rod assemblies are selected based on its intended design missions. The estimated peak neutron fluence for the Atomic Alchemy Reactor internals has also been considered in the design of the selection of materials for drive mechanisms. The control		

rod drive mechanisms are inspected and cleaned in accordance with the guidance provided in the Atomic Alchemy QAPD.

The difference in the level of risk and challenges on the Control Rod Drive Mechanism System (CRD) from the consequences of Condition III and IV events and the facility's safety limits are significantly less than either a PWR or BWR.

ASME BPVC Section III, and 10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect that the material selections and the CRDM be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 14, 26 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Atomic Alchemy will do a line-by-line comparison of the acceptance criteria of this SRP to provide a better understanding of its intended compliance:

SRP 4.5.1, Acceptance Criteria II.1 and II.3 – Acceptable; the description of materials used in the CRDM design will be provided in FSAR Chapter 4a, Section 5, "Reactor Materials".

SRP 4.5.1, Acceptance Criteria II.2 and II.4 – the Atomic Alchemy QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the ASME NQA-1 standard.

Regulatory Guide 1.44, positions C.1 through C.7 - acceptable, the control of ferrite content in stainless steel welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A) and "Reactor Coolant Piping Material Inspection Program" (FSAR Chapter 13, Appendix A).

NUREG-0800 SRP 4.5.2, Rev 3 Reactor Internal and Core Support Materials

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2.3, SRP 4.2.5,	10 CFR 50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, R.G. 1.31, R.G. 1.44,	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 4.5.2– General description: this SRP addresses the adequacy of the materials selected for the construction of the reactor internal and core support structures, as defined in ASME III, Part NG-		

1120 to assure that the reactor internal and core support structures meet these regulations. The reactor internal and core support structures reviewed under this SRP section include all structures and components within the pressure vessel other than the fuel and control rod assemblies, and instrumentation in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy facility does not use a nuclear reactor vessel for the reactor core in the VIPR design. The reactor coolant system (RCS) will be designed so that it discharges directly into an open-to-atmosphere water pool via a discharge plenum located beneath the reactor core. The Atomic Alchemy core is supported above the RCS discharge plenum in the light water pool. The plenum and core support structure are integral to each other. All materials used for reactor internals, core support structures and RCS plenum structure has been selected for compatibility with the reactor coolant, as specified in sub-articles NG-2160 and NG-3120 of Section III, Division 1 of the ASME Code. The major core support and RCS plenum material for the reactor are SA-182, SA-336, SA-376, SA-479, or SA-240 Types 304, 304L, 304LN, or 304H stainless steels. Fabricators performing welding of any of these materials are required to qualify the welding procedures for maximum carbon content and heat input for each welding process in accordance with Regulatory Guide 1.44.

Mechanical design of core supports, RCS plenum, and light water pool internals loads, deflections, and stress analysis are performed by static and dynamic modeling.

Testing, inspections, and examinations of the VIPR core, Light Water Pool and RCS discharge plenum internals and materials are in accordance with ASME Section III, Division 1, Sub-article NG-2500, which specifies that examination by either radiographic or ultrasonic examination plus surface examinations as required is acceptable.

Due to the differences in the operational conditions and design limits of the VIPR vs. PWR reactors, the susceptibility to irradiation-assisted stress corrosion cracking is significantly reduced. The difference in the level of risk and challenges on the VIPR core, Core Supports, Light Water Pool internals, and RCS discharge plenum from the consequences of Condition III and IV events and the facility's safety limits are significantly less than either a PWR or BWR.

For additional information see FSAR Chapter 4a, Section 5, "Reactor Materials", and FSAR Chapter 3, Section 9, "Mechanical Systems and Components" for reactor internals and core support material design criteria.

10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect that the material selections for the light water pool internals and reactor core internals will be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.31 – Acceptable; the control of ferrite content in stainless steel welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A) Regulatory Guide 1.44, positions C.1 through C.7 - acceptable, the control of ferrite content in stainless steel piping and welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A) and "Reactor Coolant Piping Material Inspection Program" (FSAR Chapter 13, Appendix A).

NUREG-0800 SRP 4.6, Rev 2 Functional Design of Control Rod Drive System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2.2	10 CFR 50.62(c)(3), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 4, GDC 23, GDC 25, GDC 26, GDC 27, GDC 28, GDC 29	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 4.6– General description: this SRP addresses the functional performance of the control rod drive system (CRDS) to confirm that the system can affect a safe shutdown, respond within acceptable limits during anticipated operational occurrences, and prevent or mitigate the consequences of postulated accidents in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The design of Atomic Alchemy CRD system varies greatly from the design assumptions of this SRP. For example, systems such as recirculation flow control system (RFCS) or standby liquid control system (SLC) are not part of the VIPR design. There are no high energy lines in the vicinity of the CRDM, therefore, the direct effects of postulated moderate- and high-energy line breaks are not considered in the transient analysis (missiles are still analyzed). Rod control systems of the type used in the VIPR have been analyzed in detailed reliability studies of typical "TRIGA" type open pool reactors. These studies include failure mode and effects analyses. The transient analyses presented in the FSAR Chapter 15, demonstrate that the control rod drive system performs its intended safety-related function, to trip the reactor. The control rod drive system puts the reactor in a subcritical condition when a safety-related system setting is reached with an assumed credible failure of a single active component. The Atomic Alchemy control rod drive system is extensively tested prior to its operation. These tests may be subdivided into five categories: • Prototype tests of components • Prototype control rod drive system tests • Production tests of components following manufacture and prior to installation • Onsite pre-operational and initial startup tests		

- Periodic in-service tests

10 CFR 50.62(c)(3) – Not applicable; it applies to BWR reactor designs.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 4, 23, 25, 26, 27, 28, 29 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 BTP 4-1, Rev 3 Westinghouse Constant Axial Offset Control (CAOC)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy reactor design.		

5. REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS

NUREG-0800 SRP 5.2.1.1, Rev 4 Compliance with the Codes and Standards Rule, 10 CFR 50.55a

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 3.1, SRP 3.5, SRP 4.1, SRP 4.2.1, SRP 4.2.2, SRP 5.1, SRP 5.2, SRP 5.3, SRP 6.1, SRP 7.1, SRP 7.2	10CFR50.55a 10 CFR 52.47(b)(1), 10 CFR 52.79(a)(11), 10 CFR 52.80(a), GDC 1, R.G. 1.26	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 5.2.1.1 – General description: this SRP addresses industry standards and codes incorporated by reference into the regulations. Compliance with the requirements related to ASME BPVC and Operation and Maintenance of Nuclear Power Plants (OM Code) are applicable to pressurized-water reactors (PWR) and boiling-water reactor (BWR) design.		

Some of the industry codes and standards incorporated by reference have revisions dating back to the 1970s. Atomic Alchemy will attempt to procure components that conform to those versions of the standards. In some instances, it may create a hardship without a compensating increase in quality and safety to perform a code reconciliation backwards to a previously endorsed revision. In these instances, Atomic Alchemy will request relief under 10 CFR 50.55a(z).

The Versatile Isotope Production Reactor (VIPR) core is located in a light water pool, as such the RCS system is open to atmosphere, while the RCS system is pressurized (by the pump head pressure) which creates a RCPB. It is not a pressurized boundary in the context of what pressures and temperatures an RCPB would be subjected to in a PWR or BWR coolant system design. Further, Atomic Alchemy conservatively redefines the extent of the RCPB to be the “boundary” for reactor coolant system fluids in piping, pressurized or not.

Industry codes and standards requirements pertaining to steam or feedwater type systems of a BWR or PWR design do not apply to the Atomic Alchemy Versatile Isotope Production Reactor (VIPR) design.

Atomic Alchemy will list any exceptions and alternatives to the ASME BPVC in Part VII of the QAPD as part of the operating license application.

Technical Specification 5.6.2, “Inservice Inspection and Testing Program” establishes administrative controls and provides requirements, guidance, and interfaces for preparation and implementation of ASME Section XI ISI/IST and Nondestructive Examinations. The program defines compliance with the criteria of Section III of the ASME Code, Division 1 regarding preparation of certified material test reports (CMTRs) and defines ASME Section Xl Code Class 1, 2, and 3 (equivalent) boundaries in accordance with 10 CFR 50.55a (c), (d), and (e). Testing frequencies specified in the ASME OM Code and applicable Addenda are also included in the program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.26, positions C.1 through C.3 – Acceptable; for mechanical equipment Atomic Alchemy Classes A, B, and C are equivalent to ANS Safety Class 1, 2, and 3. For electrical equipment Atomic Alchemy Class C is equivalent to IEEE Class 1E. The non-safety-related electrical equipment and instrumentation (Class D) is constructed to National Electrical Manufacturers Association (NEMA) standards. Structures, systems, and components classified Class A, B, or C or Seismic Category I are basic components as defined in 10 CFR 21. Atomic Alchemy Equipment Class D is a non-safety-related class. Atomic Alchemy Equipment Class E is used for non-safety-related structures, systems, and components that do not have a specialized industry standard or classification. Atomic Alchemy Equipment Class F is used for Fire Protection Systems, which will comply with National Fire Protection Association Codes which invoke ANSI B31.1. Atomic Alchemy Equipment Class L is used in heating, ventilation, and air-conditioning systems, this complies with SMACNA, AMCA and ASHRAE industrial standards. Atomic Alchemy Equipment Class R is for air

cleaning units and components that may be required to contain, clean, or exclude radioactively contaminated air, which complies with ASME N509 and N510. Atomic Alchemy Equipment Class W complies with American Water Works Association guidelines with no specific quality assurance requirement. Service water systems are Quality Group D since they perform no safety-related functions. Systems that are normally radioactive are classified as Quality Group D.

Atomic Alchemy will classify, as Quality Group D, some important non-safety-related systems and components which may function in reducing the challenges to safety-related systems.

See FSAR Table 3.02-02 for the Atomic Alchemy Classification of Systems and Structures.

NUREG-0800 SRP 5.2.1.2, Rev 4 Applicable Code Cases

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.1, SRP 5.3, SRP 5.7	GDC 1, R.G. 1.192, R.G. 1.84, R.G. 1.147	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 5.2.1.2– General description: this SRP identifies acceptable American Society of Mechanical Engineers (ASME) Code Cases for component construction in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy design is still in its preliminary design phase, and it is anticipated that some ASME code cases will be used. For example “N-71-18 - Additional Material for Subsection NF, Class 1, 2, 3 and MC Component Supports Fabricated by Welding, Section III Division 1” would potentially be one such case. These will be identified in the appropriate sections of the QAPD, FSAR and/or Technical Specification program.

Atomic Alchemy will do a line-by-line comparison of the acceptance criteria of this SRP to provide a better understanding of its intended compliance:

SRP 5.2.1.2 Acceptance Criteria II.1 and II.2 – Acceptable to the extent that it will be applicable to the VIPR design, the Atomic Alchemy in-service test program (See Technical Specifications 5.6.2 “Inservice Inspection and Testing Program”) will identify the ASME OM Code Cases used. See also FSAR Chapter 5, Section 2, “Integrity of Reactor Coolant System Boundary” for applicable code cases used for the Reactor Coolant system boundary.

SRP 5.2.1.2 Acceptance Criteria II.3 and II.4 – Not applicable; the Atomic Alchemy facility is a 10 CFR Part 50 construction application and Design Certification (DC) or Combined Operation License (COL) requirements are not applicable.

GDC 1 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.84, positions C.1 and C.2 – Acceptable; applicable ASME BPVC Section III code cases will be identified in the FSAR Chapter 5, Section 2 and in the Technical Specifications 5.6.2 program.

Regulatory Guide 1.84, positions C.3 through C.5 – Acceptable; Atomic Alchemy will not use ASME BPVC Section III code cases that have either been superseded or annulled by the staff.

Regulatory Guide1.192, positions C.1 and C.2 – Acceptable; applicable ASME OM Code Cases used by Atomic Alchemy will be identified in the FSAR Chapter 5, Section 2, and in the Technical Specifications ISI/IST program.

Regulatory guide 1.192, positions C.3 and C.4 – Acceptable; Atomic Alchemy will not use ASME OM code cases that have either been superseded or annulled by the staff.

Regulatory Guide 1.147, positions C.1 and C.2 - Applicable ASME Section XI Code Cases will be identified in the FSAR Chapter 5, Section 2, and in the technical specification ISI/IST program.

Regulatory Guide 1.147, positions C.3 through C.5 – Acceptable; Atomic Alchemy will not use ASME Section XI code cases that have either been superseded or annulled by the staff.

NUREG-0800 SRP 5.2.2, Rev 3 Overpressure Protection

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	GDC 15, GDC 30, GDC 31	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy design does not include Power-Operated Relief Valves (PORVs). The VIPR coolant system is open to atmosphere and there is no need for “overpressure” protection devices.		

NUREG-0800 SRP 5.2.3, Rev 3 Reactor Coolant Pressure Boundary Materials

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 5.2, SRP 5.3, SRP 5.4	10 CFR50.55a, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 4, GDC 14, GDC 30, GDC 31, R.G. 1.31, R.G. 1.50, R.G. 1.34, R.G. 1.36, R.G. 1.43, R.G. 1.44, R.G. 1.50, R.G. 1.71, R.G. 1.84, ASME BPVC Section III, NB-2300, NB-2550, NB-3120	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 5.2.3– General description: this SRP addresses the materials used for the RCPB. It is separate from materials used in the reactor pressure vessel which is covered in Standard Review Plan (SRP) Section 5.3.1, “Reactor Vessel Materials,” for use in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The VIPR core is located in a light water pool and the RCS system is open to atmosphere. While the RCS system is pressurized (by the RCS pump head pressure) which creates an RCPB, it is not a pressurized boundary in the context of what pressures and temperatures an RCPB would be subjected to in a PWR or BWR coolant system design. Furthermore, Atomic Alchemy conservatively redefines the extent of the RCPB to be the “boundary” for reactor coolant system fluids in piping, pressurized or not. The Atomic Alchemy RCS piping system is a moderate energy system, in the preliminary design phase it is conservatively classified as AMSE Code Section III, Class 1 system.

Atomic Alchemy will do a line-by-line comparison of the acceptance criteria of this SRP to provide a better understanding of its intended compliance.

SRP 5.2.3 Acceptance Criteria II.1 through II.4 – Acceptable; the components in the reactor coolant system (RCS) are Atomic Alchemy Equipment Class A (equivalent to ANS Safety Class 1), Quality Group A, and will be designed and fabricated according to ASME Code Section III, Class 1. See FSAR Table 3.02-02 for the Atomic Alchemy Classification of Systems and Structures.

ASME BPVC Section III, NB-2300, NB-2550, NB-3120 and 10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation and the incorporated by reference ASME codes, with respect to the material selections for the reactor coolant boundary will be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 4, 14, 30, 31 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.34, positions C.1 through C.5 – Acceptable; see FSAR Chapter 5, Section 2, “Integrity of Reactor Coolant System Boundary.” Control of welding is conducted using procedures qualified according to the rules of Sections III and IX of the ASME Code.

Regulatory Guide 1.36, positions C.1, C.2, and C.3 – Not applicable; Atomic Alchemy uses metallic insulation on RCS piping. See FSAR Chapter 5, Section 2, “Integrity of Reactor Coolant System Boundary” for compatibility with external insulation and environmental atmosphere.

Regulatory Guide 1.43, positions C.1 through C.2 – Acceptable; control of stainless-steel weld cladding of low alloy steel components will be described in FSAR Chapter 5, Section 2, “Integrity of Reactor Coolant System Boundary” and FSAR Chapter 4a, Section 11, “Reactor Materials.” Also see FSAR Chapter 13, Appendix A, for the Atomic Alchemy welding program.

Regulatory Guide 1.44, positions C.1 through C.7 – Exceptions as noted; Atomic Alchemy does not have a pressure reactor vessel; therefore, respective welding and material requirements are not applicable. The control of ferrite content in stainless steel piping and welds is addressed by the Atomic Alchemy QAPD program “Welding Quality Assurance Program” (FSAR Chapter 13, Appendix A) and “Reactor Coolant Piping Material Inspection Program” (FSAR Chapter 13, Appendix A).

Regulatory Guide 1.50, positions C.1 through C.4 – Acceptable; requirements governing procedure qualifications for welds and control of the requirements for initial fabrication of low alloy steel in accordance with the ASME B&PV Code Section IX or Section III are contained in the FSAR Chapter 5, Section 3 “Integrity of Reactor Coolant System Boundary” and FSAR Chapter 4a, Section 11, “Reactor Materials”. Also see FSAR Chapter 13, Appendix A, for the Atomic Alchemy welding program.

Regulatory Guide 1.71, positions C.1 through C.3 – Exceptions as noted; current industry practice does not require requalification of welders for areas of limited accessibility as described by this regulatory guide. The performance of Code required nondestructive evaluations can be utilized to confirm the weld quality. Limited accessibility qualification or requalification in excess of ASME Code, Section II or IX requirements is considered an unduly restrictive requirement for component fabrication. See Atomic Alchemy QAPD program “Welding Quality Assurance Program” (FSAR Chapter 13, Appendix A) and “Reactor Coolant Piping Material Inspection Program” (FSAR Chapter 13, Appendix A) for additional information.

Regulatory Guide 1.84, positions C.1 and C.2 – Acceptable; applicable ASME BPVC Section III code cases will be identified in the FSAR Chapter 5, Section 2.

Regulatory Guide 1.84, positions C.3 through C.5 – Acceptable; Atomic Alchemy will not use ASME BPVC Section III code cases that have either been superseded or annulled by the staff.

The ANSI N45.2 series of standards that are referenced by the current revisions of the Quality Assurance Regulatory Guides have been replaced by ASME NQA-l. Atomic Alchemy has committed to NQA-1-2017 as the basis of its QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)).

NUREG-0800 SRP 5.2.4, Rev 2 Reactor Coolant Pressure Boundary Inservice Inspection and Testing

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 5.3	10 CFR 50.55a, 10 CFR 50.2, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 32, R.G 1.147 ,	Exceptions as noted

	ASME BPVC Section XI, IWA-2000, IWB-2000, IWB-1220, IWB-3000, IWB-5000, ASME BPVC Section III, NB-5280	

Summary Description of Compliance/Exceptions

SRP 5.3.1 – General design description: this SRP addresses the necessity that components that are part of the reactor coolant pressure boundary (RCPB) must be designed to permit periodic inspection and testing of important areas and features to assess their structural and leak tight integrity in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Atomic Alchemy redefines RCPB as "reactor coolant boundary."

10 CFR 50.2 – Acceptable; with respect to the definition of RCPB, the VIPR core is located in a light water pool and as such the RCS system is open to atmosphere. While the RCS system is pressurized (by the RCS pump head pressure) which creates a RCPB, it is not a pressurized boundary in the context of what pressures and temperatures a RCPB would be subjected to in a PWR or BWR coolant system design. Atomic Alchemy conservatively redefines the extent of the RCPB to be the "boundary" for reactor coolant system fluids in piping, pressurized or not.

10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect to the ASME Code III Section XI in-service inspection and testing of the materials that comprise the reactor coolant pressure boundary to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 32 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

ASME BPVC Section XI – Acceptable; see FSAR Chapter 5, Section 2, "Integrity of Reactor Coolant System Boundary" for a description of the functional design and in-service testing & inspection requirements of the RCS components that comprise the reactor coolant boundary and Technical Specifications 5.6.2 Inservice Inspection and Testing Program. Pressure-retaining Code Class component leakage and hydrostatic pressure tests are conducted as part of the modified Atomic Alchemy 10 CFR Part 50 Appendix J program and start up testing program in FSAR chapter 14. The Atomic Alchemy reactor coolant piping design and arrangement of system components are reviewed for accessibility under the QAPD "ISI/IST and Pre-Service Inspectability Program" (See FSAR Chapter 13, Appendix A). The control of ferrite content in stainless steel piping and welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A) and "Reactor Coolant Piping Material Inspection Program" (FSAR Chapter 13, Appendix A).

Regulatory Guide 1.147, positions C.1 and C.2 – Acceptable; applicable ASME Section XI Code Cases will be identified in the FSAR Chapter 5, Section 2 and in the Technical Specification ISI/IST program.

Regulatory Guide 1.147, positions C.3 through C.5 – Acceptable; Atomic Alchemy will not use ASME Section XI code cases that have either been superseded or annulled by the staff.

NUREG-0800 SRP 5.2.5, Rev 2 Reactor Coolant Pressure Boundary Leakage Detection

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 5.3, SRP 5.4	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 30, R.G. 1.29, R.G. 1.45	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 5.3.1 – General design description; this SRP addresses the reactor coolant pressure boundary (RCPB) leakage detection systems which are designed to detect and, to the extent practical, identify the source of reactor coolant leakage in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

Each VIPR core is located in its own light water pool and as such the RCS system is open to atmosphere. While the RCS system is pressurized (by the RCS pump head pressure) which technically creates a RCPB, it is not a pressurized boundary in the context of what pressures and temperatures a RCPB would be subjected to in a PWR or BWR coolant system design. Atomic Alchemy conservatively redefines the extent of the RCPB to be the "boundary" for reactor coolant system fluids in piping, pressurized or not. RCS loop piping is routed in pipe chases with HELB hatches located to permit ASME Section XI inspections.

Atomic Alchemy conservatively applies a similar type 10 CFR 50.54(o), and 10 CFR 50, App. J, reactor containment/vessel leakage inspection and surveillance type requirements to its respective light water reactor confinement pools and RCS piping chases. This is captured as commitment AA0-RC-0002 submitted in the QAPD. Technical Specification 5.6.4, "RCS and Light Water Pool Leakage Rate Testing Program" implements this Appendix B quality program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 30 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.29, General; Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary as defined by Atomic Alchemy for a Reactor located within an open light water pool rather than 10 CFR 50.2 definition.

Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic Category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis".

Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; PWR and BWR related components are not applicable to the Reactor seismic Category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does it require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. Atomic Alchemy does not have a feedwater system. Atomic Alchemy does not have safety related diesel generators, as the standby diesel generator is not required for safe shutdown, to mitigate an accident or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports".

Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i – Acceptable; safety class instrumentation seismic Category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports".

Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

Regulatory Guide 1.45, positions C.1.1 through C.2.5 – Acceptable; the Atomic Alchemy Reactor coolant boundary leakage detection systems (Technical Specifications 5.6.4) are selected and designed in accordance with the guidelines of this regulatory guide.

Regulatory Guide 1.45, positions C.3.1 through C.3.4 – Acceptable; see FSAR Chapter 13, Appendix A, RCS System Leak Detection Program, also see Technical Specification 5.6.4 "RCS and Light Water Pool Leakage Rate Testing Program."

As part of the Atomic Alchemy leak-before-break application, the installed leak detection capability is 10x greater than the postulated leak. See FSAR Chapter 3, Section 6 "Protection Against Dynamic Affects Associated with Postulated Pipe Ruptures".

Regulatory Guide 1.45, position C.4 – Acceptable; see Technical Specifications LCO 3.4.6.

NUREG-0800 SRP 5.3.1, Rev 2 Reactor Vessel Materials

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	10 CFR 50.55a, 10 CFR 50.60, 10 CFR 50, Appendix B, Criterion XIII, 10 CFR 50, Appendix G, 10 CFR 50, Appendix H,	N/A

	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 4, GDC 14, GDC 30, GDC 31, GDC 32, R.G. 1.31, R.G. 1.34, R.G. 1.43, R.G. 1.44, R.G. 1.65	

Summary Description of Compliance/Exceptions

SRP 5.3.1 – General design description: this SRP addresses the material specifications used for the reactor vessel and applicable attachments and appurtenances for their adequacy for use in the construction of reactor vessel related components on the basis of the mechanical and physical properties of the materials, the effects of irradiation on these materials, their corrosion resistance, etc. in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy VIPR design does not employ a "vessel." The intent of this SRP is in regard to the appropriate selection of materials for their intended design use in containment of a reactor core. Atomic Alchemy describes herein its conformance to appropriate requirements to the extent that they might be applicable.

10 CFR Part 50, Appendix G and 10 CFR Part 50 Appendix H - Exceptions as noted; the fracture toughness requirements of 10 CFR Part 50 Appendix G and the reactor coolant pressure boundary material surveillance of 10 CFR Part 50 Appendix H do not apply to the Reactor RCS pressure boundary because each VIPR core is located in its own light water pool. The RCS system is open to atmosphere, and while the RCS system is pressurized (by the RCS pump head pressure) which creates a RCPB, it is not a pressurized boundary in the context of what pressures and temperatures a RCPB would be subjected to in a PWR or BWR coolant system design. Atomic Alchemy does implement similar type programs; see FSAR Chapter 13, Appendix A and QAPD for the Atomic Alchemy "Material Control and Accountability Program" and the "Reactor Coolant System Material Surveillance Program".

10 CFR 50.55a – Acceptable; in the context of this SRP Atomic Alchemy will comply with this regulation with respect to the ASME Code III selection of the materials that comprise the reactor coolant pressure boundary to quality standards commensurate with the importance of the safety functions to be performed.

10 CFR 50.60 – Exception as noted; the Atomic Alchemy "reactor coolant pressure boundary" is redefined for the NPUF designed reactor and therefore requirements of 10 CFR 50.60 are acceptable with the exceptions as noted with respect to the fracture toughness and material surveillance programs of a PWR/BWR type reactor coolant pressure boundary. The light water pool uses an aluminum liner so a peak neutron fluence is not an applicable concern over the life of the facility. For similar material surveillance type programs see FSAR Chapter 13, Appendix A and QAPD for Atomic Alchemy's "Material Control and Accountability Program", Reactor Pool Liner Inspection," and the "Reactor Coolant System Material Inspection Program."

10 CFR Part 50, Appendix B, Criterion XIII – Acceptable; Atomic Alchemy implements a QAPD based on NQA-1-2017, see corresponding Criterion XIII programs for applicable special or additional handling, storage, shipping, cleaning, and preservation requirements.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 4, 14, 30, 31, 32 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.31 – Acceptable; the control of ferrite content in stainless steel welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A).

Regulatory Guide 1.34, positions C.1 through C.5 – Acceptable; see FSAR Chapter 5, Section 2, "Integrity of Reactor Coolant System Boundary" control of welding is conducted using procedures qualified according to the rules of Sections III and IX of the ASME Code.

Regulatory Guide 1.43, positions C.1 through C.2 – Acceptable; control of stainless-steel weld cladding of low alloy steel components will be described in FSAR Chapter 5, Section 2, "Integrity of Reactor Coolant System Boundary" and FSAR Chapter 4a, Section 11, "Reactor Materials". Also see FSAR Chapter 13, Appendix A, for the Atomic Alchemy welding program.

Regulatory Guide 1.44, positions C.1 through C.7 – Exceptions as noted; Atomic Alchemy does not have a pressure reactor vessel; therefore, respective welding and material requirements are not applicable. The control of ferrite content in stainless steel piping and welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A) and "Reactor Coolant Piping Material Inspection Program" (FSAR Chapter 13, Appendix A).

Regulatory Guide 1.65, positions C.1 and C.2 – Exceptions as noted; The Atomic Alchemy VIPR is not located within a reactor vessel and therefore these requirements are not applicable. However, Atomic Alchemy will apply a similar standard to the construction of the reactor core light water pool for any stud bolting materials and corrosion protection. See FSAR Chapter 4a, Section 11, "Reactor Materials" for structural fastener material requirements.

See FSAR Chapter 4a, Section 11 for CRDM, reactor internals, core supports, and other reactor core light water pool internal component materials.

NUREG-0800 SRP 5.3.2, Rev 2 Pressure-Temperature Limits, Upper-Shelf Energy, and Pressurized Thermal Shock

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
SRP 5.3.2 – General design description: this SRP addresses: • the pressure-temperature (P-T) limits on maintaining the reactor coolant pressure boundary (RCPB) • the reactor vessel beltline Charpy upper-shelf energy (USE) • assessment of potential pressurized thermal shock (PTS) (pressurized-water reactor (PWR) only) Each VIPR core is located in its own light water pool and therefore the RCS system is open to atmosphere. While the RCS system is pressurized (by the RCS pump head pressure) which creates a RCPB, it is not a pressurized boundary in the context of what pressures and temperatures a RCPB would be subjected to in a PWR or BWR coolant system design. This SRP is not applicable to the VIPR design. 10 CFR 50.60, 10 CFR 50.61, and 10 CFR Part 50, Appendix G – Exceptions as noted above; the fracture toughness requirements of 10 CFR Part 50 Appendix G do not apply to the VIPR RCS boundary. See FSAR Chapter 13, Appendix A and the QAPD for the Atomic Alchemy "Material Control and Accountability Program" and the "Reactor Coolant Piping Material Inspection Program". Pressurized Thermal Shock (PTS) Events, exceeding the P-T limits of light water pool materials, overcooling in conjunction with over-pressurization, thermal stresses in combination with the pressure stresses, or the buildup of a peak neutron fluence exceeding 1017 n/cm2 (E > 1 MeV) during the life of the facility in light water pool materials are not credible transients in the Atomic Alchemy Reactor analysis.

NUREG-0800 SRP 5.3.3, Rev 2 Reactor Vessel Integrity

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 5.3.3 – General design description: this SRP addresses the integrity of the reactor vessel in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy VIPR does not have a pressure vessel. Therefore, these specific SRP requirements are not applicable. The intent of the SRP is to define the integrity of the structures containing the reactor core. To that extent, summarized here is a description of the reinforced concrete light water pool. The light water pool is a Category I structure, designed in accordance with the requirements will be described in FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures".		

The walls of this pool are constructed using modular construction techniques. This allows higher quality than traditional construction. The advanced welding techniques used minimize the potential for weld failures during operation and allow for inspection to verify weld quality. The reactor pool is a reinforced concrete design with an aluminum liner. The reinforced concrete structure will be designed and fabricated in accordance with ASME Boiler and Pressure Vessel (B&PV) Code, Section III, Division 2, or ACI Standard 359-01. Design considerations relating to fracture toughness and radiation effects on stainless steel are not applicable with respect to the reinforced concrete pool with an aluminum liner. Requirements of Regulatory Guide 1.99, Not applicable; acceptability of the material surveillance program, as specified in Appendix H, “Reactor Vessel Material Surveillance Program Requirements” are not applicable with respect to the reinforced concrete pool with an aluminum liner. In-service surveillances similar to the acceptance criteria for adequacy of the reactor vessel materials surveillance program are not applicable to the light water pool. Atomic Alchemy has committed to a structure monitoring program, (See FSAR Chapter 3, Appendix D) that incorporates the guidance from ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures".

NUREG-0800 SRP 5.4, Rev 2 Reactor Coolant System Component and Subsystem Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2.3, SRP 5.3, SRP 5.4, SRP 5.6, SRP 5.7	N/A	N/A
Summary Description of Compliance/Exceptions		
This section contains no acceptance criteria for compliance. It is a road map to other applicable SRP Sections regarding the RCS system. The Atomic Alchemy VIPR is a non-power reactor. The following identified systems or components contained in this SRP are not part of the Atomic Alchemy NPUF coolant system design: • Steam Generator • Pressurizer • Main Steam Line Flow Restrictions • Reactor Core Isolation Cooling System (BWR) / Isolation Condenser System (ESBWR) • Residual Heat Removal System / Passive Residual Heat Removal System (ALWR) / Shutdown Cooling Mode of the Reactor Water Cleanup System (ESBWR) • Reactor Water Cleanup System (BWR) / Reactor Water Cleanup/Shutdown Cooling System (ESBWR) • Reactor Coolant System Pressure Relief Devices / Reactor Coolant Depressurization Systems		

- Pressurizer Relief Discharge System
- RCS High-Point Vents, Main Steam Line, Feedwater, and Auxiliary Feedwater Piping

NUREG-0800 SRP 5.4.1.1, Rev 2 Pump Flywheel Integrity (PWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2	10 CFR Part 50.55a(a)(1), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 4, R.G. 1.14, ASME BPVC Section III, NB-2500	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 5.4.1.1 – General design description: this SRP addresses a loss of flywheel integrity that could result in high energy missiles. The safety consequences could be significant because of possible damage to the reactor coolant system, the containment, or the engineered safety features in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy reactor coolant pumps are single-stage, hermetically sealed, high-inertia, centrifugal seal-less pump with an alloy flywheel and canned motor design. Many of the criteria in SRP 5.4.1.1 are not directly applicable to the design of an alloy flywheel in a canned motor pump.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 4 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

10 CFR 50.55a(a)(1) and BPVC Section III, NB-2500 – Acceptable; procedures and Acceptance Criteria meeting the intent of the Code requirements will be developed to be specifically applicable to the alloy material.

The reactor coolant pumps in the Atomic Alchemy Reactor Coolant System are canned motor pumps with an encased flywheel assembly which provides the rotating inertia function of the fly wheel. The flywheel assembly is adjacent to the pump impeller and surrounded by the thick pressure boundary of the pump whereas the flywheels in shaft seal pumps are at the opposite end of the motor from the pump casing surrounded by only the motor enclosure.

In-service inspection of the flywheel assembly is not required to support safe operation of the canned motor reactor coolant pump.

Planned, routine inspections of the flywheel assembly might require considerable occupational radiation exposure and at this stage of the preliminary design are not recommended. In-service inspection of the casing requires extensive disassembly. Postulated missiles from the failure of the flywheel are contained within the stator shell and the pressure boundary is not breached. Vibration of the shaft due to a small flywheel fracture or leak in the enclosure does not result in stresses in the pump pressure boundary of sufficient magnitude to result in a break in the pump primary pressure boundary.

The criterion in this section were developed to address steel flywheels in shaft seal pumps. The Atomic Alchemy RCS pumps will meet the intent of the criteria to provide a design with high integrity which will not be a source of missile generation.

Regulatory Guide 1.14, positions C.1.a – Not applicable; the Atomic Alchemy flywheel is of a bi-metallic design.

Regulatory Guide 1.14, positions C.1.b – Exceptions as noted; Fracture toughness and tensile properties are only checked for components that are required for structural integrity of the bi-metallic flywheel.

Regulatory Guide 1.14, positions C.1.c – Not applicable; there are no flame cut surfaces.

Regulatory Guide 1.14, positions C.1.d – Not applicable; the components of the flywheel that are relied upon for structural integrity require no welding.

Regulatory Guide 1.14, positions C.2.a and C.2.b – Acceptable; flywheel integrity will be described in FSAR Chapter 5, Section 3.

Regulatory Guide 1.14, positions C.2.c through C.2.e – Exceptions as noted; the limits and methods of ASME Code, Section III, Paragraph F are not directly applicable to the design of the Atomic Alchemy RCS pump flywheel assembly.

Regulatory Guide 1.14, positions C.2.f – Acceptable; the calculated stress levels in the flywheel satisfy the ASME Code, Section III, Subsection NG stress limits. See FSAR Chapter 5, Section 3.

Regulatory Guide 1.14, positions C.2.a through C.2.g – Acceptable; RCS pump overspeed from high coolant flow rates associated with pipe rupture events are mitigated by the inertia of the pump, flywheel, and motor. See FSAR Chapter 5, Section 3 for a further description.

Regulatory Guide 1.14, positions C.3.through C.4 – Acceptable; Reactor coolant pump construction is subject to a quality assurance program. The pressure boundary components meet requirements established by the ASME Code. The reactor coolant pump in-service inspection program is according to the ASME Code, Section XI. See Technical Specifications 5.6.2 for the Atomic Alchemy “Inservice Inspection and Testing Program”.

NUREG-0800 SRP 5.4.2.1, Rev 4 Steam Generator Materials and Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
As stated in response to SRP 5.4, the Atomic Alchemy Reactors do not generate steam, there is not a steam generator in the design therefore this is not applicable.

NUREG-0800 SRP 5.4.2.2, Rev 2 Steam Generator Program

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	10 CFR 50.55a(g)	N/A

Summary Description of Compliance/Exceptions

SRP 5.4.2.2– General description: this SRP addresses a necessary program for maintaining tube integrity during operation and postulated accident conditions. The steam generator program is intended to ensure that the structural and leakage integrity of the tubes is maintained at a level comparable to that of the original design requirements features in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The intent of this SRP is to maintain integrity between primary and secondary fluids. Atomic Alchemy uses a heat exchanger between primary and secondary cooling systems, and the method by which Atomic Alchemy meets the intent of this SRP is provided herein.

10 CFR 50.55a(g) – Exceptions as noted; As stated in response to SRP 5.4, the Atomic Alchemy Reactors do not generate steam, and there is no steam generator utilized in the reactor design. Atomic Alchemy does, however, have an interface between primary and secondary coolant, which is a heat exchanger. Technical Specification LCO 3.4.11, "Reactor Coolant Heat Exchanger Tube Integrity" complies with the intent of this SRP. While there is not a requirement by the NRC under NUREG-1537 Appendix A, Atomic Alchemy recognizes the good business practice of developing and implementing a heat exchanger inspection program similar to ASME Section XI ISI inspection program. Atomic Alchemy meets this intent of this SRP with the Technical Requirements Manual 5.6.7, "Reactor Coolant Heat Exchanger Inspection Program".

TSTF-510 modifies the standard T/S frequency for Steam Generator HX inspections and repairs and allows for tube plugging rather than tube repair. Atomic Alchemy will implement TSFT-510 into their Technical Requirements Heat Exchanger Tube Inspection Program.

API 510 is the industry standard for inspection HX's.

NUREG-0800 SRP 5.4.6, Rev 4 Reactor Core Isolation Cooling System (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
As stated in response to SRP 5.4, this is not applicable to the VIPR design.

NUREG-0800 SRP 5.4.7, Rev 5 Residual Heat Removal (RHR) System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 5.4, this is not applicable to the VIPR. There is no residual heat removal system in the Atomic Alchemy design.		

NUREG-0800 SRP 5.4.8, Rev 3 Reactor Water Cleanup System (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 5.4, this is not applicable to the VIPR, as this is only applicable to BWR reactors.		

NUREG-0800 SRP 5.4.11, Rev 4 Pressurizer Relief Tank

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 5.4, this is not applicable to the VIPR, as this is only applicable to PWR reactors.		

NUREG-0800 SRP 5.4.12, Rev 1 Reactor Coolant System High Point Vents

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
As stated in response to SRP 5.4, the Atomic Alchemy does not have high point vents in its reactor coolant system piping design. The accumulation of non-condensable gases would not cause the loss of function of these systems. Additionally, the core is located in an open light water pool.

NUREG-0800 SRP 5.4.13 (Initial Issuance) Isolation Condenser System (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 5.4, this is not applicable to the VIPR, as this is only applicable to BWR reactors.		

NUREG-0800 BTP 5-1, Rev 3 Monitoring of Secondary Side Water Chemistry in PWR Steam

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 5.4, the VIPR does not generate steam, and there is no steam generator in the system design. However, there is an RCS Heat Exchanger. The chilled water secondary side of the RCS Heat Exchanger is monitored for radiation and the water chemistry is controlled administratively by procedures. Additionally, while there is not a requirement by the NRC under NUREG-1537 Appendix A, Atomic Alchemy recognizes the good business practice of implementing similar requirements for Inspecting the potential service degradation and deterioration of tubing of the reactor coolant heat exchanger. See Atomic Alchemy Technical Requirements Manual section 5.6.7 for the “Reactor Coolant Heat Exchanger Tube Inspection Program”.		

NUREG-0800 BTP 5-2, Rev 3 Over pressurization Protection of Pressurized-Water Reactors While Operating at Low Temperatures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
Not applicable; the VIPR cooling system is open to atmospheric pressure as such there is no need for "overpressure" protection devices.

NUREG-0800 BTP 5-3, Rev 3 Fracture Toughness Requirements

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP BTP 5-3– General description: this SRP addresses requirements regarding fracture toughness, pressure-temperature limits, material surveillance, and pressurized thermal shock (PTS) in vessels in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Each VIPR core is located in its own light water pool. The RCS system is open-to-atmosphere and does not have a pressurized vessel. While the Atomic Alchemy RCS piping system is pressurized (by the RCS pump head pressure), which creates a RCPB, it is not a pressurized boundary in the context of what pressures and temperatures a RCPB would be subjected to in a PWR or BWR coolant system design. There are no applicable pressure/temperature operating limits such as found in Table 1 of 10 CFR part 50 appendix G. This SRP BTP is therefore not applicable to the VIPR design. 10 CFR Part 50, Appendix G and 10 CFR Part 50 Appendix H – Exceptions as noted above; the fracture toughness requirements of 10 CFR Part 50 Appendix G and the reactor coolant pressure boundary material surveillance of 10 CFR Part 50 Appendix H do not apply to the Reactor RCS pressure boundary. Atomic Alchemy does incorporate Appendix B programs to monitor RCS material. See FSAR Chapter 13, Appendix A and QAPD for the Atomic Alchemy "Material Control and Accountability Program" and the "Reactor Coolant System Material Inspection Program".		

NUREG-0800 BTP 5-4, Rev 4 Design Requirements of the Residual Heat Removal System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable; the VIPR design satisfies the intent of this branch technical paper by further reducing any potential risk associated with loss of the decay heat removal function through a combination of safety-related passive systems, together with non-safety-related active systems. The Atomic Alchemy Reactor design therefore does not rely on a designated safety related Residual Heat Removal system.		

6. ENGINEERED SAFETY FEATURES

NUREG-0800 SRP 6.1.1 Rev 2 Engineered Safety Features Materials

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 1.3, SRP 6, SRP 6.1, SRP 6.2, SRP 6.2.1, SRP 6.2.3	10 CFR 50, Appendix B, Criteria IX and XIII, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 4, GDC 14, GDC 31, GDC 35, GDC 41, ASME BPVC III, R.G. 1.7, R.G. 1.31, R.G. 1.36, R.G. 1.44, R.G. 1.50, R.G. 1.84	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 6.1.1– General description: Containment systems, residual heat removal systems, emergency core cooling systems, containment heat removal systems, containment atmosphere cleanup systems, and certain cooling water systems are typical of the systems that are required to provide an ESF. The compatibility of materials and fluids for these systems are reviewed in this SRP section in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

As an NPUF, Atomic Alchemy re-defines the reactor coolant pressure boundary (RCPB) and the containment boundary for the reactor as described in its responses to PDC 14 and PDC 16, respectively in FSAR Chapter 3, Attachment F. Further, Atomic Alchemy will apply this SRP criterion to the radioisotope process module and radwaste module buildings as they each may present a potential for a release of radioactive products to the environment following a postulated transient that will be described in the FSAR Chapter 15 accident analysis.

The Atomic Alchemy Reactor Confinement Module, Radioisotope Process Module and Radwaste Module buildings' fission products control strategy does not require onsite or offsite A/C power and it does not depend on active "safety-related" engineered safety feature (ESF) atmosphere cleanup systems to meet limits on doses offsite or onsite.

ASME BPVC Section III – Acceptable; the Atomic Alchemy safety related ESF systems components will conform to the requirements of the ASME code class they are identified as belonging to.

10 CFR Part 50, Appendix B, Criteria IX and XIII – Acceptable; Atomic Alchemy implements a QAPD based on NQA-1-2017. See corresponding Criteria IX and XIII programs for applicable special or additional handling, storage, shipping, cleaning, and preservation requirements.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 4, 14, 31, 35, 41 – Exceptions as noted; FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.7, position C.1 – Exceptions as noted; there is no potential for a post-accident LOCA combustible gas buildup greater than 10%. This is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis.

Regulatory Guide 1.7, position C.2 – Exceptions as noted; a non-safety-related combustion gas monitoring system is employed.

Regulatory Guide 1.7, position C.3 – Exceptions as noted; mixing of the Atomic Alchemy Reactor confinement atmosphere is accomplished through natural circulation, not with an active system design. Since it is not postulated that an explosive atmosphere can form following a transient, only a sensitivity study will be conducted to ensure adequate mixing.

Regulatory Guide 1.7, position C.4 – Not applicable; The Atomic Alchemy facility does not use hydrogen recombiners or igniters.

Regulatory Guide 1.7, position C.5 – Not applicable; an over-pressurization condition (or any combination of conditions exceeding 45 psi) inside the reactor confinement module, radioisotope processing module, target fabrication module, or radwaste module buildings are not credible transients in the Atomic Alchemy FSAR Chapter 15 accident analysis.

Regulatory Guide 1.31 – Acceptable; the control of ferrite content in stainless steel welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A).

Regulatory Guide 1.36, positions C.1, C.2, and C.3 – Not applicable; Atomic Alchemy uses metallic insulation on RCS piping. See FSAR Chapter 5, Section 2, "Integrity of Reactor Coolant System Boundary" for compatibility with external insulation and environmental atmosphere.

Regulatory Guide 1.44, positions C.1 through C.7 – Acceptable; the control of ferrite content in stainless steel piping and welds is addressed by the Atomic Alchemy QAPD program "Welding Quality Assurance Program" (FSAR Chapter 13, Appendix A) and "Reactor Coolant Piping Material Inspection Program" (FSAR Chapter 13, Appendix A).

Regulatory Guide 1.50 – The guidelines of this regulatory guide are followed during the initial fabrication of general low-alloy steel components of the Atomic Alchemy facility. This regulatory guide is considered as applicable to ASME Code, Section III, Class 1 components. The Atomic Alchemy practice for Class 1 components is in agreement with the guidance of this regulatory guide.

Regulatory Guide 1.84, positions C.1 and C.2 – Applicable ASME BPVC Section III code cases will be identified in the FSAR.

Regulatory Guide 1.84, positions C.3 through C.5 – Acceptable; Atomic Alchemy will not use ASME BPVC Section III code cases that have either been superseded or annulled by the staff.

NUREG-0800 SRP 6.1.2 Rev 3 Protective Coating Systems (Paints) - Organic Materials

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2	R.G. 1.54	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 6.1.2 – General design description: the Atomic Alchemy includes the use of non-safety-related coatings inside both the reactor confinement building module and the radioisotope production building module. There are no coatings inside the light water pool that might interfere with post-accident decay heat convection cooling.

Regulatory Guide 1.54, positions C.1 through C.5 - Coatings are classified as non-safety-related when their failure does not prevent functioning of the engineered safety features. Non-safety related coatings are not subject to the Quality Assurance requirements of Regulatory Guide 1.54. The quality assurance program for safety-related coatings will conform to the requirements of ASME-NQA-1-2017. Safety related coatings meet the pertinent provisions of 10 CFR Part 50 Appendix B.

NUREG-0800 SRP 6.2.1 Rev 3 Containment Functional Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions

This section contains no acceptance criteria for compliance. It is a road map to other applicable SRP Sections regarding the reactor containment system.

The Atomic Alchemy Versatile Isotope Production Reactor (VIPR) is a non-power reactor. The following identified systems, components, or analyses contained in this SRP section are not part of the Atomic Alchemy Reactor design: PWR, BWR, ABWR, ESBWR, ice condenser containment, mass and energy release analysis for postulated loss-of-coolant accidents, mass and energy release analysis for postulated secondary system pipe ruptures, minimum containment pressure analysis for emergency core cooling system (ECCS) performance capability studies.

NUREG-0800 SRP 6.2.1.1.A, Rev 3 PWR Dry Containments, Including Sub atmospheric Containments

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions

As stated in response to SRP 6.2.1, this SRP is not applicable to the VIPR.

NUREG-0800 SRP 6.2.1.1.B, Rev 2 Ice Condenser Containments

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 6.2.1, this SRP is not applicable to the VIPR.		

NUREG-0800 SRP 6.2.1.1.C, Rev 7 Pressure-Suppression Type BWR Containments

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 6.2.1, this SRP is not applicable to the VIPR.		

NUREG-0800 SRP 6.2.1.1.C, Rev 7 Appendix A Steam Bypass for Mark I, II, and III Containments

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 6.2.1, this SRP is not applicable to the VIPR.		

NUREG-0800 SRP 6.2.1.1.C, Rev 7 Appendix B Summary of Mark II LOCA-related Pool Dynamic Loads

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
As stated in response to SRP 6.2.1, this SRP is not applicable to the VIPR.		

NUREG-0800 SRP 6.2.1.2, Rev 3 Sub Compartment Analysis

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.1,	GDC 4, GDC 50, NUREG-0609	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 6.2.1.1 – General design description: not applicable to the Atomic Alchemy Reactor confinement module or reactor auxiliary module building compartments. A double ended LB primary cooling piping break is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis.

Dynamic effects need not be considered for those segments of piping that are shown mechanistically, within a large margin, not to be susceptible to a pipe rupture. The methodology for this determination is called leak-before-break (LBB).

Atomic Alchemy ASME Section III, Class 1 and Class 2 piping is evaluated for LBB.

Atomic Alchemy will perform a sensitivity study for potential asymmetrical loading on reactor support and internals resulting from transients in beyond design basis scenarios. Severe Accidents are addressed in FSAR Chapter 19.

GDC 4, 50 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0609 – Not applicable; a double ended LB primary cooling piping break is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis

NUREG-0800 SRP 6.2.1.3, Rev 3 Mass and Energy Release Analysis for Postulated Loss-of-Coolant Accidents (LOCAs)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 4.6, SRP 5.2, SRP 13	10 CFR Part 50 Appendix K, GDC 50	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 6.2.1.3 – General design description: Conservative assumptions have been made in considering the release of all energy sources (including reactor power, decay heat, stored energy in the core, stored energy in the reactor coolant system metal, including the reactor pool internals; metal-water reaction energy and stored energy in the secondary system) to reactor confinement module and reactor auxiliary module buildings.

GDC 50 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. 10 CFR Part 50 Appendix K, I.A, "Sources of heat during the LOCA" – Not applicable; the Atomic Alchemy design includes a LBB analysis of ASME Section III, Class 1, and Class 2 piping. There is no credible LB LOCA transient or LOCA in the FSAR Chapter 15 analysis where the reactor core is uncovered. 10 CFR Part 50 Appendix K, I.B, "Swelling and Rupture of the Cladding and Fuel Rod Thermal Parameters" – Acceptable; all credible heat sources are conservatively analyzed in the FSAR Chapter 15 accident analysis. 10 CFR Part 50 Appendix K, I.C, "Blowdown Phenomena" – Not applicable; two phase flow is not a credible phenomenon in the FSAR chapter 15 accident analysis. The RCS system is open to the atmosphere, and the "ECCS" type makeup water (Reactor Decay Heat Removal System (DHR)) is passively fed into the light water pool. Boiling heat transfer in the light water pool between the rods and the pool water continues throughout the entire LOCA postulated transient. 10 CFR Part 50 Appendix K, I.D, "Post-Blowdown Phenomena; Heat Removal by the ECCS" – Not applicable; Because the reactor is located in an open light water pool, and are not contained inside a pressurized vessel, it is not postulated that any transient involving a high energy primary reactor cooling pipe break would result in a significant increase in the confinement module or auxiliary module buildings design pressure. 10 CFR Part 50 Appendix K, II, "Required Documentation" – Acceptable; the description of the LOCA events is included in the FSAR chapter 15, Section 7 accident analysis.

NUREG-0800 SRP 6.2.1.4, Rev 2 Mass and Energy Release Analysis for Postulated Secondary System Pipe Ruptures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.6, SRP 5.3, SRP 13	10 CFR Part 50 Appendix K, GDC 50	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 6.2.1.4 – General design description: The Atomic Alchemy facility does not have feedwater, auxiliary feedwater, or main steam (from a reactor vessel, or pressurizer) piping related systems. Atomic Alchemy secondary systems only involve medium energy systems. Conservative assumptions have been made in considering the release of all energy sources to the reactor confinement module, reactor auxiliary module, and radioisotope process module buildings. Because the VIPR is located in an open pool and are not contained inside a pressurized vessel, there are no transients involving secondary cooling piping that would result in a significant increase in the reactor confinement module or reactor auxiliary module building design pressure.		

Atomic Alchemy uses a "leak before break" analysis of ASME Section III Class 1 and Class 2 piping. A piping rupture hazards analysis is performed on high and medium energy secondary systems. Additionally, a LB LOCA or a LOCA that uncovers the reactor core are not design basis transients in the FSAR Chapter 15 accident analysis. GDC 50 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. For an evaluation and conformance with 10 CFR Part 50 Appendix K, see Atomic Alchemy's responses in SRP 6.2.1.3.

NUREG-0800 SRP 6.2.1.5, Rev 3 Minimum Containment Pressure Analysis for Emergency Core Cooling System Performance Capability Studies

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 6.2.1, SRP 6.2.3, SRP 13.3.1	10 CFR 50.46(a)(1)(i), 10 CFR 50.46(a)(1)(ii), 10 CFR Part 50 Appendix K	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 6.2.1.5 – General description, following a LOCA in a PWR the ECCS must overcome the buildup of pressure inside the reactor vessel. The Atomic Alchemy facility does contain its reactor core within a vessel, nor is steam a byproduct of an RCS piping break. The equivalent Atomic Alchemy ECCS system is passive and relies on gravity to refill the light water pool if needed. Therefore a minimum pressure analysis is not performed as part of the FSAR Chapter 15 accident analysis. Atomic Alchemy may choose to perform a sensitivity study on the potential pressurization of the reactor confinement module building to assure building leakage remains minimal following any LOCA transient. 10 CFR 50.46(a)(1)(i) and 10 CFR 50.46(a)(1)(ii) – Acceptable; the LOCA transients accurately analyze the behavior of the VIPR core in the FSAR Chapter 15 accident analysis. ASME Section III, Class 1 and Class 2 piping are shown mechanistically, within a large margin, not to be susceptible to a pipe rupture. See FSAR Chapter 3, Section 6, "Protection Against Dynamic Affects Associated with Postulated Pipe Ruptures". For an evaluation and conformance with 10 CFR Part 50 Appendix K, see Atomic Alchemy's responses in SRP 6.2.1.3.		

NUREG-0800 SRP 6.2.2, Rev 5 Containment Heat Removal Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2,	10 CFR 50.46(b)(5),	Exceptions as noted

SRP 6.2.1,	GDC 38, GDC 39, GDC 40, R.G. 1.82	

Summary Description of Compliance/Exceptions

SRP 6.2.2 – General design description: Heat removal from the confinement building is accomplished by use of natural forces such as convection, condensation, evaporation, gravity, and conduction.

10 CFR 50.46(b)(5) – Not applicable; (in the context that adequate NPSH margin is necessary to be maintained by any designated ECCS system following a design basis LOCA). The Atomic Alchemy ESF design employs a safety related "ECC" like system (designated as Reactor Decay Heat Removal system - DHR) for conservatism, should the reactor core light water pool level drop due to a loss of coolant accident, the light water in the radioisotope transfer canal pool will passively drain by gravity (therefore maintaining a NPSH margin is not necessary) into the reactor core/spent fuel light water pool. No active pump is necessary to fulfill this long-term decay heat removal function.

GDC 38, 39, 40 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.82, positions C.1, C.2 – Not applicable; Heat removal from the Atomic Alchemy confinement building does not rely on a spray system and requires no active pumps. Heat removal does not require the use of an internal spray system. Heat removal from the confinement building does not require fan coolers. Heat removal from the reactor pool does not require active pumps for recirculation of water.

The Atomic Alchemy Facility utilizes the volume of light water contained in the Molybdenum Target Transfer Light Water Canal System (TTW) as its "emergency core cooling" type system (designated as the Reactor Decay Heat Removal - DHR). Components of the TTW system that provide the ECC function are designated as a DHR component. The volume of water stored in the transfer canal is sufficient for Reactor pool decay heat removal for 72 hours.

The transfer canal is monitored as a safety related "ECC" type system for level, temperature, and flow rate.

NUREG-0800 SRP 6.2.3, Rev 3 Secondary Containment Functional Design

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.1, SRP 6.2.2	10 CFR 50 Appendix J, GDC 4, GDC 16, GDC 43, R.G. 1.52	Exceptions as noted

Summary Description of Compliance/Exceptions
SRP 6.2.3 – General design description: the VIPR confinement building design does not include a secondary containment structure. The reactors are located within open-to-atmosphere light water pools inside the primary reactor confinement module buildings. The Atomic Alchemy atmospheric confinement design features a cascade effect from areas of least potential contamination to areas of highest potential contamination before being processed through HEPA and Charcoal filters and being released through the stack. The reactor confinement module, reactor auxiliary module, target fabrication module, and radioisotope process module buildings are maintained at -0.25 W.G. with respect to the other adjacent contiguous plant areas and the environment under all wind conditions up to the wind speed at which diffusion becomes sufficient to assure site boundary exposures less than those calculated for the design basis accident even if exfiltration occurs. 10 CFR 50 Appendix J - 10 CFR 50 Appendix J – exceptions as noted, testing is not required by regulations under NUREG-1537 Appendix A. Atomic Alchemy commits to establish technical specifications conservative limits on the total fraction of reactor confinement module leakage. The technical specifications also specify periodic testing to detect bypass leakage paths, determine leakage rates, and verify operability of confinement module building. GDC 4, 16 – A double ended LB primary cooling piping break is not a credible transient in the Reactor model design. The dynamic effects of postulated pipe ruptures and pipe whip are eliminated based on the application of the leak-before-break approach to safety related ASME Section III Class 1 and 2 piping. Conservative assumptions have been made in considering radioactive releases from the reactor confinement building module and radioisotope process building module. GDC 43 – Exceptions as noted; as an NPUF, Atomic Alchemy redefines the containment boundary for the Reactor as described in Atomic Alchemy compliance with GDC 16, see FSAR Chapter 3, Appendix F. As described in Atomic Alchemy's compliance with GDC 41, The Reactor Confinement Air Filtration System (RCF) is a non-safety-related seismic Cat-II system and is not required for any post-accident scenarios. However, Atomic Alchemy intends to perform functional testing for component integrity, operability of active components, operability of the system as a whole, and performance of the sequence that brings the system into operation. See FSAR Chapter 9, Section 4, for a description of the components that comprise the reactor confinement module, reactor auxiliary module, target fabrication module, radioisotope process module and radwaste module building non-safety-related air filtration systems. Regulatory Guide 1.52, positions C.1 through C.7 – The Atomic Alchemy Reactor Confinement Module does not require engineered safety feature atmosphere cleanup systems to meet limits on doses offsite or onsite. The Reactor Confinement Air Filtration System (RCF) is a non-safety-related system. However, Atomic Alchemy commits to comply with some of the requirements in this regulatory guide for good business practice purposes. The Atomic Alchemy Control Room Atmospheric Cleanup system (made up of the CRF and CRE) is safety related and the requirements

for compliance of this position is acceptable. Atomic Alchemy Startup testing will comply with the testing requirements of the remainder of this regulatory guide for the non-safety-related air filtration systems.

NUREG-0800 SRP 6.2.4, Rev 3 Containment Isolation System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 5.2, SRP 6.2.1, SRP 6.2.2	10 CFR 50.62(a)(2), 10 CFR 50 Appendix K, GDC 1, GDC 2, GDC 4, GDC 16, GDC 54, GDC 55, GDC 56, GDC 57, R.G. 1.11, R.G. 1.26, R.G. 1.141,	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 6.2.4 — General design description: the VIPR is not housed inside a “containment” building or system. The reactor core is located within a light water pool which is open to the atmosphere of the reactor confinement module building.

The design of the confinement module, and radioisotope process module buildings prevent the rapid, uncontrolled release of radioactive material to the environment. The Atomic Alchemy reactor confinement module and process module buildings establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the design conditions important to safety are not exceeded for as long as postulated accident conditions require.

There is no potential for a steam release or pressure surge inside the reactor confinement building. The thick walls of the confinement building module also help to mitigate any potential direct radiation exposure during certain accidents.

The Atomic Alchemy design incorporates a significant reduction in the number of penetrations between the reactor confinement building module and the reactor auxiliary building module and radioisotope production building module, respectively.

The reactor coolant piping system is an open-to-atmosphere system, routed between the light water pool located in the reactor confinement module and reactor auxiliary module buildings in a water-tight piping chase. There are no locked closed isolation valves in this system and the system utilizes two passive check valves as the isolation valves inside and outside of the confinement module building. Over-pressurization of the RCS is not a credible transient in the FSAR Chapter 15 accident analysis; therefore the passive double check valve arrangement is sufficient to perform the SRP intended design safety isolation function.

Each reactor confinement module building is connected to the radioisotope process module building via a common light water transfer canal (TTW system). The portion of the canal system within the

radioisotope building is separated by series of water/air locks from the reactor confinement module building.

The Reactor Confinement Module Atmosphere Cleanup and Filtration System (RCF) ductwork passes from the confinement module building to the radioisotope process module building. It is isolated by a combination of the following three devices: a barometric damper, a motorized isolation damper (fail closed), and a backdraft damper.

The Atomic Alchemy confinement isolation design satisfies the current NRC requirements including post-TMI requirements.

The reactor confinement building module is capable of maintaining a negative pressure in relation to the atmosphere during normal operation and have a measurable leakage rate less than 5% over 24 hours.

10 CFR 50.62(a)(2) – the ATWS rule applies to power reactors, so it is not applicable. However, the Atomic Alchemy instrumentation architecture will conform to NUREG/CR-6303. Control functions, reactor trip functions, engineered safety features functions, and monitoring & indication functions are divided into three levels containing: non-safety systems, safety systems, and non-safety diverse systems. The Atomic Alchemy Diverse Actuation System (IDA) reduces the probability and consequences of a postulated ATWS. The Atomic Alchemy IDA system will be designed to meet the quality guidelines established by Generic Letter 85-06, "Quality Assurance Guidelines for ATWS Equipment that is not Safety-Related." With respect to a SBO event, this regulation in the context of this SRP only applies to a PWR.

For an evaluation and conformance with 10 CFR Part 50 Appendix K, see Atomic Alchemy's responses in SRP 6.2.1.3.

GDC 1, 2, 4, 16 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

GDC 54, 55, 56, and 57 Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.11, positions C.1 through C.7- The design of instrument lines penetrating the Atomic Alchemy confinement will conform with this regulatory guide.

Regulatory Guide 1.26 - see Atomic Alchemy response to SRP 5.2.1.1.

Regulatory Guide 1.141, position C.1 – the design of the piping lines penetrating the confinement module building will conform with this position.

Regulatory Guide 1.141, position C.2 – Not applicable; the piping lines penetrating the confinement module building do not contain pressure relief devices.

Regulatory Guide 1.141, position C.3 – Not applicable; following a LOCA, a thermally induced over-pressure transient in piping located between closed isolation barriers is not credible in the FSAR Chapter 15 accident analysis. Pressure can be relieved through the passive isolation barriers in the direction of the confinement module.

Regulatory Guide 1.141, position C.4 – Exceptions as noted; there are no power operated confinement isolation valves in the Atomic Alchemy piping design. However, position indication of the passive isolation barriers is available in the control room.

Regulatory Guide 1.141, position C.5 – Acceptable; the design of the passive isolation barriers requires a deliberate separate operator action for the reopening of each isolation barrier device.

Regulatory Guide 1.141, position C.6 – Acceptable; the Atomic Alchemy instrumentation architecture will conform to NUREG/CR-6303. Control functions, reactor trip functions, engineered safety features functions, and monitoring & indication functions are divided into three levels containing: non-safety systems, safety systems, and non-safety diverse systems. the design of the containment isolation meets this position.

Regulatory Guide 1.141, position C.7 – Exceptions as noted; there are no power operated confinement isolation valves in the Atomic Alchemy piping design. The design of other systems will conform to this position and 10 CFR 50.34(f)(2)(xiv), also see FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)".

Regulatory Guide 1.141, position C.8 – the design of Atomic Alchemy closed system will conform to this position.

Regulatory Guide 1.141, position C.9 – Not applicable; a combustible gas buildup greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis. Also see Atomic Alchemy's response to SRP 6.2.5 in FSAR Chapter 1, Appendix B.

Regulatory Guide 1.141, position C.10 – the design of piping located between closed isolation barrier devices will conform to this position.

The Atomic Alchemy safety related engineered safeguards feature (light water transfer canal passive check valves) are designed to avoid transport of post-accident fluids outside of the confinement and thus avoid the concern associated with remote manual isolation of ESF piping lines.

Reactor Confinement Module HVAC System (RCV) ductwork are automatically isolated by radiation monitors located inside the confinement area. Ductwork radiation monitors provide an alarm signal for manual isolation.

Isolation valves close automatically on receipt of engineered safety signal to close. The time to close is within 60 seconds or less. This time frame is consistent with the physically based source term for typical ALWRs.

Isolation valves are designed such that resetting of the system signal does not result in the automatic opening of any of the valves. Each confinement isolation valve has to be opened on an individual basis by an operator.

NUREG-0800 SRP 6.2.5, Rev 3 Combustible Gas Control in Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2,	10 CFR 50.44,	Exceptions as noted

SRP 5.2, SRP 6.2.1, SRP 6.2.2, SRP 13	GDC 5, GDC 41, GDC 42, GDC 43, R.G. 1.7, R.G. 1.97, NUREG-0718, NUREG-0737	

Summary Description of Compliance/Exceptions

SRP 6.2.5 -General design description: Atomic Alchemy employs a non-safety combustion gas monitoring system in the design of the reactor confinement module and radioisotope process module buildings for conservatism. The non-safety-related fire protection smoke exhaust system(s) can be utilized to purge any combustible gases, and natural convection will minimize any accumulation of combustible gases inside the confinement building module.

10 CFR 50.44(b) and (c) – Not applicable; the Atomic Alchemy facility does not have a “containment” building or system. The reactor core is located within a light water pool which is open to the atmosphere of the confinement module building. A combustible gas buildup due to a reactor-related transient within the confinement module building greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis.

The reactor confinement module building is a classified as a seismic C-I structure in accordance with regulatory guide 1.29.

GDC 5, 41, 42, 43 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.7, position C.1 – Exceptions as noted; there is no potential for a post-accident LOCA combustible gas buildup greater than 10%. This is not a credible accident in the Atomic Alchemy design.

Regulatory Guide 1.7, position C.2 – Exceptions as noted; a non-safety-related combustion gas monitoring system is employed.

Regulatory Guide 1.7, position C.3 – Exceptions as noted; mixing of the reactor confinement atmosphere is accomplished through natural circulation and not with an active system.

Regulatory Guide 1.7, position C.4 – Not applicable; The Atomic Alchemy facility does not use hydrogen recombiners or igniters.

Regulatory Guide 1.7, position C.5 – Not applicable; an over-pressurization condition inside the reactor confinement module, radioisotope processing module, target fabrication module, or radwaste module buildings is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis.

Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in this Regulatory Guide.

The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, “Emergency Plan”. See

FSAR Chapter 7, Section 7, subsection, "Variable Categories, Classifications and Requirements" for a description of type F variables that are monitored by the Operations and Control Systems (IOC).

The design of the confinement building prevents the rapid, uncontrolled release of radioactive material to the environment. The reactor confinement building module is capable of maintaining a negative pressure in relation to the atmosphere during normal operation and have a measurable leakage rate less than 5% over 24 hours.

NUREG-0718 – Exceptions as noted; this applies to NUREG-0737 TMI Item I.D.3, "Safety System Status Monitoring," regarding application of Regulatory Guide 1.47. Atomic Alchemy's conformance to the RG is as follows: There are no AC power safety related I&C systems in the Atomic Alchemy design therefore these I&C guidelines are applicable to the Class 1E D/C and UPS safety related I&C systems only. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems, additionally FSAR Chapter 7, Section 2, "Identification of Safety Criteria." Will describe the criteria for single failure criteria and self-testing of computer digital instrumentation. The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 603-1991, IEEE 379, and IEEE 338.

NUREG-0800 SRP 6.2.6, Rev 3 Containment Leakage Testing

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.4	10 CFR 100.10, 10 CFR 100.11, 10 CFR 50 Appendix J, GDC 52, GDC 53, GDC 54, R.G. 1.163	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 6.2.6 – General design description: Atomic Alchemy meets the intent of this SRP by committing to establish technical specifications conservative limits on the total fraction of reactor confinement module building leakage. The technical specifications also specify periodic testing to detect bypass leakage paths, determine leakage rates, and verify operability of confinement module building. (See T/S LCO 3.6.7 and 3.6.14 respectively for the reactor confinement module and process module building leakage)

10 CFR 100 Subpart A – Exceptions as noted; as an NPUF, Atomic Alchemy re-defines the containment boundary for the Reactors as described in PDC 16 (see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs). The Atomic Alchemy facility does not have its Reactor core located within a pressurized vessel or a "containment" building or system. The reactor core is located within a light water pool which is open to the atmosphere of a "confinement" building module, therefore there would not be a significant buildup of atmospheric pressure following any accident that would challenge the integrity of the

confinement module building structure. The reactor confinement module building is a classified as a seismic C-I structure in accordance with regulatory guide 1.29. (See FSAR Chapter 3, Section 8) GDC 52, 53, 54 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. 10 CFR 50 Appendix J – Exceptions as noted; Appendix J type testing is not required by regulatory code under NUREG-1537 Appendix A. Atomic Alchemy will commit to institute a leakage test of penetrations of the confinement and radioisotope building modules to be developed similar to Appendix J, Option B with leak detection, isolation, and performance testing capabilities, this will be provided in the Technical Specifications. Regulatory Guide 1.163, positions C.1 through C.4 – Exceptions as noted; Appendix J type testing is not required by regulatory code under NUREG-1537 Appendix A. Atomic Alchemy will commit to institute a leakage test of penetrations of the confinement and radioisotope building modules and establish test intervals, pre-test inspections, as-found inspections, detection, isolation, and performance testing capabilities, a description of this will be provided in the Technical Specifications.

NUREG-0800 SRP 6.2.7, Rev 1 Fracture Prevention of Containment Pressure Boundary

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.1	10 CFR 50 Appendix K, GDC 1, GDC 16, GDC 51, R.G. 1.29	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 6.2.7 – General design description: Atomic Alchemy redefines containment as confinement (see Atomic Alchemy's response to GDC 16 in FSAR Chapter 3, Appendix F). the Atomic Alchemy module building design follows the code requirements for nuclear safety related structures of ACI-349 and AISC-N690, thereby reducing the probability of fracture propagation. The concrete and steel module building walls are designed for dead, live, thermal, pressure, safe shutdown earthquake, and loads due to postulated pipe breaks. A LB LOCA is not a design basis credible transient in the Reactor FSAR Chapter 15 accident analysis. The Atomic Alchemy design applies the ASME Section III, Division 1, Class MC (Metal Containment) (or Section III, Division 2, Class CC (concrete containment) as appropriate) fracture toughness testing requirements to the reactor confinement module and radioisotope process module building materials. The Atomic Alchemy reactor confinement module and process module buildings establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the design conditions important to safety are not exceeded for as long as postulated accident conditions require.		

For an evaluation and conformance with 10 CFR Part 50 Appendix K, see Atomic Alchemy's responses in SRP 6.2.1.3.

GDC 1, 16, 51 – Exceptions as noted; as an NPUF, Atomic Alchemy re-defines the containment boundary for the Reactors as described in response to GDC 16. See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.29 – General; with respect to this SRP, Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary is redefined by Atomic Alchemy for a reactor located within an open light water pool rather than 10 CFR 50.2 definition.

Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic Category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis".

Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR related components are not applicable to the seismic category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does it require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. Atomic Alchemy does not have a feedwater system. Atomic Alchemy does not have safety related diesel generators and the standby diesel generator is not required for safe shutdown, to mitigate an accident, or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports".

Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i safety class instrumentation seismic Category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports".

Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

NUREG-0800 SRP 6.3, Rev 3 Emergency Core Cooling System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 5.5, SRP 6.1, SRP 6.2.3,	10 CFR 50, Appendix K, 10 CFR 50.46, 10 CFR 50.34(f)(1)(vi), 10 CFR 50.34(f)(1)(vii),	Exceptions As Noted

SRP 7.5, SRP 13.3.1	10 CFR 50.34(f)(1)(viii), 10 CFR 50.34(f)(1)(ix), 10 CFR 50.34(f)(1)(x), 10 CFR 50.34(f)(1)(xi), 10 CFR 50.34(f)(2)(xxvi), 10 CFR 50.34(f)(2)(xviii), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 17, GDC 27, GDC 35, GDC 36, GDC 37, R.G. 1.47, R.G. 1.157,	

Summary Description of Compliance/Exceptions

SRP 6.3– General description: this SRP addresses information presented in the applicant's safety analysis report (SAR) regarding the ECC in PWR and BWR designs.

Atomic Alchemy complies with 10 CFR 50 Appendix K to the extent that sections are applicable to the Atomic Alchemy design. Atomic Alchemy does not have a pressurizer, torus, containment spray, or pressurized core vessel, and therefore those components are not applicable. 10 CFR 50.46(b)(2) oxidation limits are not exceeded. Even without an ECC system activation, a postulated LOCA in the Atomic Alchemy accident analysis does not cause the core to become uncovered, nor causes a radioactive release exceeding 10 CFR Part 20 limits. Therefore, even in the low-level water state the reactor light water pools alone are capable of dissipating decay heat of both the Reactor and the spent fuel for 30 days by convection alone.

10 CFR 50.46 – Exceptions as noted; The VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling. It relies on convection cooling for decay heat or residual heat removal. The Atomic Alchemy design, however, will provide an additional “emergency core cooling” type safety related system (designated as Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The passive “emergency core cooling” system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components. See FSAR Chapter 6, Section 3, “Reactor Decay Heat Removal System (DHR)”.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f)”. Provided below are the relevant SRP 6.3 compliance/exceptions.

(1)(vi), (1)(vii), (1)(viii), (1)(ix), (1)(x), (1)(xi), and (2)(xviii) – Not applicable; the Atomic Alchemy reactor design is non-power and not a BWR.

(2)(xxvi) – Acceptable; The VIPR coolant pressure boundary leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, RCS System Leak Detection Program. Also see Technical Specification Administration

Section 5.6.4 “RCS and Light Water Pool Leakage Rate Testing Program” and Limited Conditions of Operation LCO 3.3.10 “RCS Leakage Detection Instrumentation” (RLD), LCO 3.4.6 “RCS Operational Leakage (RLD)”, and LCO 3.7.6 Reactor Coolant/Light Water Pool Leak Collection System (RLC).

(2)(xviii) – Exceptions as noted; the Atomic Alchemy VIPR is not a PWR or BWR. Important safety related reactor and radioisotope process variables are defined in FSAR Chapter 16. Using the Common Q Platform I&C architecture, Atomic Alchemy provides the In-Core Instrumentation System (IIC) (will be described in FSAR Chapter 7, Section 4) to monitor reactor core cooling.

GDC 2, 4, 5, 17, 27, 35, 36, 37 – Exceptions as noted; as an NPUF, Atomic Alchemy re-defines the containment boundary for the Reactors as described in the response to GDC 16. See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no A/C power safety related I&C systems in the Atomic Alchemy design and therefore these I&C guidelines are only applicable to the Class 1E D/C and UPS safety related I&C systems. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, FSAR Chapter 7, Section 2, “Identification of Safety Criteria.” Will describe criteria for single failure criteria and self-testing of computer digital instrumentation. The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 603, IEEE 379, and IEEE 338.

Regulatory Guide 1.157, positions C.1 through C.4 – Exceptions as noted; A LB LOCA is not a credible accident in the Atomic Alchemy design basis. The effects of a hypothetical transient have been analyzed. See Atomic Alchemy’s response to SRP 15.6.5. Dynamic effects need not be considered for those segments of piping that are shown mechanistically, with a large margin, not to be susceptible to a pipe rupture.

The Atomic Alchemy facility utilizes the volume of light water contained in the transfer canal system (TTW) as its “emergency core cooling (ECC)” type system. Components of the TTW system that provide the ECC function are designated as an ECC component. The volume of water stored in the transfer canal is sufficient for VIPR pool decay heat removal for 72 hours. After 72 hours the light water pools are capable of dissipating decay heat of both the reactor and the spent fuel pools for 30 days.

NUREG-0800 SRP 6.4, Rev 3 Control Room Habitability System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5, SRP 6.2.1, SRP 7.2, SRP 7.5, SRP 9.1	10 CFR 50.34(f)(2)(xxviii), GDC 4, GDC 5, GDC 19, R.G. 1.52, R.G. 1.78, R.G. 1.195, R.G. 1.196, R.G. 1.197	Acceptable

Summary Description of Compliance/Exceptions

SRP 6.4 – General design description: the Atomic Alchemy Control Room Ventilation Area System (CRAVS) is comprised of four (4) systems.

1) Control Room Re-Circulating Sensible Cooling/Heating System (CRX), (non-safety)
2) Control Room Emergency Habitability System (CRE), (safety)
3) Control Room Emergency Ventilation and Filtration System (CRF), (safety) and
4) Control Room HVAC System (CRV), (non-safety).

The CRE and CRF are considered Engineered Safety Feature (ESF) systems.

The functional design and layout of the control room ventilation systems are designed in accordance with ASME Code AG-1 including the AG-1a Addenda with single failure criteria applied to safety related systems.

Challenges to the Control Room Habitability are postulated to occur during a major accident involving significant core damage and is typically postulated to occur in conjunction with a large loss-of-coolant accident (LOCA). A LB LOCA is not a design basis credible transient in the Reactor FSAR Chapter 15 accident analysis. Conservative assumptions have been made in considering radioactive releases from the Reactor confinement building module as well as the radioisotope process building module that could impact the MCR.

The main control room is centrally located in the Administrative / Service Module building and is shielded from direct gamma radiation and inhalation doses resulting from the postulated release of fission products from any of the reactor confinement module buildings or from either the radioisotope process module building or radwaste module building.

10 CFR 50.34(f)(2)(xxviii) – Acceptable; see FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f)” (response to NUREG-0737, TMI Action Item III.D.3.4 – Control Room Habitability).

Also see FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933)”, Section 3, Issue 83 - Control Room Habitability.

GDC 4, 5, 19 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.52, positions C.1 through C.7 – The Reactor Confinement Module does not require engineered safety features or atmospheric cleanup systems to meet limits on doses offsite or onsite. The reactor confinement air filtration system (RCF) is a non-safety-related system. However Atomic Alchemy commits to comply with some of the requirements in this regulatory guide for good business practice purposes. The Atomic Alchemy Control Room Atmospheric Cleanup (made up of the CRE and CRF) system is safety related and the requirements for compliance of this position is acceptable. Atomic Alchemy Startup testing will comply with the testing requirements of the remainder of this regulatory guide for the non-safety-related air filtration systems.

Regulatory Guide 1.78, position C.1 and C.2 – Acceptable; Atomic Alchemy evaluates and manages potential risks from chemical releases programmatically, see Technical Specification program 5.6.7, “Chemical Process Safety and Surveillance Program”.

Regulatory Guide 1.78, position C.3 and C.4 – Acceptable; Atomic Alchemy evaluates toxic gas hazards by analysis, summarized in FSAR Chapter 6, Section 8, subsection “Toxic Gas Hazards”. The analysis uses the methodology described in NUREG-0570, “Toxic Vapor Concentrations in the Control Room Following a Postulated Accidental Release.” The MCR will be designed with habitability systems which provide the capability to detect and protect main control room personnel from external fire, smoke, toxic chemicals, and airborne radioactivity. Automatic actuation of the individual systems that perform these habitability systems functions is also provided. See FSAR Chapter 6, Section 8, subsections “Control Room Emergency Zone (CREZ)” and “System Design”.

Regulatory Guide 1.78, position C.5 – Acceptable; Atomic Alchemy’s Emergency Plan will be provided in FSAR Chapter 13, Appendix B.

Regulatory Guide 1.195, positions C.1 through C.5 – Acceptable; a LB LOCA is not a design basis credible transient in the Reactor model. The effects of a hypothetical transient have been analyzed, see Atomic Alchemy response to SRP 15.6.5. Conservative assumptions have been made in considering radioactive releases from the Reactor confinement building module and radioisotope process building module.

Regulatory Guide 1.196, positions C.1 and C.2 – Acceptable; a LB LOCA is not a design basis credible transient in the Reactor FSAR Chapter 15 accident analysis. The effects of a hypothetical transient have been analyzed, see Atomic Alchemy response to SRP 15.6.5. Conservative assumptions have been made in considering radioactive releases from the Reactor confinement building module and radioisotope process building module.

Regulatory Guide 1.197, positions C.1 and C.2 – Acceptable; a LB LOCA is not a design basis credible transient in the Reactor FSAR Chapter 15 accident analysis. The effects of a hypothetical transient have been analyzed, see Atomic Alchemy response to SRP 15.6.5. Conservative assumptions have been made in considering radioactive releases from the Reactor confinement module building and radioisotope processes module buildings. Atomic Alchemy will utilize the general equations provided in this regulatory guide to model the transport and removal of fission products between compartments, the calculation of activities in the environment, and the calculation of offsite and compartment doses in its determination of the consequences.

NUREG-0800 SRP 6.4, Rev 3 Appendix A Acceptance Criteria for Valve or Damper Repair Alternative

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Acceptable
Summary Description of Compliance/Exceptions		
SRP 6.4 Appendix A – General design description: the Atomic Alchemy functional design and layout of safety related ventilation systems are designed in accordance with ASME Code AG-1 including the AG-1a Addenda with single failure criteria applied to safety related systems. Technical Specification LCO 3.6.3, “Reactor Confinement Module Building Confinement Isolation Valves/Dampers” determines the operability and compensatory required actions for valves and		

dampers. Reduced reliability of components are addressed under the Atomic Alchemy Maintenance Rule. Technical Requirements program 5.6.2, "Main Control Room Habitability Program" controls the reliability and functionality of ventilation related components including valves and dampers. Technical Requirements program 5.6.1, "Safety Function Program" ensures if a loss of safety function is detected the appropriate actions are taken.

NUREG-0800 SRP 6.5.1, Rev 4 ESF Atmosphere Cleanup System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.1, SRP 6.2.2, SRP 9.1, SRP 9.3, SRP 11.1.4	GDC 19, GDC 41, GDC 42, GDC 43, GDC 61, GDC 64, R.G. 1.52	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 6.5.1 – General design description: Atomic Alchemy will conservatively apply the GDC 41, 42, 43, and 64 criteria to the radioisotope process module, target fabrication module, and radwaste module buildings as they each may present a potential for a release of radioactive products to the environment following a postulated transient as described in the FSAR Chapter 15 accident analysis. The calculated offsite doses for the VIPR from a Beyond Design Basis Event (BDBE) are well within the 10 CFR 100 guidelines. There are no safety related ESF atmosphere cleanup systems required for the Atomic Alchemy facility. For conservatism, the Control Room Emergency Habitability System (CRE) and the Control Room Emergency Ventilation and Filtration System (CRF) are designated Atomic Alchemy Safety Class C (equivalent to ANSI Class 3) The Atomic Alchemy Qualified Data Processing System (IQD) provides safety-related display of selected parameters in the control room, safe shutdown panel room, and at the technical support center workstation. The IQD consists of a redundant configuration of sensors, QDPS hardware, and qualified displays. The Atomic Alchemy Reactor Confinement Module, Radioisotope Process Module, and Radwaste Module buildings do not require engineered safety feature (ESF) atmosphere cleanup systems to meet limits on doses offsite or onsite. The reactor confinement air filtration system (RCF), Process Production Module Air Filtration Systems (PMF), and Radwaste Module Air Filtration system (WHF) are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases.		

The Atomic Alchemy design does not depend on active systems to remove airborne particulates or elemental iodine from the confinement atmospheres of the Reactor Module or Radioisotope Process Module following a postulated accident in either Building. GDC 19, 41, 42, 43, 61, 64 – Exceptions as noted; as an NPUF, Atomic Alchemy re-defines the containment boundary for the Reactor as described in PDC 16. See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.52, positions C.1 through C.7 – The Atomic Alchemy Reactor Confinement Module does not require engineered safety feature atmosphere cleanup systems to meet limits on doses offsite or onsite. The reactor confinement air filtration system (RCF) is a non-safety-related seismic Cat-II system however Atomic Alchemy will comply with some of the requirements for business practice purposes. The Atomic Alchemy Control Room Atmospheric Cleanup system (made up of the CRE and CRF) is safety related and this position requirements are acceptable for that system. Atomic Alchemy commits to comply with the testing requirements of the remainder of this regulatory guide for the non-safety-related air filtration systems as part of startup testing (FSAR chapter 14).

NUREG-0800 SRP 6.5.2, Rev 4 Containment Spray as a Fission Product Cleanup System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	GDC 41, GDC 42, GDC 43	N/A
Summary Description of Compliance/Exceptions		
SRP 6.5.2 – General design description: the Atomic Alchemy design does not depend on active or safety related systems to remove airborne particulates or elemental iodine from the atmosphere of the Reactor Module, Radwaste Module, or Radioisotope Process Module following a postulated accident in either Building. Naturally occurring passive removal processes provide significant removal capability such that airborne elemental iodine is reduced to very low levels within a few hours and the airborne particulates are reduced to extremely low levels within 12 hours. There are no safety related cleanup spray systems for the Atomic Alchemy facility. The non-safety fire sprinkler system may be used as cleanup. GDC 41, 42, 43 – Exceptions as noted; as an NPUF, Atomic Alchemy re-defines the containment boundary for the Reactor as described in PDC 16. See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.		

NUREG-0800 SRP 6.5.3, Rev 3 Fission Product Control Systems and Structures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2,	10 CFR 100,	Exceptions as noted.

SRP 6.2.1, SRP 6.2.2, SRP 9.1,	GDC 41, GDC 42, GDC 43, R.G.1.52, Regulatory Positions C.5 and C.6	

Summary Description of Compliance/Exceptions

SRP 6.5.3 – General design description: this SRP addresses fission product control systems and structures to verify that the values of certain key parameters are within pre-established limits, confirm the applicability of important modeling assumptions, and verify the functional capability of ventilation systems used to control fission product releases in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The Atomic Alchemy confinement atmosphere (as well as the atmospheres of the radioisotope process modules buildings) is depleted of elemental iodine and particulates as a result of the passive removal processes discussed in FSAR Chapter 15, Appendixes B and C. No active fission product control systems are required in the Atomic Alchemy design to meet regulatory requirements.

10 CFR Part 100 – Acceptable; the calculated offsite doses for the Atomic Alchemy Reactors from a BDBE are well within the 10 CFR 100 guidelines. Severe Accidents are addressed in FSAR Chapter 19. FSAR Table 15.A-01, “Accident Dose Criteria” will describe the exclusion area boundary, low population zone, and release duration from all postulated Atomic Alchemy transients including SB and LB LOCA’s. FSAR Tables 15.A-04 through 15.A-11 will provide the Dispersion Factors (χ/Q) for offsite, control room, technical support center, and each module building.

GDC 41, 42, 43 – Exceptions as noted; as an NPUF, Atomic Alchemy re-defines the containment boundary for the reactor. Atomic Alchemy will conservatively apply GDC 41, 42, and 43 criteria to the radioisotope process module and radwaste module buildings as they each may present a potential for a release of radioactive products to the environment following a postulated transient as described in the FSAR Chapter 15 accident analysis. See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Atomic Alchemy meets the intent of this SRP, the reactor confinement module, radioisotope process module, and radwaste module buildings are maintained at -0.25 W.G. with respect to the other contiguous plant areas and the environment under all wind conditions up to the wind speed at which diffusion becomes sufficient to assure site boundary exposures less than those calculated for the design basis accident even if exfiltration occurs.

Regulatory Guide 1.52, Regulatory Positions C.5 and C.6 – Exceptions as noted; the Atomic Alchemy reactor confinement module, radioisotope process module, and radwaste module buildings do not require engineered safety feature atmosphere cleanup systems to meet limits on doses offsite or onsite. The reactor confinement air filtration system (RCF) is a non-safety-related system. However Atomic Alchemy commits to comply with some of the requirements in this regulatory guide for good business practice purposes.

The Atomic Alchemy functional design and layout for safety related ventilation systems are designed in accordance with ASME Code AG-1 including the AG-1a Addenda with single failure criteria applied

to safety related systems. Technical Requirements Manual program 5.6.6, "Ventilation Filter Testing Program (VFTP)" requires testing of Engineered Safety Feature (ESF) filter ventilation systems at the frequencies specified in ASME N510, and AG-1.

NUREG-0800 SRP 6.5.4, Rev 3 Ice Condenser as a Fission Product Cleanup System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy facility does not have a fission product cleanup system. The non-safety fire protection sprinkler system may be used as cleanup.		

NUREG-0800 SRP 6.5.5, Rev 1 Pressure Suppression Pool as a Fission Product Cleanup System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy facility does not have a pressure suppression pool. The non-safety fire protection sprinkler system may be used as cleanup.		

NUREG-0800 SRP 6.6, Rev 2 Inservice Inspection of Class 2 and 3 Components

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 3.1, SRP 3.5, SRP 5.1	10 CFR 50.55a, GDC 36, GDC 37, GDC 39, GDC 40, GDC 42, GDC 43, GDC 45, GDC 46, ASME BPVC XI	Acceptable
Summary Description of Compliance/Exceptions		
SRP 6.6 – General design description: Code Class components must meet the applicable inspection requirements set forth in Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of ASME BPVC. ISI includes preservice examinations prior to initial plant startup as required by articles IWC-2200 and IWD-2200 of Section XI of the ASME Code. 10 CFR 50.55a – Acceptable as applicable to ASME Section XI requirements; Atomic Alchemy Technical Specification 5.6.2 program, "Inservice Inspection and Testing Program" will define ASME		

Section Xl Code Class 1, 2, and 3 (equivalent) inspection boundaries in accordance with 10 CFR 50.55a (c), (d), and (e).

This T/S program also establishes administrative controls and provides inspection intervals, evaluation of examine results, requirements, guidance, and interfaces for preparation and implementation of ASME BPVC Section XI ISI/IST and Nondestructive Examinations. This program will also provide the ASME Code Case requests for relief from the ASME Section XI program code requirements in the construction license application.

QAPD program "ISI/IST and Pre-Service Inspectability Program" will determine the design and arrangement of Class 2 and 3 system components to include allowances for adequate clearances to conduct the examinations specified in ASME BPVC Section XI Code.

GDC 36, 37, 39, 40, 42, 43, 45, 46 – Exceptions as noted; Atomic Alchemy will conservatively additionally apply these GDC requirements' criterion to the radioisotope process module, target fabrication module, and radwaste module buildings ASME Class 2 and 3 components. See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 6.7, Rev 3 Main Steam Isolation Valve Leakage Control System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy non-power VIPR. This is a BWR concern only.		

NUREG-0800 BTP 6-1, (Initial Issuance) pH for Emergency Coolant Water for Pressurized Water Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable for the purpose of potential corrosion of stainless steel. The Atomic Alchemy reactor light water pool and target transfer canal are lined with aluminum the respective Chemical Volume and Control (CVC) systems for each pool will maintain the pH of the pools to avoid any aluminum corrosion.		

NUREG-0800 BTP 6-2, Rev 3 Minimum Containment Pressure Model for PWR ECCS Performance Evaluation

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
An over-pressurization transient in either the reactor confinement module or radioisotope process module is not postulated in the Atomic Alchemy FSAR chapter 15 accident analysis.		

NUREG-0800 BTP 6-3, Rev 3 Determination of Bypass Leakage Paths in Dual Containment Plants

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The VIPR is not enclosed in a dual containment.		

NUREG-0800 BTP 6-4, Rev 3 Containment Purging During Normal Plant

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The VIPR is a non-power reactor. It does not have a containment structure, but rather a confinement building. The non-safety-related fire protection smoke exhaust systems in each of the following buildings can be utilized to alleviate operational problems and purge the reactor confinement module, radioisotope process module or radwaste module buildings.		

NUREG-0800 BTP 6-5, Rev 3 Currently the Responsibility of Reactor Systems Piping from the RWST (or BWST) and Containment Sump(s) to the Safety Injection

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR.		

7. INSTRUMENTATION & CONTROLS

NUREG-0800 SRP 7.0, Rev 7 Instrumentation and Controls - Overview of Review Process

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7, SRP 7.2	N/A	N/A
Summary Description of Compliance/Exceptions		
This section contains no acceptance criteria for compliance, it is a road map to other applicable SRP Sections regarding instrument and control systems.		

NUREG-0800 SRP Appendix 7.0-A, Rev 6 Review Process for Digital Instrumentation and Control Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7, SRP 7.2	10 CFR 50.55a(h), 10 CFR 50.54(jj), 10 CFR 50.55(i)	N/A
Summary Description of Compliance/Exceptions		
This section contains no acceptance criteria for compliance, it is an overview of the process for reviewing digital instrumentation and control (I&C) systems to be applied to other SRP Sections regarding I&C systems.		

NUREG-0800 SRP 7.1, Rev 6 Instrumentation and Controls - Introduction

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 7.1, SRP 7.2	10 CFR 50.55a(h), 10 CFR 50.54(jj), 10 CFR 50.55(i)	Acceptable
Summary Description of Compliance/Exceptions		
SRP 7.1 Acceptance Criteria II.1 through II.3 – Acceptable; details of Atomic Alchemy's compliance will be described in SRP 7.1 Table Sections 1 through 5.		

NUREG-0800 SRP 7.1-T, Rev 6 Table 7-1 Regulatory Requirements, Acceptance Criteria, and Guidelines for Instrumentation and Control Systems Important to Safety

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2, SRP 4.5.2, SRP 5.2, SRP 7.1, SRP 7.2 SRP 7b.3	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.55a(h), 10 CFR 50.34(f)(2)(v), 10 CFR 50.34(f)(2)(xi), 10 CFR 50.34(f)(2)(xii), 10 CFR 50.34(f)(2)(xvii), 10 CFR 50.34(f)(2)(xviii), 10 CFR 50.34(f)(2)(xix), 10 CFR 50.34(f)(2)(xx), 10 CFR 50.34(f)(2)(xxii), 10 CFR 50.34(f)(2)(xxiv), 10 CFR 50.62, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 4, GDC 10, GDC 13, GDC 15, GDC 16, GDC 19, GDC 20, GDC 21, GDC 22, GDC 23, GDC 24, GDC 25, GDC 28, GDC 29, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44 R.G. 1.22, R.G.1.28, R.G. 1.47, R.G. 1.53, R.G. 1.62, R.G. 1.70, R.G. 1.75, R.G. 1.97, R.G. 1.100, R.G. 1.105, R.G. 1.118, R.G. 1.151, R.G. 1.152, R.G. 1.168, R.G. 1.169, R.G. 1.170, R.G. 1.171, R.G. 1.172, R.G. 1.173, R.G. 1.174, R.G. 1.177, R.G. 1.180, R.G. 1.189, R.G. 1.200, R.G. 1.204, R.G. 1.206, R.G. 1.209	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP Table 7.1 – General design description: Atomic Alchemy addresses its compliance with Title 10 regulatory requirements and conformance to industry codes, standards, and guidelines in this section.

SRP Table 7-1, Section 1
This section of the table addresses compliance with 10 CFR Parts 50 and 52.

10 CFR 50.54(j)(j) and 10 CFR 50.55(i) – Acceptable; the Atomic Alchemy QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the ASME NQA-1 standard.

10 CFR 50.55a(h) – Acceptable; the Atomic Alchemy Protection and Safety Monitoring System (IMS) meets the requirements for safety systems of IEEE 603-1991. The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. The Atomic Alchemy IMS system is based on the design architecture of the Protection and Monitoring system defined in the Common Q architecture submitted as topical report WCAP-16675-NP and approved by the NRC. The IMS interfaces with both the Reactor Protection System (IRP) and the Reactor Trip System (IRT). All three provide detection of off-nominal conditions and actuation of appropriate safety-related functions necessary to achieve and maintain the facility in a safe shutdown condition.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)". Provided below are the relevant SRP 7.1 regulations compliance/exceptions.

(2)(v) – Acceptable; the description of the availability of the status of bypassed systems to the operators are included in FSAR Chapter 7, Section 2, "Identification of Safety Criteria."

(2)(xi) – Not applicable; there are no safety related relief valves in the Atomic Alchemy piping design.

(2)(xii) – Not applicable; the Atomic Alchemy Reactor is a non-power reactor as such there are no turbine related fluid systems.

(2)(xiv) (A) through (E) – Acceptable; as an NPUF, Atomic Alchemy re-defines the containment boundary for the Versatile Isotope Production Reactor (VIPR) as described in GDC 16. Atomic Alchemy will comply with these Action Items for the primary confinement isolation by providing at least one automatic isolation device located both inside and outside of the confinement building. The safety related isolation functions of the Radiation Monitoring and Alarm System (IRM) will be described in FSAR chapter 11, Section 6, subsection, "Safety Design Functions".

(2)(xvii) – Exceptions as noted; the VIPR is situated in an-open-to atmosphere light water pool; containment structure is redefined by Atomic Alchemy for NPUF Facilities in PDC 16 (FSAR Chapter 1, Appendix F). The potential for hydrogen or combustible gas buildup greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis. Technical Specifications

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***Atomic Alchemy intends to base its I&C architecture on the Westinghouse Common Qualified (Common Q) platform. It is a computer system consisting of a set of commercial-grade hardware and previously developed software components dedicated and safety related qualified for use in nuclear power plants. Since the number of safety related systems in a Non-power [ ] PROP reactor are substantially less than those required in a 1500 MW power reactor, and since the challenges to these systems are also not as severe, the overall Atomic Alchemy Common Q I&C architecture will be modified to suit these differences while maintaining the same NRC approved system design elements.**

The Westinghouse Common Q Platform consists of the following Class 1E major building blocks that can be used to design any specific safety related system: Advant Controller 160 (AC160) with PM646 Processor Module, S600 Input and Output Modules, Flat Panel Display System for human-machine interface consisting of the MTP, Safety/QDPS display and Operators Module, Component Interface Module (CIM), Termination Units, and Cabinets.

Program 5.6.5, "Radiation Protection Program" administratively controls sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points.

(2)(xviii) – Exceptions as noted; the VIPR is not a PWR or BWR. Important safety related reactor and radioisotope process variables are defined in FSAR Chapter 16. Using the Common Q platform I&C architecture, Atomic Alchemy provides the In-Core Instrumentation System (IIC) (See FSAR Chapter 7, Section 4) to monitor reactor core cooling.

(2)(xix) – Acceptable; Using the Common Q platform I&C architecture, Atomic Alchemy provides the Post-Accident Monitoring and Sampling System (IPA) (See FSAR Chapter 7, Section 3)

(2)(xx) – Not applicable; the Atomic Alchemy Reactor is not a PWR, does not have a pressurizer, nor power operated safety relief valves.

(2)(xxii) – Not applicable; however, a Failure Modes and Effects Analysis (FMEA) will be provided in FSAR Chapter 7, Section 2 "Identification of Safety Criteria" in compliance with the requirements of regulatory guide 1.97.

(2)(xxiv) – Not applicable; the VIPR is not a BWR. Post-accident parameters are monitored and recorded by the IPA system.

10 CFR 50.62(a)(2) – the ATWS Rule applies to power reactors and therefore not applicable. However, the instrumentation architecture will conform to NUREG/CR-6303. Control functions, reactor trip functions, engineered safety features functions, and monitoring & indication functions are divided into three levels containing: nonsafety systems, safety systems, and non-safety diverse systems. The Atomic Alchemy Diverse Actuation System (IDA) reduces the probability and consequences of a postulated ATWS (FSAR Chapter 7, Section 3 will describe the IDA system). The Atomic Alchemy IDA system will be designed to meet the quality guidelines established by Generic Letter 85-06, "Quality Assurance Guidelines for ATWS Equipment that is not Safety-Related."

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

SRP Table 7-1, Section 2

This section of the table addresses compliance with 10 CFR Part 50, Appendix A, General Design Criteria.

GDC 1, 2, 4, 10, 13, 15, 16, 19, 20, 21, 22, 23, 24, 25, 28, 29, 33, 34, 35, 38, 41, 44 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

SRP Table 7-1, Section 3

This section of the table addresses compliance with Staff Requirements Memoranda (SRM).

SRM to SECY 93-087 Defense Against Common-Mode Failures in Digital Instrumentation and Control Systems and Control Room Annunciator (Alarm) Reliability – Acceptable; Atomic Alchemy FSAR Chapter 7, Section 2, subsection "Single Failure Criteria" will describe the design methodology for

mitigating this issue. FSAR Chapter 7, Section 2, subsection "Processing and Display Equipment" will describe the design methodology to ensure control room annunciator devices reliability.

SRP Table 7-1, Section 4

This section of the table addresses compliance with the Regulatory Guides.

Regulatory Guide 1.22, positions D.1 through D.4 – Acceptable; Safety actuation circuitry is provided with a capability for testing with the reactor at power. The protection system, including the engineered safety features, will conform to the regulatory guides. The protection functions are tested at power to the greatest extent practical. See FSAR Chapter 7, Section 2, subsection "Maintenance, Testing and Calibrations".

Regulatory Guide 1.28, positions C.1 through C.4 – Acceptable; Atomic Alchemy submitted its QAPD as a topical report, AA0-VIPR-20-QAPD (NP) Rev. 0. Atomic Alchemy committed to follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, "Quality Assurance Program Requirements for Nuclear Facilities" and QME-1-2017, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants".

Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no AC power safety-related I&C systems in the Atomic Alchemy design therefore these I&C guidelines are applicable only to the Class 1E DC and UPS safety related I&C systems. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, FSAR Chapter 7, Section 2, "Identification of Safety Criteria" will describe criteria for single failure criteria and self-testing of computer digital instrumentation. The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 603-1991, IEEE 379, and IEEE 338.

Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture will conform with the intent of the requirements of IEEE 379, "Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems" as applicable to DC safety related power systems. There are no AC power safety related I&C systems in the Atomic Alchemy facility. The evaluation for applying single failure criterion will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria."

Regulatory Guide 1.62, positions C.1 through C.7 – Acceptable; using the modified-for-NPUF[*] Common Q architecture platform, the manual initiation of protective actions is provided by the Atomic Alchemy IDA system (See FSAR Chapter 7, Section 3). The Atomic Alchemy IDA system functionality and architecture is based upon WCAP-17184-P, "AP1000™ Diverse Actuation System Planning and Functional Design Summary Technical Report". (The Common Q architecture platform complies with Branch Technical Position (BTP) 7-19, "Guidance for Evaluation of Diversity and Defense-In Depth in Digital Computer-Based Instrumentation and Control Systems.")

Regulatory Guide 1.62, position C.8 – Not applicable; the Atomic Alchemy I&C architecture complies with positions C.1 through C.7.

[*] See footnote section SRP 7.1-T

Regulatory Guide 1.70 – Acceptable; Atomic Alchemy follows the formatting of the FSAR based on this R.G.

Regulatory Guide 1.75, position C – Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Because the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.75 are applicable on a very limited basis to provide guidance on the Class 1E/non-1E electrical separation and isolation.

Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in this Regulatory Guide.

The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, "Emergency Plan". See FSAR Chapter 7, Section 7, subsection, "Variable Categories, Classifications and Requirements" for a description of type F variables that are monitored by the Operations and Control Systems (IOC).

Regulatory Guide 1.100, position C.1 - Acceptable; for equipment that must perform a safety related function, the recommendations concerning methods to be employed for seismic qualification of electrical and mechanical equipment are contained in Regulatory Guide 1.100, "Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants," which endorses IEEE 344-2004, "IEE Recommended Practice for Seismic Qualification of Class E Equipment for Nuclear Power Generating Stations," for the qualification of both electrical and mechanical equipment. The Atomic Alchemy design will meet these requirements by either type testing, analysis, or a combination of both.

The qualification program for valves that are part of the reactor coolant pressure boundary shall include testing or analysis that demonstrate that these valves will not experience leakage beyond the design criteria when subjected to design loading.

Regulatory Guide 1.100, position C.2 – Acceptable; Atomic Alchemy complies with ASME QME-1-2017. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.105, positions C.1 through C.4 – Acceptable; Atomic Alchemy will comply with ISA-S67.04 in developing limited safety system settings (LSSS) for the Technical Specifications. See FSAR Chapter 16, Section 3, "Limiting Conditions for Operation".

Regulatory Guide 1.118, positions C.1 through C.3 – Exceptions as noted; Atomic Alchemy will comply with the latest revision of IEEE-338, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems." This latest version should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide. See Technical Specifications LCO 3.3.1 through 3.3.7 for Instrumentation surveillances. Sensors are not tested as part of the standard, and Atomic Alchemy does not have any AC power safety related systems.

Regulatory Guide 1.151, Guidance positions C.1 and C.2 – Acceptable; this regulatory guide addresses the use of ISA-S67.02, "Nuclear-Safety-Related Instrument Sensing Line Piping and Tubing Standards for Use in Nuclear Power Plants," 1980, to provide a basis for the design and

installation of instrument sensing lines. The Atomic Alchemy I&C instrument design will be depicted on P&ID drawings, delineating pressure, class, and specification breaks. Where there is a conflict between the ISA standard and the ASME Code, Section III, the ASME Code requirements are followed.

Regulatory Guide 1.152, positions C.1 through C.3 – Acceptable; this regulatory guide addresses the conformance with the requirements of IEEE Std. 7-4.3.2-2003 as a method that the NRC staff has deemed acceptable for satisfying the NRC's regulations with respect to high functional reliability and design requirements for computers used in the safety systems of nuclear power plants. Summary compliance with this standard will be described in FSAR Chapter 7, Section 1, "Atomic Alchemy Instrument and Control Architecture". Also see the Atomic Alchemy programs "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 for additional information.

Regulatory Guide 1.168, guidance positions C.1 through C.8 – Acceptable; this regulatory guidance addresses the detail I&C safety related system software verification & validation planning and the conduct of reviews and audits. Using the Common Q platform, Atomic Alchemy takes advantage of the verification and validation of Previously Designed Software (PDS) and the adequacy of its safety related I&C software is administratively controlled through "Software Safety Hazards Program," a QAPD program which analyzes existing facility software. See FSAR Chapter 7 for additional information.

Regulatory Guide 1.169, guidance positions C.1 through C.14 – Acceptable; this regulatory guidance addresses identification, control, and documentation of safety system software to comply with NRC requirements. Using the Common Q platform, Atomic Alchemy takes advantage of the documentation of Previously Designed Software (PDS) and the configuration control of its safety related I&C software is administratively controlled through the "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and software updates. See FSAR Chapter 7 for additional information.

Regulatory Guide 1.170, guidance positions C.1 through C.10 – Acceptable; this regulatory guidance addresses software and system test documentation for digital computer software. Using the Common Q platform, Atomic Alchemy takes advantage of the documentation for Previously Designed Software (PDS) and the documentation of its safety related I&C software is administratively controlled through the "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and software updates. See FSAR Chapter 7 for additional information.

Regulatory Guide 1.171, guidance positions C.1 through C.6 – Acceptable; this regulatory guidance addresses safety related system software testing. Using the Common Q platform, Atomic Alchemy takes advantage of testing of Previously Designed Software (PDS). The testing of Atomic Alchemy's safety related I&C software is administratively controlled through the "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 respectively for additional information.

Regulatory Guide 1.172, guidance positions C.1 through C.7 – Acceptable; this regulatory guidance addresses Software Requirements Specifications (SRS). Using the Common Q platform, Atomic Alchemy takes advantage of the specification requirements developed for Previously Designed Software (PDS). The development of SRS for new software is administratively controlled by the “I&C Software Development Program,” a QAPD program that administrative controls new facility software. See FSAR Chapter 7 and FSAR Chapter 13, Appendix A additional information.

Regulatory Guide 1.173, guidance positions C.1 through C.6 – Acceptable; this regulatory guidance addresses the development of software through a planned and controlled development process that incorporates the best available approaches to the various aspects of software engineering. Using the Common Q platform, Atomic Alchemy takes advantage of controls utilized for the development of Previously Designed Software (PDS). The control process for the development of new software is administratively controlled by the “I&C Software Development Program,” a QAPD program that administrative controls new facility software. See FSAR Chapter 7 and FSAR Chapter 13, Appendix A additional information.

Regulatory Guide 1.174, guidance positions C.1 through C.6 – Not applicable; this regulatory guidance addresses developing risk-informed applications for a licensing basis change that considers engineering issues and applies risk insights (the guidance provided here does not preclude other approaches). Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

Regulatory Guide 1.177, guidance positions C.1 through C.4 – Not applicable; this regulatory guidance addresses utilizing risk information to evaluate changes to nuclear power plant Technical Specifications (T/S), Complete Times (CT) and Surveillance Frequencies (SF) in order to assess the impact of such proposed changes on the risk associated with plant operation (the guidance provided here does not preclude other approaches). Atomic Alchemy Technical Specifications is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

Regulatory Guide 1.180, guidance positions C.1 through C.7 – Acceptable; this regulatory guidance addresses the effects of electromagnetic and radiofrequency interference (EMI/RFI), power surges, and electrostatic discharge on safety-related I&C systems. FSAR Chapter 7, Section 2, “Identification of Safety Criteria”, FSAR Chapter 3, Section 11, “Environmental Qualification of Mechanical and Electrical Equipment, and Technical Requirements Manual program 5.6.14, “Electromagnetic Compatibility and Radio Frequency Interference (EMC/RFI) Program” will describe the design and installation practices to limit and administratively control the impact of electromagnetic effects and testing practices to assess the emissions and susceptibility of safety related systems and components.

Regulatory Guide 1.189, positions C.1 through C.7 – Acceptable; Atomic Alchemy will provide its Fire Protection Plan as FSAR Chapter 9, Appendix A. the plan will conform to the requirements of 10 CFR 50.48(a)(1)-(3).

Regulatory Guide 1.189, positions C.8 – Acceptable; the Atomic Alchemy fire protection plan will conform to the requirements for enhanced fire protection criteria and the safe shutdown of a passively safe ALWR.

Regulatory Guide 1.189, position C.9 – Not applicable; this guide addresses license renewal.

Regulatory Guide 1.200, positions C.1 through C.4 – Not applicable; Atomic Alchemy construction license is submitted under 10 CFR Part 50, Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

Regulatory Guide 1.204, positions C.1 and C.2 – Acceptable; See FSAR Chapter 8, Section 3, subsection "Lightning Protection System" which will conform to NFPA 780.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLAs and DC and ESP applications. Atomic Alchemy is applying for a construction and operating permit under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy's QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1 standard.

Regulatory Guide 1.209, positions C.1 through C.5 – Acceptable; this guide addresses the qualification criterion of 10 CFR 50.55a(h)(2) for safety-related computer-based I&C systems. Atomic Alchemy FSAR Chapter 7, Section 2, "Identification of Safety Criteria", FSAR Chapter 3, Section 11, "Environmental Qualification of Mechanical and Electrical Equipment, and Technical Requirements Manual program 5.6.14, "Electromagnetic Compatibility and Radio Frequency Interference (EMC/RFI) Program" will describe the design and installation practices to limit and administratively control the impact of electromagnetic effects and testing practices to assess the emissions and susceptibility of safety related systems and components. The testing of Atomic Alchemy's safety related I&C software is administratively controlled through the "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 respectively for additional information.

SRP Table 7-1, Section 5

This section of the table addresses compliance with Branch Technical Positions (BTP)

BTP 7-1 through BTP 7-21 – Exceptions as noted; each BTP is addressed individually below.

NUREG-0800 SRP Appendix 7.1-A, Rev 6 Acceptance Criteria and Guidelines for Instrumentation and Controls Systems Important to Safety

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2, SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 5.2, SRP 6.2.3, SRP 7.2, SRP 7.3,	10 CFR 50 Appendix B, 10 CFR 50.34(f)(2), 10 CFR 50.55a, 10 CFR 50.47, 10 CFR 50.62, GDC 1, GDC 2, GDC 4, GDC 10, GDC 13, GDC 15, GDC 16, GDC 19, GDC 20, GDC	Exceptions as noted.

SRP 7.4, SRP 7.5, SRP 7.6 SRP 7b.2 SRP 7b.3	21, GDC 22, GDC 23, GDC 24, GDC 25, GDC 28, GDC 29, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44 R.G. 1.22, R.G. 1.47, R.G. 1.53, R.G. 1.62, R.G. 1.70, R.G. 1.75, R.G. 1.97, R.G. 1.118, R.G. 1.151, R.G. 1.152, R.G. 1.168, R.G. 1.169, R.G. 1.170, R.G. 1.171, R.G. 1.172, R.G. 1.173	
Summary Description of Compliance/Exceptions		
See Atomic Alchemy Response to SRP 7.1, Table 7-1, Sections 1 through 5.		

NUREG-0800 SRP Appendix 7.1-B, Rev 6 Guidance for Evaluation of Conformance to IEEE Std 279

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.2	IEEE Std 279-1971	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy I&C architecture and system design will conform to IEEE-603-1991 and the latest revision of IEEE-338, IEEE 379.These versions may not be presently endorsed by the regulatory guides, but their use should not result in deviations from the design philosophy otherwise stated in Regulatory Guides. The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097 which was approved by the NRC.		

NUREG-0800 SRP Appendix 7.1-C, Rev 6 Guidance for Evaluation of Conformance to IEEE Std 603

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.2 SRP 7b.2 SRP 7b.3	IEEE Std 603-1991	Exceptions as noted.
Summary Description of Compliance/Exceptions		
The Atomic Alchemy license application is under 10 CFR Part 50; therefore, any related DC and COL reviews, and proposed ITAAC associated with the structures, systems, and components (SSCs) related to this SRP are not applicable. The VIPR is a non-power reactor, therefore, I&C requirements related to SSCs like Auxiliary Feedwater, Main Steam, Pressurizer, PORV's, etc. are also not applicable.		

* See Footnote section SRP 7.1-T

The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF*. Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. See FSAR Chapter 7, Section 2, "Identification of Safety Criteria," where SRP 7.1-C related requirements are addressed in subsections. (Separation Criteria, Single Failure, Software Verification and Validation, C-II over C-I, EMI/RFI, Reliability and Availability, Channel Independence and Integrity, Maintenance, Testing and Calibrations, Fault Tolerances, Maintenance, Blocks, Test and Bypasses Descriptions, Failure Modes and Effects Analysis (FMEA), Manual Initiation of Protective Action Functions, Cyber Security of Digital Control Safety Related Systems, Digital Safety-to-Non-Safety System Communications, Setpoint Determination and Confirmations, etc.)

NUREG-0800 SRP Appendix 7.1-D, Rev 1 Guidance for Evaluation of the Application of IEEE Std 7-4.3.2

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.3, SRP 7.4, SRP 7.5, SRP 7b.3	IEEE/American Nuclear Society (ANS) 7-4.3.2-1982	Acceptable
Summary Description of Compliance/Exceptions		
Regulatory Guide 1.152, positions C.1 through C.3 – Acceptable; addresses the conformance with the requirements of IEEE Std. 7-4.3.2-2003 as a method that the NRC staff has deemed acceptable for satisfying the NRC's regulations with respect to high functional reliability and design requirements for computers used in the safety systems of nuclear power plants. Using the modified-for-NPUF* Common Q platform, Atomic Alchemy takes advantage of the existing controls utilized for the development of Previously Designed Software (PDS). The control process for the development of new software is administratively controlled by the "I&C Software Development Program," a QAPD program that administratively controls the development of new facility software. See FSAR Chapter 7 and FSAR Chapter 15, Appendix A for additional information. See the Atomic Alchemy programs "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates and the "Software Verification and Validation Program," a TRM program which analyzes new facility software in FSAR Chapter 7 and TRM 5.6.13.		

* See Footnote section SRP 7.1-T
* See Footnote in section SRP 7.1-T

NUREG-0800 SRP 7.2, Reactor Trip System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2, SRP 4.5.1, SRP 7.3, SRP 7.4	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.34(f)(2)(v), 10 CFR 50.55a(h)(2), 10 CFR 50.47, 10 CFR 50.62, GDC 1, GDC 2, GDC 10, GDC 13, GDC 15, GDC 16, GDC 19, GDC 20, GDC 21, GDC 22, GDC 23, GDC 24, GDC 25, GDC 28, GDC 29, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44 R.G. 1.22, R.G. 1.47, R.G. 1.53, R.G. 1.62, R.G. 1.70, R.G. 1.75, R.G. 1.97, R.G. 1.118, R.G. 1.151, R.G. 1.152, R.G. 1.168, R.G. 1.169, R.G. 1.170, R.G. 1.171, R.G. 1.172, R.G. 1.173	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 7.2 – General design description: the NPUF design includes a safety related analog and digital instrumentation Reactor Trip System (IRT). Each Reactor IRT system also interfaces with the other Reactors IRT systems, as well as with other safety related instrumentation (located in module buildings where radioisotope processes or radwaste processes are taking place) that monitor radioisotope production processes for potential transients that might necessitate one or more reactor trips. The Atomic Alchemy instrumentation architecture will conform to NUREG/CR-6303. The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.		

NUREG-0800 SRP 7.3, Rev 6 Engineered Safety Features System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2, SRP 5.2,	10 CFR 50.54(jj), 10 CFR 50.55(i),	Exceptions as noted

SRP 6.2.3, SRP 7.5 SRP 7b.4	10 CFR 50.34(f)(2)(v), 10 CFR 50.55a(h)(2), 10 CFR 50.47, 10 CFR 50.62, GDC 1, GDC 2, GDC 3, GDC 4, GDC 10, GDC 13, GDC 15, GDC 16, GDC 19, GDC 20, GDC 21, GDC 22, GDC 23, GDC 24, GDC 25, GDC 29, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44 R.G. 1.22, R.G. 1.47, R.G. 1.53, R.G. 1.70, R.G. 1.75, R.G. 1.97, R.G. 1.118, R.G. 1.152	

Summary Description of Compliance/Exceptions

SRP 7.3 – General design description: the Atomic Alchemy reactor facility design includes ESF systems. The ESF systems also encompasses other module buildings where radioisotope processes or radwaste processes are taking place.

The ESF systems are comprised of the following supporting features:

- Isolation of the reactor confinement, reactor auxiliary, radioisotope process, radwaste and isotope target fabrication module buildings
- Emergency Core Cooling system for the light water reactor pool
- Control room isolation and safety related HVAC systems

Safety related reactor confinement module building heat removal and depressurization systems are not required in the facility design, nor is safety related combustion gas control system. Heat removal in each module building is accomplished passively, and both over-pressurization and combustible gas accumulation are not credible design basis transients in the FSAR Chapter 15 accident analysis. The Atomic Alchemy design does include a non-safety-related combustion gas detection system.

Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.

NUREG-0800 SRP 7.4, Rev 6 Safe Shutdown System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 2.4, SRP 3.5, SRP 4.2.2, SRP 4.5.3, SRP 5.2, SRP 6.2.3,	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.34(f), GDC 1, GDC 2, GDC 4, GDC 13,	Exceptions as noted

SRP 7.3, SRP 7.4 SRP 7b.4	R.G. 1.70, R.G. 1.97, R.G. 1.152	

Summary Description of Compliance/Exceptions

SRP 7.4 – General design description: the Atomic Alchemy reactor facility design includes safety related analog and digital instrumentation systems that are designated as being required to achieve a safe shutdown of each Reactor and all radioisotope processes.

- These systems provide the following capabilities:
- Isolation of the reactor confinement module building
- Isolation of the reactor auxiliary module building
- Reactivity control
- Reactor coolant makeup
- Decay heat removal

These functions are performed by the following systems:

- Systems associated with decay heat removal.
- Systems associated with reactor coolant system Inventory control.
- Systems associated with reactor coolant system Temperature control.
- Systems associated with Reactivity control.
- Systems associated with module building ventilation configuration.
- Post-Accident monitoring system.
- Class 1E and UPS electrical systems.

Safe shutdown of the Reactors can be accomplished by any one of the following 3 methods:

- Safe shutdown using safety related systems.
- Safe shutdown using safety related and non-safety-related systems.
- Safe shutdown using non-safety-related systems.

Each Reactor system required for safe shutdown also interfaces with the other Reactors systems, as well as with other safety related instrumentation (located in module buildings where radioisotope processes or radwaste processes are taking place) that monitor radioisotope processes for potential transients that might necessitate one or more reactor shutdowns.

Also included in the Atomic Alchemy I&C Architecture are safety related analog and digital instrumentation systems that are designated as being required to achieve a safe shutdown of all radioisotope related processes.

These systems provide the following capabilities:

- Isolation of a module building
- Shutdown of hot cell operations
- Shutdown of radwaste processes
- Shutdown of radioisotope target fabrication and handling
- Shutdown of SNM recycling processes (if any)

These functions are performed by the following systems:

- Systems associated with liquid, solid and gaseous radwaste collection, process, and storage.
- Systems associated with the fabrication of molybdenum targets.
- Systems associated with module building ventilation configurations.
- Systems associated with the handling of “active” molybdenum target capsules.
- Systems associated with the LEU recycling process.
- Systems associated with the SNM recycling process.
- Post-Accident monitoring.
- Class 1E and UPS electrical systems.

Each related radioisotope I&C system required for safe shutdown also interfaces with the other reactor’s I&C systems, as well as with other safety related instrumentation (located in module buildings where reactor, radioisotope processes, or radwaste processes are taking place) that monitor radioisotope processes for potential transients that might necessitate one or more radioisotope related processes or reactors to be shutdown.

These systems will be further described in FSAR Chapter 7.

Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.

NUREG-0800 SRP 7.5, Rev 6 Information Systems Important to Safety

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 7.2, SRP 7.3, SRP 7.4 SRP 7b.3	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.34(f)(2)(v), 10 CFR 50.34(f)(2)(xi), 10 CFR 50.34(f)(2)(xii), 10 CFR 50.34(f)(2)(xviii), GDC 1, GDC 2, GDC 4, GDC 13, GDC 19, GDC 24, R.G. 1.47, R.G. 1.70, R.G. 1.75, R.G. 1.97, R.G. 1.151, R.G. 1.152,	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 7.5 – General design description: the design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF*. Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. The Atomic		

* See Footnote section SRP 7.1-T

Alchemy Reactor facility and radioisotope process facility I&C design include safety related analog and digital instrumentation information systems for monitoring variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions. This includes incorporating into the I&C system design the recommendations of applicable related Three Mile Island (TMI) task action plan items. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.54(f) and Appendix D, "Compliance with Generic Safety Issues (NUREG-0933)". Data flow between safety and non-safety equipment is isolated by using division separated unidirectional gateways and individual digital signals. Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.

NUREG-0800 SRP 7.6, Rev 6 Interlock Systems Important to Safety

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.2, SRP 7.3, SRP 7.4 SRP 7b.3 SRP 7b.4	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.34(f)(2)(v), GDC 1, GDC 2, GDC 3, GDC 4, GDC 10, GDC 13, GDC 15, GDC 16, GDC 19, GDC 24, GDC 28, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44, R.G. 1.47, R.G. 1.70, R.G. 1.97, R.G. 1.152,	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 7.6 – General design description: the design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. Reactor Trip Permissives and interlocks are identified in FSAR Table 7-17.01. Radioisotope Processes Permissives and Interlock are identified in FSAR Table 7-18.01. Bypassed or Inoperable Status Indication (BISI) will be described in FSAR chapter 7, Section 2. Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.		

* See Footnote section SRP 7.1-T

NUREG-0800 SRP 7.7, Rev 6 Control Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.1, SRP 7.2, SRP 7.3, SRP 7.4	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.34(f), GDC 1, GDC 10, GDC 13, GDC 15, GDC 19, GDC 24, GDC 28, GDC 29, GDC 44, R.G. 1.70, , R.G. 1.151, R.G. 1.152	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 7.7 – General design description: the Atomic Alchemy facility will be designed with a number of passively-safe systems. It does not have many power reactor (BWR or PWR) related systems such as main steam, feedwater, pressurizers, RHR, PORV, RCIC, HPSI, etc.

The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC.

Atomic Alchemy I&C design provides the Protection and Safety Monitoring System (IMS) which consists of four redundant divisions, designated A, B, C, and D. The Atomic Alchemy IMS system is based on the Common Q design architecture submitted to the NRC as WCAP-16675-NP."

The Atomic Alchemy Plant Control System (IPC) provides the functions necessary for all normal operations of the plant from cold shutdown through full power. The plant control system controls non-safety-related components in the plant that are operated from the main control room and remote shutdown room in each reactor module. The IOC ties into both safety and non-safety-related systems to monitor, operate, and maintain the plant operating conditions within prescribed limits. Safety related radioisotope process systems are also tied into the IPC system.

Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.

NUREG-0800 SRP 7.8, Rev 6 Diverse Instrumentation and Control System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 7.2, SRP 7.3, SRP 7.4	10 CFR 50.54(jj), 10 CFR 50.55(i), 10 CFR 50.62,	Exceptions as noted

* See Footnote section SRP 7.1-T

	GDC 1, GDC 13, GDC 19, GDC 24, R.G. 1.70, R.G. 1.152	

Summary Description of Compliance/Exceptions

SRP 7.8 – General design description: the Atomic Alchemy facility will be designed with a number of passively-safe systems. It does not have many power reactor (BWR or PWR) related systems such as main steam, feedwater, pressurizers, RHR, PORV, RCIC, HPSI, etc.

The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC.

Using the modified-for-NPUF* Common Q platform I&C architecture, Atomic Alchemy provides the Diverse Actuation System (IDA). The diverse actuation system is a non-safety-related, diverse system that provides an alternate means of initiating reactor trip and actuating selected engineered safety features for selected transients analyzed in the FSAR Chapter 15 accident analysis.

See FSAR Chapter 7, Section 2, subsection "Defense in Depth and Diversity (D3) Analysis," which will describe the scope of the selected FSAR Chapter 15 accident analysis transients included in the IDA system.

Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.

NUREG-0800 SRP 7.9, Rev 6 Data Communication Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.6, SRP 7b.5 SRP 9.4	10 CFR 50.54(jj), 10 CFR 50.34(f)(2), 10 CFR 50.62, GDC 1, GDC 2, GDC 4, GDC 13, GDC 19, GDC 20, GDC 21, GDC 22, GDC 23, GDC 24, GDC 29, R.G. 1.22, R.G. 1.47, R.G. 1.53, R.G. 1.70, R.G. 1.75, R.G. 1.118, R.G. 1.152	Exceptions as noted

Summary Description of Compliance/Exceptions
SRP 7.9 – General design description: the design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. Using the Common Q platform I&C architecture, Atomic Alchemy provides a high speed, real-time data redundant communications network that links systems of importance to the operators. Safety-related systems are connected to the network through gateways and qualified isolation devices so that the safety-related functions are not compromised by failures elsewhere. The Atomic Alchemy IDA reduces the probability and consequences of a postulated ATWS (FSAR Chapter 7, Section 3 will describe the IDA system). The Atomic Alchemy IDA system will be designed to meet the quality guidelines established by Generic Letter 85-06, "Quality Assurance Guidelines for ATWS Equipment that is not Safety-Related." Atomic Alchemy provides its conformance and exceptions to the specific corresponding codes and standards requirements of this SRP in its response to SRP 7.1-Table Rev 6.

NUREG-0800 Appendix 7-A, Rev 5 General Agenda, Station Site Visits (formerly Appendix 7-B)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Acceptable
Summary Description of Compliance/Exceptions		
The agenda for site visits to supplement the review of the design based on the drawings and to evaluate the actual implementation of the design as installed at the site is acceptable.		

NUREG-0800 Appendix 7-B, Rev 5 Acronyms, Abbreviations, and Glossary (formerly Appendix 7-C)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy Reactor is a non-power design, therefore not all acronym, abbreviations, and definitions will be applicable.		

* See Footnote section SRP 7.1-T

NUREG-0800 BTP 7-1, Rev 6 Guidance on Isolation of Low-Pressure Systems from the High-Pressure Reactor Coolant System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	GDC 15, GL 87-12, GL 88-17	N/A
Summary Description of Compliance/Exceptions		
GDC 15 – Exceptions as noted; see FSAR Chapter 3, Appendix F. Over-pressurization of the RCS is not a credible transient in the FSAR Chapter 15 accident analysis and therefore the isolation guidance of this SRP is not applicable. Atomic Alchemy utilizes a passive, double check valve arrangement which is sufficient to perform the SRP intended design safety isolation. unction.		

NUREG-0800 BTP 7-2, Rev 6 Guidance on Requirements of Motor-Operated Valves in the Emergency Core Cooling System Accumulator Lines

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	IEEE Std 603-1991	N/A
Summary Description of Compliance/Exceptions		
The VIPR is a non-power reactor. There are no safety related MOV's in the "ECC" equivalent system (Reactor Decay Heat Removal System (DHR)) or RCS system piping design. Over-pressurization of the RCS is not a credible transient in the FSAR Chapter 15 accident analysis and therefore the isolation guidance of this SRP is not applicable. Atomic Alchemy utilizes a passive, double check valve arrangement is sufficient to perform the SRP intended design safety isolation.		

NUREG-0800 BTP 7-3, Rev 6 Guidance on Protection System Trip Point Changes for Operation with Reactor Coolant Pumps Out of Service

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.3, SRP 7.3, SRP 7.4,	IEEE Std 603-1991	Acceptable
Summary Description of Compliance/Exceptions		
The Atomic Alchemy reactor Protection and Safety Monitoring System (IMS) meets the requirements for safety systems in IEEE 603-1991. This version may not be presently endorsed by the regulatory guides, but their use should not result in deviations from the design philosophy otherwise stated in		

Regulatory Guides. The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC.

NUREG-0800 BTP 7-4, Rev 6 Guidance on Design Criteria for Auxiliary Feedwater Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	10 CFR 50.34(f)(2)(xii)	N/A
Summary Description of Compliance/Exceptions		
The VIPR is a non-power reactor and there are no auxiliary feedwater systems in the design. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f)” for a full evaluation of Atomic Alchemy’s conformance to 10 CFR 50.34(f).		

NUREG-0800 BTP 7-5, Rev 6 Guidance on Spurious Withdrawals of Single Control Rods in Pressurized Water Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	GDC 20, GDC 25	N/A
Summary Description of Compliance/Exceptions		
The VIPR is a non-power reactor. Some typical PWR reactor coolant anticipated operational occurrences are either not applicable to the Atomic Alchemy VIPR reactor design or pose a substantially reduced risk to impacting the safe operation of the reactor. For example, the Atomic Alchemy RCS, Chemical Volume and Control (CVC), and DHR systems are boron-free. Failures that could lead to single or multiple rod position changes or out-of-sequence rod patterns are analyzed in the FSAR Chapter 15 accident analysis, however, these failures do not lead to reactivity changes by boron.		

NUREG-0800 BTP 7-6, Rev 6 Guidance on Design of Instrumentation and Controls Provided to Accomplish Changeover from Injection to Recirculation Mode

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	IEEE Std 603-1991	Acceptable

* See Footnote section SRP 7.1-T

Summary Description of Compliance/Exceptions
The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. See FSAR Chapter 7, Section 2 “Identification of Safety Criteria” where BTP 7-6 /IEEE 603 related requirements are addressed in subsection “Manual Initiation of Protective Action Functions”.

NUREG-0800 HICB-7, NOT USED

NUREG-0800 BTP 7-8, Rev 6 Guidance for Application of Regulatory Guide 1.22

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.2, SRP 7.3, SRP 7.4, SRP 7.5	R.G. 1.22	Exceptions as noted.
Summary Description of Compliance/Exceptions		
Regulatory Guide 1.22, positions D1 through D.4, Acceptable; safety actuation circuitry is provided with a capability for testing with the reactor at power. The Atomic Alchemy Reactor protection systems are designed to be reliable and tested while in service. The design employs redundant logic trains and component diversity. The protection system, including the engineered safety features, will conform to this regulatory guide. During testing or maintenance, protection system functions are provided to bypass a channel monitoring a variable for reactor trip. Although no setpoints need to be changed for bypassing, the coincidence logic is automatically adjusted. The protection functions are tested at power to the greatest extent practical.		

NUREG-0800 BTP 7-9, Rev 6 Guidance on Requirements for Reactor Protection System Anticipatory Trips

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.2, SRP 7.3, SRP 7.4, SRP 10.2	IEEE 279-1971 or IEEE 603-1991	Acceptable
Summary Description of Compliance/Exceptions		
The Atomic Alchemy Reactor Trip System (IRT) interlocks will be described in FSAR Chapter 7, Section 2, subsection “Reactor Trip Interlock and Interfaces”. FSAR Chapter 7, Section 17 will describe the		

* See Footnote section SRP 7.1-T

Interlocks and Permissives for each trip function. Atomic Alchemy provides a defense-in-depth, non-safety-related Diverse Actuation System (IDA). The IDA functional requirements are based on an assessment of the protection system instrumentation common mode failure probabilities combined with the event probability.

NUREG-0800 BTP 7-10, Rev 6 Guidance on Application of Regulatory Guide 1.97

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 6.0, SRP 7.3, SRP 7.4	10 CFR 50.34(f)(2)(xvii), R.G. 1.97	Acceptable
Summary Description of Compliance/Exceptions		
10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f)”. Provided below are the relevant BTP 7-10 regulations compliance/exceptions. (2)(xvii) – Exceptions as noted; the Atomic Alchemy VIPR is situated in an open to atmosphere light water pool. Containment structure is redefined by Atomic Alchemy for its NPUF in response to GDC 16 (FSAR Chapter 1, Appendix F); The potential for hydrogen or combustible gas buildup greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis; Technical Specifications Program 5.6.5, “Radiation Protection Program” administratively controls sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points. Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in this Regulatory Guide. The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, “Emergency Plan”. See FSAR Chapter 7, Section 7, subsection, “Variable Categories, Classifications and Requirements” for a description of type F variables that are monitored by the IOC.		

NUREG-0800 BTP 7-11, Rev 6 Guidance on Application and Qualification of Isolation Devices

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.0, SRP 7.1, SRP 7.2, SRP 7.3, SRP 7.4	GDC 1, GDC 21, GDC 22, IEEE 279-1971 or IEEE 603-1991, R.G. 1.75, R.G. 1.204,	Exceptions as noted

SRP 7b.3		

Summary Description of Compliance/Exceptions

GDC 1, 21, 22 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F.

Regulatory Guide 1.75, position C – Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Since the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.75 are applicable on a very limited basis to provide guidance on the Class 1E/non-1E electrical separation and isolation. Atomic Alchemy will comply with this portion of the guide.

Regulatory Guide 1.204, positions C.1 and C.2 – Acceptable; See FSAR Chapter 8, Section 3, subsection “Lightning Protection System” which will conform to NFPA 780 requirements.

See Atomic Alchemy’s response to SRP Appendix 7.1-C Rev 6 for IEEE 603-1991 compliance.

NUREG-0800 BTP 7-12, Rev 6 Guidance on Establishing and Maintaining Instrument Setpoints

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 6.0, SRP 6.2.3, SRP 7.3, SRP 7b.3 SRP 7.4, SRP 13, SRP 14	10 CFR 50.36(c)(1)(ii)(A), 10 CFR 50.36(c)(3), GDC 13, GDC 20, R.G. 1.105, R.G. 1.174, R.G. 1.177, R.G. 1.200, IEEE 279-1971 or IEEE 603-1991,	Acceptable

Summary Description of Compliance/Exceptions

10 CFR 50.36(c)(1)(ii)(A), and 10 CFR 50.36(c)(3) – Acceptable; Limited Safety System Settings (LSSS) will be described in FSAR Chapter 16, Section 2, subsection “Limiting Safety System Settings (LSSS)” which also will describe Atomic Alchemy’s conformance to Regulatory Guide 1.105, and ISA-S67.04. Technical Specifications program 5.6.9, “Setpoint Control Program” establishes the requirements for ensuring that setpoints for automatic protective devices are initially within and remain within the assumptions of the applicable safety analyses and provides a means for processing changes to instrumentation setpoints.

GDC 13, 20 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F.

Regulatory Guide 1.105, positions C.1 through C.4 – Acceptable; Atomic Alchemy will comply with ISA-S67.04 in developing limited safety system settings (LSSS) for the technical specifications. See FSAR Chapter 16, Section 2, “Limited Conditions for Operation” for a description of the relationship

between safety limit, the analytical limit, the limiting trip setpoint, the allowable value, the setpoint, the acceptable as-found band, and the acceptable as-left band.

Regulatory Guide 1.174, guidance positions C.1 through C.6 – Not applicable; this regulatory guidance addresses developing risk-informed applications for a licensing basis change that considers engineering issues and applies risk insights. The Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

Regulatory Guide 1.177, guidance positions C.1 through C.4 – Not applicable; this regulatory guidance addresses utilizing risk information to evaluate changes to nuclear power plant Technical Specifications (T/S), Complete Times (CT), and surveillance Frequencies (SF) in order to assess the impact of such proposed changes on the risk associated with plant operation. Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

Regulatory Guide 1.200, positions C.1 through C.4 – Exceptions as noted; The Atomic Alchemy construction license is submitted under 10 CFR Part 50. The Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

See Atomic Alchemy's response to SRP Appendix 7.1-C Rev 6 for IEEE 603-1991 compliance.

The Atomic Alchemy QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1 standard. The "Calibration and Control Program" is a QAPD level program that contains provisions for the control of measuring and test equipment used for calibration of the instrumentation.

The "Electrical Equipment Qualification Program" is a QAPD-level program that ensures safety related components are environmentally qualified.

NUREG-0800 BTP 7-13, Rev 6 Guidance on Cross-Calibration of Protection System Resistance Temperature Detectors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 6.0, SRP 6.2.3 SRP 7.2, SRP 7.3, SRP 7b.3 SRP 7.4	GDC 13, GDC 20, GDC 21, GDC 24, GDC 29, IEEE 603-1991	Acceptable

Summary Description of Compliance/Exceptions
GDC 13, 20, 21, 24, 29 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F.

See Technical Specifications LCO 3.3.13, "Primary Coolant Parameter Monitoring System" for operating requirements and surveillances regarding minimum performance requirements including response times and accuracies to maintain these variables and systems within prescribed operating ranges on reactor coolant protection system instrumentation.

NUREG-0800 BTP 7-14, Rev 6 Guidance on Software Reviews for Digital Computer-Based Instrumentation and Control Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.2, SRP 7.3, SRP 7b.3 SRP 7.4, SRP 7.5, SRP 7.6	GDC 21, IEEE 603-1991, R.G. 1.28, R.G. 1.152, R.G. 1.169, R.G. 1.170, R.G. 1.171, R.G. 1.172, R.G. 1.173	Acceptable
Summary Description of Compliance/Exceptions		
GDC 21 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F. Regulatory Guide 1.28, positions C.1 through C.4, Acceptable; Atomic Alchemy submitted its QAPD as a topical report, AA0-VIPR-20-QAPD (NP) Rev. 0. Atomic Alchemy committed to follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, "Quality Assurance Program Requirements for Nuclear Facilities" and QME-1-2017, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants". Regulatory Guide 1.152, positions C.1 through C.3 – Acceptable; this regulatory guide addresses the conformance with the requirements of IEEE Std. 7-4.3.2-2003 as a method that the NRC staff has deemed acceptable for satisfying the NRC's regulations with respect to high functional reliability and design requirements for computers used in the safety systems of nuclear power plants. Summary compliance with this standard will be described in FSAR Chapter 7, Section 1, "Atomic Alchemy Instrument and Control Architecture". Also, see the Atomic Alchemy programs "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates, and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 for additional information. Regulatory Guide 1.169, guidance positions C.1 through C.14 – Acceptable; this regulatory guidance addresses identification, control, and documentation of safety system software to comply with NRC requirements. Using the Common Q platform, Atomic Alchemy takes advantage of the documentation of Previously Designed Software (PDS) and the configuration control of its existing safety related I&C software is administratively controlled through the "Software Safety Hazards Program," a QAPD program which analyzes existing facility software and their respective software updates. See FSAR Chapter 7 for additional information.		

Regulatory Guide 1.170, guidance positions C.1 through C.10 – Acceptable; this regulatory guidance addresses software and system test documentation for digital computer software. Using the Common Q platform, Atomic Alchemy takes advantage of the documentation for Previously Designed Software (PDS) and the documentation of its existing safety related I&C software is administratively controlled through the "Software Safety Hazards Program," a QAPD program which analyzes existing facility software and software updates. See FSAR Chapter 7 for additional information.

Regulatory Guide 1.171, guidance positions C.1 through C.6 – Acceptable; this regulatory guidance addresses safety related system software testing. Using the Common Q platform, Atomic Alchemy takes advantage of testing of Previously Designed Software (PDS). The testing of Atomic Alchemy's existing safety related I&C software is administratively controlled through the "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 for additional information.

Regulatory Guide 1.172, guidance positions C.1 through C.7 – Acceptable; this regulatory guidance addresses Software Requirements Specifications (SRS). Using the Common Q platform, Atomic Alchemy takes advantage of the specification requirements developed for Previously Designed Software (PDS). The development of SRS for new software is administratively controlled by the "I&C Software Development Program," a QAPD program that places administrative controls on evaluating new facility software. See FSAR Chapter 7 and FSAR Chapter 15, Appendix A additional information.

Regulatory Guide 1.173, guidance positions C.1 through C.6 – Acceptable; this regulatory guidance addresses the development of software through a planned and controlled development process that incorporates the best available approaches to the various aspects of software engineering. Using the Common Q platform, Atomic Alchemy takes advantage of controls utilized for the development of Previously Designed Software (PDS). The control process for the development of new software is administratively controlled by the "I&C Software Development Program," a QAPD program that places administrative controls on developing new facility software. See FSAR Chapter 7 and FSAR Chapter 15, Appendix A additional information.

NUREG-0800 BTP 7-17, Rev 6 Guidance on Self-Test and Surveillance Test Provisions

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 6.0, SRP 6.2.3 SRP 7.2, SRP 7.3, SRP 7b.3 SRP 7.4	GDC 21, GDC 22, IEEE 603-1991, R.G. 1.22, R.G. 1.47, R.G. 1.53, R.G. 1.118, R.G. 1.152	Exceptions as noted.

Summary Description of Compliance/Exceptions
GDC 21, 22 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F. Digital safety related instrumentation self-testing will be described in FSAR Chapter 7, Section 2, subsection, "Digital I&C System Self-Testing". The section will describe the automatic self-test design features that maintain channel independence, maintain system integrity, and meet the single-failure criterion during testing. The Atomic Alchemy instrumentation will comply with the latest revision of IEEE-338. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in the regulatory guides. Regulatory Guide 1.22, positions D1 through D.4 – Exceptions as noted; safety actuation circuitry is provided with a capability for testing with the reactor at power. The Atomic Alchemy Reactor protection systems are design to be reliable and tested while in service. The design employs redundant logic trains and component diversity. The protection system, including the engineered safety features, will conform to this regulatory guide. During testing or maintenance, protection system functions are provided to bypass a channel monitoring a variable for reactor trip. Although no setpoints need to be changed for bypassing, the coincidence logic is automatically adjusted. The protection functions are tested at power to the greatest extent practical. Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no AC power safety related I&C systems in the Atomic Alchemy design. Therefore, these I&C guidelines are applicable to the Class 1E DC and UPS safety related I&C systems only. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital instrumentation will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991. Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture will conform with the intent of the requirements of IEEE 379, "Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems" as applicable to DC safety related power systems. There are no AC power I&C systems in the Atomic Alchemy facility. The evaluation for applying single failure criterion will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." Regulatory Guide 1.118, positions C.1 through C.3 – Exceptions as noted; Atomic Alchemy will comply with the latest revision of IEEE-338, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems." This latest version should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide. See Technical Specifications LCO 3.3.1 through 3.3.7 for Instrumentation surveillances. Sensors are not tested as part of the standard, and Atomic Alchemy does not have any AC power safety related systems. Regulatory Guide 1.152, positions C.1 through C.3 – Acceptable; this regulatory guide addresses the conformance with the requirements of IEEE Std. 7-4.3.2-2003 as a method that the NRC staff has deemed acceptable for satisfying the NRC's regulations with respect to high functional reliability and

design requirements for computers used in the safety systems of nuclear power plants. Summary compliance with this standard will be described in FSAR Chapter 7, Section 1, "Atomic Alchemy Instrument and Control Architecture". Also see the Atomic Alchemy programs "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 for additional information.

NUREG-0800 BTP 7-18, Rev 6 Guidance on the Use of Programmable Logic Controllers in Digital Computer-Based Instrumentation and Control Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.1, SRP 7.2, SRP 7b.3	GDC 21, RG 1.152, NUREG/CR-6090, NUREG/CR-6421, EPRI TR-106439, EPRI TR-107330	Acceptable

Summary Description of Compliance/Exceptions

GDC 21 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F.

NUREG/CR-6090 – Acceptable; the design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC.

EPRI TR-106439, EPRI TR-107330, and NUREG/CR-6421 – Not applicable; Atomic Alchemy utilizes commercial grade components that have already been accepted. Additionally, for any components not previously approved, the Atomic Alchemy QAPD follows the guidance of NQA-1, SUBPART 3.2-2.7.2, "Implementation Guidance on the Requirements of NQA-1, Parts I and II for Software Used for Nuclear Facility Applications".

Safety-related instrumentation & control systems based on the application of Common Q platforms are designed to provide protection against unsafe reactor operation during steady state and transient power operations. They also initiate selected protective functions to mitigate the consequences of design-basis events and accidents, and to safely shut down the plant by either automatic means or manual actions.

The Common Q platform was developed from the standard Advant Control (AC)160 computer system. This PLC hardware and software will conform to the guidance of this BTP 7-18 and EPRI TR-

* See Footnote section SRP 7.1-T

106439 as stated in the NRC's SER on the WCAP. The modified-for NPUF* Atomic Alchemy Common Q platform will also conform to this. Regulatory Guide 1.152, positions C.1 through C.3 – Acceptable; this regulatory guide addresses the conformance with the requirements of IEEE Std. 7-4.3.2-2003 as a method that the NRC staff has deemed acceptable for satisfying the NRC's regulations with respect to high functional reliability and design requirements for computers used in the safety systems of nuclear power plants. Summary compliance with this standard will be described in FSAR Chapter 7, Section 1, "Atomic Alchemy Instrument and Control Architecture". Also see the Atomic Alchemy programs "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates, and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 for additional information.

NUREG-0800 BTP 7-19, Rev 8 Guidance for Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based Instrumentation and Control Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.1, SRP 7.2, SRP 7.3, SRP 7b.3 SRP 7.4	10 CFR 50.34(a)(1)(ii)(D), 10 CFR 50.62, GDC 21, GDC 22, GDC 24, GDC 26, NUREG-0493, R.G. 1.53, R.G. 1.62, R.G. 1.152	Exceptions as noted.
Summary Description of Compliance/Exceptions		
10 CFR 50.34(a)(1)(ii)(D) – Not applicable; this code provides guideline values for construction permit applicants for power reactors and the VIPR is non-power. 10 CFR 50.62 – Not applicable; the ATWS Rule applies to power reactors. However, the Atomic Alchemy instrumentation architecture will conform to NUREG/CR-6303. Control functions, reactor trip functions, engineered safety features functions, and monitoring & indication functions are divided into three levels containing: non-safety systems, safety systems, and non-safety diverse systems. The Atomic Alchemy Diverse Actuation System (IDA) reduces the probability and consequences of a postulated ATWS. The Atomic Alchemy IDA system will be designed to meet the quality guidelines established by Generic Letter 85-06, "Quality Assurance Guidelines for ATWS Equipment that is not Safety-Related." GDC 21, 22, 24, 26 – Acceptable; for Atomic Alchemy compliance with the GDCs see FSAR Chapter 3, Appendix F.		

* See Footnote section SRP 7.1-T

NUREG -0493 – Acceptable; Using the modified-for-NUPF* Common Q platform I&C architecture, Atomic Alchemy provides the IDA. The IDA system is a non-safety-related, diverse system that provides an alternate means of initiating reactor trip and actuating selected engineered safety features for selected transients analyzed in the FSAR Chapter 15 accident analysis.

See FSAR Chapter 7, Section 2, subsection "Defense in Depth and Diversity (D3) Analysis" which will describe the scope of the selected FSAR Chapter 15 accident analysis transients included in the IDA system.

Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture will conform with the intent of the requirements of IEEE 379, "Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems" as applicable to DC safety related power systems. There are no AC power safety related I&C systems in the Atomic Alchemy facility. The evaluation for applying single failure criterion will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria."

Regulatory Guide 1.62, positions C.1 through C.7 – Acceptable; using the modified-for-NPUF* Common Q architecture platform, the manual initiation of protective actions is provided by the Diverse Actuation System (IDA) (See FSAR Chapter 7, Section 3). The Atomic Alchemy IDA system functionality and architecture elements are based upon WCAP-17184-P, "AP1000™ Diverse Actuation System Planning and Functional Design Summary Technical Report". (The Common Q architecture platform complies with Branch Technical Position (BTP) 7-19, "Guidance for Evaluation of Diversity and Defense-In Depth in Digital Computer-Based Instrumentation and Control Systems.")

Regulatory Guide 1.62, position C.8 – Not applicable; the Atomic Alchemy I&C architecture complies with positions C.1 through C.8.

Regulatory Guide 1.152, positions C.1 through C.3 – Acceptable; this regulatory guide addresses the conformance with the requirements of IEEE Std. 7-4.3.2-2003 as a method that the NRC staff has deemed acceptable for satisfying the NRC's regulations with respect to high functional reliability and design requirements for computers used in the safety systems of nuclear power plants. Summary compliance with this standard will be described in FSAR Chapter 7, Section 1, "Atomic Alchemy Instrument and Control Architecture". Also see the Atomic Alchemy programs "Software Safety Hazards Program," which is a QAPD program that analyzes existing facility software and existing software updates, and the "Software Verification and Validation Program," a TRM program which analyzes new facility software. See FSAR Chapter 7 and TRM 5.6.13 for additional information.

NUREG-0800 BTP 7-21, Rev 6 Guidance on Digital Computer Real-Time Performance

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.1, SRP 7b.3 SRP 7.6	N/A	Acceptable

* See Footnote section SRP 7.1-T

Summary Description of Compliance/Exceptions
Safety-related instrumentation & control systems are based on the application of the modified-for-NPUF* Common Q platform which utilizes AC160 programmable logic controllers. The NRC staff has previously concluded in their SER of the Common Q architecture that the design features and the operation of the AC160 PLC system provided sufficient confidence that the AC160 will operate deterministically to meet the recommendations in BTP 7-21.

8. ELECTRIC POWER

NUREG-0800 SRP 8.1, Rev 4 Electric Power - Introduction

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.3, SRP 8	N/A	Acceptable
Summary Description of Compliance/Exceptions		
This section contains no acceptance criteria for compliance. It is a road map to other applicable SRP Sections regarding electrical systems.		

NUREG-0800 SRP 8.2, Rev 5 Offsite Power System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.1	10 CFR 50.34(f)(2)(v), 10 CFR 50.63, 10 CFR 50.65(a)(4), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 17, GDC 18, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44, R.G. 1.32, R.G. 1.155, R.G. 1.160, R.G. 1.204, R.G. 1.206, NUREG-1793,	Exceptions as noted

* See Footnote section SRP 7.1-T

	SECY-90-016, SECY-94-084, SECY-95-132, SECY-91-078, SECY-05-0227	

Summary Description of Compliance/Exceptions

SRP 8.2 – General design description: this SRP addresses description of the offsite power system regarding the interrelationships between the nuclear unit, the utility grid, and the interconnecting grids in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The onsite power system is comprised of the main AC power system and the DC power system. A transmission system to supply offsite AC energy for startup and normal shutdown through a site-specific transmission switchyard will be described in FSAR Chapter 8, Section 2. This offsite AC power system is not required for plant safety. The normal AC power supply to the main AC power system is provided from the main generator. Atomic Alchemy uses a single non-Class 1E onsite standby diesel generator to supply power to selected plant loads in the event of loss of the normal power sources. The Atomic Alchemy facility will be designed with passive safety-related systems for core cooling, confinement module and radioisotope module building integrity and, therefore, does not depend on the electric power grid for safe operation. This feature of the Atomic Alchemy design significantly reduces the importance of the grid connection and the requirement for grid stability.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).” Provided below are the relevant SRP 8.1 regulations compliance/exceptions.

(2)(v) – Acceptable; the description of the availability of the status of bypassed systems to the operators are included in FSAR Chapter 7, Section 2, “Identification of Safety Criteria.”

10 CFR 50.63 – Not applicable; the Atomic Alchemy design minimizes the potential risk contribution of a station blackout (SBO) by not requiring AC power sources to mitigate design-basis events. The Atomic Alchemy Reactors are designed with reliable, non-safety-related offsite and onsite AC power that are normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module, radioisotope module, or radwaste module building integrity. Offsite power has no safety-related function due to the passively safe design of the Atomic Alchemy Versatile Isotope Production Reactor (VIPR). The VIPR will be designed to maintain natural convection cooling independent of a safety-related AC power source indefinitely. Also see FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-57, “Station Blackout.”

Additional radioisotope processes related Station Blackout concerns will be analyzed in FSAR Chapter 15, Section 8, subsection “station blackout.”

10 CFR 50.65(a)(4) – Exceptions as noted; the Atomic Alchemy Maintenance Rule program is an NQA-1 quality program and part of the QAPD. However, evolutions performed under the program procedures are based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 4, 5, 17, 18, 33, 34, 35, 38, 41, 44 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.6, positions D.1 through D.5 – Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Since the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.6 are applicable to provide guidance on the Class 1E DC and UPS safety related power sources. The Atomic Alchemy design includes connections to a non-safety-related onsite standby diesel generator.

Regulatory Guide 1.32, position C – Exceptions as noted; the guidelines are applicable to the Class 1E DC and UPS system only. There are no safety-related AC power systems in the Atomic Alchemy design. Atomic Alchemy will comply with the latest revisions of IEEE-308 and IEEE-450. These versions are not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in Regulatory Guide 1.32.

Regulatory guide 1.155, positions C.1 - Exceptions as noted; the Atomic Alchemy NPUF will be designed with reliable, non-safety-related offsite and onsite AC power that are normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module integrity, radioisotope module integrity, or radwaste module integrity. Therefore, requirements pertaining to onsite emergency AC power sources are not applicable. During loss of offsite AC power, AC power can be supplied by the onsite non-safety-related standby diesel-generators. Preassigned loads and equipment are automatically loaded on the diesel-generators in a predetermined sequence. Additional loads can be manually added as required. The reliability of the non-safety-related diesel generator is assured by the system's inclusion in the Atomic Alchemy's QAPD 10 CFR 50.63 program (Maintenance Rule). Also see FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-56, "Diesel Generator Reliability."

Regulatory guide 1.155, positions C.2 - Exceptions as noted; the Atomic Alchemy Emergency Planning Program addresses administrative procedures and actions to be taken during postulated loss of offsite AC power transients.

Regulatory guide 1.155, positions C.3 - Exceptions as noted; non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module integrity, radioisotope module integrity, or radwaste module integrity. Therefore, requirements pertaining to station blackout are not applicable to the Atomic Alchemy facility.

Additional radioisotope processes that might be related to Station Blackout concerns will be analyzed in FSAR Chapter 15, Section 8, subsection "station blackout."

Regulatory Guide 1.160, positions C.1 through C.4 – Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance.

Regulatory Guide 1.204, positions C.1 and C.2 – Acceptable; See FSAR Chapter 8, Section 3, subsection “Lightning Protection System” which will conform to NFPA 780.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLAs, DC, and ESP applications. Atomic Alchemy is applying for a construction and operating permit under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy’s QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1 standard.

NUREG-1793 – Not applicable; this SER provides the staff's safety review of the AP1000 standard design against the requirements of 10 CFR Part 52, Subpart B and describes the basis for acceptance of passive features and systems not found in current operating reactors. As it is an evaluation of conformance, there are no applicable requirements for Atomic Alchemy.

SECY-90-016 – Not applicable; this letter applies to alternate guidance on—and the proposed resolution of—issues that were necessary for the staff's continued review of EPRI's ALWR Requirements Document, General Electric's (GE's) ABWR, Westinghouse's RESAR SP/90, and Combustion Engineering's (CE's) System 80+ designs, as related to the use of AAC power sources and application of Regulatory Treatment of Non-Safety Systems (RTNSS) at Advanced Light Water Reactors (ALWR) provided with passive safety systems. It contains no requirements. The VIPR is a non-power reactor.

SECY-94-084 – Not applicable; this letter applies to alternate guidance on, and the proposed resolution of issues that were necessary for the staff's continued review of the Regulatory Treatment of Non-Safety Systems (RTNSS) related to ALWR’s and the use of AAC power sources and application of RTNSS at ALWRs provided with passive safety systems. It contains no requirements. The VIPR is a non-power reactor. The Atomic Alchemy design is based on deterministic qualitative approach rather than a probabilistic quantitative approach. Atomic Alchemy applies a conservative review of non-safety-related systems for inclusion into the scope of the Maintenance Rule program.

SECY-95-132 – Not applicable; this letter applies to alternate guidance on, and the proposed resolution of issues that were necessary for the staff's continued review of:

- RTNSS
- Definition of passive failure
- Safe shutdown requirements
- Control room habitability
- Reliability assurance program
- Station blackout
- Electric distribution
- Inservice testing of pumps and valves

As they relate to the use of AC power sources and application of RTNSS at ALWRs provided with passive safety systems for the General Electric's (GE's) ABWR, Westinghouse's RESAR SP/90 and Combustion Engineering's (CE's) System 80+ designs. It contains no requirements. Station Blackout is addressed by Atomic Alchemy in response to SRP 8.4.

SECY-91-078 – Not applicable; this letter applies to the proposed draft SER of chapter 11 of EPRI's ALWR Requirements Document, General Electric's (GE's) ABWR, Westinghouse's RESAR SP/90 and Combustion Engineering's (CE's) System 80+ designs, as it relates to the inclusion of an alternate power source to non-safety-related loads at evolutionary plant designs. It contains no requirements. The VIPR is a non-power reactor.

SECY-05-0227 – Not applicable; this letter provides the staff's safety review of the AP1000 standard design as it relates to an exemption to the GDC 17 requirement for two physically independent offsite circuits at passive reactor designs. It contains no requirements. The VIPR is a non-power reactor.

NUREG-0800 SRP 8.2, Rev 5 Appendix A Guidelines for Generator Circuit Breakers/Load Break Switches

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.1	IEEE Std C37.013	Acceptable
Summary Description of Compliance/Exceptions		
SRP 8.2, Appendix A– General description: this SRP Appendix addresses means of providing immediate access of the onsite ac power systems to the offsite circuits by isolating the unit generator from the main step-up and unit auxiliary transformers and allowing back feeding of power through these circuits to the onsite ac power system in PWR and BWR nuclear power plants. Atomic Alchemy does not incorporate this feature in its AC power design. Atomic Alchemy does perform short circuit analyses of the electrical power design. IEEE Std C37.013 – Not applicable; the Atomic Alchemy's facility is an NPUF and does not contain a turbine generator. Electric circuit protection and circuit breaker analysis will be described in FSAR Chapter 8, Section 4, subsection "Electric Circuit Protection." Short circuit analyses will be performed in accordance with latest revision of IEEE 946 and/or other acceptable industry standards or practices to determine fault currents.		

NUREG-0800 SRP 8.3.1, Rev 4 A-C Power Systems (Onsite)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.1 SRP 13a2.1.5	10 CFR 50.34(f)(2)(v), 10 CFR 50.34(f)(2)(xiii), 10 CFR 50.34(f)(2)(xx), 10 CFR 50.55a, 10 CFR 50.63, 10 CFR 50.65(a)(4), 10 CFR 52.47(b)(1), 10 CFR 52.80(a),	Exceptions as noted

	GDC 2, GDC 4, GDC 5, GDC 17, GDC 18, GDC 50, R.G. 1.6, R.G. 1.9, R.G. 1.32, R.G. 1.47, R.G. 1.53, R.G. 1.63, R.G. 1.75, R.G. 1.81, R.G. 1.106, R.G. 1.118, R.G. 1.153, R.G. 1.160, R.G. 1.204, R.G. 1.206, BTP 8-2, BTP 8-5, BTP 8-6, BTP 8-7, NUREG-0718, NUREG-0737, NUREG/CR-0660, NUREG-1793, SECY-90-016, SECY-94-084, SECY-95-132	

Summary Description of Compliance/Exceptions

SRP 8.3.1 – General design description: this SRP addresses information with respect to ensuring that the onsite AC power system satisfies the requirements of General Design Criteria (GDCs) 2, 4, 5, 17, 18, and 50 and will perform its intended design functions during all plant operating and accident conditions in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy AC onsite power system is a non-Class 1E system and does not perform any safety-related functions. A transmission system to supply offsite AC energy for startup and normal shutdown through a site-specific transmission switchyard will be described in FSAR Chapter 8, Section 2. The normal AC power supply to the main AC power system is provided from the main generator. Atomic Alchemy uses a single non-Class 1E onsite standby diesel generator to supply power to selected plant loads in the event of loss of the normal power sources.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).” Provided below are the relevant SRP 8.3.1 regulations compliance/exceptions.

(2)(v) – Acceptable; the description of the availability of the status of bypassed systems to the operators are included in FSAR Chapter 7, Section 2, “Identification of Safety Criteria.”

(2)(xiii) – Not applicable; the VIPR is not a PWR, does not have a pressurizer, nor power operated safety relief valves.

(2)(xx) – Not applicable; the VIPR is not a PWR, does not have a pressurizer, nor power operated safety relief valves.

10 CFR 50.55a – Acceptable; in this context with respect to SRP 8.3.1, this code refers to sub paragraph (h) and compliance with IEEE-603-1991. Refer to Atomic Alchemy’s conformance to SRP Appendix 7.1-C Rev 6 and IEEE-603.

10 CFR 50.63 – Not applicable; the Atomic Alchemy design minimizes the potential risk contribution of a station blackout (SBO) by not requiring AC power sources for mitigating design-basis events. The

Atomic Alchemy NPUF will be designed with reliable, non-safety-related offsite and onsite AC power that is normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module, radioisotope module, or radwaste module building integrity. Offsite power has no safety-related function due to the passively safe design of the VIPR. The VIPR will be designed to maintain natural convection cooling independent of a safety-related AC power source indefinitely. Also see FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-57, "Station Blackout."

10 CFR 50.65(a)(4) – Exceptions as noted; the Atomic Alchemy Maintenance Rule program is an NQA-1 quality program and part of the QAPD. However, evolutions performed under the program procedures are based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 17, 18, 50 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.6, positions D.1 through D.5 – Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Since the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.6 are applicable to provide guidance on the Class 1E DC and UPS safety related power sources. The Atomic Alchemy design includes connections to a non-safety-related, onsite, standby diesel generator.

Regulatory Guide 1.9, positions C.1 through C.3 – Exceptions as noted; this guide pertains to conformance with the guidelines in IEEE Std 387-1995 which constitutes an acceptable method for satisfying the NRC's regulations with respect to the design, qualification, and periodic testing of diesel generators used as onsite electric power systems for nuclear power plants. The Atomic Alchemy standby diesel generator performs no safety related functions and is not required to bring the plant to a safe shutdown condition. For good business practices, the diesel generator will be included in the Maintenance Rule program and some of the guidelines of IEEE 387 will be incorporated. See FSAR Chapter 8, Section 4, subsection "Diesel Generator Inspections and Testing."

Regulatory Guide 1.32, position C – Exceptions as noted; the guidelines are applicable to the Class 1E DC and UPS system only. There are no safety-related AC power systems in the Atomic Alchemy design. Atomic Alchemy will comply with the latest revisions of IEEE-308 and IEEE-450. These versions are not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in Regulatory Guide 1.32.

Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no AC power safety-related I&C systems in the Atomic Alchemy design and therefore these I&C guidelines are applicable only to the Class 1E DC and UPS safety related I&C systems. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital

instrumentation will also be described in FSAR Chapter 7, Section 2, “Identification of Safety Criteria.” The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991.

Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture will conform with the intent of the requirements of IEEE 379, “Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems” as applicable to DC safety related power systems. There are no AC power safety related I&C systems in the Atomic Alchemy facility. The evaluation for applying single failure criterion will be described in FSAR Chapter 7, Section 2, “Identification of Safety Criteria.”

Regulatory Guide 1.63, position C – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-317. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.75, position C – Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Since the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.75 are applicable on a very limited basis to provide guidance on the Class 1E/non-1E electrical separation and isolation. Atomic Alchemy complies with this portion of the guide.

Regulatory Guide 1.81, positions C.1 and C.2 – Not applicable; the Atomic Alchemy operating license submission is after 6/1/1973.

Regulatory Guide 1.81, positions C.3 – Exceptions as noted; the Atomic Alchemy DC 1E UPS system includes augmented design provisions for sharing 1E power across radwaste and radioisotope processes that prevents adverse interactions and the introduction of other failures of systems that are required to ensure a safe shutdown of any radioisotope process. Each VIPR has its own dedicated DC 1E UPS system located in the reactor auxiliary module. The Class 1E DC and UPS system will be designed to accommodate component failures, such as the loss of a battery charger, a battery, or an inverter, without the loss of power to either the DC bus or the AC instrumentation and control power bus which feeds all related radioisotope processes.

Additional radioisotope processes that might be related to station blackout concerns will be analyzed in FSAR Chapter 15, Section 8, subsection “station blackout.”

Regulatory Guide 1.106, positions C.1 through C.3 – Not applicable; the Atomic Alchemy Reactor design does not have any safety related motor operated valves. The design of the radioisotope processes and radwaste processes is ongoing. It is not anticipated that safety related motorized valves (with or without thermal overload protection devices) will be necessary to provide a safety function. Additionally, temperatures would not be significantly elevated above ambient in the radioisotope and radwaste modules for there to be a concern with thermal overload devices. The current preliminary design features small bore air operated valves that fail close.]

Regulatory Guide 1.118, positions C.1 through C.3 – Exceptions as noted; Atomic Alchemy will comply with the latest revision of IEEE-338, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems." This latest version should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide. (See Technical Specifications LCO

3.3.1 through 3.3.7 for Instrumentation surveillances.) Sensors are not tested as part of the standard, and Atomic Alchemy does not have any AC power safety related systems.

Regulatory Guide 1.153, position C – Acceptable; this regulatory guide refers to compliance with IEEE-603-1991. See Atomic Alchemy's conformance to SRP Appendix 7.1-C Rev 6 for the compliance with IEEE-603-1991.

Regulatory Guide 1.160, positions C.1 through C.4 – Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance.

Regulatory Guide 1.204, positions C.1 and C.2 – Acceptable; See FSAR Chapter 8, Section 3, subsection "Lightning Protection System" which will conform to NFPA 780.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLAs, DC, and ESP applications. Atomic Alchemy is applying for a construction and operating permit under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy's QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1 standard.

BTP 8-1 through BTP 8-8 – Exceptions as noted; each BTP is addressed individually in their respective line item in this table.

NUREG-0718 – Exceptions as noted; this applies to TMI Item I.D.3, "Safety System Status Monitoring," regarding application of Regulatory Guide 1.47. Atomic Alchemy's conformance to the RG is as follows: There are no AC power safety related I&C systems in the Atomic Alchemy design and therefore these I&C guidelines are only applicable to the Class 1E DC and UPS safety related I&C systems. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure and self-testing of computer digital instrumentation will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991.

NUREG-0737 – Not applicable; in the context of applying to this SRP, the referenced TMI Items II.E.3.1,"Emergency Power Supply for Pressurizer Heaters," and II.G.1, "Emergency Power for Pressurizer Equipment" are not applicable to the VIPR, as it is a non-power reactor.

NUREG/CR-0660 – Provided for reference only; Atomic Alchemy conformance to applicable TMI Action Items will be provided in FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0993)."

NUREG-1793 – Not applicable; this SER provides the staff's safety review of the AP1000 standard design against the requirements of 10 CFR Part 52, Subpart B and describes the basis for acceptance of passive features and systems not found in current operating reactors. As it is an evaluation of conformance, there are no applicable requirements for Atomic Alchemy.

SECY-90-016 – Not applicable; this letter applies to alternate guidance on, and the proposed resolution of issues that were necessary for the staff's continued review of EPRI's ALWR

Requirements Document, General Electric's (GE's) ABWR, Westinghouse's RESAR SP/90 and Combustion Engineering's (CE's) System 80+ designs, as related to the use of AAC power sources and application of Regulatory Treatment of Non-Safety Systems (RTNSS) at Advanced Light Water Reactors (ALWR) provided with passive safety systems. It contains no requirements. The VIPR is a non-power reactor.

SECY-94-084 – Not applicable; this letter applies to alternate guidance on, and the proposed resolution of issues that were necessary for the staff's continued review of the Regulatory Treatment of Non-Safety Systems (RTNSS) related to ALWR's and the use of AAC power sources and application of RTNSS at ALWRs provided with passive safety systems. It contains no requirements. The VIPR is a non-power reactor. The Atomic Alchemy design is based on deterministic qualitative approach rather than a probabilistic quantitative approach. Atomic Alchemy applies a conservative review of non-safety-related systems for inclusion into the scope of the Maintenance Rule program.

SECY-95-132 – Not applicable; this letter applies to alternate guidance on, and the proposed resolution of issues that were necessary for the staff's continued review of:

- RTNSS
- Definition of passive failure
- Safe shutdown requirements
- Control room habitability
- Reliability assurance program
- Station blackout
- Electric distribution
- Inservice testing of pumps and valves

As they relate to the use of AC power sources and application of RTNSS at ALWRs provided with passive safety systems for the General Electric's (GE's) ABWR, Westinghouse's RESAR SP/90 and Combustion Engineering's (CE's) System 80+ designs. It contains no requirements. Station blackout is addressed by Atomic Alchemy in response to SRP 8.4.

NUREG-0800 SRP 8.3.2, Rev 4 D-C Power Systems (Onsite)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.2 SRP 13a2.1.5	10 CFR 50.55a, 10 CFR 50.63, 10 CFR 50.65(a)(4), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 17, GDC 18, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44, GDC 50,	Exceptions as noted

	R.G. 1.6, R.G. 1.32, R.G. 1.47, R.G. 1.53, R.G. 1.63, R.G. 1.75, R.G. 1.81, R.G. 1.106, R.G. 1.118, R.G. 1.128, R.G. 1.129, R.G. 1.155, R.G. 1.160, R.G. 1.206, BTP 8.5, NUREG-0718, NUREG-1793	

Summary Description of Compliance/Exceptions

SRP 8.3.2 – General design description: the Atomic Alchemy facility DC power system is comprised of independent Class 1E and non-Class 1E DC power systems. Each system consists of ungrounded stationary batteries, DC distribution equipment, and uninterruptible power supply (UPS).

The Class 1E DC and UPS system is capable of providing reliable power for the safe shutdown of the plant without the support of battery chargers during a loss of all AC power sources coincident with a design basis event (DBE).

The non-Class 1E DC and UPS system will provide continuous, reliable electric power to the plant non-Class 1E control and instrumentation loads and equipment that are required for plant operation and investment protection.

10 CFR 50.55a(h) – Acceptable; Atomic Alchemy intends to comply with the requirements of IEEE-603-1991, in some instances Atomic Alchemy may choose to comply with later revisions than what industry standard is incorporated by reference into the regulations. In these instances, Atomic Alchemy will submit an alternative under 10 CFR 50.55a(z) as procuring components from vendors along with a code reconciliation would result in a hardship and/or unusual difficulty without providing an increase in the level of quality and safety.

10 CFR 50.63 – Not applicable; the Atomic Alchemy design minimizes the potential risk contribution of a station blackout (SBO) by not requiring AC power sources for mitigating design-basis events. The Atomic Alchemy NPUF will be designed with reliable, non-safety-related offsite and onsite AC power that are normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module, radioisotope module, or radwaste module building integrity. Offsite power has no safety-related function due to the passively safe design of the VIPR. The VIPR will be designed to maintain natural convection cooling independent of a safety-related AC power source indefinitely. Also see FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-57, "Station Blackout."

Additional radioisotope processes with station blackout concerns will be analyzed in FSAR Chapter 15, Section 8, subsection "Station Blackout."

10 CFR 50.65(a)(4) – Exceptions as noted; the Atomic Alchemy Maintenance Rule program is an NQA-1 quality program and part of the QAPD, however, evolutions performed under the program procedures are based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 17, 18 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.6, positions D.1 through D.5 – Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Since the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.6 are applicable to provide guidance on the Class 1E DC and UPS safety related power sources. The Atomic Alchemy design includes connections to a non-safety-related onsite standby diesel generator.

Regulatory Guide 1.32, position C – Exceptions as noted; the guidelines are applicable to the Class 1E DC and UPS system only. There are no safety-related AC power systems in the Atomic Alchemy design. Atomic Alchemy will comply with the latest revisions of IEEE-308 and IEEE-450. These versions are not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in Regulatory Guide 1.32.

Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no AC power safety-related I&C systems in the Atomic Alchemy design therefore these I&C guidelines are applicable only to the Class 1E DC and UPS safety related I&C systems. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital instrumentation will also be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991.

Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture will conform with the intent of the requirements of IEEE 379, "Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems" as applicable to DC safety related power systems. There are no AC power safety related I&C systems in the Atomic Alchemy facility. The evaluation for applying single failure criterion will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria."

Regulatory Guide 1.63, position C – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-317. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.75, position C -Exceptions as noted; there are no safety-related AC power sources in the Atomic Alchemy facility. Since the Atomic Alchemy facility does not use safety-related AC power sources, the guidelines of Regulatory Guide 1.75 are applicable on a very limited basis to provide guidance on the Class 1E/non-1E electrical separation and isolation. Atomic Alchemy will comply with this portion of the guide.

Regulatory Guide 1.81, positions C.1 and C.2 – Not applicable; the Atomic Alchemy operating license submission is after 6/1/1973.

Regulatory Guide 1.81, positions C.3 – Exceptions as noted; the Atomic Alchemy DC 1E UPS system includes augmented design provisions for sharing 1E power across radwaste and radioisotope processes that prevents adverse interactions and the introduction of other failures of systems that are required to ensure a safe shutdown of any radioisotope process. Each reactor has its own dedicated DC 1E UPS system located in the reactor auxiliary module building. The Atomic Alchemy Class 1E DC and UPS system will be designed to accommodate component failures, such as the loss of a battery charger, a battery, or an inverter, without the loss of power to either the DC bus or the AC instrumentation and control power bus which feeds all related radioisotope processes.

Regulatory Guide 1.106, positions C.1 through C.3 – Not applicable; the VIPR design does not have any safety related motor operated valves. The design of the radioisotope processes and radwaste processes is ongoing. It is not anticipated that safety related motorized valves (with or without thermal overload protection devices) will be necessary to provide a safety function. Additionally, temperatures would not be significantly elevated above ambient in the radioisotope and radwaste modules for there to be a concern with thermal overload devices. The current preliminary design features small bore air operated valves that fail close.

Regulatory Guide 1.118, positions C.1 through C.3 – Exceptions as noted; Atomic Alchemy will comply with the latest revision of IEEE-338, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems." This latest version should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide. (See Technical Specifications LCO 3.3.1 through 3.3.7 for Instrumentation surveillances.) Sensors are not tested as part of the standard, and Atomic Alchemy does not have any AC power safety related systems.

Regulatory Guide 1.128, positions C.1 through C.10 – Acceptable; see Atomic Alchemy technical specifications LCO 3.8.1, and LCO 3.8.2 for ensuring operability of the 1E DC and UPS sources.

Regulatory Guide 1.129, positions C.1 through C.6 – Acceptable; see Atomic Alchemy's technical specifications program 5.6.3, "Battery Monitoring and Maintenance Program" which will conform to IEEE-450, IEEE-484, and this regulatory guide.

Regulatory Guide 1.155, position C.1 – Exceptions as noted; the Atomic Alchemy NPUF will be designed with reliable, non-safety-related offsite and onsite AC power that are normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module integrity, radioisotope module integrity, or radwaste module integrity. Therefore, requirements pertaining to onsite emergency AC power sources are not applicable. During loss of offsite AC power, AC power can be supplied by the onsite non-safety-related standby diesel-generators. Preassigned loads and equipment are automatically loaded on the diesel-generators in a predetermined sequence. Additional loads can be manually added as required. The reliability of the non-safety-related diesel generator is assured by the system's inclusion in the Atomic Alchemy's QAPD 10 CFR 50.63 program (Maintenance Rule). Also see FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-56, "Diesel Generator Reliability."

Regulatory Guide 1.155, positions C.2 – Exceptions as noted; the Atomic Alchemy Emergency Planning Program addresses administrative procedures and actions to be taken during postulated loss of offsite AC power transients.

Regulatory Guide 1.155, positions C.3 – Exceptions as noted; non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module integrity, radioisotope module integrity, or radwaste module integrity. Therefore, requirements pertaining to station blackout are not applicable to the Atomic Alchemy facility.

Regulatory Guide 1.160, positions C.1 through C.4 – Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLAs, DC, and ESP applications. Atomic Alchemy is applying for a construction and operating permit under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy's QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1 standard.

BTP 8-5 – Exceptions as noted; each BTP is addressed individually in their respective line item in this table.

NUREG-0718 – Exceptions as noted; this applies to TMI Item I.D.3, "Safety System Status Monitoring," regarding application of Regulatory Guide 1.47. Atomic Alchemy's conformance to the RG is as follows: There are no AC power safety related I&C systems in the Atomic Alchemy design and therefore these I&C guidelines are applicable to the Class 1E DC and UPS safety related I&C systems only. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital instrumentation will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991.

NUREG-1793 – Not applicable; this SER provides the NRC staff's safety review of the Westinghouse AP1000 standard design against the requirements of 10 CFR Part 52, Subpart B and describes the basis for acceptance of passive features and systems not found in current operating reactors. There are no applicable requirements for Atomic Alchemy.

NUREG-0800 SRP 8.4, Rev 1 Station Blackout

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.2, SRP 4.5.3, SRP 6.2,	10 CFR 50.34(f)(2)(v), 10 CFR 50.55a, 10 CFR 50.65(a)(4),	N/A

SRP 8.2	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 17, GDC 18, GDC 33, GDC 34, GDC 35, GDC 38, GDC 41, GDC 44, GDC 50, R.G. 1.9, R.G. 1.155, R.G. 1.160, R.G. 1.182, R.G. 1.206, BTP 8-5, NUREG-0718, NUREG-1793, SECY-90-016, SECY-94-084, SECY-95-132	

Summary Description of Compliance/Exceptions

SRP 8.4 – General design description: the Atomic Alchemy NPUF will be designed with reliable, non-safety-related offsite and onsite AC power that is normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module integrity, radioisotope module integrity, or radwaste module integrity. Therefore, requirements pertaining to onsite emergency AC power sources are not applicable. During loss of offsite AC power, AC power can be supplied by the onsite non-safety-related standby diesel-generators. Preassigned loads and equipment are automatically loaded on the diesel-generators in a predetermined sequence. Additional loads can be manually added as required. The reliability of the non-safety-related diesel generator is assured by the system's inclusion in the Atomic Alchemy's QAPD 10 CFR 50.63 program (Maintenance Rule).

Also see FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-56, "Diesel Generator Reliability."

The Atomic Alchemy Emergency Planning Program addresses administrative procedures and actions to be taken during postulated loss of offsite AC power transients.

The non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module integrity, radioisotope module integrity, or radwaste module integrity. Therefore, regulatory requirements pertaining to station blackout are not applicable to the Atomic Alchemy facility.

NUREG-0800 SRP Appendix 8-A, Rev 1 General Agenda, Station Site Visits (formerly Appendix B)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Acceptable

Summary Description of Compliance/Exceptions
This section contains no acceptance criteria for compliance, it is a road map to a typical NRC onsite inspection schedule.

NUREG-0800 SRP 8-A, Rev 3 (Draft) Branch Technical Positions (PSB)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Acceptable
Summary Description of Compliance/Exceptions		
This section contains no specific acceptance criteria for compliance. It is a road map to the NUREG-0800 SRP 8, Branch Technical Papers (BTP) BTP 8.1 through BTP 8.9. Atomic Alchemy provides its conformance and exceptions to the specific corresponding SRP Chapter 8 BTP's codes and standards requirements for each in the sections below.		

NUREG-0800 SRP 8-B, Rev 1 (Draft) General Agenda, Station Site Visits

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This section is identical to SRP Appendix 8-A Rev 1. It also contains no acceptance criteria for compliance, as it is a road map to a typical NRC onsite inspection schedule.		

NUREG-0800 BTP 8-1, Rev 3 Requirements on Motor-Operated Valves in the ECCS Accumulator Lines

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	IEEE Std. 603-1991, R.G. 1.153	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy VIPR is a non-power reactor. There are no "accumulator" type tanks used in the passive "ECCS" type equivalent system (Reactor Decay Heat Removal System (DHR)). Further, there are no safety related motor-operated valves in the reactor design.		

NUREG-0800 BTP 8-2, Rev 3 Use of Diesel-Generator Sets for Peaking

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	IEEE Std. 308, R.G, 1.32	N/A
Summary Description of Compliance/Exceptions		
The Stand-by Diesel Generator is a non-safety-related source of AC power, providing reliable AC power to the various plant system electrical loads. These loads represent non-safety-related system components that can enhance an orderly plant shutdown under emergency conditions. Additional loads that are for investment protection can be manually loaded on the standby power supply after the loads required for orderly shutdown have been satisfied.		

NUREG-0800 BTP 8-3, Rev 3 Stability of Offsite Power Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.1	IEEE Std. 242, IEEE Std. 399, R.G. 1.206	Acceptable
Summary Description of Compliance/Exceptions		
See FSAR Chapter 8, Section 2, subsection “Grid Stability Interface Evaluation” for Atomic Alchemy’s stability study performed using IEEE-242 and IEEE-399 guidance.		

NUREG-0800 BTP 8-4, Rev 3 Application of the Single Failure Criterion to Manually Controlled Electrically Operated Valves

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.1	N/A	Acceptable
Summary Description of Compliance/Exceptions		
See FSAR Chapter 6, Section 3, subsection, “System Reliability” for Atomic Alchemy’s application of single active and passive failures of ESF components. See FSAR Chapter 7, Section 2, subsection “Single Failure Mode Evaluations,” for Atomic Alchemy’s evaluation in accordance with IEEE 379, “IEEE Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems.”		

NUREG-0800 BTP 8-5, Rev 3 Supplemental Guidance for Bypass and Inoperable Status Indication for Engineered Safety Features Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2, SRP 6.2.3 SRP 7.1, SRP 7.2, SRP 7.5	R.G. 1.47, R.G. 1.153, IEEE Std. 603-1991	Exceptions as noted.

Summary Description of Compliance/Exceptions

Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no AC power safety related I&C systems in the Atomic Alchemy design. Therefore, these I&C guidelines are applicable to the Class 1E DC and UPS safety related I&C systems only. Atomic Alchemy will conform with the IEEE-603-1991.

The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital instrumentation will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991.

Regulatory Guide 1.153, position C – Acceptable; this regulatory guide refers to compliance with IEEE-603-1991. The Atomic Alchemy Reactor is a non-power design and therefore I&C requirements related to SSCs like Auxiliary Feedwater, Main Steam, Pressurizer, PORV's, etc. are also not applicable.

The design and architecture of the Atomic Alchemy I&C system is based on a modified-for-NPUF* Common Q platform whose elements are essentially the same as the platform defined in Topical Report WCAP-16097, which was approved by the NRC. See FSAR Chapter 7, Section 2 "Identification of Safety Criteria" where IEEE-603-1991 related requirements are addressed in subsections. These include: Separation Criteria, Single Failure, Software Verification and Validation, C-II over C-I, EMI/RFI, Reliability and Availability, Channel Independence and Integrity, Maintenance, Testing and Calibrations, Fault Tolerances, Maintenance, Blocks, Test and Bypasses Descriptions, Failure Modes and Effects Analysis (FMEA), Manual Initiation of Protective Action Functions, Cyber Security of Digital Control Safety Related Systems, Digital Safety-to-Non-Safety System Communications, Setpoint Determination and Confirmations, etc.

*** Atomic Alchemy intends to base its I&C architecture on the Westinghouse Common Qualified (Common Q) platform. It is a computer system consisting of a set of commercial-grade hardware and previously developed software components dedicated and safety related qualified for use in nuclear power plants. Since the number of safety related systems in a Non-power [ ] PROP reactor are substantially less than those required in a 1500 MW power reactor, and since the challenges to these systems are also not as severe, the overall Atomic Alchemy Common Q I&C architecture will be modified to suit these differences while maintaining the same NRC approved system design elements.**

The Westinghouse Common Q Platform consists of the following Class 1E major building blocks that can be used to design any specific safety related system: Advant Controller 160 (AC160) with PM646 Processor Module, S600 Input and Output Modules, Flat Panel Display System for human-machine interface consisting of the MTP, Safety/QDPS display and Operators Module, Component Interface Module (CIM), Termination Units, and Cabinets.

NUREG-0800 BTP 8-6, Rev 3 Adequacy of Station Electric Distribution System Voltages

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.1, SRP 8.1	NUREG-1793, Information Notice IN 2000-06, Regulatory Issue Summary (RIS) 2000-24, IEEE Std. 741	Exceptions as noted.

Summary Description of Compliance/Exceptions

The onsite AC power system is a non-Class 1E system comprised of a normal, preferred, maintenance and standby power supplies. The main AC power system is a non-Class 1E system and does not perform any safety-related functions.

The Class 1E DC and UPS system will be designed in accordance with the latest revision of the IEEE 308 and IEEE 946 standards.

The battery monitoring system detects battery open circuit condition and monitors battery voltage.

The Class 1E DC and UPS distribution panels are equipped with undervoltage protection which satisfies the guidance of this BTP.

Also see FSAR Chapter 8, Section 3, subsection, “Electric Circuit Protection” for further description of bus under-voltage relay protection provided for non-safety-related AC onsite power.

NUREG-0800 BTP 8-7, Rev 3 Criteria for Alarms and Indications Associated with Diesel-Generator Unit Bypassed and Inoperable

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.2	RG 1.47, IEEE Std. 603	Exceptions as noted.

Summary Description of Compliance/Exceptions

The Atomic Alchemy stand-by diesel generator is a non-safety-related source of AC power, therefore the “unavailable” status indication in the control room is not necessary. However, in the interest of good business practices, Atomic Alchemy has provided for remote indication in the control room to display diesel generator status (i.e., under test, ready-standby, lockout) is provided. A means of communication is also provided for diesel generator testing locations and the main control room to ensure that the operators know the status of the diesel generator under test.

Regulatory Guide 1.47, positions C.1 through C.6 – Exceptions as noted; there are no AC power safety related I&C systems in the Atomic Alchemy design. Therefore, these I&C guidelines are applicable to the Class 1E DC and UPS safety related I&C systems only. The status indication in the MCR for fault tolerances, maintenance, blocks, test, and bypassed systems are evaluated for safety related systems. Additionally, criteria for single failure criteria and self-testing of computer digital instrumentation will be described in FSAR Chapter 7, Section 2, "Identification of Safety Criteria." The instrumentation and control portion of the Atomic Alchemy safety related I&C systems meets the latest requirements of IEEE 379, IEEE 338, and IEEE 603-1991.

NUREG-0800 BTP 8-8, Initial, Onsite (Emergency Diesel Generators) and Offsite Power Sources Allowed Outage Time Extensions.

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.2	GDC 17, R.G. 1.93, R.G. 1.174, R.G. 1.177, R.G. 1.200	Exceptions as noted.
Summary Description of Compliance/Exceptions		
GDC 17 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. The onsite AC power system is a non-Class 1E system comprised of a normal, preferred, maintenance, and standby power supplies. The main AC power system (onsite or offsite) is a non-Class 1E system and does not perform any safety-related functions. Regulatory Guide 1.93, positions C.1 through C.7 – Exceptions as noted; the Atomic Alchemy Technical Specifications therefore does not contain any Required Actions and Completion Times to verify that a supplemental AC source is available before entering an extended allowed outage time (AOT). For good business practices, the Atomic Alchemy Technical Requirements Manual will provide limiting conditions of operation related to the unavailability of the non-safety-related standby diesel generator in TRM 3.3.x and TRM 3.8.x (to be determined in the operating license and FSAR submittal) Regulatory Guide 1.174, guidance positions C.1 through C.6 – Not applicable; this regulatory guidance addresses developing risk-informed applications for a licensing basis change that considers engineering issues and applies risk insights. Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach. Regulatory Guide 1.177, guidance positions C.1 through C.4 – Not applicable; this regulatory guidance addresses utilizing risk information to evaluate changes to nuclear power plant Technical Specifications (T/S), Complete Times (CT) and surveillance Frequencies (SF) in order to assess the impact of such proposed changes on the risk associated with plant operation. Atomic Alchemy's		

Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach. Regulatory Guide 1.200, positions C.1 through C.4 – Exceptions as noted; Atomic Alchemy construction license is submitted under 10 CFR Part 50. Atomic Alchemy's Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

NUREG-0800 BTP 8-9, Rev 0 Open Phase Conditions in Electric Power System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 8.1, SRP 8.2	NRC Bulletin 2012-01	Acceptable
Summary Description of Compliance/Exceptions		
BTP 8.9, positions 1 – Not applicable; this requirement applies to operating power reactors. BTP 8.9, position 2 – Not applicable; this requirement applies to new power reactors with "active" safety related systems. BTP 8.9, position 3 – Acceptable; the onsite AC power system is a non-Class 1E system comprised of a normal, preferred, maintenance and standby power supplies. The main AC power system (onsite or offsite) is a non-Class 1E system and does not perform any safety-related functions. However, while this BTP is not necessarily applicable to the NPUF facility, for good business practices the non-safety onsite AC power systems are provided with OPC detection and alarms, and procedures administrative control operator actions to ensure that the standby diesel generator is correctly aligned to AC buses. See FSAR Chapter 8, Section 3, subsection, "Electric Circuit Protection."		

9. AUXILIARY SYSTEMS

NUREG-0800 SRP 9.1.1, Rev 3 Criticality Safety of Fresh and Spent Fuel Storage and Handling

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.2, SRP 9.5, SRP 9.7, SRP 11.1.1	10 CFR 50.68, 10 CFR 70.24, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 62	Acceptable

Summary Description of Compliance/Exceptions
SRP 9.1.1 – General design description: this SRP addresses the verification that the as-built facility will conform to the approved design and is performed with respect to criticality fuel storage design in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. New fuel is stored in a high-density rack in a compartment adjacent to the light water pool in the reactor confinement module building. The racks include integral neutron absorbing material to maintain the required degree of subcriticality. The rack will be designed to store fuel of the maximum design basis enrichment. The new fuel rack includes storage locations for (number to be determined) fuel assemblies. The rack layout and array center-to-center spacing is shown in FSAR Figure 9.01-01. This spacing provides a minimum separation between adjacent fuel assemblies which is sufficient to maintain a subcritical array. 10 CFR 50.68 and 10 CFR 70.24 – Acceptable; Atomic Alchemy will provide a safety class Criticality Area Detection and Alarm Systems for the Reactor modules, Radioisotope Module, Target Fabrication Module, and Radwaste Module buildings (ICA) and a separate safety class system for radioisotope process hot cells (ICC). These will be described in FSAR Chapter 7, Section 3. Additionally, Atomic Alchemy addresses the issue of criticalities programmatically in Technical Specification 5.6.5.3 "Nuclear Criticality Safety Program." 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 62 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 9.1.2, Rev 4 New and Spent Fuel Storage

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.7, SRP 9.2, SRP 11.1	10 CFR 20.1101(b), 10 CFR 50.68, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 61, GDC 63, R.G. 1.13, R.G. 1.29, R.G. 1.117	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.1.2 – General design description: this SRP addresses a review of the new and spent fuel storage facilities. It covers the new fuel vault, the new fuel storage racks, spent fuel storage pool, spent fuel storage racks, spent fuel pool liner, equipment storage pits, and the structures housing		

these systems for compliance with applicable Title 10 regulations in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs.

The storage of new fuel is described in response to SRP 9.1.1. Spent fuel is similarly stored in high density racks which include integral neutron absorbing material to maintain the required degree of subcriticality. The racks are designed to store fuel of the maximum design basis enrichment.

The new fuel rack will be designed to withstand nominal operating loads and safe shutdown earthquake seismic loads. The rack is also designed to withstand the maximum uplift force of the fuel handling machine. The fuel handling machine is used to handle new fuel assemblies. The capacity of the fuel handling machine, while over the new fuel storage rack, is limited to lifting a fuel assembly, control rod assembly, and handling tools. This precludes the movement of loads greater than fuel components over stored fuel in accordance with Regulatory Guide 1.13.

The Atomic Alchemy spent fuel is in the same light water pool (inside the reactor confinement module building) as the reactor core, located on the opposite side, in a cavity below the level of the core. The design of the spent fuel racks is such that a fuel assembly cannot be inserted into a location other than a location designed to receive an assembly. Insertion of a fuel assembly into a fuel pool location not designed to receive it is prevented by administrative controls. Criticality analyses are performed in accordance with the requirements of ANSI N16.1-75, Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors. The fuel handling machine traverses the spent fuel pool, the reactor core, and the new fuel storage area. It is used in the movement of both new and spent fuel assemblies. The fuel handling machine performs fuel handling operations in the new and spent fuel handling areas. It also provides a means of tool support and operator access for long tools used in various services and handling functions. The fuel handling machine is equipped with two hoists, one of which is single failure proof and will be designed according to NUREG-0554.

The new fuel and spent fuel storage is located within the reactor confinement module building. As previously described the module building is protected from the effects of natural phenomena such as earthquakes, wind and tornadoes, floods, and external missiles. The module building will be designed to maintain its structural integrity following the SSE and other postulated transients.

10 CFR 20.1101(b) – Acceptable; Atomic Alchemy will provide several specific Radiation Protection Programs in the Technical Specifications, See Technical Specification for the following:

5.6.5 Radiation Protection Program

5.6.5.1 Radiation Safety

5.6.5.2 Respiratory Protection Program

5.6.5.3 Nuclear Criticality Safety Program

10 CFR 50.68 – Acceptable; Atomic Alchemy will provide safety class Criticality Area Detection and Alarm Systems for the Reactor modules, Radioisotope Module, Target Fabrication Module, and Radwaste Module buildings (ICA), and a separate safety class system for radioisotope process hot cells (ICC). These will be described in FSAR Chapter 7, Section 3.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 61, 63– Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.13, positions C.1, C.2, and C.6 – Acceptable; each reactor core and its respective spent fuel are located in a common light water pool. The spent fuel sits in a lower cavity below the level of the core at the opposite end of the pool. The spent fuel pool is therefore located in the same confinement building module as the reactor which is classified as a Seismic Category I structure conforming to Regulatory Guide 1.29.

Regulatory Guide 1.13, position C.3 – Not applicable; the Atomic Alchemy facility does not have a turbine, as the Versatile Isotope Production Reactor (VIPR) is a non-power reactor.

Regulatory Guide 1.13, position C.4 – Acceptable; the air filters in the reactor confinement clean-up ventilation system are not Seismic Category I, as it is not a safety related system. The purpose of the filters in the normal confinement ventilation system is to control normal operating releases. They are not provided for accident mitigation.

Regulatory Guide 1.13, positions C.5 – Acceptable; heavy loads are administratively controlled by several QAPD quality level programs: "Overhead Loads Handling Equipment Inspection Program," "Heavy Load Handling Program," "Lifting and Rigging Program" and the "Fuel Loading Conditions Surveillance Program." See FSAR Chapter 13, Appendix A.

Regulatory Guide 1.13, position C.7 – Acceptable; the spent fuel is located in the same light water pool as the reactor core. All instrumentation is safety related.

Regulatory Guide 1.13, position C.8, C.9, C.10 and C.11 – Not applicable; the VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The minimum heat removal capacity (with the reactor coolant system in operation) of the light water pool at the design basis temperature of the structure, and the heat sink at its maximum design temperature is greater than 0.3 percent of the reactor rated thermal power. The Atomic Alchemy design will provide an additional passive "emergency core cooling" type safety related system (Reactor Decay Heat Removal - DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy DHR system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components. Since the spent fuel shares the same light water pool as the reactor core, the Chemical Volume and Control (CVC) system provides makeup.

Regulatory Guide 1.13, positions C.12 – Acceptable; Atomic Alchemy applies programmatic administrative controls for monitoring light water pool leakage. See FSAR Chapter 13, Appendix A for the "Light Water Pool Leakage Rate Test Program" and "RCS System Leak Detection Program."

Regulatory Guide 1.13, positions C.13 – Acceptable; since the spent fuel occupies the same light water pool as the reactor core, the water cleanup system is part of the CVC makeup water system for the light water pool.

Regulatory Guide 1.13, positions C.14 – Acceptable; high burnup fuel that may become more brittle or susceptible to damage is addressed by the robust design of the racks. The racks are designed with adequate energy absorption capabilities to withstand the impact of a dropped fuel assembly from the maximum lift height of the fuel handling machine. Other reactor confinement module overhead handling equipment capable of carrying loads heavier than fuel components are prevented by design from carrying loads directly above the spent fuel storage area of the light water pool.

Regulatory Guide 1.29, General summary; Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target fabrication and process modules, and radwaste module that contain or may contain radioactive material and whose postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary as defined by Atomic Alchemy for a Reactor located within an open light water pool rather than 10 CFR 50.2 definition.

Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic Category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis."

Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR related components are not applicable to the Reactor seismic Category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does it require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. Atomic Alchemy does not have a feedwater system. Atomic Alchemy does not have safety related diesel generators, as the standby diesel generator is not required for safe shutdown, to mitigate an accident, or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports."

Regulatory Guide 1.29, position C.1.f, C.1.h, and C.1.i – Acceptable; safety class instrumentation seismic Category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports."

Regulatory Guide 1.29, position C.1.g – Not applicable; Atomic Alchemy at this phase in the preliminary design does not have systems not already covered by positions C.1.a through C.1.f.

Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

Regulatory Guide 1.117, positions C.1 through C.3 – Acceptable; the VIPR coolant system is open to the atmosphere. The only coolant boundary is the piping itself, which is ASME III Class 1. The reactor

is located at the bottom of a pool, the decay heat removal is passive. The reactor confinement module building structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards.

NUREG-0800 SRP 9.1.3, Rev 2 Spent Fuel Pool Cooling and Cleanup System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.4, SRP 5.7, SRP 9.7	10 CFR 20.1101(b), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 61, GDC 63, R.G. 1.13, R.G. 1.26, R.G. 1.52, ASME BPVC Section XI	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 9.1.3 – General design description: the minimum heat removal capacity (with the reactor coolant system in operation) of the light water pool at the design basis temperature of the structure, and the heat sink at its maximum design temperature is greater than 0.3 percent of the reactor rated thermal power.

The spent fuel pool has been designed (in a cavity below the level of the reactor core) so that in the event of a loss of coolant transient the pool level cannot be drained below a point approximately 10 feet above the top of the core.

The Spent Fuel Pool (Light Water Pool) Cooling System will be designed to remove decay heat from the spent fuel pool such that the spent fuel water temperature will be < 140°F following a full core off load. This is accomplished by passive convection cooling.

10 CFR 20.1101(b) – Acceptable; Atomic Alchemy will provide several specific Radiation Protection Programs in the Technical Specifications, See Technical Specification for the following:

- 5.6.5 Radiation Protection Program
- 5.6.5.1 Radiation Safety
- 5.6.5.2 Respiratory Protection Program
- 5.6.5.3 Nuclear Criticality Safety Program

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 61, 63– Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.13, positions C.1 through C.2, and C.6 – Acceptable; each Reactor core and its respective spent fuel are located in a common light water pool. The spent fuel sits in a lower cavity below the level of the core at the opposite end of the pool. The spent fuel pool is therefore located in the same confinement building module as the reactor which is classified as a Seismic Category I structure conforming to Regulatory Guide 1.29.

Regulatory Guide 1.13, position C.3 – Not applicable; the Atomic Alchemy facility does not have a turbine, as the VIPR is a non-power reactor.

Regulatory Guide 1.13, position C.4 – Acceptable; the air filters in the reactor confinement clean-up ventilation system are not Seismic Category I, it is not a safety related system. The purpose of the filters in the normal confinement ventilation system is to control normal operating releases. They are not provided for accident mitigation.

Regulatory Guide 1.13, positions C.5 – Acceptable; heavy loads are administratively controlled by several QAPD quality level programs: "Overhead Loads Handling Equipment Inspection Program," "Heavy Load Handling Program," "Lifting and Rigging Program," and the "Fuel Loading Conditions Surveillance Program." See FSAR Chapter 13, Appendix A.

Regulatory Guide 1.13, position C.7 – Acceptable; the spent fuel is located in the same light water pool as the reactor core, all instrumentation is safety related.

Regulatory Guide 1.13, position C.8, C.9, C.10 and C.11 – Not applicable; the VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The minimum heat removal capacity (with the reactor coolant system in operation) of the light water pool at the design basis temperature of the structure, and the heat sink at its maximum design temperature is greater than 0.3 percent of the reactor rated thermal power. The Atomic Alchemy design will provide an additional passive "emergency core cooling" type safety related system (DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Molybdenum Target Transfer Light Water Canal System (TTW) water is used for the DHR. The Atomic Alchemy passive "emergency core cooling" system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components. Since the spent fuel shares the same light water pool as the reactor core, the CVC system provides nominal makeup water. Additionally, the TTW system also includes a separate makeup water storage tank with the capacity to refill the transfer canal by operator action if needed.

Regulatory Guide 1.13, positions C.12 – Acceptable; Atomic Alchemy applies programmatic administrative controls for monitoring light water pool leakage, see FSAR Chapter 13, Appendix A for the "Light Water Pool Leakage Rate Test Program" and "RCS System Leak Detection Program."

Regulatory Guide 1.13, positions C.13 – Acceptable; since the spent fuel occupies the same light water pool as the reactor core, the water cleanup system is part of the CVC makeup water system for the light water pool.

Regulatory Guide 1.13, positions C.14 – Acceptable; high burnup fuel that may become more brittle or susceptible to damage is addressed by the robust design of the racks. The racks are designed with

adequate energy absorption capabilities to withstand the impact of a dropped fuel assembly from the maximum lift height of the fuel handling machine. Other reactor confinement module overhead handling equipment capable of carrying loads heavier than fuel components are prevented by design from carrying loads directly above the spent fuel storage area of the light water pool. Regulatory Guide 1.26 – Acceptable; with respect to this SRP, the Atomic Alchemy Spent fuel pool shares a common light water pool with the reactor core. The cooling of the light water pool is safety related. Regulatory Guide 1.52, positions C.1 through C.7 – There are no safety-related ESF atmosphere cleanup systems for the Atomic Alchemy facility other than for the main control room. (The MCR cleanup ventilation will comply with these requirements. See FSAR Chapter 6, Section 8, “Main Control Room Habitability Design Features”). The calculated offsite doses for the Atomic Alchemy facility from a loss of coolant transient are within the 10 CFR 100 guidelines. ASME BPVC Section XI – Not applicable with respect to the spent fuel cleanup system. Atomic Alchemy does not use any safety related spent fuel cleanup features that would fall under Section XI. Atomic Alchemy will determine what non-safety-related features may be included in the Maintenance Rule program.

NUREG-0800 SRP 9.1.4, Rev 4 Light Load Handling System and Related Refueling Operations

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.2	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 5, GDC 61, GDC 62, R.G. 1.13, R.G. 1.29	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.1.4 – General design description: this SRP addresses the review of light load handling systems with respect to avoiding criticality accidents, radioactivity releases from damage to irradiated fuel, and unacceptable personnel radiation exposures in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy fuel handling and refueling system consists of equipment and structures used for conducting the refueling operation. This system will conform to General Design Criteria 2, 5, 61, and 62. The light load handling system meets the guidelines of American Nuclear Society (ANS) 57.1. Part of the design basis of the Atomic Alchemy Light load handling system include: • Fuel handling devices have provisions to avoid dropping or jamming of fuel assemblies during transfer operation. • Handling equipment has provisions to avoid dropping of fuel handling devices during the fuel transfer operation.		

- Spent Fuel Handling equipment used to raise and lower spent fuel has a limited maximum lift height so that the minimum required depth of water shielding is maintained.
- The refueling machine will be designed to maintain its load carrying and structural integrity functions during a safe shutdown earthquake.
- The inertial loads imparted to the fuel assemblies or core components during handling operations are less than potential damage causing loads.

Handling system operators are trained and qualified and conduct themselves in accordance with chapter 2-3.1 of ASME B30.2-2005, “Overhead and Gantry Cranes.” The crane is to be inspected, tested, and maintained in accordance with chapter 2-2 of ASME B30.2-2005, “Overhead and Gantry Cranes” prior to use. Special lifting devices satisfy the criteria of ANSI N14.6 or, if special lifting devices are not used, slings are selected to satisfy the criteria of ASME B30.9. The crane will be designed to the criteria of NUREG-0554. Cranes designed to the criteria of ASME NOG-1 2004 for a Type 1 crane are acceptable under the guidelines of NUREG-0554 for construction of a single failure-proof crane.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 5, 61, 62– Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.13, positions C.1, C.2, and C.6 – Acceptable; each reactor core and its respective spent fuel are located in a common light water pool. The spent fuel sits in a lower cavity below the level of the core at the opposite end of the pool. The spent fuel pool is therefore located in the same confinement building module as the reactor which is classified as a Seismic Category I structure conforming to Regulatory Guide 1.29.

Regulatory Guide 1.13, position C.3 – Not applicable; the Atomic Alchemy facility does not have a turbine, as the VIPR is a non-power reactor.

Regulatory Guide 1.13, position C.4 – Acceptable; the air filters in the reactor confinement clean-up ventilation system are not Seismic Category I, it is not a safety related system. The purpose of the filters in the normal confinement ventilation system is to control normal operating releases. They are not provided for accident mitigation.

Regulatory Guide 1.13, positions C.5 – Acceptable; heavy loads are administratively controlled by several QAPD quality level programs: “Overhead Loads Handling Equipment Inspection Program,” “Heavy Load Handling Program,” “Lifting and Rigging Program” and the “Fuel Loading Conditions Surveillance Program.” See FSAR Chapter 13, Appendix A.

Regulatory Guide 1.13, position C.7 – Acceptable; the spent fuel is located in the same light water pool as the reactor core, and all instrumentation is safety related.

Regulatory Guide 1.13, position C.8, C.9, C.10 and C.11 – Not applicable; the VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The minimum heat removal capacity with the reactor coolant system in operation of the light water pool at the design basis temperature

of the structure, and the heat sink at its maximum design temperature is greater than 0.3 percent of the reactor rated thermal power. The Atomic Alchemy design will provide an additional passive "emergency core cooling" type safety related system (Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Target Transfer Canal (TTW) water is used for the DHR. The Atomic Alchemy reactor decay heat removal cooling system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components. Since the spent fuel shares the same light water pool as the reactor core, the CVC system provides nominal makeup water. Additionally, the TTW system also includes a separate makeup water storage tank with the capacity to refill the transfer canal by operator action if needed.

Regulatory Guide 1.13, positions C.12 – Acceptable; Atomic Alchemy applies programmatic administrative controls for monitoring light water pool leakage in FSAR Chapter 13, Appendix A for the "Light Water Pool Leakage Rate Test Program" and "RCS System Leak Detection Program."

Regulatory Guide 1.13, positions C.13 – Acceptable; since the spent fuel occupies the same light water pool as the reactor core, the water cleanup system is part of the CVC makeup water system for the light water pool.

Regulatory Guide 1.13, positions C.14 – Acceptable; high burnup fuel that may become more brittle or susceptible to damage is addressed by the robust design of the racks. The racks are designed with adequate energy absorption capabilities to withstand the impact of a dropped fuel.

Regulatory Guide 1.29, general, Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary as defined by Atomic Alchemy for a Reactor located within an open light water pool rather than 10 CFR 50.2 definition.

Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis."

Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR related components are not applicable to the Reactor seismic category I design, additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does it require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. Atomic Alchemy does not have a feedwater system. Atomic Alchemy does not have safety related diesel generators, the standby diesel generator is not required for safe shutdown, to mitigate an accident or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports."

Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i – Acceptable; safety class instrumentation seismic category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports." Regulatory Guide 1.29, position C.2 – Acceptable; the methodology used by Atomic Alchemy for seismic analysis will conform to this position. Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

NUREG-0800 SRP 9.1.5, Rev 1 Overhead Heavy Load Handling System (OHLHS)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.2, SRP 9.7	NUREG-0554, NUREG-0612, GDC 1, GDC 2, GDC 4, GDC 5 R.G. 1.13, 1.29	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.1.5 – General design description: the main emphasis in the OHLHS review is on critical load handling where inadvertent operations or equipment malfunctions, separately or in combination, could cause a release of radioactivity, a criticality accident, inability to cool fuel within the reactor vessel, or spent fuel pool or could prevent safe shutdown of the reactor in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The Atomic Alchemy heavy load handling systems consist of equipment which lift loads whose weight is greater than the combined weight of a single spent fuel assembly, and its associated tools, handling device etc. This equipment is part of the Material Handling System (MHS) and is located in the Reactor Confinement Module, Reactor Auxiliary Module, Radioisotope Process Module, and Radwaste Module buildings. The principal equipment is the confinement module and auxiliary module bridge cranes, and the radioisotope module hot cell bridge crane. Other such equipment includes the reactor coolant pump and HX handling machine, and miscellaneous monorail hoists and fixed hoists. The bridge cranes and RCS pump and HX handling machine are single-failure-proof systems and are classified as seismic Category I. They are designed to support a critical load during and after a safe shutdown earthquake. Overhead Heavy Load Handling system operators are trained and qualified and conduct themselves in accordance with chapter 2-3.1 of ASME B30.2-2005, "Overhead and Gantry Cranes." The crane is to be inspected, tested, and maintained in accordance with chapter 2-2 of ASME B30.2-2005 "Overhead and Gantry Cranes" prior to use. Special lifting devices satisfy the criteria of ANSI N14.6 or, if special lifting devices are not used, slings are selected to satisfy the criteria of ASME B30.9.		

See FSAR Chapter 9, Section 1, subsections "Light Load Handling Sub-System (Reactor Confinement Module) (MHS)," "Overhead Heavy Load Handling Sub-System (Reactor Auxiliary Module) (MHS)" and "Overhead Heavy Load Handling Sub-System (Process Production Module) (MHS)" for a description of the design and safety criteria.

NUREG-0554 and NUREG-0612 - The Atomic Alchemy design of single-failure proof cranes is based on ASME NOG-1 2004 for Type 1 cranes.

GDC 1, 2, 4, 5 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.13, positions C.1, C.2, and C.6 – Acceptable; each Reactor core and its respective spent fuel are located in a common light water pool. The spent fuel sits in a lower cavity below the level of the core at the opposite end of the pool. The spent fuel pool is therefore located in the same confinement building module as the reactor which is classified as a Seismic Category I structure conforming to Regulatory Guide 1.29.

Regulatory Guide 1.13, position C.3 – Not applicable; the Atomic Alchemy facility does not have a turbine, as the VIPR is a non-power reactor.

Regulatory Guide 1.13, position C.4 – Acceptable; the air filters in the reactor confinement clean-up ventilation system are not Seismic Category I and it is not a safety related system. The purpose of the filters in the normal confinement ventilation system is to control normal operating releases. They are not provided for accident mitigation.

Regulatory Guide 1.13, positions C.5 – Acceptable; heavy loads are administratively controlled by several QAPD quality level programs: "Overhead Loads Handling Equipment Inspection Program," "Heavy Load Handling Program," "Lifting and Rigging Program" and the "Fuel Loading Conditions Surveillance Program." See FSAR Chapter 13, Appendix A.

Regulatory Guide 1.13, position C.7 – Acceptable; the spent fuel is located in the same light water pool as the reactor core, all instrumentation is safety related.

Regulatory Guide 1.13, position C.8, C.9, C.10 and C.11 – Not applicable; the VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The minimum heat removal capacity with the reactor coolant system in operation of the light water pool at the design basis temperature of the structure, and the heat sink at its maximum design temperature is greater than 0.3 percent of the reactor rated thermal power. The Atomic Alchemy design will provide an additional passive "emergency core cooling" type safety related system (Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Target Transfer Canal (TTW) water is used for the DHR. VIPR decay heat removal does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various "EEC" system components. Since the spent fuel shares the same light water pool as the reactor core, the CVC system provides nominal makeup water. Additionally, the TTW system also includes a separate makeup water storage tank with the capacity to refill the transfer canal by operator action if needed.

Regulatory Guide 1.13, positions C.12 – Acceptable; Atomic Alchemy applies programmatic administrative controls for monitoring light water pool leakage, see FSAR Chapter 13, Appendix A for the "Light Water Pool Leakage Rate Test Program" and "RCS System Leak Detection Program."

Regulatory Guide 1.13, positions C.13 – Acceptable; since the spent fuel occupies the same light water pool as the reactor core, the water cleanup system is part of the CVC makeup water system for the light water pool.

Regulatory Guide 1.13, positions C.14 – Acceptable; high burnup fuel that may become more brittle or susceptible to damage is addressed by the robust design of the racks. The racks are designed with adequate energy absorption capabilities to withstand the impact of a dropped fuel.

Regulatory Guide 1.29, General summary: Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable.

Regulatory Guide 1.29, positions C.1a – Exceptions as noted; position C.1.a, the RCS confinement boundary as defined by Atomic Alchemy for a Reactor located within an open light water pool rather than 10 CFR 50.2 definition.

Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis."

Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR related components are not applicable to the Reactor seismic category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does it require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. Atomic Alchemy does not have a feedwater system. Atomic Alchemy does not have safety related diesel generators, the standby diesel generator is not required for safe shutdown, to mitigate an accident or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports."

Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i safety class instrumentation seismic category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports."

Regulatory Guide 1.29, position C.2 – Acceptable; the methodology used by Atomic Alchemy for seismic analysis will conform to this position.

Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program.

NUREG-0800 SRP 9.2.1, Rev 5 Station Service Water System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.5, SRP 9.7	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 44, GDC 45, GDC 46, GL 96-06, GL 89-13, GL 91-13, NUREG-0927, NUREG-1461	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 9.2.1 general design description: The equivalent of the Service Water System (SWS) identified in this SRP for the Atomic Alchemy Facility is the Chilled Water and Condenser Water systems (CHW, CWS respectively). These systems differ from a power reactor design in that the Atomic Alchemy systems are non-safety-related. Typical power reactor service water systems employed a design in which portions of the system were required to perform safety related functions. (The Atomic Alchemy cooling systems employ a passive design that accomplishes decay heat removal and dissipation to the ultimate heat sink by relying on gravity and natural circulation. The Atomic Alchemy CHW and CWS are not part of the emergency cooling flow path.)

Although the Atomic Alchemy CHW, and CWS systems removes heat from primary and secondary system sources for normal operation, normal cooldown, and refueling, the system is not required to prevent or mitigate the consequences of any accident. The CHW and CWS have no direct interfaces with radioactive systems. Potential radioactive leakage into the CHW from the Reactor Coolant Water System (RCS) is administratively monitored by a radiation monitor and periodic HX Tube leak detection (See Technical Requirements Manual 5.6.7 "Reactor Coolant Heat Exchanger Inspection Program"). Atomic Alchemy employs a passive design that accomplishes decay heat removal and dissipation to the ultimate heat sink by relying on gravity and natural circulation. The CHW and CWS are not part of any safety related emergency cooling flow path.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 44, 45, 46 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-1461 – Exceptions as noted; see FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933) for Issue 153, "Loss of Essential Service Water in LWRs."

NUREG-0927 – Not applicable; in the context of this SRP related to SWS water systems. The Atomic Alchemy facility has only a few piping systems that are determined to be high energy. See FSAR Chapter 3, Table 3.6-01, "High and Moderate Energy Piping Identification System." A pipe break

hazards evaluation is part of the Atomic Alchemy piping design for these systems. The consequences of water hammer effects in the design of non-safety-related systems are also considered for piping in proximity of seismic class C-I piping and for good business practices in the Atomic Alchemy piping design. Generic Letters GL 89-13 and GL 91-13 – Not applicable; the CHW and CW water systems are non-safety-related systems in the Atomic Alchemy design and are therefore non-essential. Generic Letter GL 96-06 – Not applicable; in the context of this SRP related to a Service Water "type" system, the equivalent Atomic Alchemy CHW and CW systems do not form a confinement integrity boundary during any postulated transients and post-accident scenarios.

NUREG-0800 SRP 9.2.2, Rev 4 Reactor Auxiliary Cooling Water Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.3, SRP 5.5	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 5, GDC 44, GDC 45, GDC 46	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.2.2 – General design description: The VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling. It relies on natural convection for decay heat or residual heat removal. Therefore, the Atomic Alchemy facility does not have a Component Cooling system or a Reactor Auxiliary Cooling Water system. The nearest similar type of system would be the transfer canal system (TTW). Parts of the TTW system performs the passive safety related function of an "emergency core cooling" type system, designated as Reactor Decay Heat Removal (DHR). The Atomic Alchemy reactor decay heat removal cooling (DHR) safety related system functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy reactor decay heat removal cooling system also does not rely on the non-safety-related diesel-generator or the 1E UPS power system for electrical power to either activate or operate the various EEC system components. Components of the TTW system that provide this DHR function are separately designated as a DHR system component. DHR system components are ASME Section III, Safety Class A, Quality Class A, and Seismic Cat-I. The DHR system components are designed to permit access for periodic testing according to the ASME Section XI Code and technical specification requirements, to provide confidence in the integrity and capability of the system.		

Atomic Alchemy will determine the acceptance criteria within certain OM Code-defined expectations including bi-directional testing when it establishes an IST acceptance criteria for the type A and type C check valves that are part of the DHR system.

See FSAR Chapter 6, Section 3 for additional information on "EEC" design criteria.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 44, 45, 46 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 9.2.3, Rev 2 Demineralized Water Makeup System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	Withdrawn	N/A
Summary Description of Compliance/Exceptions		
N/A		

NUREG-0800 SRP 9.2.4, Rev 3 Potable and Sanitary Water Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.7	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 60	Acceptable
Summary Description of Compliance/Exceptions		
SRP 9.2.4 – General design description: the Atomic Alchemy potable water system (PWS) will be designed to furnish water for domestic use and human consumption. Bacteriological and chemical quality requirements conform to 40 CFR Part 141, and the distribution of water by the system will conform with 29 CFR 1910. The Sanitary Sewer Drain System (SSD) will be designed to collect the site sanitary waste for treatment, dilution, and discharge. The piping lines of these two systems that penetrate the MCR envelope are designed as seismic Category I and utilize mechanical means to provide isolation of the main control room envelope. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.		

GDC 60 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 9.2.5, Rev 3 Ultimate Heat Sink

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.6, SRP 5.3, SRP 5.5	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 5, GDC 44, GDC 45, GDC 46, R.G. 1.27, R.G. 1.29, R.G. 1.72	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.2.5 – General design description: the Atomic Alchemy light water pool, which houses both the reactor core, and the spent fuel is the safety-related ultimate heat sink for the removal of the reactor coolant system sensible heat, core decay heat, spent fuel heat and stored energy for each reactor confinement module building. The Atomic Alchemy ultimate heat sink does not rely on any external natural sources of water for any postulated transient. Conservatively, Atomic Alchemy has designed an available additional safety related source of cool water. During an emergency shutdown event, the ultimate heat sink can utilize the cool water from the transfer canal system (TTW) as its "emergency core cooling" type system (designated as Reactor Decay Heat Removal – DHR). The target transfer light water canal is a passive seismic Cat-I system designed to meet this requirement. Components of the TTW system that have a safety related function are identified as DHR components and meet the criteria for DHR. Additionally, the TTW system also includes a non-safety-related makeup water storage tank with the capacity to refill the transfer canal by operator action if needed. The Atomic Alchemy design does not rely on any additional component cooling type of systems to remove heat from any safety-related components. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 5, 44, 45, 46 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.27 – Acceptable; general description of compliance, the light water reactor and spent fuel pools are the UHS. The Atomic Alchemy Facility utilizes the volume of light water contained in the transfer canal system (TTW) as its "emergency core cooling" type system (designated as Reactor Decay Heat Removal – DHR). Components of the TTW system that provide the "ECC" function are designated as a safety related DHR component. The volume of water stored in the transfer canal is sufficient for decay heat removal for 72 hours should it be needed. After 72		

hours the remaining volume of the light water pools are capable of dissipating decay heat of both the reactor and the spent fuel pools for 30 days. Atomic Alchemy takes an exception to full functional testing, see response to GDC 46, in FSAR Chapter 3, Appendix F. Nevertheless, Atomic Alchemy meets the intent of this regulatory guide. Regulatory Guide 1.29, General summary: Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable. Regulatory Guide 1.29, positions C.1a – Exceptions as noted; for position C.1.a: the RCS confinement boundary as defined by Atomic Alchemy for a reactor located within an open light water pool rather than 10 CFR 50.2 definition. Regulatory Guide 1.29, position C.1.b and position C.2 – Acceptable; seismic category I reactor core and structures are addressed in FSAR Chapter 3, Appendix G for "Atomic Alchemy Nuclear Island Seismic Analysis." Regulatory Guide 1.29, position C.1.c, C.1.d, and C.1.e – Exceptions as noted; BWR related components are not applicable to the reactor's seismic category I design. Additionally, Atomic Alchemy does not have a residual heat removal system in its design, nor does it require an atmosphere cleanup system to achieve safe shutdown or mitigate a design basis accident. Atomic Alchemy does not have a feedwater system. Atomic Alchemy does not have safety related diesel generators, as the standby diesel generator is not required for safe shutdown, to mitigate an accident, or to maintain a safe shutdown condition. Structures or equipment whose failure results in incapacitating injury to the occupants of the main control room are classified as seismic Category II. See FSAR Chapter 3, Appendix A for "Seismic HVAC Equipment, Ducts and Supports." Regulatory Guide 1.29, position C.1.f, C.1.g, C.1.h, and C.1.i safety class instrumentation seismic category I supports are addressed in FSAR Chapter 3, Appendix B for "Seismic Cable Trays and Tray Supports." Regulatory Guide 1.29, position C.3 – Acceptable; the Atomic Alchemy QAPD is an NQA-1 quality program. Regulatory Guide 1.72, positions C.1 through c.7 – Not applicable; Atomic Alchemy does not use safety related piping components made from fiberglass reinforced thermosetting resins.

NUREG-0800 SRP 9.2.6, Rev 3 Condensate Storage Facilities

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.7	10 CFR 50.63,	N/A

	GDC 2, GDC 5, GDC 44, GDC 45, GDC 46, GDC 60, R.G. 1.29	
Summary Description of Compliance/Exceptions		
The VIPR is a non-power reactor. It does not have a condensate storage facility.		

NUREG-0800 SRP 9.2.7, Rev 3 Chilled Water System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 9.2.7 – not applicable, the Atomic Alchemy "Emergency Core Cooling" system does not rely on a Chilled Water safety related source. The VIPR core and spent fuel located in the light water pool can be cooled without onsite or offsite AC electric power. There are no additional safety-related active components performing water source cooling functions other than the Reactor Coolant System (RCS) (during normal operations) and the DHR system (during any transient conditions involving pool level drop). Systems and components requiring safety related cooling, (like the Main Control Room, or 1E & UPS rooms) rely on direct expansion (D/X) type safety related air condensing units.		

NUREG-0800 SRP 9.3.1, Rev 2 Compressed Air System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.7	10 CFR 50.63 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 5, R.G. 1.68.3	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.3.1 – General design description: Atomic Alchemy utilizes three (3) air systems. Compressed Air (CAS), Compressed Safety Related Air (CSA) and Plant Instrument Air (CIS) system. The instrument (CIS) and service air systems (CSA) are classified as moderate-energy systems, while the high-pressure air system (CSA) is classified as high energy. The low-pressure CAS and IAS systems are required for normal operation and startup of the plant. Air-operated valves that are essential for safe shutdown and accident mitigation are designed to		

either actuate to the fail-safe position upon loss of air pressure or utilize local air accumulators. These air-operated valves utilize safety-related solenoid valves to control the air supply.

The high-pressure air system supplies air to the main control room emergency habitability system, and any firefighting apparatus recharge stations. High pressure air system tubing and piping passing through safety related areas is seismic class C-I. It is not required to be operational or functional to bring the plant to safe shutdown, mitigate a postulated transient, or maintain safe shutdown.

10 CFR 50.63 – Not applicable; non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module, radioisotope module or radwaste module building integrity. Offsite power has no safety-related function due to the passive design of the Atomic Alchemy Reactors. The VIPR will be designed to maintain natural convection cooling independent of a safety-related AC power source indefinitely. Air-operated valves that are essential for safe shutdown and accident mitigation are either designed to actuate to the fail-safe position upon loss of air pressure or utilize local air accumulators. These air-operated valves utilize safety-related solenoid valves to control the air supply.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 5 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.68.3, positions C.1 through C.19 – Acceptable; compressed air systems, and other safety-related components are tested to confirm that they satisfy their safety-related function when instrument air pressure is lost during pre-operational testing. A total loss of instrument air supply does not compromise any safety-related functions. A test simulating the total loss of instrument air to safety-related systems is not performed during plant operation since this type of testing would adversely affect continued plant operation because the safety-related air-operated components fail to their safeguards actuation position on a loss of air. The unnecessary actuation of the safety-related components can adversely affect plant operation and plant safety.

NUREG-0800 SRP 9.3.2, Rev 3 Process and Post-Accident Sampling Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.7, SRP 9.7	10 CFR 50.34(f)(2)(xxvi), GDC 1, GDC 2, GDC 13, GDC 14, GDC 26, GDC 41, GDC 60, GDC 63, GDC 64, R.G. 1.21, R.G. 1.23, R.G. 1.26, R.G. 1.29, R.G. 1.97, R.G. 1.111, R.G. 4.15, R.G. 8.8, NUREG-1301, NUREG-1302	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 9.3.2 – General design description: Atomic Alchemy does not have a dedicated PASS system. The design of the facility allows for the collection and analysis of potentially high radioactive samples from the confinement, process, rad waste, and target fabrications module buildings to determine levels of liquid and atmospheric fission products.

- High levels of combustible gases are not a postulated transient in the FSAR Chapter 15 accident analysis.
- There is no decrease in effectiveness of the Atomic Alchemy Emergency Plan from not having a PASS system.
- Administrative contingency plans can be developed for obtaining highly radioactive samples of the reactor coolant, and confinement atmosphere should the existing methods suffer a catastrophic failure.
- Atomic Alchemy maintains offsite monitoring capabilities .
- Atomic Alchemy has developed Severe Accident Guidelines (SAMG) and Flex Support Guidelines (FSG) to manage a fuel damage event at the Alert level threshold.

Atomic Alchemy implements programmatic and procedural controls for radiological effluents through the Offsite Dose Calculation Manual. The Standard Atomic Alchemy Radiological Effluent Controls (SREC) compiled in this manual and its accompanying procedures meets the requirements of 10 CFR 20.106, 40 CFR 190, 10 CFR 50.36(a), 10 CFR 70.59, and Appendix I to 10 CFR 50. The ODCM contains all of the controls required by Generic letter 89-01, to be incorporated into a licensee's ODCM. The Atomic Alchemy ODCM will be submitted as part of the FSAR with the operating permit application.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).” Provided below are the relevant SRP 9.3.2 regulations compliance/exceptions.

(f)(2)(xxvi) – Acceptable; The Atomic Alchemy Reactor coolant pressure boundary leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, RCS System Leak Detection Program, also see Technical Specification

Administration Section 5.6.4 “RCS and Light Water Pool Leakage Rate Testing Program” and Limited Conditions of Operation LCO 3.3.10 “RCS Leakage Detection Instrumentation” (RLD), LCO 3.4.6 “RCS Operational Leakage (RLD),” and LCO 3.7.6 Reactor Coolant/Light Water Pool Leak Collection System (RLC).

10 CFR Part 52 Criteria – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 13, 14, 26, 41, 60, 63, 64 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

NUREG-1301 and NUREG-1302 – Not applicable; these pertain to BWR and PWR type facilities, Atomic Alchemy is an NPUF. However, some applicable sections have been incorporated into the Atomic Alchemy ODCM.

Regulatory Guide 1.21, Position C.1 through C.8 – Exceptions as noted; the Atomic Alchemy ODCM (technical specification program 5.6.1) has been developed to meet the applicable requirements of 10 CFR 20.106, 40 CFR 190, 10 CFR 50.36(a), 10 CFR 70.59, 10 CFR Part 50 Appendix I and applicable sections of this regulatory guide. Effluent monitoring, sampling, and dispersion are administratively controlled by ODCM 5.6.1, “Radioactive Process Effluent Control Program.” Reporting is controlled by ODCM 5.7.1, “Annual Radiological Environmental Operating Report” and ODCM 5.7.2, “Radioactive Effluent Release Report.” These programs meet the Atomic Alchemy QAPD quality standard which is based on NQA-1.

Regulatory Guide 1.29 – not applicable with respect to a dedicated PASS system. Alternative systems that implement technical specification related programs are seismically categorized.

Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in this Regulatory Guide.

The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, “Emergency Plan.”

See FSAR Chapter 7, Section 7, subsection, “Variable Categories, Classifications and Requirements” for a description of type F variables that are monitored by the Operations and Control Systems (IOC).

Regulatory Guide 1.111, positions C.1 through C.4 – Acceptable; Atomic Alchemy uses the mean wind direction model for determining the atmospheric transport and diffusion of effluents. See FSAR Chapter 15, Table 15.08-01 for representative parameters to be tabulated for postulated accidents for dispersion data and factors.

Regulatory Guide 4.15, positions C.1 through C.10 – Acceptable; this guide addresses quality assurance for effluent monitoring programs. Atomic Alchemy ODCM 5.6.1, “Radioactive Process Effluent Control Program,” ODCM 5.7.1, “Annual Radiological Environmental Operating Report,” and ODCM 5.7.2, “Radioactive Effluent Release Report” programs meets the Atomic Alchemy QAPD quality standard which is based on NQA-1.

Regulatory Guide 8.8, positions C.1 through C.4 – Acceptable; this guide addresses ALARA. Atomic Alchemy's QAPD, Section IX, will describe the ALARA program. Additionally, see FSAR Chapter 13, Appendix A for the "Radiation Protection Program," "Respiratory Protection Program" and the "Nuclear Criticality Safety Program."

NUREG-0800 SRP 9.3.3, Rev 3 Equipment and Floor Drainage System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.7	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 4, GDC 60	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 9.3.3 – General design description: the Atomic Alchemy equipment and Floor Drainage Systems (FDS) are non-safety-related and serve no safety-related function. The floor drainage systems and equipment are designed to prevent damage to safety-related systems, structures, and equipment. Safety-related components are not damaged as a result of equipment and floor drain components failure from a seismic event. Atomic Alchemy applies a seismic safety classification to all related components in the reactor module, auxiliary module, radioisotope target and process modules, and radwaste module that contain or may contain radioactive material and its postulated failure would result in conservatively calculated potential offsite doses that are more than 0.005 Sievert (0.5 rem) to the whole body or its equivalent to any part of the body or total effective dose equivalent (TEDE), as applicable. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 4, 60 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.		

NUREG-0800 SRP 9.3.4, Rev 3 Chemical and Volume Control System (PWR) (Including Boron Recovery System)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 5.3, SRP 5.5, SRP 9.7	10 CFR 50.34(f)(2)(xxvi), 10 CFR 52.47(b)(1), 10 CFR 52.80(a),	Exceptions as noted

	GDC 1, GDC 2, GDC 5, GDC 14, GDC 29, GDC 33, GDC 35, GDC 60, GDC 61 R.G. 1.26, R.G. 1.29, R.G. 1.155	

Summary Description of Compliance/Exceptions

SRP 9.3.4 – General design description: the Atomic Alchemy Chemical Volume and Control (CVC) system is not required for safe shutdown but is conservatively designated a safety-related system for makeup during normal and AOO conditions. The system does not use boron dilution for the RCS system, or for the light water pools. The system is designated as a Safety Class C, Quality Class B, non-seismic in accordance with the Atomic Alchemy system classification in FSAR Chapter 3, Table 3.02-02 for good business practices.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 9.3.4 regulations compliance/exceptions.

(f)(2)(xxvi) – Acceptable; The reactor coolant boundary leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, RCS System Leak Detection Program. Also see Technical Specification Administration Section 5.6.4 "RCS and Light Water Pool Leakage Rate Testing Program" and Limited Conditions of Operation LCO 3.3.10 "RCS Leakage Detection Instrumentation" (RLD), LCO 3.4.6 "RCS Operational Leakage (RLD)," and LCO 3.7.6 RCS/Light Water Pool Leak Collection System (RLC).

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 5, 14, 29, 33, 35, 60, 61 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.26 – positions C.1 through C.3 – Exceptions as noted as it applies to the CVC system. For good business practices, the CVC system is a Safety Class C, Quality Class B, in accordance with the Atomic Alchemy system classification in FSAR Chapter 3, Table 3.02-02.

Regulatory Guide 1.29, positions C.1 through C.3 – Exceptions as noted as it applies to the CVC system. For good business practices, the CVC system is Seismic Category C-II in accordance with the Atomic Alchemy system classification in FSAR Chapter 3, Table 3.02-02.

Regulatory Guide 1.155, position C.1 through C.3 – Not applicable; as it applies to the CVC system, since the CVC system is not necessary during SBO therefore requirements pertaining to onsite emergency AC power sources for the CVC system during SBO are not applicable.

NUREG-0800 SRP 9.3.5, Rev 3 Standby Liquid Control System (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR, as this applies to BWRs.		

NUREG-0800 SRP 9.4.1, Rev 3 Control Room Area Ventilation System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2, SRP 6.2.3, SRP 9.1	10 CFR 52.47(b)(1), 10 CFR 52.80(a) 10 CFR 50.63, GDC 2, GDC 4, GDC 5, GDC 19, GDC 60, R.G. 1.29, R.G. 1.52, R.G. 1.78, R.G. 1.140	Exceptions as noted

Summary Description of Compliance/Exceptions

SRP 9.4.1 – General design description: the Atomic Alchemy Control Room Ventilation Area System (CRAVS) is comprised of four (4) systems:

1) Control Room Re-Circulating Sensible Cooling/Heating System (CRX), (non-safety)
2) Control Room Emergency Habitability System (CRE), (safety related, Atomic Alchemy Safety Class C, Quality Class C, Seismic C-I, principal construction codes: SMACNA Industrial, AG-1, ASME N509/N510, AMSE 511, UL-586, R.G. 1.52)
3) Control Room Emergency Ventilation and Filtration System (CRF), (safety related, Atomic Alchemy Safety Class C, Quality Class C, Seismic C-I, principal construction codes: SMACNA Industrial, AG-1, ASME N509/N510, ASME 511, UL-586, R.G. 1.52)
4) Control Room HVAC System (CRV), (non-safety).

The CRE and CRF systems are considered Engineered Safety Feature (ESF) systems.

10 CFR 50.63 – Not applicable; non-safety-related AC power is not relied upon to maintain the control room cooling or ventilation systems. Offsite power has no safety-related function due to the passive design of the Atomic Alchemy Reactors. The Atomic Alchemy Main Control Room integrity, ventilation and filtration is maintained by Class 1E DC and UPS power alone.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 19, 60 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.26, positions C.1 through C.3 – Acceptable; with respect to the MCR ventilation systems, the CRE and CRF are Atomic Alchemy Equipment Class C which corresponds to ANSI Class 3, and basic components as defined in 10 CFR 21. The CRX and CRV are Atomic Alchemy Equipment Class L used for heating, ventilation, and air-conditioning systems, this will comply with SMACNA, AMCA and ASHRAE industrial standards.

Regulatory Guide 1.29, positions C.1 through C.3 – Acceptable with respect to MCR ventilation systems, the CRE and CRF are Atomic Alchemy Seismic Category C-I, the CRX and CRV are Atomic Alchemy Seismic Category C-II.

Regulatory Guide 1.52, positions C.1 through C.7 – Acceptable with respect to this SRP as it pertains to the MCR safety related ventilation and filtration system, see FSAR Chapter 6, Section 8, "Main Control Room Habitability Design Features."

Regulatory Guide 1.78, position C.1 and C.2 – Acceptable; Atomic Alchemy evaluates and manages potential risks from chemical releases programmatically, see Technical Specification program 5.6.7, "Chemical Process Safety and Surveillance Program."

Regulatory Guide 1.78, position C.3 and C.4 – Acceptable; Atomic Alchemy evaluates toxic gas hazards by analysis, summarized in FSAR Chapter 6, Section 8, subsection "Toxic Gas Hazards." The analysis uses the methodology described in NUREG-0570, "Toxic Vapor Concentrations in the Control Room Following a Postulated Accidental Release." The MCR will be designed with habitability systems which provide the capability to detect and protect main control room personnel from external fire, smoke, toxic chemicals, and airborne radioactivity. Automatic actuation of the individual systems that perform these habitability systems functions is also provided. See FSAR Chapter 6, Section 8, subsections "Control Room Emergency Zone (CREZ)" and "System Design."

Regulatory Guide 1.78, position C.5 – Acceptable; Atomic Alchemy's Emergency Plan will be provided in FSAR Chapter 13, Appendix B.

Regulatory Guide 1.140, positions C1 through C.6 – Exceptions as noted; the calculated offsite doses for the Atomic Alchemy Reactors from a BDBE are well within the 10 CFR 100 guidelines. Severe Accidents are addressed in FSAR Chapter 19. There is no safety related ESF atmosphere cleanup system required for the Atomic Alchemy facility. For conservatism, the CRF and CRE are Atomic Alchemy Equipment Class C which corresponds to ANSI Class 3. These systems will be designed to meet the system design, pre-operational, in place, laboratory testing, qualification, maintenance criterion of ASME AG-1, ASME N509/N510, and ASME N511.

NUREG-0800 SRP 9.4.2, Rev 3 Spent Fuel Pool Area Ventilation System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.4, SRP 9.1,	10 CFR 52.47(b)(1), 10 CFR 52.80(a),	Exceptions as noted

SRP 11.1.1, SRP 11.1.4	GDC 2, GDC 5, GDC 60, GDC 61, R.G. 1.13, R.G. 1.52, R.G. 1.29, R.G. 1.140	

Summary Description of Compliance/Exceptions

SRP 9.4.2 – General design description: the Atomic Alchemy spent fuel pool is located within the reactor confinement module and shares a light water pool with the reactor core inside the Reactor Confinement Module Building (RCM). A dedicated Spent Fuel Pool Area Ventilation System (SFPAVS) is not utilized in the Atomic Alchemy design scheme.

The reactor confinement module ventilation system is comprised of three (3) systems:

1) Reactor Confinement Module Re-Circulating Sensible Cooling/Heating System (RCX) (non-safety,
2) Reactor Confinement Module Atmosphere Cleanup and Filtration System, (RCF) (non-safety),
3) Reactor Confinement Module HVAC System (RCV) (non-safety).

These systems are not shared between reactor modules. The loss of a reactor confinement module building ventilation or filtration system in one reactor module will not propagate to any of the other reactor modules.

There is no safety related ESF atmosphere cleanup system for the Atomic Alchemy reactor confinement module (only the control room located in another building module). The calculated onsite and offsite doses for the Atomic Alchemy facility from a BDBE are well within the 10 CFR 100 guidelines.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 5, 60, 61 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.13, positions C.1, C.2, and C.6 – Acceptable; each Reactor core and its respective spent fuel are located in a common light water pool. The spent fuel sits in a lower cavity below the level of the core at the opposite end of the pool. The spent fuel pool is therefore located in the same confinement building module as the reactor which is classified as a Seismic Category I structure conforming to Regulatory Guide 1.29.

Regulatory Guide 1.13, position C.3 – Not applicable; the Atomic Alchemy facility does not have a turbine, as the VIPR is a non-power reactor.

Regulatory Guide 1.13, position C.4 – Exceptions as noted; the air filters in the reactor confinement clean-up ventilation system are not Seismic Category I, it is not a safety related system. The purpose of the filters in the normal confinement ventilation system is to control normal operating releases. They are not provided for accident mitigation.

Regulatory Guide 1.13, positions C.5 – Acceptable; heavy loads are administratively controlled by several QAPD quality level programs: "Overhead Loads Handling Equipment Inspection Program,"

"Heavy Load Handling Program," "Lifting and Rigging Program" and the "Fuel Loading Conditions Surveillance Program." See FSAR Chapter 13, Appendix A.

Regulatory Guide 1.13, position C.7 – Acceptable; the spent fuel is located in the same light water pool as the reactor core, all instrumentation is safety related.

Regulatory Guide 1.13, position C.8, C.9, C.10 and C.11 – Not applicable; the VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The minimum heat removal capacity with the reactor coolant system in operation of the light water pool at the design basis temperature of the structure, and the heat sink at its maximum design temperature is greater than 0.3 percent of the reactor rated thermal power. The Atomic Alchemy design will provide an additional passive "emergency core cooling" (ECC) safety related system that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy passive "emergency core cooling" system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various "EEC" system components. Since the spent fuel shares the same light water pool as the reactor core, the CVC system provides makeup.

Regulatory Guide 1.13, positions C.12 – Acceptable; Atomic Alchemy applies programmatic administrative controls for monitoring light water pool leakage, see FSAR Chapter 13, Appendix A for the "Light Water Pool Leakage Rate Test Program," and "RCS System Leak Detection Program."

Regulatory Guide 1.13, positions C.13 – Acceptable; since the spent fuel occupies the same light water pool as the reactor core, the water cleanup system is part of the CVC makeup water system for the light water pool.

Regulatory Guide 1.13, positions C.14 – Acceptable; high burnup fuel that may become more brittle or susceptible to damage is addressed by the robust design of the racks. The racks are designed with adequate energy absorption capabilities to withstand the impact of a dropped fuel assembly from the maximum lift height of the fuel handling machine. Other reactor confinement module overhead handling equipment capable of carrying loads heavier than fuel components are prevented by design from carrying loads directly above the spent fuel storage area of the light water pool.

Regulatory Guide 1.29, positions C1 through C.3 exceptions as noted, as applied to a "spent fuel ventilation system," all the Atomic Alchemy confinement module building ventilation and filtration systems are non-safety-related as previously discussed. The RCF, RCX and RCV systems are Atomic Alchemy equipment class R; they comply with SMACNA, AMCA and ASHRAE industrial standards. Portions of these systems that could be utilized as a defense-in-depth function of cooling or dispersion or that that may be required to contain, clean, or exclude radioactively contaminated air or radioactivity are also designed, constructed, and tested to conform with Generic Issue B-36, See FSAR Chapter 1, Appendix B and Regulatory Guide 1.140, See FSAR Chapter 1, Appendix A, and applicable portions of ASME AG-1, ASME N509/510 and ASME N511.

HVAC equipment and ductwork whose failure could affect the operability of safety-related systems or components are designed to seismic Category II requirements. Atomic Alchemy will determine in

the FSAR which non-safety-related ventilation cooling systems and respective components will fall within the scope of the Atomic Alchemy 10 CFR 50.65(b) program. Regulatory Guide 1.52, positions C.1 through C.7 – The Atomic Alchemy Reactor Confinement Module does not require engineered safety feature atmosphere cleanup systems to meet limits on doses offsite or onsite. The reactor confinement air filtration system (RCF) is a non-safety-related system. However Atomic Alchemy commits to comply with some of the requirements in this regulatory guide for conservatism and good business practice purposes. (The Atomic Alchemy Control Room Atmospheric Cleanup (made up of the CRE and CRF) system is the only ESF safety related system and the requirements for compliance of this position are acceptable). Atomic Alchemy Startup testing will comply with the testing requirements of the remainder of this regulatory guide for the non-safety-related air filtration systems. Regulatory Guide 1.140 position C.1, C.2 – Atomic Alchemy takes an exception. Component design, performance and testing requirements are based on the latest ASME Standard N509, N510, and ASME Standard N511 criteria. Physical properties of activated charcoal are based on criteria referenced in latest ASME Standard N509. These versions are not endorsed by regulatory guides, but their use should not result in deviation from the design philosophy otherwise stated in RG. 1.140.

NUREG-0800 SRP 9.4.3, Rev 3 Auxiliary and Radwaste Area Ventilation System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.4, SRP 9.1, SRP 11.1.4,	10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 2, GDC 5, GDC 60, R.G. 1.29, R.G. 1.140	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 9.4.2 – General design description: the Atomic Alchemy radwaste area, is a self-contained radwaste processing module building in the Atomic Alchemy facility design. There are two (2) such modular building constructed in phases, located adjacent to the radioisotope module building. Each radwaste module building ventilation system is comprised of two (2) systems. Rad Waste Handling Module Air Filtration System (WHF) (non-safety) and Rad Waste Handling Module HVAC System (WHV)(non-safety). These systems are not shared between radwaste modules. The loss of a radwaste module building ventilation or filtration system in one radwaste module will not propagate to the other radwaste module. There is no safety related ESF atmosphere cleanup system for the Atomic Alchemy radwaste module. The calculated onsite and offsite doses for the Atomic Alchemy facility from a BDBE are well within the 10 CFR 100 guidelines. Severe Accidents are addressed in FSAR Chapter 19.		

The Atomic Alchemy's fission products control strategy does not depend on active systems to remove airborne particulates or elemental iodine from the confinement atmospheres of the Radwaste Module following a postulated accident. Atomic Alchemy fission product control is provided via natural removal processes such as deposition and sedimentation within the radwaste module building and by limiting the module building's leakage. The purpose of the radwaste filter ventilation system (WHF) is to control normal operating releases. This system may also be powered by the non-safety-related Diesel Generator. The WHF system is not required for any post-accident scenarios. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. GDC 2, 5, 60 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.29, positions C1 through C.3 exceptions as noted, as applied to a "radwaste ventilation system," the Atomic Alchemy radwaste module building ventilation and filtration systems are non-safety-related as previously discussed. The WHF system is Atomic Alchemy equipment class R and the WHV system is equipment class L. The WHF will be designed, constructed, and tested to conform with Generic Issue B-36, See FSAR Chapter 1, Appendix B and Regulatory Guide 1.140, See FSAR Chapter 1, Appendix A, and applicable portions of ASME AG-1, ASME N509/510 and ASME N511. Regulatory Guide 1.140, positions C1 through C.7 – Exceptions as noted; the WHF system is Atomic Alchemy Equipment Class C which corresponds to ANSI Class 3. The system will be designed to meet the system design, pre-operational, in place, laboratory testing, qualification, maintenance criterion of ASME AG-1, ASME N509/N510, ASME N511.

NUREG-0800 SRP 9.4.4, Rev 3 Turbine Area Ventilation System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy Reactors, the reactors are non-power.		

NUREG-0800 SRP 9.4.5, Rev 3 Engineered Safety Feature Ventilation System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2, SRP 6.2.2, SRP 9.1	10 CFR 52.47(b)(1), 10 CFR 52.80(a), 10 CFR 50.63,	Exception as Noted

	GDC 2, GDC 4, GDC 5, GDC 17, GDC 60, R.G. 1.29, R.G. 1.52, R.G. 1.140, R.G. 1.155	

Summary Description of Compliance/Exceptions

SRP 9.4.5 – General design description: the Atomic Alchemy design does not require safety related ESF ventilation systems.

The calculated onsite and offsite doses for the Atomic Alchemy facility from a BDBE are well within the 10 CFR 100 guidelines. The main control room is provided with a safety related ESF ventilation systems (CRE, CRF) for conservatism.

10 CFR 50.63 – Not applicable; the Atomic Alchemy design minimizes the potential risk contribution of a station blackout (SBO) by not requiring AC power sources to mitigate design-basis events. The Atomic Alchemy Reactors are designed with reliable, non-safety-related offsite and onsite AC power that are normally expected to be available for important plant functions. Non-safety-related AC power is not relied upon to maintain the core and spent fuel cooling, confinement module, radioisotope module or radwaste module building integrity. Offsite power has no safety-related function due to the passively safe design of the VIPR. The VIPR will be designed to maintain natural convection cooling independent of a safety-related AC power source indefinitely. Also see FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933), Issue Number B-57, “Station Blackout.”

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 4, 5, 17, 60 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.29, positions C.1 through C.3 – Acceptable as previously discussed; this applies to the only ESF type system in the Atomic Alchemy design, with respect to MCR ventilation systems. The CRE and CRF are Atomic Alchemy Seismic Category C-I.

Regulatory Guide 1.52, positions C.1 through C.7 – Acceptable; The Atomic Alchemy Control Room Atmospheric Cleanup (CRF) system is the only ESF system in the design of the facility, and the requirements for compliance of this position are acceptable. The CRF will be designed, constructed, and tested to conform with Generic Issue B-36, See FSAR Chapter 1, Appendix B and Regulatory Guide 1.140, See FSAR Chapter 1, Appendix A, and applicable portions of ASME AG-1, ASME N509/510 and ASME N511.

Regulatory Guide 1.140, positions C1 through C.7 – Exceptions as noted; the calculated offsite doses for the VIPR from a BDBE are well within the 10 CFR 100 guidelines. Severe Accidents are addressed in FSAR Chapter 19. There is no safety related ESF atmosphere cleanup system required for the Atomic Alchemy facility. For conservatism, the Class 1E DC and UPS Rooms Emergency Ventilation and Filtration System (UPF), Miscellaneous Hot Cell Air Filtration Systems and Subsystems (HCF),

Pneumatic Capsule Room Air Filtration System (PCF), CRF, Rad Waste Handling Module Air Filtration System (WHF), and Mo-99 Hot Cell Air Filtration Systems (MCF) are Atomic Alchemy Equipment Class C which corresponds to ANSI Class 3. These systems are designed to meet the system design, pre-operational, in place, laboratory testing, qualification, maintenance criterion of ASME AG-1, ASME N509/N510, ASME N511. Regulatory Guide 1.155, positions C.1 through C.3 – not applicable with respect to ESF system operation, the CRF and CRE are powered by 1E DC and UPS power during SBO transient.

NUREG-0800 SRP 9.5.1.1, Rev 0 Fire Protection Program

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.3	10 CFR 50.48, 10 CFR 50 Appendix R, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 3, GDC 5, GDC 19, GDC 23, R.G. 1.174, R.G. 1.188, R.G. 1.189, R.G. 1.191, SECY 90-016, SECY 93-087, SECY 94-084, NFPA 804	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 9.5.1.1 – General design description: this new SRP applies to fire protection programs developed using deterministic approach. The Atomic Alchemy fire protection program is based on a deterministic approach. (Branch Technical Position (BTP) SPLB 9.5-1 has been removed and has been incorporated in Revision 1 of RG 1.189). The Atomic Alchemy fire protection program is provided in FSAR Chapter 9, Appendix A, it will comply with NFPA 804 and 10 CFR 50.48. The Atomic Alchemy Fire protection plan performs the following: • Identifies the potential for a fire based on the type, quantity, of combustible materials • Determines the consequences of a postulated fire • Provides a basis for how to prevent, detect, contain, and suppress fires • Evaluates the facilities fire protection vulnerability and firefighting capability • Confirms the capability to safely shut down the reactor(s), radioisotope and radwaste processes following a fire • Evaluates the consequences of reactor confinement module building fires on radioisotope and radwaste processes and vice versa		

- Evaluates the consequences of any related fire hazard created by phased construction activities of remaining Reactors on the operational Reactor(s) and Radioisotope and Radwaste processes

The Atomic Alchemy facility is divided into fire areas and fire zones. These fire areas/zones and their boundaries are analyzed to determine the type, quantity, and distribution of in-situ combustible material and for the principal systems and safety-related components in the fire area.

The FHA fire areas and zones are re-evaluated, and the FHA revised as ongoing phased construction activities proceed and are completed.

Only one fire is assumed to occur within the plant at any given time.

Any damage which would prevent proper operation of equipment and which the fire is capable of causing is assumed to occur immediately.

A safe shutdown analysis is performed for each area.

The FHA also evaluates the Loss of Large Area (LOLA) of the facility (reactor module, radioisotope module, target fabrication module, radwaste module buildings and diesel generators module building) due to fires or explosions.

Only safety-related components and systems are assumed to be available to perform safe shutdown functions.

Fire consequences are analyzed and will be described in FSAR chapter 15 and in FSAR chapter 1, Appendix F, Atomic Alchemy's conformance to non-power reactors on multi-unit sites.

10 CFR 50.48 – the Atomic Alchemy Fire Protection plan will conform to this regulation by meeting 10 CFR Part 50 Appendix A, GDC 3.

10 CFR Part 50 Appendix R – Not applicable; only applies to plants licensed before 1/1/1979.

NFPA 804, paragraphs 1.1 through 9.8.5 – Exceptions as noted; items not applicable to the design of the Atomic Alchemy facility such as turbine buildings, safety related pumps, primary containment structures, or alternate means of compliance are identified in a compliance with NFPA 804 table within the Fire Protection Plan located in FSAR Chapter 9, Appendix A.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 3, 5, 19, 23 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.174, guidance positions C.1 through C.6 – Not applicable; this regulatory guidance addresses developing risk-informed applications for a licensing basis change that considers engineering issues and applies risk insights. Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.

Regulatory Guide 1.188, positions C.1 through C.3 – Not applicable; the Atomic Alchemy facility is not applying for a license renewal at this time.

Regulatory Guide 1.189, positions C.1 through C.7 – Acceptable; Atomic Alchemy will provide its Fire Protection Plan as FSAR Chapter 9, Appendix A. the plan will conform to the requirements of 10 CFR 50.48(a)(1)-(3).

Regulatory Guide 1.189, positions C.8 – Acceptable; the Atomic Alchemy fire protection plan will conform to the requirements for enhanced fire protection criteria and the safe shutdown of a passive designed ALWR.

Regulatory Guide 1.189, position C.9 – currently not applicable. This guide addresses license renewal.

Regulatory Guide 1.191, positions C.1 through C.5 – not applicable at this time, the guide addresses permanent shutdown and decommissioning.

SECY-90-016 – Not applicable; this letter applies to alternate guidance on and the proposed resolution of issues that were necessary for the staff's continued review of EPRI's ALWR Requirements Document, General Electric's (GE's) ABWR, Westinghouse's RESAR SP/90 and Combustion Engineering's (CE's) System 80+ designs, as related to the use of AAC power sources and application of Regulatory Treatment of Non-Safety Systems (RTNSS) at Advanced Light Water Reactors (ALWR) provided with passive safety systems. It contains no requirements. The VIPR is a non-power reactor.

SECY-94-084 – Not applicable; this letter applies to alternate guidance on, and the proposed resolution of issues that were necessary for the staff's continued review of the Regulatory Treatment of Non-Safety Systems (RTNSS) related to ALWR's and the use of AAC power sources and application of RTNSS at ALWRs provided with passive safety systems. It contains no requirements. The VIPR is a non-power reactor. The Atomic Alchemy design is based on deterministic qualitative approach rather than a probabilistic quantitative approach. Atomic Alchemy applies a conservative review of non-safety-related systems for inclusion into the scope of the Maintenance Rule program.

SRM to SECY 93-087 Defense Against Common-Mode Failures in Digital Instrumentation and Control Systems and Control Room Annunciator (Alarm) Reliability – Acceptable; Atomic Alchemy FSAR Chapter 7, Section 2, subsection “Single Failure Criteria” will describe the design methodology for mitigating this issue. FSAR Chapter 7, Section 2, subsection “Processing and Display Equipment” will describe the design methodology to ensure control room annunciator devices reliability.

NUREG-0800 SRP 9.5.1.1, Rev 0, Appendix A Supplemental Fire Protection Review Criteria for New Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.3	SECY-90-016, SECY-93-087, SECY-94-084 R.G. 1.189	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 9.5.1.1 Appendix A, Review Criteria 1 and 2 – Exceptions as noted; a RHR system is not required in the Atomic Alchemy Reactor design and post fire safe shutdown temperatures are not applicable to the reactor pool. The Atomic Alchemy fire protection plan will conform to the other criterion in these 2 sections.

SRP 9.5.1.1 Appendix A, Review Criteria 3 – Acceptable; the Atomic Alchemy fire protection plan will comply with the following NFPA codes:

- NFPA 4 – “Organization for Fire Services”
- NFPA 4A – “Organization of a Fire Department”
- NFPA 6 – “Industrial Fire Loss Prevention”
- NFPA 7 – “Management of Fire Emergencies”
- NFPA 8 – “Management Responsibilities for Effects of Fire on Operations”
- NFPA 27 – “Private Fire Brigades”
- NFPA 804, “Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants”
- NFPA 101,"Life Safety Code."
- NFPA 802 – “Recommended Fire Protection Practice for Nuclear Reactors.”
- NFPA 801 - “Standard for Fire Protection for Facilities Handling Radioactive Materials.”
- NFPA 804 – “Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants.”

Atomic Alchemy Fire Protection Program Compliance with BTP CMEB 9.5-1 will be provided in FSAR Table 9A-03 of the Fire Protection Plan.

SRP 9.5.1.1 Appendix A, Review Criteria 4 – Not applicable; this criterion applies to non ALWR’s.

SRP 9.5.1.1 Appendix A, Review Criteria 5 – Acceptable; the implementation schedule for the Fire Protection Plan will be followed by Atomic Alchemy.

SRP 9.5.1.1 Appendix A, Review Criteria 6 – Exceptions as noted; Atomic Alchemy fire protection plan is based on a deterministic approach. Atomic Alchemy does incorporate some of the fire plant safety enhanced aspects identified in Criteria 6.2.

SRP 9.5.1.1 Appendix A, Review Criteria 7 – Acceptable; Atomic Alchemy will provide its Fire Protection Plan as FSAR Chapter 9, Appendix A. the plan will conform to the requirements of 10 CFR 50.48(a)(1)-(3) which meets Regulatory Guide 1.189, positions C.2.

SRP 9.5.1.1 Appendix A, Review Criteria 8.1 and 8.2 – Exceptions as noted; the Atomic Alchemy Fire Hazards Analysis (FHA) determines the importance to safety to provide automatic fire suppression for control room under-floor areas and ceiling areas and peripheral rooms in the control room complex. This information will be provided in the FSAR. While the Atomic Alchemy standby diesel generators are non-safety-related, the Fire Hazards Analysis and LOLA analysis evaluates the potential of diesel related fires from spreading to safety related electrical components.

Regulatory Guide 1.189, positions C.1 through C.7 – Acceptable; Atomic Alchemy will provide its Fire Protection Plan as FSAR Chapter 9, Appendix A. the plan will conform to the requirements of 10 CFR 50.48(a)(1)-(3). Regulatory Guide 1.189, positions C.8 – Acceptable; the Atomic Alchemy fire protection plan will conform to the requirements for enhanced fire protection criteria and the safe shutdown of a passive designed ALWR. Regulatory Guide 1.189, position C.9 – currently not applicable. This guide addresses license renewal.

NUREG-0800 SRP 9.5.1.1, Rev 0, Appendix B Supplemental Fire Protection Review Criteria for License Renewal

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This is not applicable to the Atomic Alchemy facility.		

NUREG-0800 SRP 9.5.1.1, Rev 0, Appendix C Supplemental Fire Protection Review Criteria for Fire Probabilistic Risk Assessments

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy fire protection program is based on a deterministic approach.		

NUREG-0800 SRP 9.5.1.1, Rev 0, Appendix D Supplemental Fire Protection Review Criteria for Power Uprates

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This is not applicable to the Atomic Alchemy facility.		

NUREG-0800 SRP 9.5.1.2, Rev 0 Risk-Informed (RI), Performance-Based (PB) Fire Protection Program (FPP)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
The Atomic Alchemy fire protection program is based on a deterministic approach.		

NUREG-0800 SRP 9.5.2, Rev 3 Communications System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.4	10 CFR 50.55a, 10 CFR Part 50, Appendix E, 10 CFR 50.34(f)(2)(xxv), 10 CFR 50.47(a)(8) 10 CFR 73.45(e)(2)(iii), 10 CFR 73.45(g)(4)(i), 10 CFR 73.46(f), 10 CFR 73.55(e), 10 CFR 73.55(f), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), GDC 1, GDC 2, GDC 3, GDC 4, GDC 19	Exceptions as noted
Summary Description of Compliance/Exceptions		
SRP 9.5.2 – General design description: the Atomic Alchemy Communication and Data Systems (EFS) has an integrated design that provides effective communication between plant personnel in all vital areas during normal plant operation and during the full spectrum of accident or incident conditions (including fire) under maximum potential noise levels. 10 CFR Part 50, Appendix E and 10 CFR 50.47(a)(8) – Acceptable; the Atomic Alchemy Emergency Plan will be submitted along with the PSAR. The "General Emergency" class of accident is not a credible transient in the FSAR Chapter 15 accident analysis. The BDBE for the Atomic Alchemy facility does not have a significant radiological impact at substantial distances from the facility (Severe Accidents are addressed in FSAR Chapter 19). Therefore, this class is not included in the Emergency Plan. The Atomic Alchemy Emergency Plan will conform to the guidance in NUREG-0849, "Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors" and regulatory guide 2.6, "Emergency Planning for Research and Test Reactors." The Technical Support Center (TSC) and Operational Support Center (OSC) are located onsite within the Administration and Service Module Building (ASM) and the Emergency Operations Center Module Building (EOM) is		

located nearby offsite. The Atomic Alchemy Emergency Plan will be provided in the FSAR Chapter 13, Appendix B.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 9.5.2 regulations compliance/exceptions.

(2)(xxv) – Acceptable; the Atomic Alchemy Technical Support Center and Operational Support Center are located in the Administration and Services Module building lower basement level. An Emergency Operations Facility is located offsite. See FSAR Chapter 9, Section 5, subsections, "Technical Support Center (TSC) (onsite)," "Operational Support Center (OSC) (onsite)," and "Emergency Operations Center Module Building (offsite) (EOM)" for further description of these facilities.

10 CFR 73.45, and 10 CFR 73.55 – Acceptable; [ ] SEC The Security Plan will be provided in the FSAR Chapter 13, Appendix C. The Atomic Alchemy Physical Security Program, Insider Mitigation Program, Security Training and Requalification Program, FFD for Security Personnel Program, Safeguards Protection Program, FFD and Access Authorization Program, FFD for Construction Personnel Program, and Cyber Security Program are all QAPD level programs developed in accordance with NQA-1. Access control and physical security barriers are identified on the Atomic Alchemy General Arrangement drawings. Conformance with the additional details described in 10 CFR 73.45, 10 CFR 73.55 are administratively addressed in the Atomic Alchemy QAPD programs.

10 CFR 73.46 – Acceptable; the Atomic Alchemy security plan (FSAR Chapter 13, Appendix C) will meet the requirements of this regulation.

10 CFR 50.55a – Acceptable; in the context of this SRP, safety related SSCs will conform to the applicable incorporated by reference industry codes and standards.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 1, 2, 3, 4, 19 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 9.5.3, Rev 3 Lighting Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.7	10 CFR 52.47(b)(1), 10 CFR 52.80(a)	N/A
Summary Description of Compliance/Exceptions		
There are no general design criteria or other requirements that directly apply to the normal and emergency or supplementary plant lighting systems.		

NUREG-0800 SRP 9.5.4, Rev 3 Emergency Diesel Fuel Oil Storage and Transfer System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Exceptions as noted
Summary Description of Compliance/Exceptions		
The on-site AC power source does not perform a safety function. Diesel generators are not safety related.		

NUREG-0800 SRP 9.5.5, Rev 3 Emergency Diesel Engine Cooling Water System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Exceptions as noted
Summary Description of Compliance/Exceptions		
The on-site AC power source does not perform a safety function. Diesel generators are not safety related.		

NUREG-0800 SRP 9.5.6, Rev 3 Emergency Diesel Engine Starting System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Exceptions as noted
Summary Description of Compliance/Exceptions		
The on-site AC power source does not perform a safety function. Diesel generators are not safety related.		

NUREG-0800 SRP 9.5.7, Rev 3 Emergency Diesel Engine Lubrication System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Exceptions as noted
Summary Description of Compliance/Exceptions		
The on-site AC power source does not perform a safety function. Diesel generators are not safety related.		

NUREG-0800 SRP 9.5.8, Rev 3 Emergency Diesel Engine Combustion Air Intake and Exhaust System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	Exceptions as noted
Summary Description of Compliance/Exceptions		
The on-site AC power source does not perform a safety function. Diesel generators are not safety related.		

10. STEAM POWER AND CONVERSION SYSTEM

NUREG-0800 Chapter 10

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the non-power Versatile Isotope Production Reactor (VIPR).		

NUREG-1537, PART 2, SRP 10 EXPERIMENTAL FACILITIES AND UTILIZATION

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Atomic Alchemy will address this specific NUREG-1537, Part 2 SRP 10 in its PSAR along with its application for a construction license.		

11. RADIOACTIVE WASTE MANAGEMENT

NUREG-0800 SRP 11.1, Rev 4 Coolant Source Terms

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1 SRP 11.1.1	10 CFR 50.34a(a), 10 CFR 50.34a(b), 10 CFR 50.34(h), 10 CFR 52.47(a)(5),	Exceptions as noted.

	10 CFR 52.47(a)(8), 10 CFR 52.79(a)(3), 10 CFR 52.79(a)(1)(i), 10 CFR 50 Appendix I, GDC 60, GDC 61, RG 1.110, R.G. 1.112, R.G. 1.140, NUREG-0016, NUREG-0017	

Summary Description of Compliance/Exceptions

SRP 11.1 – General design description; procedural processes and administrative controls are provided to control the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, target fabrication, radioisotope production, and radwaste processing, including anticipated operational occurrences. The radioactive waste management systems are designed to minimize the potential for an inadvertent release of radioactivity from the facility and to provide confidence that the discharge of radioactive wastes is maintained below regulatory limits. Atomic Alchemy determines source terms using Regulatory Guide 1.183.

10 CFR 50.34a(a) and 10 CFR 50.34a(b) – Acceptable; Atomic Alchemy will provide principal radionuclides of the gases, halides, and particulates expected to be released annually in gaseous effluents produced during normal reactor operations and normal radioisotope processes in FSAR Chapter 11, Table 11.01-04, “Realistic Source Terms”. A general description of the provisions for packaging, storage, and shipment of solid wastes containing radioactive materials is provided in FSAR Chapter 11, Section 5, “Solid Waste Management”. The Radioactive Solid Waste Collection & Packaging System (RSW) performs no function related to the safe shutdown of the plant. The system's failure does not adversely affect any safety-related system or component. In accordance with the requirements of 10 CFR 20.1406, the solid radwaste system will be designed to minimize contamination of the facility and the environment, facilitate decommissioning, and minimize the generation of radioactive solid waste. This is done through appropriate selection of design technology for the system.

10 CFR 50.34(h), Conformance with the Standard Review Plan (SRP) – Acceptable; Atomic Alchemy provides FSAR Chapter 1, Appendix B, “SRP Conformance” as a topical report.

10 CFR 50 Appendix I, Section I – Acceptable; descriptions of equipment and components are identified in FSAR Chapter 11, Sections 3, 4, 5 (Liquid Waste Management, Gaseous Waste Management, and Solid Waste Management respectively).

10 CFR 50 Appendix I, Section II.A, II.B, II.C, and Section III – Acceptable; Atomic Alchemy offsite calculated annual total quantity of all radioactive material above background to be released from each Versatile Isotope Production Reactor (VIPR) and from radioisotope-related processes to unrestricted areas are well within the code’s minimum quantities established for nuclear power reactors. Atomic Alchemy establishes the “Radioactive Waste Control Program,” a QAPD level

program, in accordance with NQA-1 and the "Radioactive Process and Effluent Control Program" which is an Offsite Dose Calculation Manual level program to conform to the applicable requirements for guides and implementation.

10 CFR 50 Appendix I, Section II.D – Exceptions as noted; the Atomic Alchemy offsite quantities are extremely low such that any further cost benefit analysis was determined unnecessary.

10 CFR 50 Appendix I, Section IV – Acceptable; Atomic Alchemy establishes the Technical Specifications program 5.6.1, "Offsite Dose Calculation Manual." The ODCM shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program.

10 CFR 50, Appendix I, Section V.A – Acceptable; the conformance effective dates of Subsection A are applicable to the Atomic Alchemy facility.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 60, 61 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.110, positions C.1 through C.5 – Exceptions as noted; the Atomic Alchemy offsite quantities are extremely low, and well within the limits of Appendix I of 10 CFR Part 50. Therefore, any further cost benefit analysis was determined not necessary.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.140, positions C.1 and C.2 – Exceptions as noted; the Atomic Alchemy reactor confinement air filtration system (RCF), Reactor Auxiliary Module Cascade Exhaust System (RAE), Process Production Module Air Filtration Systems (PMF), Mo-99 Target, Production, Processing Module Air Filtration System (TPF), and the Radwaste Module Air Filtration system (WHF) are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases. They do not perform any post-accident cleanup functions. However, for conservatism, and good business practices, Atomic Alchemy implements ASME AG-1-2009, including 2010 Addenda, 1a and 2011 Addenda 1b and ASME N511-2007, ASME N509, N510 (latest revisions) and ASME AG-1 in the design, construction, acceptance testing, quality assurance, and in-service testing of normal atmosphere cleanup systems and components.

Regulatory Guide 1.140, positions C.3 – Exception as noted; the Atomic Alchemy air filtration systems RCF, RAE, PMF, TPF, WHF are non-safety-related systems. The purpose of these filter

ventilation systems is to control normal operating releases. For conservatism, the design of these systems will conform to ASME AG-1b-2009.

Regulatory Guide 1.140, positions C.4 – Acceptable; Atomic Alchemy ventilation filtration design initial qualification testing will conform to Division II of ASME AG-1b-2009.

Regulatory Guide 1.140, positions C.5 through C.7 – Acceptable; Atomic Alchemy ventilation design will conform to ASME AG-1b-2000. Atomic Alchemy implements the latest revision of ASME N509 and N510 in the maintenance and testing of the ventilation filtration systems.

NUREG-0016 and NUREG-0017 – Not applicable; these relate to BWR and PWR power reactors design features or processes that would affect the development of the radioactive source terms. Components such as steam generators, containment internal cleanup systems, waste gas pressurized holdup decay tanks, steam generator blowdown treatment systems, off gases from the main condenser evacuation system, turbine gland sealing systems, etc. are not part of the Atomic Alchemy NPUF design. Atomic Alchemy determines source terms using Regulatory Guide 1.183.

NUREG-0800 SRP 11.2, Rev 5 Liquid Waste Management System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.5, SRP 11.2 SRP 11.1.1, SRP 11.2.1, SRP 11.2.2, SRP 11.2.3, SRP 11.1.6	10 CFR 20.1101(b), 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR Part 20 Appendix B, 10 CFR 20.1406, 10 CFR 50.34, 10 CFR 50.34a, 10 CFR 50.34(f), 10 CFR 50.36a(b), 10 CFR Part 50, Appendix I 10 CFR 52.17(a)(1)(ii), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), 40 CFR Part 190, GDC 2, GDC 3, GDC 60, GDC 61, R.G. 1.33, R.G. 1.54, R.G. 1.109, R.G. 1.111, R.G. 1.112, R.G. 1.113, R.G. 1.140, R.G. 1.143, R.G. 4.21, NUREG/CR-3587, NUREG-0933,	Exceptions as noted.

	ANS N42.18-2004	

Summary Description of Compliance/Exceptions

SRP 11.2 – General design description; procedural processes and administrative controls are provided to control the release of radioactive materials in liquid effluents and to handle radioactive liquid wastes produced during normal reactor operation, target fabrication, radioisotope production, and radwaste processing, including anticipated operational occurrences. See FSAR Chapter 11, Section 3 “Liquid Radwaste Management” for a description of the system, quality control, components, operations, testing, etc.

10 CFR 20.1101(b) – acceptable, See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy’s in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable.

10 CFR 20.1301, and 10 CFR 20.1302 – acceptable, See FSAR Chapter 13, Appendix A for Atomic Alchemy’s ALARA program, a QAPD Section IX program. Also see the Atomic Alchemy’s Offsite Dose Calculation Manual ODM 5.6.1, “Radioactive Process Effluent Control Program” for monitoring radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas.

10 CFR Part 20 Appendix B – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) and the Radioactive Gaseous Waste Collection System and Sub-systems (RGW) are designed so that the annual average concentration limits established by 10 CFR 20 (Appendix B, table 2, column 2) for liquid and gaseous releases are not exceeded during the operation of the NPUF reactors and the radioisotope process operations.

10 CFR 20.1406 – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) will be designed to minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. This is accomplished through design of the system, and the ability to upgrade the system using whatever advanced technology that becomes available throughout the life of the facility.

10 CFR 50.34a – Acceptable; Atomic Alchemy will provide principal radionuclides of the gases, halides, and particulates expected to be released annually in gaseous effluents produced during normal reactor operations and normal radioisotope processes in FSAR Chapter 11, Table 11.01-04, “Realistic Source Terms.” A general description of the provisions for packaging, storage, and shipment offsite of solid waste containing radioactive materials is provided in FSAR Chapter 11, Section 5, “Solid Waste Management.” The solid waste management system (RSW) performs no function related to the safe shutdown of the plant. The system's failure does not adversely affect any safety-related system or component. In accordance with the requirements of 10 CFR 20.1406, the solid radwaste system will be designed to minimize contamination of the facility and the environment, facilitate decommissioning, and minimize the generation of radioactive solid waste. This is accomplished through the selection of specific design technology for the system.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).”

NUREG-0933 – Exceptions as noted; Atomic Alchemy addresses NUREG-0933 Task Action Items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933).”

10 CFR Part 50, Appendix I, and 10 CFR 50.36a(b) – Acceptable; the NRC has determined that programmatic controls can be implemented in the Administrative Controls section of the Technical Specifications to satisfy existing Title 10 regulatory requirements for Radiological Effluent Technical Specifications (RETS) pursuant to 10 CFR 50.36a and 10 CFR 50 Appendix I. See Atomic Alchemy’s Technical Specifications administrative program 5.6.1, “Offsite Dose Calculation Manual.” The ODCM shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

40 CFR Part 190, Subpart B – Acceptable; Atomic Alchemy will comply with the annual dose equivalent requirement to not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials. The ODM Program 5.6.1, “Radioactive Process Effluent Control Program” administrative monitors and controls the discharge of radioactive materials from the Atomic Alchemy facility.

GDC 2, 3, 60, 61 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Regulatory Guide 1.54, positions C.1 through C.5 – Acceptable; coatings are classified as non-safety-related when their failure does not prevent functioning of the engineered safety features. Non-safety related coatings are not subject to the Quality Assurance requirements of Regulatory Guide 1.54. The quality assurance program for safety-related coatings will conform to the requirements of ASME-NQA-1. Safety related coatings meet the pertinent provisions of 10 CFR Part 50 Appendix B.

There are no coatings inside the light water pool that might interfere with post-accident decay heat convection cooling.

Regulatory Guide 1.109, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy utilizes methods and data from 10 CFR Part 20, Appendix B, NUREG 1887 for the core inventory, RG 1.183 for the pool release rates, and RG 1.111 for the plume model from the stack.

Regulatory Guide 1.110, positions C.1 through C.5 – Exceptions as noted; the Atomic Alchemy offsite quantities are extremely low, well within the limits of Appendix I of 10 CFR Part 50 and therefore any further cost benefit analysis was determined not necessary.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.113, positions C.1 through C.3 – Not applicable; there are no large bodies of water within the vicinity of the Atomic Alchemy facility located [ ] PROP The Atomic Alchemy ODM 5.6.1 describes the Radioactive Process Effluent Control Program and ODM 5.7.2 describes the Radioactive Effluent Release Report.

Regulatory Guide 1.140, positions C.1 and C.2 – Exceptions as noted; the reactor confinement air filtration system (RCF), Reactor Auxiliary Module Cascade Exhaust System (RAE), Process Production Module Air Filtration Systems (PMF), Mo-99 Target, Production, Processing Module Air Filtration System (TPF), and the Radwaste Module Air Filtration system (WHF) are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases, and they do not perform any post-accident cleanup functions. However, for conservatism, and good business practices, Atomic Alchemy implements ASME AG-1-2009, including 2010 Addenda, 1a and 2011 Addenda 1b and ASME N511-2007, ASME N509, N510 (latest revisions) and ASME AG-1 in the design, construction, acceptance testing, quality assurance, and in-service testing of normal atmosphere cleanup systems and components.

Regulatory Guide 1.140, positions C.3 – Exception as noted; the air filtration systems RCF, RAE, PMF, TPF, and WHF are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases. For conservatism, the design of these systems will conform to ASME AG-1b-2009.

Regulatory Guide 1.140, positions C.4 – Acceptable; Atomic Alchemy ventilation filtration design initial qualification testing will conform to Division II of ASME AG-1b-2009.

Regulatory Guide 1.140, positions C.5 through C.7 – Acceptable; Atomic Alchemy's ventilation design will conform to ASME AG-1b-2000. Atomic Alchemy implements the latest revision of ASME N509 and N510 in the maintenance and testing of the ventilation filtration systems.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building. See FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 4.21, positions C.1 – Acceptable; Atomic Alchemy minimizes contamination through the use of procedural processes and administrative controls during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. Technical Specification 5.6.4, "Reactor Coolant System (RCS) and Light Water Pool Leakage Rate Testing Program" ensures prompt detection of leakage. Technical Specification 5.6.1, "Offsite Dose Calculation Manual" provides leakage detection surveillances and limited conditions of operation on all potential leakage sources, including the radioisotope, target fabrication and radwaste processes.

Regulatory Guide 4.21, positions C.2 – Acceptable; the Atomic Alchemy Tech Spec and other QAPD related administrative control programs minimizes the potential for environmental contamination. FSAR Chapter 1, Appendix F, "Non-power Reactors on Multi-module Sites" will provide administrative controls to monitor the site configuration during and following construction to aid in preventing the offsite migration of radionuclides via an unmonitored pathways.

Regulatory Guide 4.21, positions C.3 – Acceptable; Atomic Alchemy FSAR Chapter 21, Appendix A will address decommissioning contamination concerns.

Regulatory Guide 4.21, positions C.4 – Acceptable; the Atomic Alchemy QAPD Section IX ALARA program periodically reviews procedural processes to improve controls to minimize onsite and offsite radiological doses.

NUREG/CR-3587 – Exceptions as noted; this document addresses decommissioning techniques for a power reactor, as such some items will not be applicable to the VIPR and radioisotope processes. See FSAR Chapter 21, Appendix A will describe the Atomic Alchemy decommissioning plan.

ANS N42.18-2004 is addressed in the Atomic Alchemy response to SRP 11.5.

NUREG-0800 SRP 11.3, Rev 4 Gaseous Waste Management System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.5, SRP 11.1.1, SRP 11.2.1, SRP 11.2.2, SRP 11.2.3, SRP 11.1.6	10 CFR 20.1101(b), 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR Part 20 Appendix B, 10 CFR 20.1406, 10 CFR 50.34, 10 CFR 50.34a, 10 CFR 50.34(f), 10 CFR 50.36a(b), 10 CFR Part 50 Appendix I, 10 CFR 52.17(a)(1)(ii), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), 40 CFR Part 190,	Exceptions as noted

	GDC 2, GDC 3, GDC 60, GDC 61, R.G. 1.33, R.G. 1.54, R.G. 1.109, R.G. 1.111, R.G. 1.112, R.G. 1.113, R.G. 1.140, R.G. 1.143, R.G. 4.21, NUREG/CR-3587, NUREG/CR-4653, NUREG-1431, NUREG-0933, ANS N42.18-2004, ANSI/HPS N13.1-2011	

Summary Description of Compliance/Exceptions

SRP 11.3 – General design description; procedural processes and administrative controls are provided to control the release of radioactive materials in gaseous effluents and to handle radioactive gaseous wastes produced during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. See FSAR Chapter 11, Section 4 “Gaseous Radwaste Management” for a description of the system, quality control, components, operations, testing, etc.

10 CFR 20.1101(b) – Acceptable; See Technical Specifications Programs: 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program, for Atomic Alchemy’s in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable.

10 CFR 20.1301, and 10 CFR 20.1302 – Acceptable; See FSAR Chapter 13, Appendix A for Atomic Alchemy’s ALARA program, which is a QAPD Section IX program. Also see the Atomic Alchemy’s Offsite Dose Calculation Manual ODM 5.6.1, “Radioactive Process Effluent Control Program” for monitoring radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas.

10 CFR Part 20 Appendix B – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) and the Radioactive Gaseous Waste Collection System and Sub-Systems (RGW) are designed so that the annual average concentration limits established by 10 CFR 20 (Appendix B, table 2, column 2) for liquid and gaseous releases are not exceeded during the operation of the VIPR and radioisotope process operations.

10 CFR 20.1406 – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) will be designed to minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. This is accomplished through the selection of specific design technology for the system, and the ability to upgrade the system using whatever advanced technology that becomes available throughout the life of the facility.

10 CFR 50.34a – Acceptable; Atomic Alchemy will provide principal radionuclides of the gases, halides, and particulates expected to be released annually in gaseous effluents produced during normal reactor operations and normal radioisotope processes in FSAR Chapter 11, Table 11.01-04, "Realistic Source Terms." A general description of the provisions for packaging, storage, and shipment offsite of solid waste containing radioactive materials is provided in FSAR Chapter 11, Section 5, "Solid Waste Management." The solid waste management system (RSW) performs no function related to the safe shutdown of the plant. The system's failure does not adversely affect any safety-related system or component. In accordance with the requirements of 10 CFR 20.1406, the solid radwaste system will be designed to minimize contamination of the facility and the environment, facilitate decommissioning, and minimize the generation of radioactive solid waste. This is accomplished through the selection of specific design technology for the system.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)."

10 CFR Part 50, Appendix I, and 10 CFR 50.36a(b) – Acceptable; the NRC has determined that programmatic controls can be implemented in the Administrative Controls section of the Technical Specifications to satisfy existing Title 10 regulatory requirements for Radiological Effluent Technical Specifications (RETS) pursuant to 10 CFR 50.36a and 10 CFR 50 Appendix I. See Atomic Alchemy's Technical Specifications administrative program 5.6.1, "Offsite Dose Calculation Manual". The ODCM shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

40 CFR Part 190, Subpart B – Acceptable; Atomic Alchemy will comply with the annual dose equivalent requirement to not exceed 25 millirem to the whole body, 75 millirem to the thyroid, and 25 millirem to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials. The ODM Program 5.6.1, "Radioactive Process Effluent Control Program" administrative monitors and controls the discharge of radioactive materials from the Atomic Alchemy facility.

GDC 2, 3, 60, 61 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Regulatory Guide 1.54, positions C.1 through C.5 – Acceptable; coatings are classified as non-safety-related when their failure does not prevent functioning of the engineered safety features. Non-safety related coatings are not subject to the Quality Assurance requirements of Regulatory Guide 1.54. The quality assurance program for safety-related coatings will conform to the requirements of ASME-NQA-1-2017. Safety related coatings meet the pertinent provisions of 10 CFR Part 50 Appendix B.

There are no coatings inside the light water pool that might interfere with post-accident decay heat convection cooling.

Regulatory Guide 1.109, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy utilizes methods and data from 10 CFR Part 20, Appendix B, NUREG 1887 for the core inventory, RG 1.183 for the pool release rates, and R.G. 1.111 for the plume model from the stack.

Regulatory Guide 1.110, positions C.1 through C.5 – Exceptions as noted; the Atomic Alchemy offsite quantities are extremely low, and well within the limits of Appendix I of 10 CFR Part 50. Therefore, any further cost benefit analysis was determined not necessary.

Regulatory Guide 1.111, positions C.1 through C.4 – Acceptable; Atomic Alchemy uses the "mean wind direction model" for determining the atmospheric transport and diffusion of effluents. See FSAR Chapter 15, Table 15.08-01 for representative parameters to be tabulated for postulated accidents for dispersion data and factors.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.113, positions C.1 through C.3 – Not applicable; there are no large bodies of water within the vicinity of the Atomic Alchemy facility located on [ ] PROP See FSAR Chapter 16, Appendix C: the Atomic Alchemy ODM 5.6.1 describes the Radioactive Process Effluent Control Program and ODM 5.7.2 describes the Radioactive Effluent Release Report.

Regulatory Guide 1.140, positions C.1 and C.2 – Exceptions as noted; the Atomic Alchemy reactor confinement air filtration system (RCF), Reactor Auxiliary Module Cascade Exhaust System (RAE), Process Production Module Air Filtration Systems (PMF), Mo-99 Target Production, Processing Module Air Filtration System (TPF), and the Radwaste Module Air Filtration system (WHF) are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases. However, for conservatism, Atomic Alchemy implements ASME AG-1-2009, including 2010 Addenda, 1a and 2011 Addenda 1b and ASME N511-2007, ASME N509, N510 and ASME AG-1 in the design, construction, acceptance testing, quality assurance, and in-service testing of normal atmosphere cleanup systems and components.

Regulatory Guide 1.140, positions C.3 – Exception as noted; the air filtration systems RCF, RAE, PMF, TPF, and WHF are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases. For conservatism, the design of these systems will conform to ASME AG-1b-2009.

Regulatory Guide 1.140, positions C.4 – Acceptable; Atomic Alchemy's ventilation filtration's design initial qualification testing will conform to Division II of ASME AG-1b-2009.

Regulatory Guide 1.140, positions C.5 through C.7 – Acceptable; Atomic Alchemy ventilation design will conform to ASME AG-1a-2000. Atomic Alchemy implements the latest revision of ASME N509 and N510 in the maintenance and testing of the ventilation filtration systems.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building. See FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing, and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 4.21, positions C.1 – Acceptable; Atomic Alchemy minimizes contamination through the use of procedural processes and administrative controls during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. Technical Specification 5.6.4, "RCS and Light Water Pool Leakage Rate Testing Program" ensures prompt detection of leakage. Technical Specification 5.6.1, "Offsite Dose Calculation Manual" provides leakage detection surveillances and limited conditions of operation on all potential leakage sources, including the radioisotope, target fabrication and radwaste processes.

Regulatory Guide 4.21, positions C.2 – Acceptable; the Atomic Alchemy Tech Spec and other QAPD related administrative control programs minimizes the potential for environmental contamination. FSAR Chapter 1, Appendix F, "Non-power Reactors on Multi-module Sites" will provide administrative controls to monitor the site configuration during and following construction to aid in preventing the offsite migration of radionuclides via an unmonitored pathway.

Regulatory Guide 4.21, positions C.3 – Acceptable; Atomic Alchemy FSAR Chapter 21, Appendix A will address decommissioning contamination concerns.

Regulatory Guide 4.21, positions C.4 – Acceptable; the Atomic Alchemy QAPD Section IX ALARA program periodically reviews procedural processes to improve controls to minimize onsite and offsite radiological doses.

NUREG/CR-3587 – Exceptions as noted; this document addresses decommissioning techniques for a power reactor. As such, some items will not be applicable to the VIPR and radioisotope processes. FSAR Chapter 21, Appendix A will describe the Atomic Alchemy decommissioning plan.

NUREG-0933 – Exceptions as noted; Atomic Alchemy addresses NUREG-0933 Safety Issues in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933)."

NUREG/CR-4653 – Not applicable; Atomic Alchemy is a non-power reactor and as such, the design does not utilize GASPAR II to perform environmental dose analyses for releases of radioactive effluents from nuclear power plants into the atmosphere. See FSAR Chapter 11, Table 11.04-04, for a summary of expected annual average release of airborne radionuclides.

NUREG-1431 – Exceptions as noted; Guidance for Technical Specifications' formatting for non-power light water reactors is provided in NUREG-1537, which invokes the format in ANSI/ANS-15.1. The ANS-15.1 Standard guidance was reviewed as part of the creation of the Atomic Alchemy T/S. Keeping with Atomic Alchemy's commitment to quality excellence, a more robust regulatory approach to the Atomic Alchemy Technical Specifications was also taken. Although Atomic Alchemy's non-power, [ ] PROP light-water VIPRs do not have a NSSS vendor with an accompanying staff-approved Standard Technical Specification (STS) format to follow, Atomic Alchemy has determined to create a hybrid T/S format based on the formatting of the Standard Technical Specification (STS) found in NUREG-1431. Supplemental Technical Specification formatting as outlined in ANSI/ANS-15.1 will be incorporated where deemed necessary. The Atomic Alchemy content will differ from the requirements of NUREG-1431, 10 CFR 50.36 and 10 CFR 70.61 only as necessary to reflect technical differences between a PWR power reactor design and the Atomic Alchemy non-power reactor design. Additional Technical Specifications for the radioisotope, radiochemical, and chemical processing that will be conducted outside of the reactor module buildings, but within the Atomic Alchemy facility, will also be derived from the Accident Analysis in FSAR Chapter 15 and will be included in this hybrid Technical Specification.

NUREG-0800 SRP 11.4, Rev 4 Solid Waste Management System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.5, SRP 11.1.1, SRP 11.2.1, SRP 11.2.2, SRP 11.2.3, SRP 11.1.6,	10 CFR 20.1101(b), 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR Part 20 Appendix B, 10 CFR Part 20 Appendix G, 10 CFR 20.1406, 10 CFR 20.1501, 10 CFR 20.2006, 10 CFR 20.2007, 10 CFR 20.2108, 10 CFR 50.34, 10 CFR 50.34a, 10 CFR 50.34(f), 10 CFR 50.36a(b), 10 CFR 50.48, 10 CFR Part 50 Appendix I, 10 CFR 52.17(a)(1)(ii), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), 10 CFR 61.55, 10 CFR 61.56, 10 CFR Part 71,	Exceptions as noted.

	40 CFR Part 190, 49 CFR 173.443, 49 CFR Parts 171-180, GDC 2, GDC 3, GDC 60, GDC 61, GDC 63, R.G. 1.109, R.G. 1.111, R.G. 1.112, R.G. 1.143, R.G. 4.21, NUREG-1431	

Summary Description of Compliance/Exceptions

SRP 11.4 – General design description; the solid waste management system (RSW) is comprised of two identical solid waste processing trains located in two separate module buildings. Each radwaste train can handle the solid waste from two reactors and the byproducts of Molybdenum (and other future radioisotope processes) production and provides processing and packaging for the solid wastes. The system has a 40-year design objective and will be designed for maximum reliability, minimum maintenance, and minimum radiation exposure to operating and maintenance personnel. The system has sufficient temporary waste accumulation capacity based on maximum waste generation rates so that maintenance, repair, or replacement of the solid waste management system components does not impact the process production. See FSAR Chapter 11, Section 5 "Solid Radwaste Management" for a description of the system, quality control, components, operations, testing, etc.

10 CFR 20.1101(b) – Acceptable; See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable.

10 CFR 20.1301, and 10 CFR 20.1302 – Acceptable; See FSAR Chapter 13, Appendix A for Atomic Alchemy's QAPD-level ALARA program. Also see the Atomic Alchemy's Offsite Dose Calculation Manual ODM 5.6.1, "Radioactive Process Effluent Control Program" for monitoring radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas.

10CFR Part 20 Appendix B – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) and the Radioactive Gaseous Waste Collection System and Sub-systems (RGW) are designed so that the annual average concentration limits established by 10 CFR 20 (Appendix B, table 2, column 2) for liquid and gaseous releases are not exceeded during the operation of the VIPRs and the radioisotope process operations.

10 CFR Part 20 Appendix G – Acceptable; the Atomic Alchemy QAPD Section XIII, Radioactive Waste Control Program, has been developed in compliance with 10 CFR 61.55 and 10 CFR 61.56 for wet solid wastes and 10 CFR 71 for both wet and dry solid wastes. Atomic Alchemy QAPD, Section 13.7.2 describes the handling, packaging, and shipping of nuclear waste. Radioactive Waste shipping containers will be provided to Atomic Alchemy by other entities that have established an

appropriate QA Program and are licensed by the NRC for manufacturing and transporting them. These containers will be subjected to a procedural inspection prior to use to detect any non-compliant container or damage done to the container during shipping to the Atomic Alchemy Facility.

10 CFR 20.1406 – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) will be designed to minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. This is accomplished through the selection of specific state of the art design technologies for the system, and the ability to upgrade the system using whatever advanced technology that becomes available throughout the life of the facility.

10 CFR 20.1501 – Acceptable; dosimetry, radiation surveying, and equipment used for quantitative radiation measurements will conform to the requirements of this regulation. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The Rad-Worker Radiation Permit System (ERW) monitors and tracks employees dosimetry.

10 CFR 50.34a – Acceptable; Atomic Alchemy will provide principal radionuclides of the gases, halides, and particulates expected to be released annually in gaseous effluents produced during normal reactor operations and normal radioisotope processes in FSAR Chapter 15, Table 11.01-04, “Realistic Source Terms.” A general description of the provisions for packaging, storage, and shipment offsite of solid waste containing radioactive materials is provided in FSAR Chapter 11, Section 5, “Solid Waste Management.” The solid waste management system (RSW) performs no function related to the safe shutdown of the plant. The system's failure does not adversely affect any safety-related system or component. In accordance with the requirements of 10 CFR 20.1406, the solid radwaste system will be designed to minimize contamination of the facility and the environment, facilitate decommissioning, and minimize the generation of radioactive solid waste. This is accomplished through the selection of specific state-of-the-art design technology for the system.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).”

10 CFR Part 50, Appendix I, and 10 CFR 50.36a(b) – Acceptable; the NRC has determined that programmatic controls can be implemented in the Administrative Controls section of the Technical Specifications to satisfy existing Title 10 regulatory requirements for Radiological Effluent Technical Specifications (RETS) pursuant to 10 CFR 50.36a and 10 CFR 50 Appendix I. See Atomic Alchemy Technical Specifications administrative program 5.6.1, “Offsite Dose Calculation Manual.” The ODCM shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

40 CFR Part 190, Subpart B – Acceptable; Atomic Alchemy will comply with the annual dose equivalent requirement to not exceed 25 millirem to the whole body, 75 millirem to the thyroid, and 25 millirem to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials. The ODM Program 5.6.1, "Radioactive Process Effluent Control Program" administrative monitors and controls the discharge of radioactive materials from the Atomic Alchemy facility.

10 CFR 61.55 and 10 CFR 61.56 – Acceptable; Atomic Alchemy's classification of radioactive waste streams and packaging of radioactive waste will conform to these regulations. See also QAPD section 13.7.1 and 13.7.2. Radioactive waste streams are sampled and/or assessed prior to packaging and shipment as required or after any evolution that may affect the distribution of radionuclides by a factor of ten in waste streams for Class A, B, and C waste as defined in 10 CFR 61.55. Atomic Alchemy will use High Integrity Container (HIC) for sludges, resins, and filters. HICs meet applicable regulatory packaging and transportation disposal requirements. Contaminated cartridge filter waste elements and depleted resins are planned to be shipped for off-site processing and disposal. Solid Wastes consist of miscellaneous solidified liquid/wet wastes and Dry Active Waste (DAW). DAW waste will be typically packaged into boxes, intermodal containers, and shipped to a licensed vendor that processes DAW for final disposal.

49 CFR 173.443 and 10 CFR Part 71 – Acceptable; Atomic Alchemy's packaging of radioisotope products and waste will conform to these regulations. Administrative controls and procedures of QAPD Section XIII programs (Package Design Control Program, Receipt Inspection Program) implement these requirements. Also see QAPD Section 13.7.1 and 13.7.2.

40 CFR Part 190, Subpart B – Acceptable; Atomic Alchemy will comply with the EPA standard annual dose equivalent requirement to not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials. The ODM Program 5.6.1, "Radioactive Process Effluent Control Program" administratively monitors and controls the discharge of radioactive materials from the Atomic Alchemy facility.

49 CFR Parts 171-180 Acceptable; with respect to Hazardous Materials Regulations (HMR), Hazardous Materials Transportation Act (HMTA), and approved hazardous material packaging, Atomic Alchemy packaging and shipping of radioisotope products and waste will conform to these regulations. Administrative controls and procedures of QAPD Section XIII programs (Package Design Control Program, Receipt Inspection Program) ensure the implementation of these requirements. Special handling and storage procedures are established by Atomic Alchemy to account for handling and storing packages, materials and other items that will require special handling. Specific methods and procedures are employed to ensure that all liquid and wet radioactive wastes in storage will be stabilized in accordance with the Radwaste Program before processing for offsite shipment. The Atomic Alchemy onsite radwaste storage facilities provide sufficient storage capacity to allow time for shorter lived radionuclides to decay before packaging and shipping. Also see QAPD Section 13.6, 13.7.1 and 13.7.2.

GDC 2, 3, 60, 61, 63 – acceptable, See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.109, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy utilizes methods and data from 10 CFR Part 20, Appendix B, NUREG 1887 for the core inventory, RG 1.183 for the pool release rates, and RG 1.111 for the plume model from the stack.

Regulatory Guide 1.111, positions C.1 through C.4 – Acceptable; Atomic Alchemy uses the "mean wind direction model" for determining the atmospheric transport and diffusion of effluents. See FSAR Chapter 15, Table 15.08-01 for representative parameters to be tabulated for postulated accidents for dispersion data and factors.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building. See FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10CFR71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 4.21, positions C.1 – Acceptable; Atomic Alchemy minimizes contamination through the use of procedural processes and administrative controls during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. Technical Specification 5.6.4, "RCS and Light Water Pool Leakage Rate Testing Program" ensures prompt detection of leakage. Technical Specification 5.6.1, "Offsite Dose Calculation Manual" provides leakage detection surveillances and limited conditions of operation on all potential leakage sources, including the radioisotope, target fabrication and radwaste processes.

Regulatory Guide 4.21, positions C.2 – Acceptable; the Atomic Alchemy Tech Spec and other QAPD related administrative control programs minimizes the potential for environmental contamination. FSAR Chapter 1, Appendix F, "Non-power Reactors on Multi-module Sites" provides administrative controls to monitor the site configuration during and following construction to aid in preventing the offsite migration of radionuclides via an unmonitored pathways.

Regulatory Guide 4.21, positions C.3 – Acceptable; Atomic Alchemy FSAR Chapter 21, Appendix A will address decommissioning contamination concerns.

Regulatory Guide 4.21, positions C.4 – Acceptable; the Atomic Alchemy QAPD Section IX ALARA program periodically reviews procedural processes to improve controls to minimize onsite and offsite radiological doses. NUREG-1431 – Exceptions as noted; guidance for Technical Specifications' formatting for non-power light water reactors is provided in NUREG-1537, which invokes the format in ANSI/ANS-15.1. The ANS-15.1 Standard guidance was reviewed as part of the creation of the Atomic Alchemy T/S. Keeping with Atomic Alchemy's commitment to quality excellence, a more robust regulatory approach to the Technical Specifications was also taken. Although Atomic Alchemy's non-power [ ] PROP VIPRs do not have a NSSS vendor with an accompanying staff approved Standard Technical Specification (STS) format to follow, Atomic Alchemy has determined to create a hybrid T/S format based on the formatting of the Standard Technical Specification (STS) found in NUREG-1431. Supplemental Technical Specification formatting as outlined in ANSI/ANS-15.1 will be incorporated where deemed necessary to address any NPUF requirements. Atomic Alchemy's content will differ from the requirements of NUREG-1431, 10 CFR 50.36 and/or 10 CFR 70.61 only as necessary to reflect technical differences between a PWR power reactor design and the Atomic Alchemy non-power reactor design. Additional Technical Specifications for the radioisotope, radiochemical, and chemical processing that will be conducted outside of the reactor module buildings but within the Atomic Alchemy facility will also be derived from the Accident Analysis in FSAR Chapter 15 and will be incorporated in this Technical Specification.

NUREG-0800 SRP 11.5, Rev 6 Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7b.6 SRP 11.1.7, SRP 11.2.1, SRP 11.2.2, SRP 11.2.3	10 CFR 20.1101(b), 10 CFR 20.1301, 10 CFR 20.1301(e), 10 CFR 20.1406, 10 CFR 20.1501, 10 CFR 50.34a, 10 CFR 50.34(f), 10 CFR 50.34(f)(2)(viii), 10 CFR 50.34(f)(2)(xiv)(E), 10 CFR 50.34(f)(2)(xvii), 10 CFR 50.34(f)(2)(xxvi), 10 CFR 50.34(f)(2)(xxvii), 10 CFR 50.36a, 10 CFR 50.65(a), 10 CFR 50.65(b), 10 CFR Part 50 Appendix I, 10 CFR 52.47(b)(1),	Exceptions as noted.

	10 CFR 52.80(a), 40 CFR Part 190, GDC 2, GDC 19, GDC 60, GDC 61, GDC 63, GDC 64, R.G. 1.109, R.G. 1.111, R.G. 1.112, R.G. 1.143, R.G. 4.21, NUREG-1431	

Summary Description of Compliance/Exceptions

SRP 11.5 – General design description; the Radiation Monitoring and Alarm System (IRM) provides plant effluent monitoring, process fluid monitoring, airborne monitoring, and continuous indication of the radiation environment in plant areas where such information is needed. Radiation monitors that have a safety-related function are qualified environmentally, seismically, or both. The IRM is divided functionally into 3 subsystems:

- Process, airborne, and effluent radiological monitoring
- Sampling
- Area radiation monitoring

The system has a 40-year design objective and will be designed for maximum reliability, minimum maintenance, and minimum radiation exposure to operating and maintenance personnel. See FSAR Chapter 11, Section 6 "Radiological Monitoring, and Alarm Systems (IRM)" for a description of the system, quality control, components, operations, testing, etc.

10 CFR 20.1101(b) – Acceptable; See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable.

10 CFR 20.1301, and 10 CFR 20.1302 – Acceptable; See FSAR Chapter 13, Appendix A for Atomic Alchemy's QAPD-level ALARA program. Also see Atomic Alchemy's Offsite Dose Calculation Manual ODM 5.6.1, "Radioactive Process Effluent Control Program" for monitoring radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas.

10 CFR 20.1406 – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) will be designed to minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. This is accomplished through the selection of specific state of the art design technologies for the system, and the ability to upgrade the system using whatever advanced technology that becomes available throughout the life of the facility.

10 CFR 20.1501 – Acceptable; Atomic Alchemy dosimetry, radiation surveying, and equipment used for quantitative radiation measurements will conform to the requirements of this regulation. See

QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employee's dosimetry.

10 CFR Part 50, Appendix I and 10 CFR 50.34a – Acceptable; Atomic Alchemy will provide principal radionuclides of the gases, halides, and particulates expected to be released annually in gaseous effluents produced during normal reactor operations and normal radioisotope processes in FSAR Chapter 15, Table 11.01-04, "Realistic Source Terms." A general description of the provisions for packaging, storage, and shipment offsite of solid waste containing radioactive materials is provided in FSAR Chapter 11, Section 5, "Solid Waste Management." The solid waste management system (RSW) performs no function related to the safe shutdown of the plant. The system's failure does not adversely affect any safety-related system or component. In accordance with the requirements of 10 CFR 20.1406, the solid radwaste system will be designed to minimize contamination of the facility and the environment, facilitate decommissioning, and minimize the generation of radioactive solid waste. This is accomplished through the selection of specific state of the art design technology for the system.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." SRP 11.5 specific Action Items are identified below:

(2)(viii) – Acceptable; the Atomic Alchemy NPUF reactor sits in an open-to-atmosphere light water pool, and the primary method to sample the RCS would be to draw a sample directly from the pool top. If this is not available due to fire, temperatures, toxic atmosphere, or high radiation exposures, the alternate method would be to draw a sample from the Chemical Volume and Control (CVC) room located in the reactor auxiliary module building. Sampling analysis is performed in the Radioactive Sampling room located in the Administrative Services Module building using a glove box pass through to the Reactor Auxiliary Module building.

(2)(xiv)(A) through (E) – Acceptable; as an NPUF, Atomic Alchemy re-defines the containment boundary for the NPUF reactor as described in GDC 16. Atomic Alchemy will comply with these Action Items for the primary confinement isolation by providing at least one automatic isolation device located both inside and outside of the confinement building. The safety related isolation functions of the Radiation Monitoring and Alarm System (IRM) will be described in FSAR chapter 11, Section 6, subsection, "Safety Design Functions."

(2)(xvii) – Exceptions as noted; the Atomic Alchemy VIPR is situated in an open-to-atmosphere light water pool. The containment structure is redefined by Atomic Alchemy in PDC 16 (FSAR Chapter 1, Appendix F). The potential for hydrogen or combustible gas buildup greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis; Technical Specifications Program 5.6.5, "Radiation Protection Program" administratively controls sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points.

(f)(2)(xxvi) – Acceptable; The Atomic Alchemy VIPR coolant pressure boundary leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, RCS System Leak Detection Program. Also see Technical Specification Administration Section 5.6.4 "RCS and Light Water Pool Leakage Rate Testing Program," Limited Conditions of Operation LCO 3.3.10 "RCS Leakage Detection Instrumentation" (RLD), LCO 3.4.6 "RCS

Operational Leakage (RLD)", and LCO 3.7.6 Reactor Coolant/Light Water Pool Leak Collection System (RLC).

(2)(xxvii) – Acceptable; the Atomic Alchemy nominal range of radiation detectors are provided in FSAR Table 11.06-01 "Radiation Monitor Detector Parameters" and Table 11.06-02, "Area Radiation Monitor Detector Parameters."

10 CFR 50.36a – Acceptable; the NRC has determined that programmatic controls can be implemented in the Administrative Controls section of the Technical Specifications to satisfy existing Title 10 regulatory requirements for Radiological Effluent Technical Specifications (RETS) pursuant to 10 CFR 50.36a and 10 CFR 50 Appendix I. See Atomic Alchemy's Technical Specifications administrative program 5.6.1, "Offsite Dose Calculation Manual." The ODCM shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip setpoints, and in the conduct of the radiological environmental monitoring program.

10 CFR 50.65(a) and (b) – Acceptable; See Atomic Alchemy's QAPD Section XIV for the Maintenance Rule Program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

GDC 2, 19, 60, 61, 63, 64 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.109, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy utilizes methods and data from 10 CFR Part 20, Appendix B, NUREG 1887 for the core inventory, RG 1.183 for the pool release rates, and RG 1.111 for the plume model from the stack.

Regulatory Guide 1.111, positions C.1 through C.4 – Acceptable; Atomic Alchemy uses the "mean wind direction model" for determining the atmospheric transport and diffusion of effluents. See FSAR Chapter 15, Table 15.08-01 for representative parameters to be tabulated for postulated accidents for dispersion data and factors.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 Nuclear Criticality Safety Program for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building. See FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both

wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 4.21, positions C.1 – Acceptable; Atomic Alchemy minimizes contamination through the use of procedural processes and administrative controls during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. Technical Specification 5.6.4, "RCS and Light Water Pool Leakage Rate Testing Program" ensures prompt detection of leakage. Technical Specification 5.6.1, "Offsite Dose Calculation Manual" provides leakage detection surveillances and limited conditions of operation on all potential leakage sources, including the radioisotope, target fabrication and radwaste processes.

Regulatory Guide 4.21, positions C.2 – Acceptable; the Atomic Alchemy Tech Spec and other QAPD related administrative control programs minimizes the potential for environmental contamination. FSAR Chapter 1, Appendix F, "Non-power Reactors on Multi-module Sites" provides administrative controls to monitor the site configuration during and following construction to aid in preventing the offsite migration of radionuclides via an unmonitored pathways.

Regulatory Guide 4.21, positions C.3 – Acceptable; Atomic Alchemy FSAR Chapter 21, Appendix A will address decommissioning contamination concerns.

Regulatory Guide 4.21, positions C.4 – Acceptable; the Atomic Alchemy QAPD Section IX ALARA program periodically reviews procedural processes to improve controls to minimize onsite and offsite radiological doses.

NUREG-1431 – Exceptions as noted; guidance for Technical Specifications' formatting for non-power light water reactors is provided in NUREG-1537, which invokes the format in ANSI/ANS-15.1. The ANS-15.1 Standard guidance was reviewed as part of the creation of the Atomic Alchemy T/S. Keeping with Atomic Alchemy's commitment to quality excellence, a more robust regulatory approach to the Technical Specifications was also taken. Although Atomic Alchemy's non-power [ ] PROP VIPRs do not have a NSSS vendor with an accompanying staff approved Standard Technical Specification (STS) format to follow, Atomic Alchemy has determined to create a hybrid T/S format based on the formatting of the Standard Technical Specification (STS) found in NUREG-1431. Supplemental Technical Specification formatting as outlined in ANSI/ANS-15.1 will be incorporated where deemed necessary to address any NPUF requirements. The Atomic Alchemy content will differ from the requirements of NUREG-1431, 10 CFR 50.36 and/or 10 CFR 70.61 only as necessary to reflect technical differences between a PWR power reactor design and the Atomic Alchemy non-power reactor design. Additional Technical Specifications for the radioisotope, radiochemical, and chemical processing that will be conducted outside of the NPUF reactor module buildings but within the Atomic Alchemy facility will also be derived from the Accident Analysis in FSAR Chapter 15 and will be incorporated in this Technical Specification.

NUREG-0800 BTP 11-3, Rev 4 Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.2.1, SRP 11.2.2, SRP 11.2.3, SRP 11.1.6	49 CFR Part 171-180, NUREG-0133, NUREG-1301, NUREG-1302, R.G. 1.183	Exceptions as noted.

Summary Description of Compliance/Exceptions

BTP 11.3 Positions B.1 through B.5 – Acceptable; Atomic Alchemy applies administrative controls and procedures in processing and managing radioactive waste. QADP Sections 13.7.1 and 13.7.2 addresses the guidance in this BTP. The Atomic Alchemy Technical Specification programs 5.6.1 “Offsite Dose Calculation Manual” and 5.6.5 “Radiation Protection Program” ensures adherence to industry guidance in processing and storing radioactive wastes.

49 CFR Parts 171-180 – Acceptable; with respect to Hazardous Materials Regulations (HMR), Hazardous Materials Transportation Act (HMTA), and approved hazardous material packaging, Atomic Alchemy’s packaging and shipping of radioisotope products and waste will conform to these regulations. Administrative controls and procedures of QAPD Section XIII programs (Package Design Control Program and Receipt Inspection Program) ensure the implementation of these requirements. Special handling and storage procedures are established by Atomic Alchemy to account for handling and storing packages, materials, and other items that will require special handling. Specific methods and procedures are employed to ensure that all liquid and wet radioactive wastes in storage will be stabilized in accordance with the Radwaste Program before processing for offsite shipment. The Atomic Alchemy onsite radwaste storage facilities provide sufficient storage capacity to allow time for shorter lived radionuclides to decay before packaging and shipping. Also see QAPD Section 13.6, 13.7.1 and 13.7.2.

Regulatory Guide 1.183, positions C.1 through C.6 – Exceptions as noted; the values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the Atomic Alchemy NPUF design, as the parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the Atomic Alchemy AST. FSAR Chapter 15, Appendix B, “Removal of Airborne Activity from the Reactor Confinement Module Atmosphere Following Severe / Beyond Design Basis Accident” and FSAR Chapter 15 Appendix C, “Removal of Airborne Activity from the Radioisotope Process Production Module, Target Fabrication Module, and Radwaste Processing Module Atmosphere Following Severe / Beyond Design Basis” address the dispersion of radionuclides from the reactor cores, spent fuels, and radioisotope processes under various postulated transients.

Regulatory Guide 1.183, Appendix A, position 1 through 6 – Not applicable; the Atomic Alchemy VIPR design does not have: “dual containment,” “primary containment sump water (in PWRs) suppression pool (in BWRs),” nor “main steam isolation valves”.

Regulatory Guide 1.183, Appendix A, position 7 - Not applicable; to the Atomic Alchemy VIPRs, there is no potential for a post-accident LOCA hydrogen or combustible gas buildup. However, a non-safety combustion gas monitoring system is employed, the non-safety-related fire protection smoke exhaust system can be utilized to purge any combustible gases, and natural convection will minimize any accumulation of combustible gases inside the confinement building module.

Regulatory Guide 1.183, Appendix B, positions 1 through 5 – Exceptions as noted; Atomic Alchemy will utilize the methodology described in the guide. The Atomic Alchemy NPUF design does not include a separate Spent Fuel building, nor does it include a containment structure, as both the reactor core and spent fuel are located in the same light water pool open to the atmosphere of the confinement model building. The reactor confinement module building is presumed to be isolated at all times (through the use of airlocks). An ESF filtration system is not part of the design, a non-safety-related filtration system is used for normal releases.

Regulatory Guide 1.183, Appendix C through H – Not applicable; the postulated accidents are not credible transients in the Atomic Alchemy FSAR chapter 15 analysis.

Regulatory guide 1.183, Appendix I – Exceptions as noted; basic assumptions and dose models will be conservatively applied to the evaluation of the aging effects by radiation on Atomic Alchemy EEQ components. See FSAR chapter 3, Appendix E, “Methodology for Qualifying Safety Related Electrical and Mechanical Equipment”.

NUREG-1301 and NUREG-1302 – Not applicable; these pertain to BWR and PWR type facilities and Atomic Alchemy is an NPUF. However, some applicable sections have been incorporated into the Atomic Alchemy ODCM.

NUREG-0133 – Not applicable; detailed guidance to effect a transfer of the RETS to the Offsite Dose Calculation Manual (ODM) was given in Generic Letter 89-01 Appendix C. As part of the development of the Atomic Alchemy Technical Specifications, the RETS has been relocated to the Atomic Alchemy ODM and are considered as part of the Atomic Alchemy licensing basis (a part of the FSAR).

NUREG-0800 BTP 11-5, Rev 4 Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1.6, SRP 11.2.1, SRP 11.2.2, SRP 11.2.3, SRP 13	R.G. 1.24, R.G. 1.183, NUREG-0016, NUREG-0017	Exceptions as noted.

Summary Description of Compliance/Exceptions
BTP 11.5 Positions B.1 and B.2 – Acceptable; Atomic Alchemy incorporates the guidance of this BTP in FSAR Chapter 15, accident analysis, Section 7, “Initiating Reactor Events,” subsection “Radioactive Release Accident from a Subsystem or Component,” and in Section 9 “Initiating Radioisotope Process, Radwaste Process and Target Fabrication Events,” subsection “Waste Handling System Process Transients”. Regulatory Guide 1.24, positions C.1 through C.3 – Exceptions as noted; the Atomic Alchemy VIPR is not a PWR, and as such, the equipment is not directly similar. However, in FSAR Chapter 15, accident analysis, Section 7, “Initiating Reactor Events”, subsection “Radioactive Release Accident from a Subsystem or Component” the intent of this regulatory guide in addressed. Regulatory Guide 1.183, positions C.1 through C.6 – Exceptions as noted; the values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the Atomic Alchemy NPUF design, as the parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the Atomic Alchemy AST. FSAR Chapter 15, Appendix B, “Removal of Airborne Activity from the Reactor Confinement Module Atmosphere Following Severe / Beyond Design Basis Accident” and FSAR Chapter 15 Appendix C, “Removal of Airborne Activity from the Radioisotope Process Production Module, Target Fabrication Module, and Radwaste Processing Module Atmosphere Following Severe / Beyond Design Basis” address the dispersion of radionuclides from the reactor cores, spent fuels, and radioisotope processes under various postulated transients. Regulatory Guide 1.183, Appendix A, position 1 through 6 – Not applicable; the Atomic Alchemy VIPR design does not have: “dual containment,” “primary containment sump water (in PWRs) or a suppression pool (in BWRs),” and “main steam isolation valves.” Regulatory Guide 1.183, Appendix A, position 7 - Not applicable to the Atomic Alchemy VIPR, as there is no potential for a post-accident LOCA hydrogen or combustible gas buildup. However, a non-safety combustion gas monitoring system is employed. The non-safety-related fire protection smoke exhaust system can be utilized to purge any combustible gases, and natural convection will minimize any accumulation of combustible gases inside the confinement building module. Regulatory Guide 1.183, Appendix B, positions 1 through 5 – Exceptions as noted; Atomic Alchemy will utilize the methodology described in this guide. The Atomic Alchemy NPUF design does not include a separate spent fuel building, nor does it include a containment structure, and both the reactor core and spent fuel are located in the same light water pool open to the atmosphere of the confinement model building. The reactor confinement module building is presumed to be isolated at all times through the use of airlocks. An ESF filtration system is not part of the design, and a non-safety-related filtration system is used for normal releases. Regulatory Guide 1.183, Appendix C through H – Not applicable; the postulated accidents are not credible transients in the Atomic Alchemy FSAR chapter 15 analysis. Regulatory guide 1.183, Appendix I – Exceptions as noted; basic assumptions and dose models will be conservatively applied to the evaluation of the aging effects by radiation on Atomic Alchemy EEQ

components. See FSAR chapter 3, Appendix E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment". NUREG-0016 and NUREG-0017 – Not applicable; these apply to BWR and PWR reactor designs.

NUREG-0800 BTP 11-6, Rev 4 Postulated Radioactive Releases Due to Liquid-containing Tank Failures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1.6, SRP 13,	10 CFR 20.1301, 10 CFR 20.1302	Acceptable
Summary Description of Compliance/Exceptions		
BTP 11.6 Positions B.1 through B.7 – Acceptable; Atomic Alchemy incorporates the guidance of this BTP in FSAR Chapter 15, accident analysis, Section 7, "Initiating Reactor Events," subsection "Radioactive Release Accident from a Subsystem or Component" and in Section 9 "Initiating Radioisotope Process, Radwaste Process and Target Fabrication Events," subsection "Waste Handling System Process Transients." 10 CFR 20.1301, and 10 CFR 20.1302 – Acceptable; See FSAR Chapter 13, Appendix A for Atomic Alchemy's QAPD-level ALARA program. Also see the Atomic Alchemy's Offsite Dose Calculation Manual ODM 5.6.1, "Radioactive Process Effluent Control Program" for monitoring radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas.		

12. RADIATION PROTECTION

NUREG-0800 SRP 12.1, Rev 4 Assuring that Occupational Radiation Exposures Are As Low As Reasonably Achievable

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 11.1.3, SRP 11.1.5, SRP 11.1.6,	10CFR19.12, 10CFR20.1101(b), R.G. 1.8, R.G. 1.33, R.G. 8.8, R.G. 8.10, R.G. 8.27, NUREG-1736	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 12.1 – General design description; the Atomic Alchemy's QAPD, Section IX, will describe the ALARA program. Additionally, see FSAR Chapter 13, Appendix A for the following QAPD level		

programs: “Radiation Protection Program,” “Respiratory Protection Program,” and the “Nuclear Criticality Safety Program.”

10 CFR 19.12 – Acceptable; employees are informed of the location of radioactive materials through programmatic and administrative controls, including locked radiation areas, magenta and yellow signs, warning lights, and alarms, etc. Many of the engineers and supervisors assigned to the Atomic Alchemy NPUF design have performed similar design work or service work on other nuclear power plants. Through this experience, they have acquired knowledge of the radiation protection aspects which are applied to the Atomic Alchemy facility. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The Rad-Worker Radiation Permit System (ERW) monitors and tracks employees’ dosimetry.

10 CFR 20.1101(b) – Acceptable; Atomic Alchemy will provide several specific Radiation Protection Programs in the Technical Specifications. See Technical Specifications for the following:

5.6.5 Radiation Protection Program
5.6.5.1 Radiation Safety
5.6.5.2 Respiratory Protection Program
5.6.5.3 Nuclear Criticality Safety Program

Regulatory Guide 1.8, position C.1 – Exceptions as noted; the Atomic Alchemy facility is not a nuclear power plant, and as such, training will be different. However Atomic Alchemy meets the intent of this regulatory guide by providing robust training and qualifications programs. See QAPD 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine if individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Additionally, Atomic Alchemy implements an NUPF operator radioisotope process training and requalification program (See Commitment AA0-RC-0004 in QAPD).

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Regulatory Guide 8.8, positions C.1 through C.4, Acceptable; Atomic Alchemy will describe the policies, common major equipment and component design features, contamination control, radioactive material control, radiation zoning and access control, shielding, environmental and personnel monitoring, etc. in FSAR Chapter 12.

Regulatory Guide 8.10, positions C.1 through C.3 – Acceptable;guidance associated with this regulatory guide, is basically a summary of regulatory codes and other regulatory guide requirements used to describe to the methods that the staff considers acceptable for use in implementing specific parts of the agency’s regulations related to ALARA. Atomic Alchemy’s ALARA-related programs are robust and will meet the highest standards for ensuring radiation safety.

Regulatory Guide 8.27, positions C.1 through C.4 – Acceptable; See QAPD 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for

positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" and ANSI/ANS 15.4-2016, "Selection and Training of Personnel for Research Reactors" criteria.

NUREG-1736 – Not applicable; the document is just a consolidation of existing regulatory guides and codes and contains no new requirements. Atomic Alchemy has summarized its conformance to or exceptions to guides and codes that are contained in this document in other sections of this Appendix.

NUREG-0800 SRP 12.2, Rev 4 Radiation Sources

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 5.2, SRP 11.1.1	10 CFR 20.1101, 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, 10 CFR 20.1204, 10 CFR 20.1206, 10 CFR 20.1207, 10 CFR 20.1301, 10 CFR 20.1406, 10 CFR 20.1801, 10 CFR 50.34(b)(3), 10 CFR 50.34(f)(2)(vii), 10 CFR 50.49(e)(4), 10 CFR 52.47(b)(1), 10 CFR 52.80(a), 10 CFR 52.47(a)(22), 10 CFR 52.47(a)(5), 10 CFR 52.79(a)(3), 10 CFR 52.157(e), 40 CFR Part 190, GDC 4, GDC 19, GDC 61, R.G. 1.7, R.G. 1.89, R.G. 1.112, R.G. 1.183, R.G. 4.21, NUREG-0737 Action Item II.B.2	Exceptions as noted

Summary Description of Compliance/Exceptions
SRP 12.2 – General design description; Atomic Alchemy FSAR Chapter 12, Section 2 will describe the sources of radiation that form the basis for shielding design calculations and the sources of airborne radioactivity used for the design of personnel protection measures and dose assessment. The shielding design source terms are based on the three reactor and three radioisotope process (radioisotope process includes target fabrication and radwaste) conditions of normal power operation, shutdown, and design basis accident events. 10 CFR 20.1101 – Acceptable; Atomic Alchemy will provide several specific Radiation Protection Programs in the Technical Specifications. See Technical Specification for the following: 5.6.5 Radiation Protection Program 5.6.5.1 Radiation Safety 5.6.5.2 Respiratory Protection Program 5.6.5.3 Nuclear Criticality Safety Program 10 CFR 20 Subpart C - Acceptable; radiation exposures to operating personnel are restricted to be within the limits of 10 CFR 20. The health physics program and the radiation protection features will be described in FSAR Chapter 12, Section 3 together maintain occupational radiation exposures ALARA. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employees' dosimetry. See FSAR Tables 12.4-01 through 12.4-04 for dose estimates for routine operations, inspections, surveillances, and maintenance for the Versatile Isotope Production Reactor (VIPR) and radioisotope processes (including target fabrication and radwaste). Additional tables are provided in FSAR Chapter 12, Section 4 for dose estimates for ASME Section XI in-service inspections, special maintenance operations and refueling. 10 CFR 20.1301 – Acceptable; See FSAR Chapter 13, Appendix A for Atomic Alchemy's ALARA program, a QAPD Section IX program, also see the Atomic Alchemy's Offsite Dose Calculation Manual ODM 5.6.1, "Radioactive Process Effluent Control Program" for monitoring radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas. 10 CFR 20.1406 – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) will be designed to minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. This is accomplished through the selection of specific design technology for the system, and the ability to upgrade the system using whatever advanced technology that becomes available throughout the life of the facility. 10 CFR 20 subpart I – Acceptable; the Atomic Alchemy QAPD Section XIII program "Material Control and Accountability Program" is developed from the criteria of ANSI N15.8-2009, "Methods of Nuclear Material Control - Material Control Systems - Special Nuclear Material Control and Accounting Systems for Nuclear Power Plants". 10 CFR 50.34(b)(3) – Acceptable; Atomic Alchemy uses QAPD-level programs and administrative controls as the means for controlling and limiting radioactive effluents and radiation exposures from

the types and quantities of radioactive materials and products expected to be produced in the operation of the VIPR and radioisotope processes. See QAPD Section VIII, “Materials, Equipment, and Parts List (MEPL) Program,” “Special Nuclear Material Accounting and Control Program,” QAPD Section XIII, “Chemical Process Safety & Surveillance Program,” “Radioactive Waste Program,” and ODM 5.6.1 “Radioactive Process Effluent Control Program” and ODM 5.6.1.1 “Radiological Environmental Monitoring Program (REMP).” The Atomic Alchemy REMP monitors radiological contaminants from both air and liquid point sources, as well as collects and analyzes environmental samples from numerous locations throughout the site and the surrounding area.

10 CFR 50.34(f) – Acceptable; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).” Provided below are the relevant SRP 12.2 regulations compliance/exceptions.

(2)(vii) – Acceptable; Atomic Alchemy FSAR Chapter 12, Section 3, “Radiation Protection Design Features” will describe the methodology of how the facility areas are categorized into radiation zones according to design basis radiation levels and anticipated personnel occupancy with consideration given toward maintaining personnel exposures ALARA and within the standards of 10 CFR 20. Rooms, corridors, piping chases, and other areas are evaluated for potential radiation sources during normal, shutdown, emergency operations and for maintenance occupancy requirements.

10 CFR 50.49(e)(4) – Acceptable; Atomic Alchemy QAPD Section IX, “Electrical Equipment Qualification Program (EEQ)” (regulatory commitment AA0-RC-0007) will conform with 10 CFR 50.49, 10 CFR 50 Appendix B, Criteria III, XI, XVII, and R.G. 1.89 criterion.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

40 CFR Part 190, Subpart B – Acceptable; Atomic Alchemy will comply with the annual dose equivalent requirement to not exceed 25 millirem to the whole body, 75 millirem to the thyroid, and 25 millirem to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials. The ODM Program 5.6.1, “Radioactive Process Effluent Control Program” administrative monitors and controls the discharge of radioactive materials from the Atomic Alchemy facility.

GDC 4, 19, 61 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.7, position C.1 – Exception as noted; there is no potential for a post-accident LOCA combustible gas buildup greater than 10%. This is not a credible accident in the Atomic Alchemy design.

Regulatory Guide 1.7, position C.2 – Exception as noted; a non-safety-related combustion gas monitoring system is employed.

Regulatory Guide 1.7, position C.3 – Acceptable; mixing of the reactor confinement atmosphere is accomplished through natural circulation and not with an active system.

Regulatory Guide 1.7, position C.4 – Not applicable; The Atomic Alchemy facility does not use hydrogen recombiners or igniters.

Regulatory Guide 1.7, position C.5 – Not applicable; an over pressurization condition inside the reactor confinement module, radioisotope processing module, target fabrication module, or radwaste module buildings is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis.

Regulatory Guide 1.89, position C.1 – Exceptions as noted; this guide has not been revised since 1984 and endorses a 1970s version of an industry standard (IEEE-323-1974). See FSAR Chapter 3, Table 3.11-01 "Environmentally Qualified Electrical and Mechanical Equipment." Atomic Alchemy's mechanical and electrical components identified in Table 3.11-01 are qualified by design to perform their required functions under the appropriate environmental effects of normal, abnormal, accident, and post-accident conditions as required by General Design Criterion 4 and as discussed in FSAR Chapter 3, Appendix 3E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment." For mild environments, the area conditions are postulated not to change as a result of a transient identified in the Chapter 15 accident analysis. There are no degrading environmental effects that lead to common mode failure of equipment in mild environments. Mechanical and electrical equipment located in harsh environmental zones are designed to perform under the appropriate environmental conditions defined for those area.

Regulatory Guide 1.89, position C.2, C.3, C.4, C.5 – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-323. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in this Regulatory Guide.

Regulatory Guide 1.89, position C.6, C.7 – Acceptable; Atomic Alchemy QAPD, Criterion VII, Section 7.9, addresses like for like replacements of components.

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 "Radiation Protection Program," 5.6.5.1 "Radiation Safety," 5.6.5.2 "Respiratory Protection Program," and 5.6.5.3 "Nuclear Criticality Safety Program" for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.183, positions C.1 through C.6 – Exceptions as noted; the values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the Atomic Alchemy NPUF design, and the parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the Atomic Alchemy Alternative Source Term (AST). FSAR Chapter 15, Appendix B, "Removal of Airborne Activity from the Reactor Confinement Module Atmosphere Following Severe / Beyond Design Basis Accident," and FSAR Chapter 15 Appendix C, "Removal of Airborne Activity from the Radioisotope Process Production Module, Target Fabrication Module and Radwaste Processing Module Atmosphere Following Severe / Beyond Design Basis" address the dispersion of radionuclides from the reactor cores, spent fuels, and radioisotope processes under various postulated transients.

Regulatory Guide 1.183, Appendix A, position 1 through 6 – Not applicable; the Atomic Alchemy VIPR design does not have: “dual containment,” “primary containment sump water (in PWRs) or a suppression pool (in BWRs),” nor “main steam isolation valves.”

Regulatory Guide 1.183, Appendix A, position 7 - Not applicable; the Atomic Alchemy VIPR has no potential for a post-accident LOCA hydrogen or combustible gas buildup. However, a non-safety combustion gas monitoring system is employed, and the non-safety-related fire protection smoke exhaust system can be utilized to purge any combustible gases, and natural convection will minimize any accumulation of combustible gases inside the confinement building module.

Regulatory Guide 1.183, Appendix B, positions 1 through 5 – Exceptions as noted; Atomic Alchemy will utilize the methodology described in this guide. The Atomic Alchemy NPUF design does not include a separate spent fuel building, nor does it include a containment structure, as both the reactor core and spent fuel are located in the same light water pool open to the atmosphere of the confinement model building. The reactor confinement module building is presumed to be isolated at all times through the use of airlocks. An ESF filtration system is not part of the design, but a non-safety-related filtration system is used for normal releases.

Regulatory Guide 1.183, Appendix C through H – Not applicable; the postulated accidents are not credible transients in the Atomic Alchemy FSAR chapter 15 analysis.

Regulatory guide 1.183, Appendix I – Exceptions as noted; basic assumptions and dose models will be conservatively applied to the evaluation of the aging effects by radiation on Atomic Alchemy EEQ components. See FSAR chapter 3, Appendix E, “Methodology for Qualifying Safety Related Electrical and Mechanical Equipment”.

Regulatory Guide 4.21, positions C.1 – Acceptable; Atomic Alchemy minimizes contamination through the use of procedural processes and administrative controls during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. Technical Specification 5.6.4, “Reactor Coolant System (RCS) and Light Water Pool Leakage Rate Testing Program” ensures prompt detection of leakage. Technical Specification 5.6.1, “Offsite Dose Calculation Manual” provides leakage detection surveillances and limited conditions of operation on all potential leakage sources, including the radioisotope, target fabrication and radwaste processes.

Regulatory Guide 4.21, positions C.2 – Acceptable; the Atomic Alchemy Tech Spec and other QAPD related administrative control programs minimizes the potential for environmental contamination. FSAR Chapter 1, Appendix F, “Non-power Reactors on Multi-module Sites” provides administrative controls to monitor the site configuration during and following construction to aid in preventing the offsite migration of radionuclides via an unmonitored pathway.

Regulatory Guide 4.21, positions C.3 – Acceptable; Atomic Alchemy FSAR Chapter 21, Appendix A will address decommissioning contamination concerns.

Regulatory Guide 4.21, positions C.4 – Acceptable; the Atomic Alchemy QAPD Section IX ALARA program periodically reviews procedural processes to improve controls to minimize onsite and offsite radiological doses.

NUREG-0800 SRP 12.3 – 12.4, Rev 5 Radiation Protection Design Features

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 3.1, SRP 5.2, SRP 7.7, SRP 11.2.2,	10 CFR 20.1003, 10 CFR 20.1101, 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, 10 CFR 20.1204, 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR 20.1406, 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.1701, 10 CFR 20.1702, 10 CFR 20.1801, 10 CFR 20.1901, 10 CFR 20.1902, 10 CFR 20.1903, 10 CFR 20.1904, 10 CFR 50.34(b)(3), 10 CFR 50.34(f)(2)(vii), 10 CFR 50.49(e)(4), 10 CFR 50.68, 10 CFR Part 50 Appendix E, 10 CFR 52.47(b)(1), 10 CFR 52.80(a), 10 CFR 52.47(a)(22), 10 CFR 52.47(a)(5), 10 CFR 52.79(a)(3), 10 CFR 52.157(e), 10 CFR 70.24, 40 CFR Part 190, GDC 4, GDC 14, GDC 19, GDC 30, GDC 61, GDC 63, R.G. 1.7, R.G. 1.45, R.G. 1.52, R.G. 1.69, R.G. 1.89, R.G. 1.97, R.G. 1.112, R.G. 1.140, R.G. 1.143, R.G. 1.183, R.G. 4.21, R.G. 8.2, R.G. 8.8, R.G. 8.10, R.G. 8.19, R.G. 8.25, R.G. 8.38,	Exceptions as noted

	NUREG-0737 Action Items II.B.2, II.F.1, NUREG-1430, 1431, 1432, 1433, 1434	

Summary Description of Compliance/Exceptions

SRP 12.3-4 – General design description; Atomic Alchemy FSAR Chapter 12, Section 3 will describe the specific radiation protection design features utilized for facility process and layout situations for maintaining personnel exposure ALARA under normal operations, shutdown, and postulated accident conditions. Access to radiation areas inside the facility structures and plant yard area is regulated and administratively controlled by posting of radiation warning signs, use of alarms, and locked areas. FSAR Chapter 12, Section 4, will describe the anticipated occupational radiation exposure (ORE) due to normal operation and anticipated inspections and maintenance evolutions. Exposure data and radiation field data obtained from operating nuclear power plants have been reviewed to obtain a breakdown of the doses incurred due to normal operations, surveillances, and maintenance functions within each category. Due to the differences between a power reactor and NPUF reactor, the anticipated Atomic Alchemy dose estimates in FSAR Tables 12.4-01 through 12.4-12 are significantly less than a power reactor. Anticipated dose limits for the radioisotope process (including target fabrication and radwaste) are also included in FSAR Chapter 12 Section 4 Tables.

10 CFR 20.1003 – Exceptions as noted; the definitions used in the Atomic Alchemy Offsite Dose Calculation Manual are based on the guidance in NEI ODCM Template 07-09A, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description."

10 CFR 20.1101 – Acceptable; Atomic Alchemy will provide several specific Radiation Protection Programs in the Technical Specifications, See Technical Specification for the following:

5.6.5 Radiation Protection Program
5.6.5.1 Radiation Safety
5.6.5.2 Respiratory Protection Program
5.6.5.3 Nuclear Criticality Safety Program

10 CFR 20 Subpart C - Acceptable; radiation exposures to operating personnel are restricted to be within the limits of 10 CFR 20. The health physics program and the radiation protection features will be described in FSAR Chapter 12 Section 3 together maintain occupational radiation exposures ALARA. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employee's dosimetry. See FSAR Tables 12.4-01 through 12.4-04 for dose estimates for routine operations, inspections, surveillances, and maintenance for the VIPR and radioisotope processes (including target fabrication and radwaste). Additional tables are provided in FSAR Chapter 12, Section 4 for dose estimates for ASME Section XI in-service inspections, special maintenance operations and refueling.

10 CFR 20 Subpart D – Acceptable; the Atomic Alchemy will provide administrative control and procedural programs to monitor public exposures. The Offsite Dose Calculator Manual program "Radioactive Process Effluent Control Program" will conform to 10 CFR 50.36a and Regulatory Guide

1.21 for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents within the limits of 10 CFR Part 20.

10 CFR 20 Subpart E – Acceptable; Atomic Alchemy's compliance with license termination and decommissioning radiation limits will be briefly described in FSAR Chapter 21. Additional conformances will be described when Atomic Alchemy submits its License Termination Plan (LTP) to the NRC.

10 CFR 20 Subpart G – Acceptable; Atomic Alchemy will provide administrative controls and procedural programs for dosimetry, radiation surveying, and equipment used for quantitative radiation measurements that will conform to the requirements of this regulation. The health physics personnel are responsible for determining area contamination and airborne readings prior to any tasks being performed. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employees' dosimetry.

10 CFR 20 Subpart H – Acceptable; Atomic Alchemy will provide administrative controls, procedural programs, and engineered design features (controls) to restrict and minimize internal exposures. The Reactor Confinement Air Filtration System (RCF), Process Production Module Air Filtration Systems (PMF), Mo-99 Target, Production, Processing Module Air Filtration System (TPF) and the Radwaste Module Air Filtration system (WHF) are non-safety-related systems provided to minimize airborne contamination. The purpose of these radiological filter ventilation systems is to control normal operating air-borne releases only. Respiratory programmatic controls are also provided in Technical Specifications program 5.6.5.2 "Respiratory Protection Program". The T/S program is developed based on NUREG-0041, "Manual of Respiratory Protection against Airborne Radioactive Materials" and regulatory guide 8.15, "Acceptable Programs for Respiratory Protection." These regulatory guidance documents provide the program elements for the Atomic Alchemy Respiratory Protection Program.

10CFR20 Subpart I – Acceptable; the Atomic Alchemy QAPD Section XIII program "Material Control and Accountability Program" is developed from the criteria of ANSI N15.8-2009, "Methods of Nuclear Material Control - Material Control Systems - Special Nuclear Material Control and Accounting Systems for Nuclear Power Plants."

10 CFR20 Subpart J – Acceptable; Atomic Alchemy uses the posting and labeling conventions described in this regulation. This information is also provided in the QAPD Criterion XIII, section 13.7, for packaging, shipping, and handling. Special Handling and Storage procedures are established by Atomic Alchemy for opening, handling, and storing packages, materials and other items that will require special handling due to radiation concerns. Atomic Alchemy implements facility-wide separations and boundaries using conspicuous signs bearing the appropriate radiation symbols and wording for the level of safety significance. These administrative controls are provided by Technical Specification programs 5.6.5, "Radiation Protection Program" and 5.6.5.1, "Radiation Safety Program".

10 CFR 50.34(b) – Acceptable; Atomic Alchemy uses QAPD level programs and administrative controls as the means for controlling and limiting radioactive effluents and radiation exposures from the types and quantities of radioactive materials and products expected to be produced in the

operation of the NPUF reactors and radioisotope processes. See QAPD Section VIII, “Materials, Equipment, and Parts List (MEPL) Program,” and “Special Nuclear Material Accounting and Control Program,” QAPD Section XIII, “Chemical Process Safety & Surveillance Program,” “Radioactive Waste Program,” and ODCM 5.6.1 “Radioactive Process Effluent Control Program” and OCDM 5.6.1.1 “Radiological Environmental Monitoring Program (REMP).” The Atomic Alchemy REMP monitors radiological contaminants from both air and liquid point sources, as well as collects and analyzes environmental samples from numerous locations throughout the site and the surrounding area.

10 CFR 50.34(f) – Acceptable; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).” Provided below are the relevant SRP 12.3-4 regulations compliance/exceptions.

(2)(vii) – Acceptable; Atomic Alchemy FSAR Chapter 12, Section 3, “Radiation Protection Design Features” will describe the methodology of how the facility areas are categorized into radiation zones according to design basis radiation levels and anticipated personnel occupancy with consideration given toward maintaining personnel exposures ALARA and within the standards of 10 CFR 20. Rooms, corridors, piping chases, and other areas are evaluated for potential radiation sources during normal, shutdown, and emergency operations and for maintenance occupancy requirements.

10 CFR 50.49(e)(4) – Acceptable; Atomic Alchemy QAPD Section IX, “Electrical Equipment Qualification Program (EEQ)” (regulatory commitment AA0-RC-0007) will conform with 10 CFR 50.49, 10 CFR 50 Appendix B, Criteria III, XI, XVII, and R.G. 1.89 criterion.

10CFR50.68 – Acceptable; Atomic Alchemy will provide safety class Criticality Area Detection and Alarm Systems for the VIPR modules, Radioisotope Module, Target Fabrication Module and Radwaste Module buildings (ICA) and a separate safety class system for radioisotope process hot cells (ICC). See FSAR Chapter 7, Section 3 for description.

10 CFR Part 50, Appendix E – Acceptable; the Atomic Alchemy Emergency Plan will be submitted along with the PSAR. The “General Emergency” class of accident is not a credible transient in the FSAR Chapter 15 accident analysis. The BDBE for the Atomic Alchemy facility does not have a significant radiological impact at substantial distances from the facility. Therefore, this class is not included in the Emergency Plan. The Atomic Alchemy Emergency Plan will conform to the guidance in NUREG-0849, “Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors” and regulatory guide 2.6, “"Emergency Planning for Research and Test Reactors.” The Technical Support Center (TSC) and Operational Support Center (OSC) are located onsite within the Administration and Service Module building (ASM) and the Emergency Operations Center Module Building (EOM) is located nearby offsite. The Atomic Alchemy Emergency Plan is provided in the FSAR Chapter 13, Appendix B.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

10 CFR 70.24 – Acceptable; Atomic Alchemy will provide safety class Criticality Area Detection and Alarm Systems for the VIPR modules, Radioisotope Module, Target Fabrication Module and

Radwaste Module buildings (ICA) and a separate safety class system for radioisotope process hot cells (ICC). See FSAR Chapter 7, Section 3 for description. Additionally, Atomic Alchemy addresses the issue of criticalities programmatically in Technical Specification 5.6.5.3 “Nuclear Criticality Safety Program.”

40 CFR Part 190, Subpart B – Acceptable; Atomic Alchemy will comply with the annual dose equivalent requirement to not exceed 25 millirem to the whole body, 75 millirem to the thyroid, and 25 millirem to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials. The ODM Program 5.6.1, “Radioactive Process Effluent Control Program” administrative monitors and controls the discharge of radioactive materials from the Atomic Alchemy facility.

GDC 4, 14, 19, 30, 61, 63 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy’s principal design criteria and compliance with the GDCs.

Regulatory Guide 1.7, position C.1 – Exceptions as noted; there is no potential for a post-accident LOCA combustible gas buildup greater than 10%. This is not a credible accident in the Atomic Alchemy design.

Regulatory Guide 1.7, position C.2 – Exceptions as noted; a non-safety-related combustion gas monitoring system is employed.

Regulatory Guide 1.7, position C.3 – Acceptable; mixing of the reactor confinement atmosphere is accomplished through natural circulation and not with an active system.

Regulatory Guide 1.7, position C.4 – Not applicable; The Atomic Alchemy facility does not use hydrogen recombiners or igniters.

Regulatory Guide 1.7, position C.5 – Not applicable; an over-pressurization condition inside the reactor confinement module, radioisotope processing module, target fabrication module, or radwaste module buildings is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis.

Regulatory Guide 1.45, positions C.1.1 through C.2.5 – Acceptable; the VIPR coolant pressure boundary leakage detection systems are selected and designed in accordance with the guidelines of this regulatory guide. Availability of the instrumentation that detects radiation within the leakage is addressed in Technical Requirements Manual TRO 3.3, “Instrumentation Systems.” Operability of the instrumentation that detects RCS boundary leakage is addressed in Technical Specification LCO 3.3.10, “RCS Leakage Detection Instrumentation (RLD).”

Regulatory Guide 1.45, positions C.3.1 through C.3.4 – Acceptable; see FSAR Chapter 13, Appendix A, RCS System Leak Detection Program.

Regulatory Guide 1.45, position C.4 – Acceptable; see Technical Specifications LCO 3.4.6 “RCS Operational Leakage.” For application to ASME Class 3 and non-ASME piping, the piping, supports, and structures have been designed with sufficient margins against failure for SSE transients, with adequate preservice and in-service inspection requirements to be specified either in the Atomic Alchemy ISI/IST program or the Maintenance Rule program (see FSAR Chapter 13, Appendix A) .

Adjacent structures and components where failure could lead to an indirect piping failure of a system important to safety are also designed as Seismic Cat-II.

Regulatory Guide 1.52, positions C.1 through C.7 – Exceptions as noted; the Atomic Alchemy Reactor Confinement Module does not require engineered safety feature atmosphere cleanup systems to meet limits on doses offsite or onsite. The reactor confinement air filtration system (RCF) is a non-safety-related system. However Atomic Alchemy commits to comply with some of the requirements in this regulatory guide for conservatism, and good business practice purposes. The Atomic Alchemy Control Room Atmospheric Cleanup (made up of the CRE and CRF) system is safety-related and the requirements for compliance of this position are acceptable. Atomic Alchemy Startup testing will comply with the testing requirements of the remainder of this regulatory guide for the non-safety-related air filtration systems.

Regulatory Guide 1.69, positions C.1 through C.3 – Acceptable; See FSAR chapter 12, Section 3 for radiation protection design features and shielding design methodology.

Regulatory Guide 1.89, position C.1 – Exceptions as noted; this guide has not been revised since 1984, it endorses a 1970s version of an industry standard (IEEE-323-1974). See FSAR Chapter 3, Table 3.11-01 "Environmentally Qualified Electrical and Mechanical Equipment." Atomic Alchemy's mechanical and electrical components identified in Table 3.11-01 are qualified by design to perform their required functions under the appropriate environmental effects of normal, abnormal, accident, and post-accident conditions as required by General Design Criterion 4 and will be discussed in FSAR Chapter 3, Appendix 3E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment." For mild environments, the area conditions are postulated not to change as a result of a transient identified in the Chapter 15 accident analysis. There are no degrading environmental effects that lead to common mode failure of equipment in mild environments. Mechanical and electrical equipment located in harsh environmental zones are designed to perform under the appropriate environmental conditions defined for those area.

Regulatory Guide 1.89, position C.2, C.3, C.4, C.5 – Exceptions as noted; Atomic Alchemy will comply with latest revision of IEEE-323. This version is not endorsed by the regulatory guide, but its use should not result in deviations from the design philosophy otherwise stated in Regulatory Guide.

Regulatory Guide 1.89, position C.6, C.7 – Acceptable; Atomic Alchemy QAPD, Criterion VII, Section 7.9, addresses like for like replacements of components.

Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in Regulatory Guide. The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, "Emergency Plan." See FSAR Chapter 7, Section 7, subsection, "Variable Categories, Classifications and Requirements" for a description of type F variables that are monitored by the Operations and Control Systems (IOC).

Regulatory Guide 1.112, positions C.1 through C.5 – Exceptions as noted; Atomic Alchemy determines source terms using Regulatory Guide 1.183. See Technical Specifications Programs 5.6.5 "Radiation Protection Program," 5.6.5.1 "Radiation Safety," 5.6.5.2 "Respiratory Protection

Program," and 5.6.5.3 "Nuclear Criticality Safety Program" for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable in accordance with the requirements of 10 CFR 20.1302, 10 CFR 50.34a, and Appendix I to 10 CFR Part 50.

Regulatory Guide 1.140, positions C.1 and C.2 – Exceptions as noted; the Atomic Alchemy reactor confinement air filtration system (RCF), Reactor Auxiliary Module Cascade Exhaust System (RAE), Process Production Module Air Filtration Systems (PMF), Mo-99 Target, Production, and Processing Module Air Filtration System (TPF), and the Radwaste Module Air Filtration system (WHF) are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases. However, for conservatism, and good business practice, Atomic Alchemy implements ASME AG-1-2009, including 2010 Addenda, 1a and 2011 Addenda 1b and ASME N511-2007, ASME N509, N510 and ASME AG-1 in the design, construction, acceptance testing, quality assurance, and in-service testing of normal atmosphere cleanup systems and components to minimize ORE. The above standards also apply to the safety related ventilation systems of the main control room (Control Room Emergency Habitability System (CRE) and the Control Room Emergency Ventilation and Filtration System (CRF).

Regulatory Guide 1.140, positions C.3 – Exception as noted; the Atomic Alchemy air filtration systems RCF, RAE, PMF, TPF, and WHF are non-safety-related systems. The purpose of these filter ventilation systems is to control normal operating releases. For conservatism, the design of these systems, however, will conform to ASME AG-1b-2009. The above standards also apply to the safety related ventilation systems of the main control room (Control Room Emergency Habitability System (CRE) and the Control Room Emergency Ventilation and Filtration System (CRF).

Regulatory Guide 1.140, positions C.4 – Acceptable; Atomic Alchemy ventilation filtration design initial qualification testing will conform to Division II of ASME AG-1b-2009. See FSAR Chapter 14, Section 3, subsections "Major Safety-Related Reactor Systems and Components to be Tested as Part of Pre-Operational Testing," and "Major Non-Safety Related Reactor Systems and Components to be Tested as Part of Pre-Operational Testing," and FSAR Chapter 14, Section 4, Subsection "Major Safety-Related Radioisotope Process Systems and Components to be Tested as Part of Pre-Operational Testing."

Regulatory Guide 1.140, positions C.5 through C.7 – Acceptable; Atomic Alchemy ventilation design will conform to ASME AG-1a-2000. Atomic Alchemy implements the latest revision of ASME N509 and N510 in the maintenance and testing of the ventilation filtration systems.

Regulatory Guide 1.143, positions C.1 through C.7 – Acceptable; See FSAR Chapter 3, Section 8, "Design of Seismic Category I Structures" for a description of the seismic and structural design requirements of the Atomic Alchemy Radwaste Module Building. See FSAR Chapter 11, Sections 4-6, for the description of Quality Assurance, Testing and Inspection requirements for processing Gaseous, Liquid and Solid radwaste. See FSAR Chapter 13, Appendix A for the Radwaste program which will conform with 10 CFR 61.55 and 10 CFR 61.56 for wet and solid wastes, 10 CFR 71 for both wet and dry solid wastes, and 10 CFR 20.1406 for overall methodology to minimize contamination and the generation of radioactive waste. (Also see Atomic Alchemy regulatory commitment AA0-RC-0013, submitted in the QAPD topical report AA0-VIPR-20-QAPD (NP) Rev 0.)

Regulatory Guide 1.183, positions C.1 through C.6 – Exceptions as noted; the values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the Atomic Alchemy NPUF design, as the parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the Atomic Alchemy AST. FSAR Chapter 15, Appendix B, "Removal of Airborne Activity from the Reactor Confinement Module Atmosphere Following Severe / Beyond Design Basis Accident" and FSAR Chapter 15 Appendix C, "Removal of Airborne Activity from the Radioisotope Process Production Module, Target Fabrication Module and Radwaste Processing Module Atmosphere Following Severe / Beyond Design Basis" address the dispersion of radionuclides from the reactor cores, spent fuels, and radioisotope processes under various postulated transients.

Regulatory Guide 1.183, Appendix A, position 1 through 6 – Not applicable; the Atomic

Alchemy VIPR design does not have: "dual containment," "primary containment sump water (in PWRs) or a suppression pool (in BWRs)," and "main steam isolation valves."

Regulatory Guide 1.183, Appendix A, position 7 - Not applicable; the VIPR has no potential for a post-accident LOCA hydrogen or combustible gas buildup. However, a non-safety combustion gas monitoring system is employed, and the non-safety-related fire protection smoke exhaust system can be utilized to purge any combustible gases, and natural convection will minimize any accumulation of combustible gases inside the confinement building module.

Regulatory Guide 1.183, Appendix B, positions 1 through 5 – Exceptions as noted; Atomic Alchemy will utilize the methodology described in this guide. The Atomic Alchemy NPUF design does not include a separate spent fuel building, nor does it include a containment structure, as both the reactor core and spent fuel are located in the same light water pool open to the atmosphere of the confinement model building. The reactor confinement module building is presumed to be isolated at all times through the use of airlocks. An ESF filtration system is not part of the design, and a non-safety-related filtration system is used for normal releases.

Regulatory Guide 1,183, Appendix C through H, Not applicable; the postulated accidents are not credible transients in the Atomic Alchemy FSAR chapter 15 analysis.

Regulatory guide 1.183, Appendix I – Exceptions as noted; basic assumptions and dose models will be conservatively applied to the evaluation of the aging effects by radiation on Atomic Alchemy EEQ components. See FSAR chapter 3, Appendix E, "Methodology for Qualifying Safety Related Electrical and Mechanical Equipment."

Regulatory Guide 4.21, positions C.1 – Acceptable; Atomic Alchemy minimizes contamination through the use of procedural processes and administrative controls during normal reactor operation, target fabrication, radioisotope production, and radwaste processing including anticipated operational occurrences. Technical Specification 5.6.4, "RCS and Light Water Pool Leakage Rate Testing Program" ensures prompt detection of leakage. Technical Specification 5.6.1, "Offsite Dose Calculation Manual" provides leakage detection surveillances and limited conditions of operation on all potential leakage sources, including the radioisotope, target fabrication and radwaste processes.

Regulatory Guide 4.21, positions C.2 – Acceptable; the Atomic Alchemy Tech Spec and other QAPD related administrative control programs minimizes the potential for environmental contamination. FSAR Chapter 1, Appendix F, "Non-power Reactors on Multi-module Sites" provides administrative controls to monitor the site configuration during and following construction to aid in preventing the offsite migration of radionuclides via an unmonitored pathway.

Regulatory Guide 4.21, positions C.3 – Acceptable; Atomic Alchemy FSAR Chapter 21, Appendix A will address decommissioning contamination concerns.

Regulatory Guide 4.21, positions C.4 – Acceptable, the Atomic Alchemy QAPD Section IX ALARA program periodically reviews procedural processes to improve controls to minimize onsite and offsite radiological doses.

Regulatory Guide 8.2, position C – Acceptable; this regulatory guide summarizes the requirements contained in 10 CFR Part 20, Subpart B, Subpart F, and Subpart L. Atomic Alchemy addressed 10 CFR Part 20, Subparts B and F above. The Atomic Alchemy QAPD, Criterion XVII, will describe the conformance to the requirements of Subpart L, for maintaining adequate records and record management for radiation protection. The QAPD Document Control Program and the Nuclear Document Records Retention Program ensure conformance to these requirements. See QAPD 1.1.2, "Nuclear Services Training Group," which details how personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Technical Specifications Program 5.6.5 "Radiation Protection Program" incorporates the elements listed in the regulatory guide.

Regulatory Guide 8.8, positions C.1 through C.4 – Acceptable; Atomic Alchemy will describe the policies, common major equipment and component design features, contamination control, radioactive material control, radiation zoning and access control, shielding, environmental and personnel monitoring, etc. in FSAR Chapter 12.

Regulatory Guide 8.10 – positions C.1 through C.3 – Acceptable; guidance associated with this regulatory guide is basically a summary of regulatory codes and other regulatory guide requirements used to describe to the methods that the staff considers acceptable for use in implementing specific parts of the agency's regulations related to ALARA. Atomic Alchemy ALARA related programs are robust and will meet the highest standards for ensuring radiation safety.

Regulatory Guide 8.19, position C – Acceptable; Atomic Alchemy FSAR chapter 12, Section 4, Tables 12.4-01 through 12.4-12 provide the dose estimates for both the NPUF reactors and the radioisotope processes (including target fabrication and radwaste) for routine operations, inspections, surveillances, maintenance, special maintenance, ASME Section XI inspections, and reactor refueling operations.

Regulatory Guide 8.25, positions C.1 through C.6 – Acceptable; the Radiation Monitoring and Alarm System (IRM) provides plant effluent monitoring, process fluid monitoring, airborne monitoring, and continuous indication of the radiation environment in facility areas where such information is needed. Radiation monitors that have a safety-related function are qualified environmentally, seismically, or both. While the radiation monitoring system is primarily a surveillance system,

certain detector channels perform safety-related functions. The components used in these channels meet the qualification requirements for safety-related equipment and will be described in FSAR Chapter 7. The radiation monitoring and alarm system will be designed in accordance with ANSI N13.1. The process monitors are designed in accordance with ANSI-N42.18.

R.G. 8.38, positions C.1 through C.4 – Acceptable; the Atomic Alchemy Technical Specifications Program 5.6.5 "Radiation Protection Program" incorporates the elements listed in the regulatory guide. Administrative Controls are developed to control entry and include areas locked to limit access, and alarms and signals that alert workers to or prevent unauthorized entry into radiation areas, high radiation areas, and very high radiation areas. Equipment in high radiation areas is operated infrequently and are provided with remote operational devices. For potentially high radiation components (such as ion exchangers, filters and spent resin tanks), design features such as shielded compartments with hatch openings or removable shield walls are used. The programmatic controls for access to high radiation areas conform to 10 CFR Part 20, Subpart G requirements. Technical Specification Administrative Control section 5.9 "High Radiation Areas" implements the controls as provided in paragraph 10 CFR 20.1601(c).

Atomic Alchemy compliance with all NUREG-0737 items is addressed in FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Pertinent items associated with this SRP are described below:

NUREG-0737 Action Items II.B.2 – Acceptable; Atomic Alchemy FSAR Chapter 12, Section 3, "Radiation Protection Design Features" will describe the methodology of how the facility areas are categorized into radiation zones according to design basis radiation levels and anticipated personnel occupancy with consideration given toward maintaining personnel exposures ALARA and within the standards of 10 CFR 20. Rooms, corridors, piping chases, and other areas are evaluated for potential radiation sources during normal, shutdown, and emergency operations and for maintenance occupancy requirements.

NUREG-0737 Action Item II.F.1 – Acceptable; Technical Specifications Program 5.6.5, "Radiation Protection Program" administratively controls sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points. The Radiation Monitoring and Alarm System (IRM) provides indication in the MCR.

NUREG-1430 – Not applicable; Atomic Alchemy Technical Specifications are based on NUREG-1431.

NUREG-1431 – Exceptions as noted; guidance for Technical Specifications' formatting for non-power light water reactors is provided in NUREG-1537, which invokes the format in ANSI/ANS-15.1. The ANS-15.1 Standard guidance was reviewed as part of the creation of the Atomic Alchemy T/S. Keeping with Atomic Alchemy's commitment to quality excellence, a more robust regulatory approach to the Atomic Alchemy Technical Specifications was also taken. Although Atomic Alchemy's non-power [ ] PROP light water VIPRs do not have a NSSS vendor with an accompanying staff approved Standard Technical Specification (STS) format to follow, Atomic Alchemy has determined to create a hybrid T/S format based on the formatting of the Standard Technical Specification (STS) found in NUREG-1431. Supplemental Technical Specification formatting as outlined in ANSI/ANS-15.1 will be incorporated where deemed necessary. The Atomic Alchemy content will differ from the requirements of NUREG-1431, 10 CFR 50.36 and 10 CFR 70.61 only as necessary to reflect technical differences between a PWR power reactor design and the Atomic

Alchemy non-power reactor design. Additional Technical Specifications for the radioisotope, radiochemical, and chemical processing that will be conducted outside of the VIPR module buildings, but within the Atomic Alchemy facility, will also be derived from the Accident Analysis in FSAR Chapter 15 and will be included in this hybrid Technical Specification.

NUREG-1432 – Not applicable; Atomic Alchemy Technical Specifications are based on NUREG-1431.

NUEG-1433 – Not applicable; Atomic Alchemy Technical Specifications are based on NUREG-1431.

NUREG-1434 – Not applicable; Atomic Alchemy Technical Specifications are based on NUREG-1431.

NUREG-0800 SRP 12.5, Rev 5 Operational Radiation Protection Program

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 7.7, SRP 11.1.2 SRP 11.1.4, SRP 11.1.5, SRP 11.1.6, SRP 11.2.1 SRP 11.2.2	10 CFR 19.12, 10 CFR 19.13, 10 CFR 20.1003, 10 CFR 20.1101, 10 CFR 20.1201, 10 CFR 20.1202, 10 CFR 20.1203, 10 CFR 20.1204, 10 CFR 20.1206, 10 CFR 20.1207, 10 CFR 20.1208, 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR 20.1406, 10 CFR 20.1501(b), 10 CFR 20.1501(c), 10 CFR 20.1502, 10 CFR 20.1601, 10 CFR 20.1602, 10 CFR 20.1701, 10 CFR 20.1702, 10 CFR 20.1703, 10 CFR 20.1801, 10 CFR 20.1802, 10 CFR 20.1901, 10 CFR 20.1902, 10 CFR 20.1903, 10 CFR 20.1904, 10 CFR 20.1905, 10 CFR 20.1906,	Exceptions as noted

	10 CFR 20.2001, 10 CFR 20.2006, 10 CFR 20.2101, 10 CFR 20.2102, 10 CFR 20.2103, 10 CFR 20.2104, 10 CFR 20.2105, 10 CFR 20.2106, 10 CFR 20.2107, 10 CFR 20.2110, 10 CFR 20.2201, 10 CFR 20.2202, 10 CFR 20.2203, 10 CFR 20.2204, 10 CFR 20.2205, 10 CFR 20.2206, 10 CFR 50.34(b)(3), 10 CFR 50.34(f)(2)(viii), 10 CFR 50.34(f)(2)(xxvi), 10 CFR 50.34(f)(2)(xxvii), 10 CFR 50.65(a), 10 CFR 50.120, 10 CFR Part 71 Subpart G, 10 CFR Part 71 Subpart H, 29 CFR 1910.134, GDC 64, R.G. 1.8, R.G. 1.33, R.G. 1.97, R.G. 8.2, R.G. 8.4, R.G. 8.7, R.G. 8.8, R.G. 8.9, R.G. 8.10, R.G. 8.13, R.G. 8.15, R.G. 8.27, R.G. 8.29, R.G. 8.34, R.G. 8.35, R.G. 8.36, R.G. 8.38, R.G. 1.160, NUREG-0041, NUREG-0731, NUREG-0737 Action Items II.B.3, III.D.3.3, NUREG-1736	
Summary Description of Compliance/Exceptions		
SRP 12.5 – General design description; Atomic Alchemy's Technical Specification programs, 5.6.5 "Radiation Protection Program," 5.6.5.1, "Radiation Safety Program," 5.6.5.2, "Respiratory Protection Program," and 5.6.5.3, "Nuclear Criticality Safety Program," along with the QAPD Criterion XIV health physics program, will form the basis of the administrative and procedural		

controls, design features, and access control methods that implement operational ALARA at the Atomic Alchemy facility. FSAR Chapter 12, Section 3 will describe the specific radiation protection design features utilized for facility process and layout situations for maintaining personnel exposure ALARA under normal operations, shutdown, and postulated accident conditions. FSAR Chapter 12, Section 4, will describe the anticipated occupational radiation exposure (ORE) due to normal operation and anticipated inspections and maintenance evolutions. Exposure data and radiation field data obtained from operating nuclear power plants have been reviewed to obtain a breakdown of the doses incurred due to normal operations, surveillances, and maintenance functions within each category. Due to the differences between a power reactor and NPUF reactor, the anticipated Atomic Alchemy dose estimates in FSAR Tables 12.4-01 through 12.4-12 are significantly less than a power reactor. Anticipated dose limits for the radioisotope process (including target fabrication and radwaste) will also be included in FSAR Chapter 12 Section 4 Tables.

10 CFR 19.12, 10 CFR 19.13 – Acceptable; employees and individuals are informed of the location of radioactive materials through programmatic and administrative controls, including locked radiation areas, magenta and yellow signs, warning lights and alarms etc. Many of the engineers and supervisors assigned to the Atomic Alchemy NPUF reactor and radioisotope process design have performed similar design work or service work on other nuclear power plants. Through this experience, they have acquired knowledge of the radiation protection aspects which are applied to the Atomic Alchemy facility. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The Rad-Worker Radiation Permit System (ERW) monitors and tracks employees' dosimetry.

10 CFR 20.1003 – Exceptions as noted; the definitions used in the Atomic Alchemy Offsite Dose Calculation Manual are based on the guidance in NEI ODCM Template 07-09A, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description."

10CFR20.1101(b) – Acceptable; See Technical Specifications Programs 5.6.5 Radiation Protection Program, 5.6.5.1 Radiation Safety, 5.6.5.2 Respiratory Protection Program, and 5.6.5.3 "Nuclear Criticality Safety Program" for Atomic Alchemy's in-plant control measures to maintain environmental releases of radioactive materials in gaseous and liquid effluents as low as is reasonably achievable. FSAR Chapter 12, Section 3 will describe the specific radiation protection design features utilized for facility process and layout situations for maintaining personnel exposure ALARA under normal operations, shutdown, and postulated accident conditions.

10 CFR 20 Subpart C - Acceptable; radiation exposures to operating personnel are restricted to be within the limits of 10 CFR 20. FSAR Chapter 12 Section 3 will describe the health physics program and the radiation protection features that will be used together to maintain occupational radiation exposures ALARA. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employees' dosimetry. See FSAR Tables 12.4-01 through 12.4-04 for dose estimates for routine operations, inspections, surveillances, and maintenance for the NPUF reactors and radioisotope processes (including target fabrication and radwaste). Additional tables are provided in FSAR Chapter 12, Section 4 for dose estimates for ASME Section XI in-service inspections, special maintenance operations, and refueling.

10 CFR 20 Subpart D – Acceptable; Atomic Alchemy will provide administrative control and procedural programs to monitor public exposures. The Offsite Dose Calculator Manual program "Radioactive Process Effluent Control Program" will conform to 10 CFR 50.36a and Regulatory Guide 1.21 for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents within the limits of 10 CFR Part 20.

10 CFR 20.1406 – Acceptable; the Atomic Alchemy Radioactive Liquid Waste Collection System (RLW) will be designed to minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. This is accomplished through the selection of specific design technology for the system, and the ability to upgrade the system using whatever advanced technology that becomes available throughout the life of the facility.

10 CFR 20 Subpart F – Acceptable; Atomic Alchemy dosimetry, radiation surveying, and equipment used for quantitative radiation measurements will conform to the requirements of this regulation. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employee's dosimetry.

10 CFR 20 Subpart G – Acceptable; Atomic Alchemy will provide administrative controls and procedural programs for dosimetry, radiation surveying, and equipment used for quantitative radiation measurements will conform to the requirements of this regulation. The health physics personnel are responsible for determining area contamination and airborne readings prior to any tasks being performed. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The ERW monitors and tracks employee's dosimetry.

10 CFR 20 Subpart H – Acceptable; Atomic Alchemy will provide administrative controls, procedural programs, and engineered design features (controls) to restrict and minimize internal exposures. The reactor confinement air filtration system (RCF), Process Production Module Air Filtration Systems (PMF), Mo-99 Target, Production, Processing Module Air Filtration System (TPF) and the Radwaste Module Air Filtration system (WHF) are non-safety-related systems provided to minimize airborne contamination. The purpose of these radiological filter ventilation systems is to control normal operating air-borne releases only. Respiratory programmatic controls are also provided in Technical Specifications program 5.6.5.2 "Respiratory Protection Program." The T/S program is developed based on NUREG-0041, "Manual of Respiratory Protection against Airborne Radioactive Materials" and regulatory guide 8.15, "Acceptable Programs for Respiratory Protection." These regulatory guidance documents provide the program elements for the Atomic Alchemy Respiratory Protection Program.

10 CFR 20 subpart I – Acceptable; the Atomic Alchemy QAPD Section XIII program "Material Control and Accountability Program" is developed from the criteria of ANSI N15.8-2009, "Methods of Nuclear Material Control - Material Control Systems - Special Nuclear Material Control and Accounting Systems for Nuclear Power Plants."

10 CFR 20 Subpart J – Acceptable; Atomic Alchemy uses the posting and labeling conventions described in this regulation. This conformance is identified in the QAPD Criterion XIII, section 13.7, for packaging, shipping, and handling. Special Handling and Storage procedures are established by

Atomic Alchemy for opening, handling, and storing packages, materials and other items that will require special handling due to radioactive concerns. Atomic Alchemy implements facility wide separations and boundaries using conspicuous signs bearing the appropriate radiation symbols and wording for the level of safety significance, these administrative controls are provided by Technical Specification programs 5.6.5, “Radiation Protection Program” and 5.6.5.1, “Radiation Safety Program.”

10 CFR 20 Subpart K – Acceptable; Atomic Alchemy will develop a radioactive waste control program in compliance with 10 CFR 61.55, 10 CFR 61.56, and 10 CFR 71. This is identified as regulatory commitment AA0-RC-0013. Atomic Alchemy QAPD Section 1.1.2, organization “Radiation Protection and Waste Services Group” carries out the functions required for managing radioactive waste and disposal. QAPD Criterion XIII, Subsection 13.7.2 will describe the processing, packaging, and disposal of radioactive waste. These functions are administratively controlled by the Radioactive Waste Program. Atomic Alchemy employs specific methods and procedures to ensure that all liquid and wet wastes in storage will be stabilized in accordance with the Radwaste Program before processing for offsite shipment. The Atomic Alchemy onsite waste storage facilities provide sufficient storage capacity to allow time for shorter lived radionuclides to decay before packaging and shipping.

10 CFR 20 Subpart L – Acceptable; The Atomic Alchemy QAPD, Criterion XVII, will describe the conformance to the requirements for maintaining adequate records and record management for radiation protection. The QAPD Document Control Program and the Nuclear Document Records Retention Program ensure conformance to these requirements. See QAPD 1.1.2, “Nuclear Services Training Group,” which describes how personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Technical Specifications Program 5.6.5 “Radiation Protection Program” incorporates the elements listed in regulatory guide 8.2.

10 CFR 20 Subpart M – Acceptable; Atomic Alchemy FSAR Chapter 13, Section 8, “Reports,” subsection “Regulatory Reports” will describe the 10 CFR 20 Subpart M required notifications for radiological incidents, excessive dose rates and exceeding limits, planned exposures, and transactions involving radioactive materials. Additional reporting requirements are met by the Offsite Dose Calculation Manual ODM 5.7.1, “Annual Radiological Environmental Operating Report” and ODM 5.7.2, “Radioactive Effluent Release Report.”

10 CFR Part 30, Part 40, and Part 70 – Acceptable; with respect to this SRP, Atomic Alchemy will provide administrative controls on the receipt, storage and use of byproduct, source, and special nuclear material through its “Special Nuclear Material Accounting and Control Program,” see FSAR Chapter 13, Appendix A for a further description.

10 CFR 50.34(b)(3) – Acceptable; Atomic Alchemy uses QAPD-level programs and administrative controls as the means for controlling and limiting radioactive effluents and radiation exposures from the types and quantities of radioactive materials and products expected to be produced in the operation of the NPUF reactors and radioisotope processes. See QAPD Section VIII, “Materials, Equipment, and Parts List (MEPL) Program,” and “Special Nuclear Material Accounting and Control Program,” QAPD Section XIII, “Chemical Process Safety & Surveillance Program,” “Radioactive Waste

Program," and ODM 5.6.1 "Radioactive Process Effluent Control Program" and ODM 5.6.1.1 "Radiological Environmental Monitoring Program (REMP)." The Atomic Alchemy REMP monitors radiological contaminants from both air and liquid point sources, as well as collects and analyzes environmental samples from numerous locations throughout the site and the surrounding area.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 12.5 regulations compliance/exceptions.

(2)(viii) – Acceptable; the Atomic Alchemy VIPR sits in an open-to-atmosphere light water pool, and the primary method to sample the RCS would be to draw a sample directly from the pool top. If this is not available due to high radiation exposures, the alternate method would be to draw a sample from the Chemical Volume and Control (CVC) room located in the reactor auxiliary module building. Sampling analysis is performed in the Radioactive Sampling room located in the Administrative Services Module building using a glove box pass through to the Reactor Auxiliary Module building.

(f)(2)(xxvi) – Acceptable; The Atomic Alchemy VIPR coolant pressure boundary leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, RCS System Leak Detection Program. Also see Technical Specification Administration Section 5.6.4 "RCS and Light Water Pool Leakage Rate Testing Program" and Limited Conditions of Operation LCO 3.3.10 "RCS Leakage Detection Instrumentation" (RLD), LCO 3.4.6 "RCS Operational Leakage (RLD)," and LCO 3.7.6 Reactor Coolant/Light Water Pool Leak Collection System (RLC).

(f)(2)(xxvii) – Acceptable; the Atomic Alchemy nominal range of radiation detectors are provided in FSAR Table 11.06-01 "Radiation Monitor Detector Parameters" and Table 11.06-02, "Area Radiation Monitor Detector Parameters."

10 CFR 50.65(a) – Acceptable; the Atomic Alchemy Maintenance Rule program is described in QAPD Part V and QAPD Criterion Section XIV programs. See Atomic Alchemy QAPD Table 2 for regulatory commitment AA0-RC-0015 which is the Atomic Alchemy Maintenance Rule Program.

10 CFR 50.120 – Acceptable; See QAPD Section 1.1.2, "Nuclear Services Training Group." Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine if individuals are properly trained and qualified. Training for positions identified in this 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" and ANSI/ANS 15.4-2016, "Selection and Training of Personnel for Research Reactors" criteria. Also see regulatory commitment AA0-RC-0004, "NUPF Operator Training and Requalification Program" in QAPD Table 2, where Atomic Alchemy implements additional training requirements and requalification for radioisotope process workers and hot cell and glove box operators.

10 CFR Part 71 Subpart G – Acceptable; Atomic Alchemy demonstrates conformance to the requirements of this Subpart in its NQA-1 level QAPD. QAPD Criterion VIII and Criterion XIII. The

Material Control and Accountability Program, Special Nuclear Material Accounting and Control Program, and the Materials, Equipment, and Parts List (MEPL) Program of Section VIII and the Package Design Control Program, Radioactive Waste Program, and Receipt Inspection Program of Section XIII ensure that radioactive materials (either products or waste) are handled appropriately through all phases of receipt, unpackaging, inspecting, packaging, and shipping. Inspections, tests, records, and reports are administratively controlled by the implementing procedures of these programs.

10 CFR Part 71 Subpart H – Acceptable; the Atomic Alchemy Quality Assurance Program exceeds the minimum requirements outlined for test and research reactors in NUREG-1537 (ANSI/ANS-15.8) for the design, procurement, fabrication, construction, testing, and operation of the Atomic Alchemy facility. The Atomic Alchemy QAPD implementing policies and procedures are designed and administered to meet the applicable requirements and standards of ASME NQA-1 2017 "Quality Assurance Requirements for Nuclear Facility Applications, ASME QME-1-2017 "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants" and the latest edition of the ASME BPV Code Section III 2017 quality standards.

29 CFR 1910.134 – Acceptable; the Atomic Alchemy Technical Specification program 5.6.5.2, "Respiratory Protection Program." The purpose of this Program is to establish a uniform set of guidelines to be implemented by Atomic Alchemy during the use of respiratory protection against radionuclides in order to comply with the specific regulations of 10 CFR 20 Subpart H.

GDC 64 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.8, position C.1 – Exceptions as noted; the Atomic Alchemy facility is not a nuclear power plant, and as such, training will be different. However, Atomic Alchemy meets the intent of this regulatory guide by providing robust training and qualifications programs. See QAPD 1.1.2, "Nuclear Services Training Group," which details how personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Additionally, Atomic Alchemy implements a NUPF operator radioisotope process training and requalification program (See Commitment AA0-RC-0004 in QAPD).

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in Regulatory Guide. The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, "Emergency Plan." See FSAR Chapter 7, Section 7, subsection, "Variable Categories, Classifications and Requirements" for a description of type F variables that are monitored by the IOC.

Regulatory Guide 8.2, position C – Acceptable; this regulatory guide summarizes the requirements contained in 10 CFR Part 20, Subparts B, Subpart F, and Subpart L. Atomic Alchemy addressed 10 CFR Part 20, Subparts B and F above. The Atomic Alchemy QAPD, Criterion XVII, will describe the conformance to the requirements of Subpart L, for maintaining adequate records and record management for radiation protection. The QAPD Document Control Program and the Nuclear Document Records Retention Program will ensure conformance to these requirements. See QAPD 1.1.2, "Nuclear Services Training Group," personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Technical Specifications Program 5.6.5 "Radiation Protection Program" incorporates the elements listed in the regulatory guide.

Regulatory Guide 8.4, positions C.1 through C.4 – Acceptable; the Atomic Alchemy will demonstrate conformance to the NRC's requirements for personnel monitoring devices through its QAPD (Criterion XIV program, "Health Physics Program") and Technical Specification program 5.6.5 "radiation protection program" which will describe its compliance with this regulatory guide.

Regulatory Guide 8.7, positions C.1 and C.2 – Acceptable; The Atomic Alchemy QAPD, Criterion XVII, will describe the conformance to the requirements for maintaining adequate records and record management for radiation protection and employee dosimetry. The QAPD Document Control Program and the Nuclear Document Records Retention Program ensure conformance to these requirements. Atomic Alchemy FSAR Chapter 13, Section 8, "Reports," subsection "Regulatory Reports" will describe the 10 CFR 20 Subpart M required notifications for radiological incidents, employee annual dose rates, excessive dose rates and exceeding limits, planned exposures, and transactions involving radioactive materials.

Regulatory Guide 8.8, positions C.1 through C.4, Acceptable; Atomic Alchemy will describe the policies, common major equipment and component design features, contamination control, radioactive material control, radiation zoning and access control, shielding, environmental and personnel monitoring, etc. in FSAR Chapter 12.

Regulatory Guide 8.9, positions C.1 through C.6 – Acceptable; Atomic Alchemy will demonstrate conformance to the methods acceptable to the NRC staff for estimating intake of radionuclides using bioassay measurements through QAPD (Criterion XIV program, "Health Physics Program") and Technical Specification (5.6.5 "Radiation Protection Program") programs. These programs meet the requirements of 10 CFR Part 20, subparts C, F, G, H, L, and M with respect to the requirements of this regulatory guide.

Regulatory Guide 8.10 – positions C.1 through C.3 – Acceptable; guidance associated with this regulatory guide is basically a summary of regulatory codes and other regulatory guide requirements used to describe to the methods that the staff considers acceptable for use in implementing specific parts of the agency's regulations related to ALARA. Atomic Alchemy's ALARA-related programs are robust and will meet the highest standards for ensuring radiation safety.

Regulatory Guide 8.13, positions C1 through C.5 – Acceptable; Atomic Alchemy demonstrates conformance to the methods for providing information to pregnant women and other personnel to help them make decisions regarding radiation exposure during pregnancy through its QAPD

(Criterion XIV program, “Health Physics Program”) and Technical Specification (5.6.5 “Radiation Protection Program”) programs. These programs will meet the requirements of 10 CFR Part 20, subparts C, L, and M with respect to the requirements of this regulatory guide.

Regulatory Guide 8.15, positions C.1 through C.6 – Acceptable; Atomic Alchemy demonstrates conformance to the NRC’s requirements for the use of respiratory protection equipment to limit the intake of radioactive material through its QAPD (Criterion XIV program, “Health Physics Program”) and Technical Specification (5.6.5 “Radiation Protection Program,” and 5.6.5.2 “Respiratory Protection Program”) programs. The T/S 5.6.5.2, “Respiratory Protection Program” incorporates the elements of NUREG/CR-0041, “Manual of Respiratory Protection Against Airborne Radioactive Material” and 10 CFR Part 20, subpart H with respect to the requirements of this regulatory guide.

Regulatory Guide 8.27, positions C.1 through C.4 – Acceptable; See QAPD 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine if individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, “Selection, Qualification, and Training of Personnel for Nuclear Power Plants” and ANSI/ANS 15.4-2016, “Selection and Training of Personnel for Research Reactors” criterion.

Regulatory Guide 8.28, positions C.1 through C.3 – Acceptable; Atomic Alchemy demonstrates conformance to the NRC’s requirements for audible alarming dosimeters through its QAPD (Criterion XIV program, “Health Physics Program”) and Technical Specification (5.6.5 “Radiation Protection Program”) programs.

Regulatory Guide 8.29, position C and Appendix – Acceptable; Atomic Alchemy demonstrates conformance to the NRC’s requirements in describing the information that should be provided to workers by licensees about health risks from occupational exposure through its QAPD (Criterion XIV program, “Health Physics Program”) and Technical Specification (5.6.5 “Radiation Protection Program”) programs. Pre-job briefs, radiation surveys, simulators, mockups, and procedures are used to ensure that workers minimize their exposure. These programs incorporate the necessary elements of 10 CFR Part 20, subparts B, C, and M with respect to meeting the requirements of this regulatory guide.

Regulatory Guide 8.34, positions C.1 through C.7 – Acceptable; Atomic Alchemy demonstrates conformance to the NRC’s requirements for calculating occupational doses for monitored individuals and provided criteria regarding which individuals should be monitored for radiation exposure through its QAPD (Criterion XIV program, “Health Physics Program”) and Technical Specification (5.6.5 “Radiation Protection Program”) programs. These programs incorporate the necessary elements of 10 CFR Part 20, subparts C, F, L, and M with respect to meeting the requirements of this regulatory guide.

Regulatory Guide 8.36, positions C.1 through C.3 – Acceptable; Atomic Alchemy demonstrates conformance to the NRC’s requirements for acceptable methods that may be used in determining the dose to the embryo/fetus through its QAPD (Criterion XIV program, “Health Physics Program”)

and Technical Specification (5.6.5 "Radiation Protection Program") programs. These programs incorporate the necessary elements of 10 CFR Part 20, subparts C, L, and M with respect to meeting the requirements of this regulatory guide.

R.G. 8.38, positions C.1 through C.4 – Acceptable; the Atomic Alchemy Technical Specifications Program 5.6.5 "Radiation Protection Program" incorporates the elements listed in this regulatory guide. Administrative Controls are developed to control entry and include areas locked to limit access and alarms and signals that alert workers to or prevent unauthorized entry into radiation areas, high radiation areas, and very high radiation areas. Equipment in high radiation areas is operated infrequently and are provided with remote operational devices. For potentially high radiation components (such as ion exchangers, filters and spent resin tanks), design features such as shielded compartments with hatch openings or removable shield walls are used. The programmatic controls for access to high radiation areas conform to 10 CFR Part 20, Subpart G requirements. Technical Specification Administrative Control section 5.9 "High Radiation Areas" implements the controls as provided in paragraph 10 CFR 20.1601(c).

Regulatory Guide 1.160, positions C.1 through C.4, Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance.

NUREG/CR-0041 – Acceptable; Technical Specifications program 5.6.5.2 "Respiratory Protection Program" is developed based on NUREG-0041, "Manual of Respiratory Protection against Airborne Radioactive Materials" and regulatory guide 8.15, "Acceptable Programs for Respiratory Protection." These regulatory guidance documents provide the program elements for the Atomic Alchemy Respiratory Protection Program.

NUREG-0731 – Exceptions as noted; this document presents guidelines for staffing levels and technical expertise considered to be essential to the NRC for operating a nuclear power plant. The Atomic Alchemy facility is a multi-reactor NPUF. The QAPD Part 1, Section 1.1.2, will describe the Atomic Alchemy key organizations, groups, and committees. In addition to the usual design engineering, emergency planning, training, regulatory affairs & licensing, radwaste, operations, and maintenance groups, Atomic Alchemy also includes both a Configuration Control Board (CCB) and a Plant Nuclear Safety Review Committee (PNSRC), whose function is the equivalent to a power reactor's PORC and SORC. The composition and minimum qualifications of the PNSRC members is described in QAPD Part I, Section 2. See QAPD Part VIII, Figure 1 for the organizational chart. The Atomic Alchemy design includes monitoring up to four VIPRs from a single control room along with radioisotope processing from an adjacent control room. This will be accomplished by human factors engineering and increased automation. Control room staffing is established to handle the highest level workload given consideration for the phased modular facility design

Atomic Alchemy compliance with all NUREG-0737 items is addressed in FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Pertinent items associated with this SRP 12.5 are described below:

Action Items II.B.3 – Acceptable; the Atomic Alchemy VIPR sits in an open-to-atmosphere light water pool, and the primary method to sample the RCS would be to draw a sample directly from the pool

top. If this is not available due to high radiation exposures, the alternate method would be to draw a sample from the CVC room located in the reactor auxiliary module building. Sampling analysis is performed in the Radioactive Sampling room located in the Administrative Services Module building using a glove box pass through to the Reactor Auxiliary Module building. Action Item III.D.3.3 – Acceptable; the Atomic Alchemy nominal range of radiation detectors are provided in FSAR Table 11.06-01 “Radiation Monitor Detector Parameters” and Table 11.06-02, “Area Radiation Monitor Detector Parameters.” NUREG-1736 – Not applicable; the document is just a consolidation of existing regulatory guides and codes and contains no new requirements. Atomic Alchemy has summarized its conformance to or exceptions to guides and codes that are contained in this document in other sections of this document. NUREG-0938 – Acceptable; Atomic Alchemy will demonstrate conformance to the NRC’s requirements for calculating tritium exposure and doses for monitored individuals and provided criteria regarding which individuals should be monitored for tritium exposure through its QAPD (Criterion XIV program, “Health Physics Program”) and Technical Specification (5.6.5 “Radiation Protection Program”) programs.

13. CONDUCT OF OPERATIONS

NUREG-0800 SRP 13.1.1, Rev 6 Management and Technical Support Organization

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.1, SRP 12.12	10 CFR Part 50, Appendix B 10 CFR 50.34(a)(6) and (9) 10 CFR 50.34(b)(6)(i), (ii), (iii), and (iv), 10 CFR 50.34(f)(3)(vii), 10 CFR 50.40(b), 10 CFR 50.48(a)(1)(ii), 10 CFR 50.71, 10 CFR 50.80, as applicable , 10 CFR 52.47(a)(7) 10 CFR 52.79(26), (27), (28), and (29)(i), R.G. 1.8	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 13.1.1 – General design description: Atomic Alchemy FSAR Chapter 13 will describe the processes to establish and maintain a staff of sufficient size and technical competence that can safely operate the facility and will provide reasonable assurance of adequate protection of the public health and safety.		

10 CFR Part 50, Appendix B – Acceptable; the Atomic Alchemy QAPD follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, "Quality Assurance Program Requirements for Nuclear Facilities" and QME-1-2017, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants." The QAPD will describe the managerial and administrative controls used to assure safe operation and conformance to Appendix B.

10 CFR 50.34(a)(6)(9) and 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv) – Acceptable; Atomic Alchemy QAPD Section 1.1 will describe the Atomic Alchemy organizational structure, functional responsibilities, levels of authority, interfaces, and technical qualifications required for training of personnel, and conducting the facility's operations safely.

The QAPD will describe the managerial and administrative controls used to assure safe operation and conformance to Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

FSAR Chapter 14 will describe the overall objective of the initial test programs that will demonstrate that the facility has been constructed as designed, that the systems perform consistent with the facility's design, and that activities culminating in operation at full licensed reactor power including initial fuel load, initial criticality, and power ascension are performed in a controlled and safe manner. The testing plans also include the major safety related radioisotope process systems and components required to be tested to ensure safe processing of radioisotope products and management of radwaste.

Atomic Alchemy QAPD Part V will describe the maintenance rule program that will be utilized for conducting maintenance, surveillance, and periodic testing of structures, systems, and components.

10 CFR 50.34(f) – Acceptable; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 13.1.1 regulations compliance/exceptions.

(3)(vii) – Exceptions as noted; Atomic Alchemy does not interface with an NSSS company. FSAR Chapter 13, Section 2, will describe the engineering, procurement and construction and project management, development of initial testing and commissioning management that occurs during the construction phases. Construction performance and the procurement of materials and equipment (modules, engineered components, ASME III materials, and highly engineered materials) are administratively monitored to provide objective data to management in order to identify problems early and develop proper corrective actions and solutions. Atomic Alchemy QAPD Section 1.1.1 will describe the key roles of management and organizations with respect to construction and the transition to operations. The General Manager of Construction Services (GMCS) reports to the Chief Operating Officer and is responsible for all of Atomic Alchemy's and their consortium partners' construction activities. The Nuclear Design Engineering Services Group (NDESG) is responsible for multi-discipline design engineering functions, supporting activities, engineering programs, and configuration management including design and configuration control, engineering technical support, systems engineering, and material engineering.

FSAR Chapter 14 will describe the overall objective of the initial test programs that will demonstrate that the facility has been constructed as designed, that the systems perform consistent with the

facility's design, and that activities culminating in operation at full licensed reactor power including initial fuel load, initial criticality, and power ascension are performed in a controlled and safe manner. The testing plans also include the major safety related radioisotope process systems and components required to be tested to ensure safe processing of radioisotope products and management of radwaste. Plant operating, emergency, and surveillance procedures are also incorporated into the initial test program procedures.

Prior to hot functional testing, Atomic Alchemy will prepare a Functional Area and Baseline Inspection Readiness Report. This report and NRC inspection coordination plan presents the basis for supporting the conclusion that the requirements of 10 CFR 50.57(a)(1), 10 CFR 50.57(a)(2), and 10 CFR 50.57(a)(3)(ii) have been satisfied and there are no outstanding issues for which the licensee has not developed adequate corrective actions.

10 CFR 50.40(b) – Not applicable; with respect for consideration of financial qualifications. Atomic Alchemy is applying for a Class 103 license under 10 CFR 50.22. The construction license application will comply with the applicable requirements of 10 CFR Part 50 and NUREG-0800. The scope of compliance will also include applicable conformance to 10 CFR Part 50 Appendix A, 10 CFR Part 50 Appendix B and the Regulatory Guides. The general and technical content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR 70.22. The regulations require that the construction permit application contain a PSAR, and an Environmental Report as addressed in 10 CFR 51.50 and NUREG-1555.

10 CFR 50.48(a)(1)(ii) – Acceptable; Atomic Alchemy implements the requirements for the fire protection plan in accordance with Regulatory Guide 1.189 Rev 3, "Fire Protection for Operating Nuclear Power Plants." FSAR Chapter 9, Appendix A, "Fire Protection Plan" Section "Fire Protection Plan Organization, Staffing and Responsibilities" will describe the various positions within the organization that are responsible for this program.

10 CFR 50.71 – Acceptable; Atomic Alchemy FSAR Chapter 13, Section 7, "Reports," Technical Specification Admin Section 5.7 "Reporting," Offsite Dose Calculation Manual Admin Section 5.7, "Reporting," and Technical Requirements Manual Admin Section 5.7, "Reporting," all describe the various regulatory, environmental and industry required reports that the facility will be submitting in compliance with the respective regulations.

10 CFR 50.80 – Not applicable; Atomic Alchemy has neither an operating nor construction license.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

Regulatory Guide 1.8, position C.1 – Exceptions as noted; the Atomic Alchemy facility is not a nuclear power plant and as such training will be different. However, Atomic Alchemy meets the intent of this regulatory guide by providing robust training and qualifications programs. See QAPD 1.1.2, "Nuclear Services Training Group," Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the

National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Additionally, Atomic Alchemy implements a radioisotope process training and requalification program (See Commitment AA0-RC-0004 in QAPD).

NUREG-0800 SRP 13.1.2–13.1.3, Rev 7 Operating Organization

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1.2, SRP 12.1	10 CFR Part 50, Appendix B, 10 CFR 50.34(a)(6) and (9), 10 CFR 50.34(b)(6)(i), (ii), (iii), and (iv), 10 CFR 50.34(f)(3)(vii), 10 CFR 50.40(b), 10 CFR 50.48(a)(1)(ii), 10 CFR 50.54 (i), (j), (k), (l), (m) , 10 CFR 55, 10 CFR 50.80, as applicable, 10 CFR 52.47(a)(7), 10 CFR 52.79(26), (27), (28), and (29)(i), R.G. 1.8, R.G. 1.33, R.G. 1.189, R.G. 1.114 NUREG-0737, Action Items I.A.1.1, I.A.1.3, I.C.3	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 13.1.2-3 – General design description: Atomic Alchemy FSAR Chapter 13 will describe the processes to establish and maintain a staff of sufficient size and technical competence that can safely operate the facility and will provide reasonable assurance of adequate protection of the public health and safety. The Atomic Alchemy facility design is based upon the operation of up to four small non-power reactors from a single main control room (MCR) which is a configuration not specifically addressed by the Table in this SRP based on 10 CFR Part 55, and 10 CFR 50.54(m)(2)(i), and SRP 13.1.2-3 Table 1. In SECY-11-0098, NRC Staff recommended “a twostep approach to address operator staffing requirements for SMRs. Therefore, Atomic Alchemy intends to request an exemption to 10 CFR 50.54(m)(2)(i). 10 CFR Part 50, Appendix B – Acceptable; the Atomic Alchemy QAPD follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, “Quality Assurance Program Requirements for Nuclear Facilities” and QME-1-2017, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants.” The QAPD will describe the managerial and administrative controls used to assure safe operation and conformance to Appendix B.		

10 CFR 50.34(a)(6)(9) and 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv) – Acceptable; Atomic Alchemy QAPD Section 1.1 will describe the Atomic Alchemy organizational structure, functional responsibilities, levels of authority, interfaces, and technical qualifications required for training of personnel, and conducting the facility's operations safely.

The QAPD will describe the managerial and administrative controls used to assure safe operation and conformance to Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

FSAR Chapter 14, will describe the overall objective of the initial test programs that will demonstrate that the facility has been constructed as designed, that the systems perform consistent with the facility's design, and that activities culminating in operation at full licensed reactor power including initial fuel load, initial criticality, and power ascension are performed in a controlled and safe manner. The testing plans also include the major safety related radioisotope process systems and components required to tested to ensure safe processing of radioisotope products and management of radwaste.

Atomic Alchemy QAPD Part V will describe the maintenance rule program that will be utilized for conducting maintenance, surveillance, and periodic testing of structures, systems, and components.

10 CFR 50.34(f) – Acceptable; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 13.1.1 regulations compliance/exceptions.

(3)(vii) – Exceptions as noted; Atomic Alchemy does not interface with a NSSS company. FSAR Chapter 13, Section 2, will describe the engineering, procurement and construction and project management, development of initial testing and commissioning management that occurs during the construction phases. Construction performance and the procurement of materials and equipment (modules, engineered components, ASME III materials, and highly engineered materials) are administratively monitored to provide objective data to management in order to identify problems early and develop proper corrective actions and solutions. Atomic Alchemy QAPD Section 1.1.1 will describe the key roles of management and organizations with respect to construction and the transition to operations. The General Manager of Construction Services (GMCS) reports to the Chief Operating Officer and is responsible for all of Atomic Alchemy's and their consortium partners' construction activities. The Nuclear Design Engineering Services Group (NDESG) is responsible for multi-discipline design engineering functions, supporting activities, engineering programs, and configuration management including design and configuration control, engineering technical support, systems engineering, and material engineering.

10 CFR 50.40(b) – Not applicable; with respect for consideration of financial qualifications, Atomic Alchemy is applying for a Class 103 license under 10 CFR 50.22. The construction license application will comply with the applicable requirements of 10 CFR Part 50 and NUREG-0800. The scope of compliance will also include applicable conformance to 10 CFR Part 50 Appendix A, 10 CFR Part 50 Appendix B and the Regulatory Guides. The general and technical content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR

70.22. The regulations require that the construction permit application contain a PSAR, and an Environmental Report as addressed in 10 CFR 51.50 and NUREG-1555.

10 CFR 50.48(a)(1)(ii) – Acceptable; Atomic Alchemy implements the requirements for the fire protection plan in accordance with Regulatory Guide 1.189 Rev 3, “Fire Protection for Operating Nuclear Power Plants.” FSAR Chapter 9, Appendix A, “Fire Protection Plan” Section ‘Fire Protection Plan Organization, Staffing and Responsibilities’ will describe the various positions within the organization that are responsible for this program.

10 CFR 50.54 (i), (j), (k), (l), (m) – Acceptable; Atomic Alchemy QAPD Section 1.1.2 will describe the Nuclear Training Services group which is responsible for reactor operators, process hot cell operators, and technical plant equipment training. Additionally, Atomic Alchemy commitment AA0-RC-0004 in QAPD Table 2 will describe the Versatile Isotope Production Reactor (VIPR) Operator and Radioisotope Process Operator Training and Requalification Program.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

Regulatory Guide 1.8, position C.1 – Exceptions as noted; the Atomic Alchemy facility is not a nuclear power plant and as such training will be different. However, Atomic Alchemy meets the intent of this regulatory guide by providing robust training and qualifications programs. See QAPD 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Additionally, Atomic Alchemy implements a radioisotope process training and requalification program (See Commitment AA0-RC-0004 in QAPD).

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Atomic Alchemy compliance with NUREG-0737 Action Items is addressed in FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933).” Pertinent items associated with SRP 13.1.2-3 are described below:

Action Item I.A.1.1 (shift technical advisor (STA)) – Acceptable; Technical Specification Administration Section 5.2.2.1.3, “Shift Technical Advisors” will describe the responsibilities and duties of the STA position. T/S Section 5.3.1 will describe the qualifications of personnel who command the MCR of both the reactors and the radioisotope process. Additionally, T/S Section 5.2.3, “Radioisotope Process Unit Staff” will describe the duties and responsibilities of radioisotope process operators.

Action Item I.A.1.3 (shift staffing) – Acceptable; Technical Specification Administration Section 5.2.2.1 “Shift Crew Composition” will describe the responsibilities and duties of all reactor control room operator positions. T/S Section 5.3.1 will describe the qualifications of personnel who command the reactor MCR and radioisotope process MCR. T/S Section 5.2.3, “Radioisotope Process

Unit Staff" will describe the duties and responsibilities of radioisotope process control room operator positions.

Action Item I.C.3 (Shift Supervisor Responsibilities) – Acceptable; As described in FSAR Chapter 13, Section "Organizational Structure," the shift supervisor is a licensed SRO responsible for the control room command function and is the General Manager of Nuclear Process Operations (GMNPO) direct management representative for the conduct of operations. The shift supervisor retains this responsibility and authority until formally relieved of operating responsibilities by a licensed SRO.

Regulatory Guide 1.114, position C.1 and C.2 – Acceptable; administrative controls will be established that define the protocols for control room operators in compliance with regulatory positions of this guide. Additionally, since the NPUF design utilizes a single control room for up to four reactors, Atomic Alchemy intends to request an exemption to the staffing requirements of 10 CFR 50.54(m)(2)(i).

Regulatory Guide 1.189, positions C.1 through C.7 – Acceptable; Atomic Alchemy will provide its Fire Protection Plan as FSAR Chapter 9, Appendix A. the plan will conform to the requirements of 10 CFR 50.48(a)(1)-(3).

Regulatory Guide 1.189, positions C.8 – Acceptable; the Atomic Alchemy fire protection plan will conform to the requirements for enhanced fire protection criteria and the safe shutdown of a passive designed ALWR.

Regulatory Guide 1.189, position C.9 – currently not applicable. This guide addresses license renewal.

For BTP 9.5-1 see Atomic Alchemy response to SRP 9.5.1-1.

NUREG-0800 SRP 13.2.1, Rev 4 Reactor Operator Requalification Program; Reactor Operator Training

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 1.5, SRP 11.1.2, SRP 12.10	10 CFR 50.34(a)(6) and (9), 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv), 10 CFR 50.34(f)(2)(i), 10 CFR 50.40(a), (b), 10 CFR 50.48, 10 CFR 50.54(a)(i-1) , 10 CFR 50.120, 10 CFR 52.47(a)(7), 10 CFR 52.79(a)(14), (33), (34), (39), (40), (44), 10 CFR 55.41, 10 CFR 55.43, 10 CFR 55.45, 10 CFR 55.46, 10 CFR 55.59, R.G. 1.8, R.G. 1.149	Exceptions as noted.

Summary Description of Compliance/Exceptions
SRP 13.2.1 – General design description: FSAR Chapter 13 will describe the processes to establish and maintain a staff of sufficient size and technical competence that can safely operate the facility and will provide reasonable assurance of adequate protection of the public health and safety. The Nuclear Training Services group is responsible for reactor operators, process hot cell operators, and technical plant equipment training. FSAR Chapter 13, Section 2, "Reactor Operator and Radioisotope Operator Training and Requalification Program" meet the guidelines of Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants." See Chapter 13, Appendix D, "License Operator Training and Requalification Plan" (commitment AA0-RC-0004 in QAPD Table 2) meets the guidelines of RG 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations." 10 CFR 50.34(a)(6)(9) and 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv) – Acceptable; Atomic Alchemy QAPD Section 1.1 will describe the Atomic Alchemy organizational structure, functional responsibilities, levels of authority, interfaces, and technical qualifications required for training of personnel, and conducting the facility's operations safely. 10 CFR 50.34(f) – Acceptable; Atomic Alchemy addresses NUREG-0737 TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 13.2.1 regulations compliance/exceptions. (2)(i) – Acceptable; See Chapter 13, Appendix D, "VIPR Operator and Radioisotope Process Operator Training and Requalification Program" (commitment AA0-RC-0004 in QAPD Table 2) meets the

guidelines of RG 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations."

10 CFR 50.40(a) and (b) – Not applicable; with respect for consideration of financial qualifications, Atomic Alchemy is applying for a Class 103 license under 10 CFR 50.22. The construction license application will comply with the applicable requirements of 10 CFR Part 50 and NUREG-0800. The scope of compliance will also include applicable conformance to 10 CFR Part 50 Appendix A, 10 CFR Part 50 Appendix B and the Regulatory Guides. The general and technical content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR 70.22. The regulations require that the construction permit application contain a PSAR, and an Environmental Report as addressed in 10 CFR 51.50 and NUREG-1555.

10 CFR 50.48 – Acceptable; Atomic Alchemy implements the requirements for the fire protection plan in accordance with Regulatory Guide 1.189 Rev 3, "Fire Protection for Operating Nuclear Power Plants." FSAR Chapter 9, Appendix A, "Fire Protection Plan" Section 'Fire Protection Plan Organization, Staffing and Responsibilities' will describe the various positions within the organization that are responsible for this program.

10 CFR 50.54 (i-1) – Acceptable; Atomic Alchemy QAPD Section 1.1.2 will describe the Nuclear Training Services group which is responsible for reactor operators, process hot cell operators, and technical plant equipment training. Additionally, see Chapter 13, Appendix D, "VIPR Operator and Radioisotope Process Operator Training and Requalification Program" (commitment AA0-RC-0004 in QAPD Table 2 for operator training program to be in place within 3 months of operating license) meets the guidelines of RG 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations."

10 CFR 50.120 – Acceptable; See QAPD Section 1.1.2, "Nuclear Services Training Group." Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in this 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" and ANSI/ANS 15.4-2016, "Selection and Training of Personnel for Research Reactors" criterion. Also see regulatory commitment AA0-RC-0004, "VIPR Operator and Radioisotope Process Operator Training and Requalification Program" in QAPD Table 2, Atomic Alchemy implements additional training requirements and requalification for radioisotope process workers and hot cell and glove box operators.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

10 CFR Part 55, Subparts E and F – Acceptable; Atomic Alchemy licensed reactor operators must complete requalification training every 24 months. Each reactor operator must complete the program and pass a written exam and an annual operating test developed and administered by Atomic Alchemy. The written exams and operating tests are prepared, administered, and graded

using the guidance in NUREG-1021. Atomic Alchemy will develop site specific exams and submit them to the NRC for approval. See FSAR Chapter 13, Appendix D for the Atomic Alchemy "License Operator Training and Requalification Plan." Training programs incorporate ANSI/ANS 3.1-2014, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" and ANSI/ANS 15.4-2016, "Selection and Training of Personnel for Research Reactors" criterion. Also see regulatory commitment AA0-RC-0004, "VIPR Operator and Radioisotope Process Operator Training and Requalification Program" in QAPD Table 2, Atomic Alchemy implements additional training requirements and requalification for radioisotope process workers and hot cell and glove box operators. Regulatory Guide 1.8, position C.1 – Exceptions as noted; the Atomic Alchemy facility is not a nuclear power plant and as such training will be different. However, Atomic Alchemy meets the intent of this regulatory guide by providing robust training and qualifications programs. See QAPD Section 1.1.2, "Nuclear Services Training Group." Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Additionally, Atomic Alchemy implements a radioisotope process training and requalification program as part of the NPUF Reactor operator training program. Regulatory Guide 1.149, positions C.1 through C.6 – Acceptable; See Chapter 13, Appendix D, "License Operator Training and Requalification Plan" (commitment AA0-RC-0004 "VIPR Operator and Radioisotope Process Operator Training and Requalification Program" in QAPD Table 2) meets the guidelines of RG 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations." The Atomic Alchemy program is based on Scenario Based Testing (SBT) methodology. The simulator training room is located on the basement level of the Administration Service Module Building (See Drawing AA0-ASM-G4-0004 Rev A).

NUREG-0800 SRP 13.2.2, Rev 4 Non-Licensed Plant Staff Training

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.3, SRP 11.1.2, SRP 12.10	10 CFR 19.12, 10 CFR 26.29, 10 CFR 50.34(a)(6) and (9), 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv), 10 CFR 50.40(b), 10 CFR 50.48, 10 CFR 50.120, 10 CFR 50, Appendix B, 10 CFR 50, Appendix E, 10 CFR 52.47(a)(7),	Exceptions as noted.

	10 CFR 52.79(a)(21), (33), (35), (39), (40) and (44), R.G. 1.8	

Summary Description of Compliance/Exceptions

SRP 13.2.2 – General design description: Atomic Alchemy FSAR Chapter 13 will describe the processes to establish and maintain a staff of sufficient size and technical competence that can safely operate the facility and will provide reasonable assurance of adequate protection of the public health and safety. The Nuclear Training Services group is responsible for reactor operators, process hot cell operators, and technical plant equipment training. Non-licensed plant staff training is addressed in QAPD Section 2.3.4, FSAR Chapter 13, Section 2, subsection "Operational Phase," and FSAR Chapter 13, Appendix A, "Non-Licensed Plant Staff Training Program." The program will conform to 10 CFR 50.120, and NEI 06-13A, "Template for an Industry Training Program Description."

10 CFR 19.12 – Acceptable; employees are informed of the location of radioactive materials through programmatic and administrative controls, including locked radiation areas, magenta and yellow signs, warning lights and alarms etc. Many of the engineers and supervisors assigned to the Atomic Alchemy Reactor and radioisotope process design have performed similar design work or service work on other nuclear power plants. Through this experience, they have acquired knowledge of the radiation protection aspects which are applied to the Atomic Alchemy facility. See QAPD section 14.5 for the Health Physics Program which will conform with National Voluntary Laboratory Accreditation Program (NVLAP). The Rad-Worker Radiation Permit System (ERW) monitors and tracks employee's dosimetry.

10 CFR 29.19 – Acceptable; Non-licensed plant staff training is addressed in QAPD Section 2.3.4, FSAR Chapter 13, Section 2, subsection "Operational Phase" and FSAR Chapter 13, Appendix A, "Non-Licensed Plant Staff Training Program." The program will conform to 10 CFR 50.120, and NEI 06-13A, "Template for an Industry Training Program Description." FSAR Chapter 13, Appendix A, "FFD and Access Authorization Program" and the "FFD Construction Personnel Program" addresses fitness for duty procedurally.

10 CFR 50.34(a)(6)(9) and 10 CFR 50.34(b)(6)(i), (ii) – Acceptable; Atomic Alchemy QAPD Section 1.1 will describe the Atomic Alchemy organizational structure, functional responsibilities, levels of authority, interfaces, and technical qualifications required for training of personnel, and conducting the facility's operations safely.

10 CFR 50.40(b) – Not applicable; with respect for consideration of financial qualifications, Atomic Alchemy is applying for a Class 103 license under 10 CFR 50.22. The construction license application will comply with the applicable requirements of 10 CFR Part 50 and NUREG-0800. The scope of compliance will also include applicable conformance to 10 CFR Part 50 Appendix A, 10 CFR Part 50 Appendix B and the Regulatory Guides. The general and technical content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR 70.22. The regulations require that the construction permit application contain a PSAR, and an Environmental Report as addressed in 10 CFR 51.50 and NUREG-1555.

10 CFR 50.48 – the Atomic Alchemy Fire Protection plan will conform to this regulation by meeting 10 CFR Part 50 Appendix A, GDC 3. FSAR Chapter 9, Appendix A, will describe the Atomic Alchemy Fire Protection Plan. The plan will conform to the following NFPA standards:

- NFPA 4 – “Organization for Fire Services”
- NFPA 4A – “Organization of a Fire Department”
- NFPA 6 – “Industrial Fire Loss Prevention”
- NFPA 7 – “Management of Fire Emergencies”
- NFPA 8 – “Management Responsibilities for Effects of Fire on Operations”
- NFPA 27 – “Private Fire Brigades”
- NFPA 101,"Life Safety Code."
- NFPA 802 – “Recommended Fire Protection Practice for Nuclear Reactors.”
- NFPA 801 - “Standard for Fire Protection for Facilities Handling Radioactive Materials”
- NFPA 804 – “Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants

10 CFR 50.120 – Acceptable; See QAPD Section 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in this 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, “Selection, Qualification, and Training of Personnel for Nuclear Power Plants” and ANSI/ANS 15.4-2016, “Selection and Training of Personnel for Research Reactors” criterion. Also see regulatory commitment AA0-RC-0004, “NPUF Operator Training and Requalification Program.” In QAPD Table 2, Atomic Alchemy implements additional training requirements and requalification for radioisotope process workers and hot cell and glove box operators.

10 CFR Part 50, Appendix B – Acceptable; the Atomic Alchemy QAPD follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, “Quality Assurance Program Requirements for Nuclear Facilities” and QME-1-2017, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants.” The QAPD will describe the managerial and administrative controls used to assure safe operation and conformance to Appendix B.

10 CFR Part 50, Appendix E – Acceptable; the Atomic Alchemy Emergency Plan will be submitted along with the PSAR. The “General Emergency” class of accident is not a credible transient in the FSAR Chapter 15 accident analysis. The BDBE for the Atomic Alchemy facility does not have a significant radiological impact at substantial distances from the facility (Severe Accidents are addressed in FSAR Chapter 19). Therefore, this class is not included in the Atomic Alchemy Emergency Plan. The Atomic Alchemy Emergency Plan will conform to the guidance in NUREG-0849, “Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors” and regulatory guide 2.6, “Emergency Planning for Research and Test Reactors.” The Technical Support Center (TSC) and Operational Support Center (OSC) are located onsite within the Administration and Service Module building (ASM) and the Emergency Operations Center Module

Building (EOM) is located nearby offsite. The Atomic Alchemy Emergency Plan is provided in the FSAR Chapter 13, Appendix B. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50. Regulatory Guide 1.8, position C.1 – Exceptions as noted; the Atomic Alchemy facility is not a nuclear power plant and as such training will be different. However, Atomic Alchemy meets the intent of this regulatory guide by providing robust training and qualifications programs. See QAPD Section 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Additionally, Atomic Alchemy implements a radioisotope process training and requalification program as part of the VIPR operator training program.

NUREG-0800 SRP 13.3, Rev 3 Emergency Planning

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1.2, SRP 12.7	10 CFR 50, Appendix E, 10 CFR 50.33, 10 CFR 50.34, 10 CFR 50.47, 10 CFR 52.17(b)(2) and (3), 10 CFR 52.18, 10 CFR 52.47(b)(1), 10 CFR 52.48, 10 CFR 52.77, 10 CFR 52.79, 10 CFR 52.80(a), 10 CFR 52.81, 10 CFR 52.83 10 CFR 100.1, 10 CFR 100.3, 10 CFR 100.20, 10 CFR 100.21(g), 44 CFR 350, 44 CFR 351, 44 CFR 352, R.G. 1.101	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 13.3 – General design description: Atomic Alchemy FSAR Chapter 13 will describe the processes to establish and maintain a staff of sufficient size and technical competence that can safely implement the facility's emergency plan and will provide reasonable assurance of adequate protection of the public health and safety. Atomic Alchemy is applying for a construction license under 10 CFR Part 50. The Emergency Plan will be submitted along with the PSAR and construction license application. FSAR Chapter 13 Appendix B, "Emergency Plan" will provide a discussion of Atomic Alchemy's preliminary plans for coping with facility emergencies. The emergency response organization has specific duties and responsibilities defined in the plan, points of contact between on-site and off-site supporting agencies are also designated. Provisions for prompt notification of State, Local, and Federal agencies that are located within the EPZ are established and include information which may be required for off-site agency response. A recovery and re-entry plan will describe the management, technical, and administrative organization necessary to execute timely and effective recovery of the facility based on assessments of plant conditions and desired end states.

10 CFR Part 50, Appendix E – Exceptions as noted; the Atomic Alchemy Emergency Plan will be submitted along with the PSAR. The "General Emergency" class of accident is not a credible transient in the FSAR Chapter 15 accident analysis. The BDBE for the Atomic Alchemy facility does not have a significant radiological impact at substantial distances from the facility. Therefore, this class is not included in the Atomic Alchemy Emergency Plan. The Atomic Alchemy Emergency Plan will conform to the guidance in NUREG-0849, "Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors," and regulatory guide 2.6, "Emergency Planning for Research and Test Reactors." The TSC and OSC are located onsite within the Administration and Service Module building (ASM) and the EOM is located nearby offsite. The Atomic Alchemy Emergency Plan is incorporated by reference into the FSAR and is provided in FSAR Chapter 13, Appendix B.

10 CFR 50.33, and 10 CFR 50.34 – Acceptable; The general and technical content of the Atomic Alchemy NPUF application will follow the requirements of 10 CFR 50.33, 50.34, 50.36, 50.42, and 10 CFR 70.22. The regulations require that the construction permit application contain a PSAR, an Environmental Report, and an Emergency Plan.

10 CFR 50.47 – Exceptions as noted; the Atomic Alchemy Emergency Plan will be submitted along with the PSAR. The "General Emergency" class of accident is not a credible transient in the FSAR Chapter 15 accident analysis. The Beyond Design Basis (BDB) for the Atomic Alchemy facility does not have a significant radiological impact at substantial distances from the facility. Therefore, this class is not included in the Emergency Plan. The Atomic Alchemy Emergency Plan will conform to the guidance in NUREG-0849, "Standard Review Plan for the Review and Evaluation of Emergency Plans for Research and Test Reactors" and regulatory guide 2.6, "Emergency Planning for Research and Test Reactors." The TSC and OSC are located onsite within the Administration and Service Module building (ASM) and the EOM is located nearby offsite. The Atomic Alchemy Emergency Plan is incorporated by reference into the FSAR and is provided in the FSAR Chapter 13, Appendix B.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

44 CFR 350, 44 CFR 351, 44 CFR 352 – Acceptable; the Atomic Alchemy Emergency Plan will be designed to adhere to Nuclear Regulatory Commission emergency planning regulations and guidelines applicable to commercial nuclear power stations (with the aforementioned exceptions described in response to 10 CFR 50.47 above). The Emergency Plan is based upon NRC and Federal Emergency Management Agency (FEMA) guidance as contained in NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," and EPA guidance as contained in EPA 400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" October 1991. Radiological emergency planning for the Atomic Alchemy Facility will be coordinated with state and local emergency response agencies.

Regulatory Guide 1.101, positions C – Acceptable; the Atomic Alchemy Emergency Plan (provided as FSAR Chapter 13, Appendix B) will conform to the requirements in 10 CFR 50.47(b).

NUREG-0800 SRP 13.4, Rev 4 Operational Programs

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.3, SRP 12.4	N/A	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 13.4 – General design description: Exceptions as noted; operational programs are specific programs that are required by regulations. Due to the design differences between a VIPR and a power reactor, not all programs listed in this SRP are applicable to Atomic Alchemy. FSAR Chapter 3, Table 3.A-01 will list each Atomic Alchemy operational program required by regulation and/or committed to by Atomic Alchemy, the regulatory source for the program, the section of the FSAR in which the operational program is described, and the associated implementation milestone. An asterisk (*) denotes a technical specification required program, a double asterisk (**) denotes a technical requirement manual required program, a triple asterisk (***) denotes an offsite dose calculation manual required program. The Atomic Alchemy QAPD Table 1 presents the relationship of the QAPD Criterion to the operational program in an interface matrix.		

There are no acceptance criteria contained in SRP 13.4 other than the required implementation milestones for each program listed in Sample Table 13.4-x.

NUREG-0800 SRP 13.5.1, Rev 0 Administrative Procedures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.3	10 CFR 50.40(b), 10 CFR 50.54(l), NUREG-0694 Task Action Item I.C.2, I.C.4 NUREG-0737 Task Action Item I.A.1.3, I.C.5, I.C.6,	Acceptable
Summary Description of Compliance/Exceptions		
SRP 13.5.1 – General design description: The Quality Assurance Program Description (QAPD), as provided in FSAR Chapter 17 Appendix A, will describe procedural document control, record retention, adherence, assignment of responsibilities, and changes for administrative procedures. 10 CFR 50.40(b) – Not applicable; Atomic Alchemy's Part 50 license application falls under 10 CFR 50.22, class 103. 10 CFR 50.54 (l) – Acceptable; Atomic Alchemy QAPD Section 1.1.2 will describe the Nuclear Training Services group which is responsible for reactor operators, process hot cell operators, and technical plant equipment training. Additionally, see Chapter 13, Appendix D, "VIPR Operator and Radioisotope Process Operator Training and Requalification Program" (commitment AA0-RC-0004 in QAPD Table 2 for operator training program to be in place within 3 months of operating license) meets the guidelines of RG 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations." FSAR Chapter 13, Section 2, defines the qualifications for Senior Reactor Operators, Reactor Operators and Radioisotope Process Operators. Atomic Alchemy compliance with NUREG-0737 and NUREG-0694 Task Action Items are addressed in FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933)." Pertinent items associated with SRP 13.5.1 are described below: Action Item I.A.1.3 (shift staffing) – Acceptable; Technical Specification Administration Section 5.2.2.1 "Shift Crew Composition" will describe the responsibilities and duties of all control room operator positions. T/S Section 5.3.1 will describe the qualifications of personnel who command the reactor MCR and radioisotope process MCR. T/S Section 5.2.3, "Radioisotope Process Unit Staff" will describe the duties and responsibilities of radioisotope process control room operator positions. Item I.C.2 and Item I.C.4 – Acceptable; shift and relief turnover are administratively controlled through procedures. Access to the Main Control Rooms is also administratively controlled through security procedures. See FSAR Chapter 13, Section 5, "Plant Procedures and Specifications" subsection, "MCR Shift Procedures."		

Item I.C.5 – Acceptable; Atomic Alchemy design engineers have been involved in reviewing industry experiences from a variety of sources such as NRC Bulletins, Licensee Event Reports, NRC request for information letters, NPUF holders of operating licenses, NPUF public meetings, NPUF PSAR submittals, and Federal Register information. Lessons learned experience was incorporated into the design of the Atomic Alchemy NPUF during the development of its Facility Requirements Document (FRD). Item I.C.6 – Acceptable; the format and content of procedures are controlled by the applicable sections of the Atomic Alchemy Writer's Guidelines. Each procedure is sufficiently detailed for an individual to perform the required function without direct supervision but does not provide a complete description of the system or plant process. The level of detail contained in the procedure is commensurate with the qualifications of the individual normally performing the function. When necessary, verification and validation of correct performances of a procedure are documented by a checklist. Verification of correct performances of verbal instructions include "repeat back" steps.

NUREG-0800 SRP 13.5.1.1, Rev 2 Administrative Procedures - General

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 9.2, SRP 10.3, SRP 12.3	10 CFR 26.27, 10 CFR 50.34(a)(6) and (9), 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv), 10 CFR 50.34(f)(3)(i), 10 CFR 50.40(a), 10 CFR 50.54(l) and (p)(2)(ii), 10 CFR 52.47(a)(7) and (a)(8), 10 CFR 52.79(a)(14), (33), and (44), R.G. 1.33, R.G. 1.114, NUREG-0694, Action Items I.A.1.2, I.C.2, I.C.3, I.C.4 NUREG-0737, Action Items I.C.5	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 13.5.1.1 – General design description: The Quality Assurance Program Description (QAPD), as provided in FSAR Chapter 17 Appendix A, will describe procedural document control, record retention, adherence, assignment of responsibilities, and changes for administrative procedures. See FSAR Chapter 13, Section 5, "Plant Procedures and Specifications" for a description of the development of procedures to be used for construction and for operations. Atomic Alchemy is submitting a 10 CFR Part 50 application for construction prior to final development of detailed procedures and associated training materials, evaluation of these items will be performed by the NRC as part of construction inspection programs.		

QAPD Criterion IV and VII implementing programs “Vendor Inspection Program” and “Approved Vendor List” (APL) respectively, ensure that vendor information for safety related components are incorporated into plant documentation.

QAPD Criterion X implementing program “Overhead Heavy Loads Equipment Inspection Program” and QAPD Criterion XIII implementing programs, “Heavy Load Handling Program,” and “Lifting and Rigging Program” ensure that crane operators conduct themselves in accordance with the guidelines of ANSI-30.2-1976, "Overhead and Gantry Cranes."

10 CFR 26.27 – Acceptable; written policies and procedures regarding FFD will be made available to all Atomic Alchemy employees in the employee handbook.

10 CFR 50.34(a)(6)(9) and 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv) – Acceptable; Atomic Alchemy QAPD Section 1.1 will describe the Atomic Alchemy organizational structure, functional responsibilities, levels of authority, interfaces, and technical qualifications required for training of personnel, and conducting the facility’s operations safely.

10 CFR 50.34(f) – Acceptable; Atomic Alchemy addresses NUREG-0737 TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, “Compliance with 10 CFR 50.34(f).” Provided below are the relevant SRP 13.5.1.1 regulations compliance/exceptions.

(f)(3)(i) – Acceptable; Atomic Alchemy design engineers have been involved in reviewing industry experiences from a variety of sources such as NRC Bulletins, Licensee Event Reports, NRC request for information letters, NPUF holders of operating licenses, NPUF public meetings, NPUF PSAR submittals, and Federal Register information. Lessons learned experience was incorporated into the design of the Atomic Alchemy during the development of its Facility Requirements Document (FRD).

10 CFR 50.40(a) – Not applicable; with respect for consideration of financial qualifications, Atomic Alchemy is applying for a Class 103 license under 10 CFR 50.22.

10 CFR 50.54(l) – Acceptable; Atomic Alchemy QAPD Section 1.1.2 will describe the Nuclear Training Services group which is responsible for reactor operators, process hot cell operators, and technical plant equipment training. Additionally, see Chapter 13, Appendix D, “VIPR Operator and Radioisotope Process Operator Training and Requalification Program” (commitment AA0-RC-0004 in QAPD Table 2 for operator training programs to be in place within 3 months of operating license) meets the guidelines of RG 1.149, “Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations.” FSAR Chapter 13, Section 2, defines the qualifications for Senior Reactor Operators, Reactor Operators and Radioisotope Process Operators.

10 CFR 50.54(p)(2)(ii) – Acceptable; the Atomic Alchemy physical security plan is being prepared and will be submitted along with the PSAR and construction application. The plan will be provided in FSAR Chapter 13, Appendix C. The plan is composed of the following QAPD Criterion IX programs

] [SEC] Specific elements of the programs that implement the Security Plan will be assessed by the NRC during construction inspection phase.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Regulatory Guide 1.114, position C.1 and C.2 – Acceptable; administrative controls will be established that define the protocols for control room operators in compliance with regulatory positions of this guide. Additionally, since the Atomic Alchemy facility utilizes a single control room for up to four reactors, Atomic Alchemy intends to request an exemption to the staffing requirements of 10 CFR 50.54(m)(2)(i).

Atomic Alchemy compliance with NUREG-0737 and NUREG-0694 Task Action Items are addressed in FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933)." Pertinent items associated with SRP 13.5.1.1 are described below:

Item I.A.1.2 – Acceptable; the Shift supervisor responsibilities will be identified administratively through programs and procedures. Some of the more important duties of the Shift Supervisor will include:

- Protect the health and safety of the public, the environment, and personnel on the plant site
- Protect the physical security of the plant
- Prevent damage to site equipment and structures
- Comply with the operating license

Item I.C.2 – Acceptable; shift and relief turnover is administratively controlled through procedures. See FSAR Chapter 13, Section 5, "Plant Procedures and Specifications."

Item I.C.3 – Acceptable; will be described in FSAR Chapter 13, Section "Organizational Structure," the shift supervisor is a licensed SRO responsible for the control room command functions and is the General Manager Nuclear Process Operations (GMNPO) direct management representative for the conduct of all operations. The shift supervisor retains this responsibility and authority until formally relieved of operating responsibilities by a licensed SRO.

Item I.C.4 – Acceptable; shift and relief turnover is administratively controlled through procedures. Access to the Main Control Rooms is also administratively controlled through security procedures. See FSAR Chapter 13, Section 5, "Plant Procedures and Specifications" subsection, "MCR Shift Procedures."

Item I.C.5 – Acceptable; Atomic Alchemy design engineers have been involved in reviewing industry experiences from a variety of sources such as NRC Bulletins, Licensee Event Reports, NRC request for information letters, NPUF holders of operating licenses, NPUF public meetings, NPUF PSAR submittals, and Federal Register information. Lessons learned experience was incorporated into the design of the Atomic Alchemy during the development of its Facility Requirements Document (FRD).

NUREG-0800 SRP 13.5.1.2, Rev 0 (DRAFT) Administrative Procedures - Initial Test Program

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section is in a draft stage (since 1996, tracked changes not accepted) and as such Atomic Alchemy considers that there is no acceptance criterion to demonstrate compliance with.		

NUREG-0800 SRP 13.5.2.1, Rev 2 Operating and Emergency Operating Procedures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.3, SRP 12.7	10 CFR Part 50 Appendix B, 10 CFR 50.34(a)(6), 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv), (v), (vi), (vii), 10 CFR 50.34(f)(2)(ii), 10 CFR 50.34(f)(3)(i), 10 CFR 50.40(a), 10 CFR 52.47(a)(7) and (a)(8) 10 CFR 52.79(a)(14), (25), (27), (28), (33), and (34), R.G. 1.33, R.G. 1.114, NUREG-0694, Action Items I.A.1.2, I.C.2, I.C.3, I.C.5, NUREG-0711	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 13.5.2.1 – General design description: the Atomic Alchemy Procedure Writer's Guideline promotes the standardization and application of human factors engineering principals to the Atomic Alchemy procedures. Atomic Alchemy uses four types of procedures to ensure that activities are carried out in compliance with the requirements of this QAPD, they are defined as: administrative, normal, abnormal, and emergency procedures. Atomic Alchemy is applying for a construction license under 10 CFR Part 50 and it intends to submit its Emergency Plan as Chapter 13, Appendix B to the PSAR. Detailed procedures and associated training materials for the plan will be developed during completion of the FSAR submittal. The construction license application will contain a preliminary target completion date for procedures to		

allow adequate time for Atomic Alchemy's facility staff to become familiar and to allow NRC staff adequate time to develop operator license examinations.

While Atomic Alchemy is using NUREG-1431 as a basis for its Technical Specifications, the accompanying Generic Technical Guidelines (GTG) for a PWR reactor is not being utilized. Instead, a NPUF Plant-Specific Technical Guideline (P-STG) will be developed that will address both reactor and radioisotope processes and their potential interfaces to derive the EOP's. The EOP's will also be updated as the facility progresses from one construction phase to the next. The PSAR Emergency Plan submittal will include the Technical Requirements 5.6.15 "Emergency Planning Program" and the P-STG. Atomic Alchemy will take an exception in developing a separate Procedure Writer's Guide for the Emergency Plan procedures and training materials. Instead, there will be an appendix in the Atomic Alchemy Writer's Guide to address the proper development of the EOPs, FRPs, FSG, SAMGs.

10 CFR Part 50, Appendix B – Acceptable; the Atomic Alchemy QAPD follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, "Quality Assurance Program Requirements for Nuclear Facilities" and QME-1-2017, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants." The QAPD will describe the managerial and administrative controls used to assure safe operation and conformance to Appendix B.

10 CFR 50.34(a)(6) and 10 CFR 50.34(b)(6)(i), (ii), (iii), (iv), (v), (vi), (vii) – Acceptable; Atomic Alchemy QAPD Section 1.1 will describe the Atomic Alchemy organizational structure, functional responsibilities, levels of authority, interfaces, and technical qualifications required for training of personnel, and conducting the facility's operations safely. The Atomic Alchemy final safety analysis report (FSAR) will be based on the format outlined in Regulatory Guide 1.70 with any additional guidance of selected sections of NUREG-1537 added as applicable. The overall Atomic Alchemy format will follow the guidance contained in Regulatory Guide 1.70 and NUREG-0800. Atomic Alchemy has determined to create a hybrid T/S format based on the formatting of the Standard Technical Specification (STS) found in NUREG-1431. Supplemental Technical Specification formatting as outlined in ANSI/ANS-15.1 will be incorporated where deemed necessary. The Atomic Alchemy T/S content will differ from the requirements of NUREG-1431, 10 CFR 50.36 and 10 CFR 70.61 only as necessary to reflect technical differences between a PWR power reactor design and the Atomic Alchemy non-power reactor design.

10 CFR 50.40(a) – Acceptable; Atomic Alchemy's Part 50 license application will include its PSAR.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

Atomic Alchemy compliance with NUREG-0694 Task Action Items is addressed in FSAR Chapter 1, Appendix D, "Compliance with Generic Safety Issues (NUREG-0933)." Pertinent items associated with SRP 13.5.2.1 are described below:

Action Item I.A.1.2 – Acceptable; some of the more important duties of the Shift Supervisor include:

- Protect the health and safety of the public, the environment, and personnel on the plant site
- Protect the physical security of the plant

- Prevent damage to site equipment and structures
- Comply with the operating license

Action Item I.C.2 – Acceptable; shift and relief turnover are administratively controlled through procedures. Access to the Main Control Rooms is also administratively controlled through security measures and procedures. See FSAR Chapter 13, Section 5, "Plant Procedures and Specifications" subsection, "MCR Shift Procedures."

Action Item I.C.3 – Acceptable; will be described in FSAR Chapter 13, Section 1, "Organizational Structure," the shift supervisor is a licensed SRO responsible for the control room command function and is the General Manager of Nuclear Process Operations (GMNPO) direct management representative for the conduct of operations. The shift supervisor retains this responsibility and authority until formally relieved of operating responsibilities by a licensed SRO.

Action Item I.C.5 – Acceptable; Atomic Alchemy design engineers have been involved in reviewing industry experiences from a variety of sources such as NRC Bulletins, Licensee Event Reports, NRC request for information letters, NPUF holders of operating licenses, NPUF public meetings, NPUF PSAR submittals, and Federal Register information. Lessons learned experience was incorporated into the design of the Atomic Alchemy during the development of its Facility Requirements Document (FRD).

Regulatory Guide 1.33, position C – Acceptable; the Atomic Alchemy QAPD is based on NQA-1-2017.

Regulatory Guide 1.114, position C.1 and C.2 – Acceptable; administrative controls will be established that define the protocols for control room operators in compliance with regulatory positions of this guide. Additionally, since the Atomic Alchemy NPUF utilizes a single control room for up to four reactors, Atomic Alchemy intends to request an exemption to the staffing requirements of 10 CFR 50.54(m)(2)(i).

NUREG-0711 – Acceptable; Atomic Alchemy FSAR Chapter 18 will describe the goal of the human factors engineering program. The program implements HFE products into the design of the Facility and provides the users of the plant operation and control centers effective means for acquiring and understanding plant data and executing actions to control the plant's processes and equipment.

NUREG-0800 SRP 13.5.2.2, Rev 0 (Draft) Maintenance and Other Operating Procedures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.3	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section is in a draft stage (since 1996) as such Atomic Alchemy considers that there is no acceptance criterion to demonstrate compliance with.		

NUREG-0800 SRP 13.6, Rev 3 Physical Security

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable, the contents of this SRP have been relocated to SRP 13.6.3 and SRP 13.6.4.		

NUREG-0800 SRP 13.6.1, Rev 2 Physical Security - Combined License and Operating Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable, COL related requirements do not apply to Atomic Alchemy.		

NUREG-0800 SRP 13.6.2, Rev 2 Physical Security - Design Certification

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable, DC related requirements do not apply to Atomic Alchemy.		

NUREG-0800 SRP 13.6.3, Rev 2 Physical Security - Operational Program - Early Site Permits and Reactor Siting Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 9.2, SRP 9.4, SRP 9.5, SRP 12.8	10 CFR 100.21(f), 10 CFR 73.21, 10 CFR 73.22, 10 CFR 73.54, 10 CFR 73.55, 10 CFR 73.56, 10 CFR 73.57, 10 CFR 73.58, 10 CFR 52.17(a)(1)(x), 10 CFR 52.17(d), 10 CFR 52.18,	Exceptions as noted.

	10 CFR 52.24	

Summary Description of Compliance/Exceptions

SRP 13.6.3 – General design description: The Atomic Alchemy Security Plan is presently being developed, an assessment of security requirements will be conducted in accordance with the
[

] SEC

The Atomic Alchemy Security Plan is submitted to the Nuclear Regulatory Commission as a separate licensing document. It is incorporated by reference into the Atomic Alchemy FSAR.

[

] SEC

This SRP pertains to Early Site Permit applications, which is not applicable to the Atomic Alchemy 10 CFR Part 50 application. The extent to which this SRP applies to 10 CFR Part 50 Construction applications and Atomic Alchemy is stated in the SRP as follows:

"Similar to the requirement for an ESP application, each construction permit (CP) application under 10 CFR 50.34a, 'Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents—Nuclear Power Reactors,' requires that the Preliminary Safety Analysis Report (PSAR) considers the site evaluation factors identified in 10 CFR Part 100, "Reactor Site Criteria," and the site characteristics must comply with this regulation. The requirement of 10 CFR 100.21(f) requires that the site characteristics must permit adequate security plans and measures to be developed. The intent of the review is to determine if adequate security plans and measures meeting the performance and prescriptive regulatory requirements of 10 CFR Part 73, "Physical Protection of Plants and Materials," for a nuclear power reactor can be developed."

Compliance with this SRP at the PSAR stage and with respect to the site characteristics acceptable to develop adequate security measures is demonstrated as follows:

The location of the Atomic Alchemy facility will be situated on [

] PROP

Atomic Alchemy exceptions to 10 CFR Part 73 will include the following:

- Atomic Alchemy will determine the tasks to be included in the security training program based on site specific criteria.
- The composition and qualifications of the mock adversary force will be at the discretion of Atomic Alchemy.
- Force-on-force exercises will be conducted in accordance with NEI 03-11.

- Control of drills will be in accordance with in NEI 05-05.
- There is no codified requirement for any licensee under 10 CFR 73 Appendix B to acquire an FFL license and to purchase and maintain fully automatic weapons for the sole purpose of training mock adversaries. Acquisition of Enhanced Weapons and Preemption Authority would also require Atomic Alchemy to conduct additional, unwarranted background investigations. [ ] SEC

[ ] SEC Atomic Alchemy will determine how best to meet the requirements of these sections of the rule within the bounds of the state laws of [ ] SEC

NUREG-0800 SRP 13.6.4, Rev 0 Access Authorization Operational Program

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.8	10 CFR 26 Subpart C, 10 CFR 73.55, 10 CFR 73.56, 10 CFR 73.57, R.G. 5.66, R.G. 5.77	Acceptable

Summary Description of Compliance/Exceptions

SRP 13.6.4 – General design description: the Atomic Alchemy Access Authorization (AA) is implemented and maintained in two phases dependent on the activities, duties, or access afforded to certain individuals at the construction site. Atomic Alchemy will implement two different Access programs, a construction access authorization program, and an operations access authorization program. The Atomic Alchemy access programs integrate the performance requirements contained in NEI 03-01, Revision 3. The NEI guide incorporates NRC access authorization requirements defined in 10 CFR 73.56, "Personnel Access Authorization Requirements for Nuclear Power Plants," and Regulatory Guide 5.77, "Insider Mitigation Program" and implements licensee security plan access authorization commitments.

10 CFR 26, Subpart C – Acceptable; Atomic Alchemy access authorization is administratively controlled through two separate programs. FSAR Chapter 13, Section 11 will describe the Atomic Alchemy programs (one for construction and one for operations) that implement access control to the Facility. Applicable milestones for the programs are located in FSAR Table 13.11-01, "AA Program Applicability and Implementation Milestones." The Atomic Alchemy access programs integrate the performance requirements contained in NEI 03-01, Revision 3. The location of the Atomic Alchemy facility will be situated on [ ] PROP

10 CFR 73.55 – Acceptable; [

] SEC

10 CFR 73.56 – Acceptable; [

] SEC

10 CFR 73.57 – Acceptable; Atomic Alchemy's FFD and Access Authorization Program (see FSAR Chapter 13, Appendix C) will be developed to meet the general performance objectives and requirements of 10 CFR 73.57(b)(1).

Regulatory Guide 5.66, position C.1 – Acceptable; [

] SEC

[

] SEC and it will be developed in FSAR Chapter 13, Appendix A.

NUREG-0800 SRP 13.6.6, Rev 0 Cyber Security

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.8	10 CFR 73.1, 10 CFR 73.71, 10 CFR 73 Appendix G, 10 CFR 73.54, 10 CFR 73.55(a)(1), 10 CFR 73.55(b)(8), 10 CFR 73.55(m), 10 CFR 73.58, R.G. 5.71	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 13.6.6 – General design description: the Atomic Alchemy cyber security program is part of the overall Atomic Alchemy Security plan contained in FSAR Chapter 13, Appendix C and submitted as a separate licensing document. The Atomic Alchemy Security Plan meets the intent of the requirements contained in 10 CFR Part 26 and 10 CFR Part 73 (with some exceptions) and will be maintained in accordance with the requirements of 10 CFR 50.54(p). The Plan is categorized as Security Safeguards Information and is withheld from public disclosure pursuant to 10 CFR 73.21 and 10 CFR 73.22.		

10 CFR 73.1 – Acceptable; Atomic Alchemy's physical security plan [

] SEC

10 CFR 73 Appendix G – Acceptable; Atomic Alchemy FSAR Chapter 13, Section 7 will provide a description of compliance for the reports that are required to be submitted, including those required for Security Events (10 CFR 73.71) and for Cyber Security Event (10 CFR 73.77) reports. Specific elements of the program will be assessed by the NRC during construction inspection phase.

10 CFR 73.54 – Acceptable; [

] SEC Specific elements of the program will be assessed by the NRC during construction inspection phase.

10 CFR 73.55(a)(1) – Acceptable; The Atomic Alchemy Security Plan which will be submitted as FSAR [

] SEC The Atomic Alchemy Security Plan is submitted to the Nuclear Regulatory Commission as a separate licensing document after the construction license and before the operating license, it is incorporated into the FSAR by reference.

10 CFR 73.55(b)(8) – Acceptable; [

] SEC

10 CFR 73.55(m) (security program reviews) – Acceptable; [

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10 CFR 73.58 (interface requirements) – Acceptable; the Atomic Alchemy Security Plan is incorporated by reference into the FSAR, as such all changes to the plan are implemented through the 10 CFR 50.59 program.

Regulatory Guide 5.71, positions C.1 through C.5 – Acceptable; the Atomic Alchemy QAPD Criterion IX program, "Cyber Security Program" will procedurally implement the positions of this regulatory guide. Specific elements of the program will be assessed by the NRC during construction inspection phase.

Regulatory Guide 5.71, Appendix A – Acceptable; the Atomic Alchemy QAPD Criterion IX program, "Cyber Security Program" will procedurally implement the positions of this regulatory guide. Specific elements of the program will be assessed by the NRC during construction inspection phase.

Regulatory Guide 5.71, Appendix B – Acceptable; the Atomic Alchemy QAPD Criterion IX program, "Cyber Security Program" will procedurally implement the positions of this regulatory guide. Specific elements of the program will be assessed by the NRC during construction inspection phase.

NUREG-0800 SRP 13.7, Rev 0 Fitness for Duty – Introduction

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.8, SRP 12.10	N/A	N/A
Summary Description of Compliance/Exceptions		
This section contains no acceptance criteria for compliance, it is a road map to other applicable SRP Sections regarding Fitness for Duty.		

NUREG-0800 SRP 13.7.1, Rev 0 Fitness for Duty - Operational Program

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.8, SRP 12.10	10 CFR Part 26, Subpart A, 10 CFR Part 26, Subpart B, 10 CFR Part 26, Subpart C, 10 CFR Part 26, Subpart D, 10 CFR Part 26, Subpart E, 10 CFR Part 26, Subpart F, 10 CFR Part 26, Subpart G, 10 CFR Part 26, Subpart H, 10 CFR Part 26, Subpart I, 10 CFR Part 26, Subpart N	Acceptable
Summary Description of Compliance/Exceptions		
SRP 13.7.1 – General design description: the Atomic Alchemy Fitness for Duty (FFD) is implemented and maintained in two phases dependent on the activities, duties, or access afforded to certain individuals at the construction site. Atomic Alchemy will implement two different FFD programs, a construction FFD program and an operations FFD program. See FSAR Chapter 13 Appendix E for a description of the FFD plans for Atomic Alchemy. See FSAR Chapter13, Appendix E, "Security Fitness for Duty Plan" which will include QAPD Criterion IX programs: "FFD and Access Authorization Program", FFD Program for persons required to physically report to the Technical Support Center (TSC) or Emergency Operations Facility (EOF)", "FFD Program for FFD Program Personnel", "FFD and Access Construction Personnel Program", and "FFD for Security Personnel Program". The location of the Atomic Alchemy facility will be situated on [ ] SEC 10 CFR Part 26 – Acceptable, the Atomic Alchemy Fitness for Duty plan programs integrate the performance requirements contained in NEI 03-01, Revision 3. See FSAR TABLE 13.10-02 AA Operations FFD Program Applicability and Implementation Milestones		

NUREG-0800 SRP 13.7.2, Rev 0 Fitness for Duty - Construction

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.8, SRP 12.10	10 CFR 26.401, 10 CFR 26.403, 10 CFR 26.405, 10 CFR 26.406, 10 CFR 26.407, 10 CFR 26.409, 10 CFR 26.411, 10 CFR 26.413, 10 CFR 26.415, 10 CFR 26.417, 10 CFR 26.419, 10 CFR 26 Subparts A, E, F, G	Acceptable
Summary Description of Compliance/Exceptions		

SRP 13.7.2 – General design description: the Atomic Alchemy Fitness for Duty (FFD) is implemented and maintained in two phases dependent on the activities, duties, or access afforded to certain individuals at the construction site. Atomic Alchemy will implement two different FFD programs, a construction FFD program and an operations FFD program. See FSAR Chapter 13 Appendix E for a description of the FFD plans for Atomic Alchemy. See FSAR Chapter13, Appendix E, "Security Fitness for Duty Plan" which includes QAPD Criterion IX programs: "FFD and Access Authorization Program," FFD Program for persons required to physically report to the Technical Support Center (TSC) or Emergency Operations Facility (EOF)," "FFD Program for FFD Program Personnel," "FFD and Access Construction Personnel Program," and "FFD for Security Personnel Program." The location of the Atomic Alchemy facility will be situated on [

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10 CFR 26, Subpart K – Acceptable; the Atomic Alchemy Fitness for Duty plan programs integrate the performance requirements contained in NEI 03-01, Revision 3. See FSAR TABLE 13.10-01 for the "AA Construction FFD Program Applicability and Implementation Milestones." See also FSAR Chapter 13, Appendix A, Table 3.A-01.

10 CFR 26, Subpart A, E, F, G – Acceptable; Atomic Alchemy identifies all "operational programs required by regulations" in FSAR Chapter 13, Appendix A, Table 3.A-01. Atomic Alchemy implements these requirements through the use of administrative controls with the following programs, "FFD and Access Authorization Program," "FFD Program for persons required to physically report to the Technical Support Center (TSC) or Emergency Operations Facility (EOF)," "FFD Program for FFD

Program Personnel," "Behavior Observation Program," "FFD and Access Construction Personnel Program," and "Fitness for Duty (FFD) Program for Construction (workers and first-line supervisors)."

14. INITIAL TEST PROGRAM AND ITAAC-DESIGN CERTIFICATION

NUREG-0800 SRP 14.2, Rev 3 Initial Plant Test Program - Design Certification and New License Applicants

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.11	R.G. 1.68	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 14.2 – General description: the Initial Test Program (ITP) is applicable to submittals for an operating license (OL), standard design approval (SDA), design certification (DC), combined license (COL), and manufacturing license (ML) respectively.

The Initial Test Program is applicable to the Atomic Alchemy NPUF 103 operating license application and FSAR submittal under 10 CFR Part 50. The Atomic Alchemy FSAR is based on the format outlined in Regulatory Guide 1.70 with any additional guidance of selected sections of NUREG-1537 added as applicable. To meet the FSAR requirements of 10 CFR 50.34(b)(6)(iii) and 10 CFR 50.43(e), Atomic Alchemy will submit its FSAR Chapter 14 Initial Testing and Startup Plan in accordance with Regulatory Guide 1.70, Chapter 14 formatting and conformance to the applicable sections contained in Regulatory Guide 1.68.

Regulatory Guide 1.68, positions C.1 through C.9 – Exceptions as noted; 10 CFR Part 52 criterion is not applicable to the Atomic Alchemy facility. Tests identified in Appendix A and Appendix C that are specific to BWR, PWR, ABWR, ESBWR, APWR or other power reactor designs are not applicable to Atomic Alchemy facility, tests identified in Appendix B as pertaining to ITAAC are not applicable to the Atomic Alchemy facility. The scope of the testing performed under the Atomic Alchemy QAPD Criterion XI, Section 11.7 "Start-Up Test Program" and the "Operational Readiness Assessment Program" will demonstrate, insofar as practicable, that the overall facility is capable of withstanding the design transients and accidents.

A preservice test program, which identifies the required functional testing for both the reactor and radioisotope processes, will be submitted to the NRC prior to performing the tests and following the start of construction. These pre-service tests will be described in FSAR Chapter 14, Section 4 (Reactor pre-operational testing) and Section 5 (Radioisotope Process Production Pre-Operational Testing). The pre-operational tests (which includes test and acceptance plans for First of a Kind (FOAK), safety related, important to safety systems and components, and other systems that meet the criteria of 10 CFR 50.43(e)) will be described in these FSAR Chapter 14 sections.

The reactor startup test program begins with initial fuel loading after the preoperational testing has been successfully completed. Startup reactor testing will be grouped into four broad categories:

- Tests related to initial fuel loading

- Tests performed after initial fuel loading but prior to initial criticality
- Tests related to initial criticality and those performed at low power (less than 5 percent)
- Tests performed at power levels greater than 5 percent

Each Start-Up Test described within the FSAR will contain at a minimum a description of the "Objective," "Prerequisites," "Test Methodology" and "Performance Criteria."

Atomic Alchemy will prepare "Functional Area and Baseline Inspection Readiness Reports" for the reactor and radioisotope process SSCs. These reports will form the basis for supporting the conclusion that 10 CFR 50.57(a)(1), 10 CFR 50.57(a)(2) and 10 CFR 50.57(a)(3)(ii) have been satisfied and that the applicable inspections identified in IP 69020, IP 69021, and IP 69023 have been completed and there are no outstanding issues for which Atomic Alchemy has not developed adequate corrective actions for.

NUREG-0800 SRP 14.2.1 (Initial Issuance) Generic Guidelines for Extended Power Uprate Testing Programs

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP is not applicable to the Atomic Alchemy facility at this time.		

NUREG-0800 SRP 14.3 (Initial Issuance) Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP applies to general inspections, tests, analyses, and acceptance criteria (ITAAC) for design certification (DC) and combined license (COL) applications under 10 CFR Part 52.		

NUREG-0800 SRP 14.3.1 [Reserved]

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP is not applicable to the Atomic Alchemy facility.		

NUREG-0800 SRP 14.3.2 (Initial Issuance) Structural and Systems Engineering - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to building structures and structural aspects of major components for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. The method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.3, Rev 1 Piping Systems and Components - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to piping systems and components for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.4 (Initial Issuance) Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to the scope of reactor systems for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.5 (Initial Issuance) Instrumentation and Controls - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to the instrumentation and control (I&C) systems for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.6 (Initial Issuance) Electrical Systems - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to the station electrical systems for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.7 (Initial Issuance) Plant Systems - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to most of the fluid systems that are not part of the core reactor systems for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.8 (Initial Issuance) Radiation Protection - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to the radiation protection aspects of the design for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.9 (Initial Issuance) Human Factors Engineering - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to the human factors aspects of the nuclear power plant design for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.10 (Initial Issuance) Emergency Planning - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to emergency planning design for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2. Atomic Alchemy intends to submit their preliminary Emergency Plan as FSAR Chapter 13 Appendix B prior to the submittal of the PSAR and construction license application.		

NUREG-0800 SRP 14.3.11 (Initial Issuance) Containment Systems - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to containment and associated systems design for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. This method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2.		

NUREG-0800 SRP 14.3.12, Rev 2 Physical Security Hardware - Inspections, Tests, Analyses, and Acceptance Criteria

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP section addresses inspections, tests, analyses, and acceptance criteria (ITAAC) related to physical security hardware design for design certification (DC) and combined license (COL) applications under 10 CFR Part 52. The method of meeting the acceptance criteria does not apply to the Atomic Alchemy 103 operating license application under 10 CFR Part 50. Atomic Alchemy's conformance to the intent of this SRP will be demonstrated in SRP 14.2. [ ] SEC		

15. TRANSIENT AND ACCIDENT ANALYSIS

NUREG-0800 SRP 15, Rev 3 Introduction - Transient and Accident Analyses

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.4 SRP 4.5.1, SRP 4.5.2, SRP 4.5.3,	10 CFR Part 20, 10 CFR 50 Appendix A, 10 CFR 50.46, 10 CFR Part 100,	Exceptions as noted.

SRP 13 SRP 13b SRP 13a2.1 SRP 13a2.1.11 SRP 14b	10 CFR Part 52, GDC 2, GDC 4, GDC 5, GDC 10, GDC 13, GDC 15, GDC 17, GDC 19, GDC 20, GDC 25, GDC 26, GDC 27, GDC 28, GDC 29, GDC 31, GDC 34, GDC 35, GDC 55, GDC 60, GDC 61	

Summary Description of Compliance/Exceptions

SRP 15 – General description: Atomic Alchemy follows the classification of facility conditions as defined in ANSI 18.2. This SRP contains examples of AOO's in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs, the majority of these are not applicable to the Atomic Alchemy reactors. In instances where the Reactors have similar AOO's to PWRs or BWRs the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

The Atomic Alchemy accident analyses substitutes the NUREG-1537 Maximum Hypothetical Accident (MHA) with the NUREG-0800 Beyond Design Basis (BDB) accident in SRP 19. The postulated BDB accidents are also evaluated for the multi-reactor site.

Atomic Alchemy evaluates radioisotope production accidents in FSAR Chapter 15 as well. Integrated Safety Analysis methodologies as described in NUREG-1520 will be used. Items Relied On For Safety (IROFS) are categorized as safety related in the Atomic Alchemy FSAR.

Atomic Alchemy separates reactor AOO's from non-reactor AOO's, (e.g. those of the radioisotope, radwaste and target fabrication modules). The categorization of types of AOO's include those from the radioisotope production processes. The effects of AOO's from the other modules are considered for their respective impact on the reactors and vice versa. Various operating occurrences and operational deviations to SSCs (both reactor and non-reactor) that occur during continued operation (as permitted by the Facility Technical Specifications) will be analyzed to determine if it is acceptable for continued operations of the Reactors.

Mechanisms that can cause accidents in the Radioisotope Process Production Module (and other isotope process modules) are analyzed in terms of their potential to propagate to the reactor modules (and vice versa). Initiators that may affect multiple modules by their definition, such as loss of off-site power (LOOP) or a failure of a shared support system are not additionally evaluated for propagation. Accident sequences that require random failures to occur in multiple modules in addition to the initiating accident component failure are also not considered. (Accidents involving future construction activities' impacts on multiple modules (reactor/non-reactor) will also be evaluated and described in FSAR Chapter 1 Appendix F)

The Atomic Alchemy FSAR Chapter 15 accident analysis follows regulatory guide 1.70, the event evaluations conform to Section 15.X.X of this regulatory guide.

10 CFR Part 20 – Exceptions as noted; see Atomic Alchemy Technical Specifications Administrative Controls section 5.6.5 for a description of the Atomic Alchemy Radiation Protection Program. See

Technical Specification Administrative Controls section 5.6.1 and FSAR Chapter 16, Appendix C for the Atomic Alchemy Offsite Dose Calculation Manual.

10 CFR 50.46 – Exceptions as noted; The Versatile Isotope Production Reactor (VIPR) core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The Atomic Alchemy design, however, will provide an additional "emergency core cooling" type safety related system (designated as Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy passive "emergency core cooling" system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components.

10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

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10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

10 CFR 50, Appendix A, and GDC 2, 4, 5, 10, 13, 15, 17, 19, 20, 25, 26, 27, 28, 29, 31, 34, 35, 55, 60, 61 – Exceptions as noted; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.0.1, Rev 0 Radiological Consequence Analysis Using Alternative Source Terms

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 11.1.1, SRP 13	10 CFR 50.49, 10 CFR 50.67, 10 CFR 50, Appendix E, IV.E.8, NUREG-0737 II.B.2, II.B.3, II.F.1, III.D.1.1, III.A.1.2, III.D.3.4, R.G. 1.183	Acceptable

Summary Description of Compliance/Exceptions

SRP 15.0.1 – General description: accident source terms used in the Atomic Alchemy design basis radiological consequence analyses are based on Regulatory Guide 1.183. FSAR Chapter 15, Appendix A, "Evaluation Models and Parameters for Analysis of Radiological Consequences of Accidents" will describe the dose models for:

- Offsite
- Control Room

- Reactor Coolant
- Reactor Confinement Module Building
- Reactor Auxiliary Module Building
- Radioisotope Module Building
- Target Fabrication Module Building
- Radwaste Module Building

10 CFR 50.49 – Acceptable; Atomic Alchemy QAPD Section IX, “Electrical Equipment Qualification Program (EEQ)” (regulatory commitment AA0-RC-0007) will conform with 10 CFR 50.49, 10 CFR 50 Appendix B, Criteria III, XI, XVII, and R.G. 1.89 criterion.

10 CFR 50.67 – Not applicable; Atomic Alchemy is preparing to submit its initial construction license application and PSAR. It is not seeking to revise its current accident source term in design basis radiological consequence analyses.

10 CFR 50 Appendix E, IV.E.8 – Acceptable; a Technical Support Operations Facility is located onsite. See FSAR Chapter 9, Section 5, subsections, “Technical Support Center (TSC) (onsite),” “Operational Support Center (OSC) (onsite),” and “Emergency Operations Center Module Building (EOM) (offsite)” for further description of these facilities.

NUREG-0737 – Atomic Alchemy compliance with NUREG-0737 and NUREG-0694 Task Action Items are addressed in FSAR Chapter 1, Appendix D, “Compliance with Generic Safety Issues (NUREG-0933).” Pertinent items associated with SRP 15.0.1 are described below:

II.B.2 (shielding) – Acceptable; Atomic Alchemy FSAR Chapter 12, Section 3, “Radiation Protection Design Features” will describe the methodology of how the facility areas are categorized into radiation zones according to design basis radiation levels and anticipated personnel occupancy with consideration given toward maintaining personnel exposures ALARA and within the standards of 10 CFR 20. Shielding provided by rooms, corridors, piping chases, and other areas are evaluated for protection from potential radiation sources during normal, shutdown, and emergency operations and for maintenance occupancy requirements.

II.B.3 (post-accident sampling) – Acceptable; the Atomic Alchemy Reactor sits in an open to atmosphere light water pool, the primary method to sample the Reactor Coolant System (RCS) would be to draw a sample directly from the pool. If this is not available due to high radiation exposures, the alternate method would be to draw a sample from the Chemical Volume and Control (CVC) room located in the reactor auxiliary module building. Sampling analysis is performed in the Radioactive Sampling room located in the Administrative Services Module building using a glove box pass through to the Reactor Auxiliary Module building.

II.F.1 (containment effluent monitoring) - Exceptions as noted; the VIPR is situated in an open to atmosphere light water pool. The containment structure is redefined by Atomic Alchemy in PDC 16 (FSAR Chapter 1, Appendix F). The potential for hydrogen or combustible gas buildup greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis. Technical Specifications Program 5.6.5, “Radiation Protection Program” administratively controls sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points.

III.D.1.1 (primary coolant outside containment) – Acceptable; The Atomic Alchemy Reactor coolant pressure boundary leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, RCS System Leak Detection Program. Also see Technical Specification Administration Section 5.6.4 “RCS and Light Water Pool Leakage Rate Testing Program,” and Limited Conditions of Operation LCO 3.3.10 “RCS Leakage Detection Instrumentation” (RLD), LCO 3.4.6 “RCS Operational Leakage (RLD),” and LCO 3.7.6 Reactor Coolant/Light Water Pool Leak Collection System (RLC).

III.A.1.2 (onsite technical support center) – Acceptable; the Atomic Alchemy Technical Support Center and Operational Support Center are located in the Administration and Services Module building basement level. An Emergency Operations Facility is located offsite. See FSAR Chapter 9, Section 5, subsections, “Technical Support Center (TSC) (onsite),” “Operational Support Center (OSC) (onsite),” and “Emergency Operations Center Module Building (offsite) (EOM)” for a description of each center.

III.D.3.4 (control room habitability) – Acceptable; non-safety-related HVAC systems Control Room Re-Circulating Sensible Cooling/Heating System (CRX) and Control Room HVAC System (CRV) keep the Atomic Alchemy main control room (MCR) slightly pressurized to prevent infiltration of air from other facility areas. During transient conditions, isolation of the MCR is automatically activated by safety-related isolation dampers. The MCR is isolated, and the Control Room Emergency Habitability System (CRE) and Control Room Emergency Ventilation and Filtration System (CRF) are activated. The compressed air system provides continued pressurization and a source of fresh air for operator habitability. The air supply is sized to last for 72 hours following an accident. It is postulated that the CRV system will be operational by that time either from offsite power or the non-safety-related onsite diesel generators.

Regulatory Guide 1.183, positions C.1 through C.6 – Exceptions as noted; the values presented in this regulatory guide in Tables 1 through Table 6 are not applicable to the Atomic Alchemy NPUF design. The parameter values are based on transients in BWR and PWR reactors. The assumptions and methodology provided in this regulatory guide will be conservatively followed in determining the Atomic Alchemy AST. FSAR Chapter 15, Appendix B, “Removal of Airborne Activity from the Reactor Confinement Module Atmosphere Following Severe / Beyond Design Basis Accident,” and FSAR Chapter 15 Appendix C, “Removal of Airborne Activity from the Radioisotope Process Production Module, Target Fabrication Module and Radwaste Processing Module Atmosphere Following Severe / Beyond Design Basis” address the dispersion of radionuclides from the reactor cores, spent fuels, and radioisotope processes under various postulated beyond design basis transients.

Regulatory Guide 1.183, Appendix A, position 1 through 6 – Not applicable; the reactor module does not have “dual containment,” “primary containment sump water (in PWRs) or a suppression pool (in BWRs),” or “main steam isolation valves.”

Regulatory Guide 1.183, Appendix A, position 7 - Not applicable to the VIPR, as there is no potential for a post-accident LOCA hydrogen or combustible gas buildup. However, a non-safety combustion gas monitoring system is employed. The non-safety-related fire protection smoke exhaust system can be utilized to purge any combustible gases, and natural convection will minimize any accumulation of combustible gases inside the confinement building module.

Regulatory Guide 1.183, Appendix B, positions 1 through 5 – Exceptions as noted; Atomic Alchemy will utilize the methodology described in the guide. The Atomic Alchemy NPUF design does not include a separate spent fuel building, nor does it include a containment structure. Both the reactor core and spent fuel are located in the same light water pool open to the atmosphere of the confinement model building. The reactor confinement module building is presumed to be isolated at all times (through the use of airlocks). An ESF filtration system is not part of the design, a non-safety-related filtration system is used for normal releases. Regulatory Guide 1,183, Appendix C through H – Not applicable; the postulated accidents are not credible transients in the Atomic Alchemy FSAR chapter 15 analysis. Regulatory guide 1.183, Appendix I – Exceptions as noted; basic assumptions and dose models will be conservatively applied to the evaluation of the aging effects by radiation on Atomic Alchemy EEQ components. See FSAR Chapter 3, Appendix E, “Methodology for Qualifying Safety Related Electrical and Mechanical Equipment.”

NUREG-0800 SRP 15.0.2, Rev 0 Review of Transient and Accident Analysis Methods

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 4.5.2, SRP 4.5.3, SRP 13	10 CFR 50 Appendix K	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 15.0.2 – General description: the methods of accident analysis will be described in Atomic Alchemy FSAR Chapter 15, Section 3, “Analytical Methods.” Atomic Alchemy uses the following computer codes for analyzing transients: RELAP5/MOD3.3 STARCCM+ 2020.3 Serpent 2 Theory and User manuals are readily available for these codes. These codes also meet NQA-1 quality standards. 10 CFR 50, Appendix K – General description: Exceptions as noted; this Appendix contains phenomena and features applicable to pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs, the majority of which are not applicable to the Atomic Alchemy reactors. In instances where the VIPR has similar transient phenomena to PWRs or BWRs (e.g., swelling and rupture of the fuel rod cladding, metal-water reactions, fission heat, fission product decay, primary to secondary heat transfer) the difference in the level of risk and challenges to the facility’s safety limits are significantly less than either of the PWR or BWR risks.		

10 CFR Part 50 Appendix K, I.A, "Sources of heat during the LOCA" – Not applicable; the Atomic Alchemy design includes a LBB analysis of ASME Section III, Class 1, and Class 2 piping. There is no credible LB LOCA transient or LOCA in the FSAR Chapter 15 analysis where the reactor core is uncovered. 10 CFR Part 50 Appendix K, I.B, "Swelling and Rupture of the Cladding and Fuel Rod Thermal Parameters" – Acceptable; all credible heat sources are conservatively analyzed in the accident analysis. 10 CFR Part 50 Appendix K, I.C, "Blowdown Phenomena" – Not applicable; two phase flow is not credible in the FSAR chapter 15 accident analysis. The RCS system is open to the atmosphere and the "ECCS" makeup water transfers directly into the light water pool. Boiling heat transfer in the light water pool between the rods and the pool water continues throughout the entire LOCA postulated transient. 10 CFR Part 50 Appendix K, I.D, "Post-Blowdown Phenomena; Heat Removal by the ECCS" – Not applicable; Because the VIPR is located in an open pool, and are not contained inside a pressurized vessel, it is not postulated that any transient involving a high energy primary reactor cooling pipe break would result in a significant increase in the confinement module or auxiliary module buildings design pressure. 10 CFR Part 50 Appendix K, II, "Required Documentation" – Acceptable; the description of the LOCA events will be included in the FSAR Chapter 15, Section 7 accident analysis.

NUREG-0800 SRP 15.0.3 (Initial Issuance) Design Basis Accident Radiological Consequences of Analyses for Advanced Light Water Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 1.2, SRP 6.2.3, SRP 13	10 CFR 50.34(a)(1), 10 CFR 100.21, 10 CFR 50 Appendix E, IV.E.8 , GDC 19	Acceptable
Summary Description of Compliance/Exceptions		
SRP 15.0.3 – General description: in FSAR Chapter 15, Sections 15.6 (Reactor Accidents Overview) and Section 15.8 (Radioisotope Process, Radwaste Process and Target Fabrication Accidents Overview) will provide an overview of the selected bounding design basis accidents, review of accident source terms, description of the major structures, systems, and components of the facility that are intended to mitigate the radiological consequences of a Design Basis Event (DBE), description of the characteristics of fission product releases from the proposed site to the environment, and will describe the total calculated radiological consequence dose at the exclusion area boundary (EAB), low population zone (LPZ) control room, and technical support center from the		

bounding DBEs. Atomic Alchemy also analyzes the consequences of severe accidents in FSAR Chapter 19, these include LOLA, AIA, and an Ex-Pool (similar to an EX-Vessel) transient.

10 CFR 50.34(a)(1) and 10 CFR 100.21 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP

10 CFR 50 Appendix E, IV.E.8 – Acceptable; a Technical Support Operations Facility is located onsite. See FSAR Chapter 9, Section 5, subsections, "Technical Support Center (TSC) (onsite)," "Operational Support Center (OSC) (onsite)," and "Emergency Operations Center Module Building (offsite) (EOM)" for further description of these facilities.

GDC 19 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.1.1- 15.1.4, Rev 2 Decrease in Feedwater Temperature, Increase in Feedwater Flow, Increase in Steam Flow, and Inadvertent Opening of a Steam Generator Relief or Safety Valve

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR. It is a non-power reactor.		

NUREG-0800 SRP 15.1.5, Rev 3 Steam System Piping Failures Inside and Outside of Containment (PWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR. It is a non-power reactor.		

NUREG-0800 SRP 15.1.5, Appendix A, Rev 2 Radiological Consequences of Main Steam Line Failures Outside Containment of a PWR

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
Not applicable to the VIPR. It is a non-power reactor.

NUREG-0800 SRP 15.2.1-15.2.5, Rev 2 Loss of External Load; Turbine Trip; Loss of Condenser Vacuum; Closure of Main Steam Isolation Valve (BWR); and Steam Pressure Regulator Failure (Closed)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR. It is a non-power reactor.		

NUREG-0800 SRP 15.2.6, Rev 2 Loss of Nonemergency AC Power to the Station Auxiliaries

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.3, SRP 8.1, SRP 13 SRP 13a2.1.5	GDC 10, GDC 13,GDC 15, GDC 26, R.G. 1.105, R.G. 1.53	Exceptions as noted.

Summary Description of Compliance/Exceptions
SRP 15.2.6 – General description: this SRP addresses the evaluation of the consequences of loss of normal (or non-emergency) AC power in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. The majority of these consequences are not applicable to the Atomic Alchemy reactors. Any type of power reactor station auxiliary components that are powered from the normal AC bus either do not exist in the NPUF design or if they do exist, do not have the same significant role in the reactor design. LOOP and ELAP type transients are evaluated for their impact to both the reactor and radioisotope production systems, components, and operations in FSAR Chapter 15, Sections 15.6 and 15.8, respectively. In instances where the NPUF processes and components may be similarly affected by loss of AC power transient, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. GDC 10, 13, 15, 26 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs. Regulatory Guide 1.105, positions C.1 through C.4 – Acceptable; Atomic Alchemy will comply with ISA-S67.04 in developing limited safety system settings (LSSS) for the technical specifications. The allowances between the technical specification limit and the safety limit include the following items: • The inaccuracy of the instrument • Process measurement accuracy

- Uncertainties in the calibration
- Environmental effects on equipment accuracy caused by limiting postulated events

The setpoints are chosen such that the accuracy of the instrument is adequate to meet the assumptions of the safety analysis. See FSAR Chapter 16, Section 3, "Limited Conditions for Operation."

Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture will conform with the intent of the requirements of IEEE 379, "Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems" as applicable to DC safety related power systems. There is no AC power safety related I&C system in the Atomic Alchemy facility. FSAR Chapter 7, Section 2, "Identification of Safety Criteria" will describe the evaluation for applying single failure criterion.

NUREG-0800 SRP 15.2.7, Rev 2 Loss of Normal Feedwater Flow

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR. It is a non-power reactor.		

NUREG-0800 SRP 15.2.8, Rev 2 Feedwater System Pipe Breaks Inside and Outside Containment (PWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR. It is a non-power reactor.		

NUREG-0800 SRP 15.3.1-15.3.2, Rev 2 Loss of Forced Reactor Coolant Flow Including Trip of Pump Motor and Flow Controller Malfunctions

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.3, SRP 5.2, SRP 13 SRP 13a2.1.3	GDC 10, GDC 13, GDC 15, GDC 17, GDC 20, GDC 26, R.G. 1.53, R.G. 1.105, R.G. 1.206	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.3.1 – 15.3.2 – General description: this SRP addresses the evaluation of the consequences of a loss of reactor coolant flow (caused by pump motor trip and flow control malfunction) in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the reactor coolant pumps and components may be similarly affected by these types of transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy evaluates both decrease in heat removal by the RCS system and decrease in RCS flow rate. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under reactor coolant/light water pool transients.

Complete loss of forced reactor coolant flow is a Condition III event. Plant characteristics and initial conditions are presented in FSAR Table 15.08-02. The accident is evaluated for both cases with and without offsite power available. Heat stored in the fuel rods continues to be transferred to the light water pool and RCS system, causing the RCS temperature to increase and the water to expand. Since the Atomic Alchemy VIPR cores are located in open to atmosphere light water pool there are no over pressure transients in any of the RCS system components.

The minimum measured reactor coolant flow is specified in the technical specifications as the flow that must be confirmed or exceeded by flow measurements obtained during reactor startup. This is the flow used in reactor core departure from nucleate boiling (DNB) analysis.

The reactor is assumed to trip on the reactor coolant pump under-speed signal. FSAR Figure 15.7-01 and 15.7-02 will show that the DNBR is always greater than the design limit value defined in the DNB analysis.

Parameter values used in the analytical model will be presented in FSAR Table 15.04-01.

The most limiting single failures assumed in each transient analysis are presented in FSAR Table 15.05-01.

The VIPR core (and spent fuel) light water pool does not require any post-accident forced cooling. It relies on natural convection for decay heat or residual heat removal.

RCS system check valves are considered active components and are tested in the open and close direction. Testing a check valve confirms the valve operability to move to the position to fulfill the safety-related mission during applicable plant modes. The test shows that the check valve opens in response to flow and closes when the flow is stopped. A demonstration of reverse-flow isolation of the check valves that is that the check valve closes when the flow is stopped is performed using direct means or diagnostics. The testing includes the effects of rapid pump starts and stops as required by expected system operating conditions.

GDC 10, 13, 15, 17, 20, 26 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Regulatory Guide 1.105, positions C.1 through C.4 – Acceptable; Atomic Alchemy will comply with ISA-S67.04 in developing limited safety system settings (LSSS) for the technical specifications. The allowances between the technical specification limit and the safety limit include the following items:

- The inaccuracy of the instrument
- Process measurement accuracy
- Uncertainties in the calibration
- Environmental effects on equipment accuracy caused by limiting postulated events.

The setpoints are chosen such that the accuracy of the instrument is adequate to meet the assumptions of the safety analysis. See FSAR Chapter 16, Section 3, "Limited Conditions for Operation."

Regulatory Guide 1.53, position C – Exceptions as noted; Atomic Alchemy I&C architecture conforms with the intent of the requirements of IEEE 379, "Application of the Single Failure Criterion to Nuclear Power Generating Station Safety Systems" as applicable to DC safety related power systems. There are no AC power safety related I&C systems in the Atomic Alchemy facility. FSAR Chapter 7, Section 2, "Identification of Safety Criteria" will describe the evaluation for applying single failure criterion.

Regulatory Guide 1.206, positions C.1 and C.2 – Not applicable; this guide addresses requirements for COLAs, DC, and ESP applications. Atomic Alchemy is applying for a construction and operating license under 10 CFR Part 50. The Atomic Alchemy FSAR will be based on Regulatory Guide 1.70 format with additional sections as required to address NUREG-1537 issues. Atomic Alchemy's QAPD (submitted as topical report AA0-VIPR-20-QAPD (NP)) is based on the NQA-1 standard.

NUREG-0800 SRP 15.3.3-15.3.4, Rev 3 Reactor Coolant Pump Rotor Seizure and Reactor Coolant Pump Shaft Break

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.2, SRP 4.5.3, SRP 5.2, SRP 13 SRP13a2.1.3	10 CFR Part 100, GDC 17, GDC 27, GDC 28, GDC 31	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.3.3 – 15.3.4 – General description: this SRP addresses the evaluation of the consequences of loss of reactor coolant flow (caused by pump rotor seizure and pump shaft breaks) in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the reactor coolant pumps and components may be similarly affected by these types of transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy evaluates loss of the RCS system flow. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under reactor coolant/light water pool transients.

Reactor coolant pump rotor seizure and shaft break are condition IV events. Either event leads to a reactor trip on low flow. Plant characteristics and initial conditions are presented in FSAR Table 15.07-02. The accident is evaluated for both with and without offsite power available. Heat stored in the fuel rods continues to be transferred to the light water pool and RCS system, causing the RCS temperature to increase and the water to expand. Since the VIPR is located in open-to-atmosphere light water pool there are no over pressure transients in any of the RCS system components.

The reactor is assumed to trip on the reactor coolant pump no flow signal. FSAR Figure 15.7-03 will show that the DNBR is always greater than the design limit value defined in the DNB analysis. With the reactor tripped a stable plant condition is attained.

Initial verification of the water transfer capability and functional operation of the passive light water pool decay heat removal system under design conditions is performed by conducting a natural circulation flow test. This test establishes the ability to maintain long term cooling of the core and spent fuel.

GDC 17, 27, 28, 31 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

Each transient in FSAR Chapter 15 is evaluated for its respective radiological consequences including:

- 10 CFR 70.61 exposure limits
- 10 CFR Part 100 exposure limits
- On-Site dose calculations
- Off-Site dose calculations
- Main Control Room dose effect
- Technical Support Center dose effect

NUREG-0800 SRP 15.4.1, Rev 3 Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power Startup Condition

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 13 SRP 13a2.1.2 SRP 13a2.1.8	GDC 10, GDC 13, GDC 20, GDC 25	Acceptable
Summary Description of Compliance/Exceptions		
SRP 15.4.1 – General description: this SRP addresses the evaluation of the consequences of uncontrolled control rod assembly withdrawal from a subcritical or low power startup condition in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the		

Reactor Control Rod Drive Mechanism System (CRD) components may experience similar transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy evaluates the withdrawal or insertion of the control rod assemblies and the regulating rod assembly from a subcritical or low power startup condition as well as from full power condition. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under Reactivity and Power Distribution Anomalies. Atomic Alchemy has determined that single failures resulting in rod withdrawals do not violate specified fuel design limits.

The uncontrolled control rod withdrawal accident is an uncontrolled addition of reactivity to the reactor core caused by the withdrawal of a control rod assembly which results in a power excursion. Such a transient can be caused by a malfunction of the CRDM components or I&C rod control systems. Mechanical failures can only cause either rod insertion or immobility, but not rod withdrawal. This can occur with the reactor subcritical, at hot zero power, or at power. This event is a Condition II event (a fault of moderate frequency).

Should a continuous rod withdrawal accident occur, the transient is terminated by the following automatic features of the Atomic Alchemy Protection and Safety Monitoring System (IMS):

- Source range high neutron flux reactor trip
- Intermediate range high neutron flux reactor trip
- Power range high neutron flux reactor trip (high and low)
- High nuclear flux rate reactor trip

The reactor is assumed to trip on any of these signals. FSAR Figure 15.7-04 will show the average channel heat flux. In the event of a rod withdrawal accident from the subcritical condition, the core and the reactor coolant system are not adversely affected because the combination of thermal power and the coolant temperature results in a DNBR greater than the safety analysis limit value.

GDC 10, 13, 20, 25 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.4.2, Rev 3 Uncontrolled Control Rod Assembly Withdrawal at Power

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 13 SRP 13a2.1.2 SRP 13a2.1.8	GDC 10, GDC 13, GDC 17, GDC 20, GDC 25	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 15.4.2 – General description: this SRP addresses the evaluation of the consequences of uncontrolled control rod withdrawal from an at power condition in pressurized-water reactor (PWR)		

and boiling-water reactor (BWR) designs. In instances where the Reactor CRD components may experience similar transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy evaluates the withdrawal or insertion of both control rod assemblies and regulating rod assembly from a subcritical or low power startup condition as well as from full power condition. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under Reactivity and Power Distribution Anomalies. Atomic Alchemy has determined that single failures resulting in rod withdrawals do not violate specified fuel design limits.

As discussed in SRP 15.4.1, again, an uncontrolled control rod withdrawal accident is an uncontrolled addition of reactivity to the reactor core caused by the withdrawal of a control rod which results in a power excursion. Such a transient can be caused by a malfunction of the CRDM components or I&C rod control systems. Mechanical failures can only cause either rod insertion or immobility, but not rod withdrawal. This can occur with the reactor subcritical, at hot zero power, or at power. This event is also a Condition II event (a fault of moderate frequency).

In the Atomic Alchemy I&C architecture design, there are trip setpoints for control rod withdrawals when the reactor is at power.

- High neutron flux (two out of four power range)
- Overpower ΔT (two out of four)
- Overtemperature ΔT (two out of four)

Additionally, the automatic features of the Atomic Alchemy PMS instrumentation system that will prevent core damage following this postulated transient include the following:

- Power range neutron flux instrumentation actuates a reactor trip
- Reactor trip is actuated if an overtemperature ΔT setpoint is reached.
- Reactor trip is actuated if overpower ΔT setpoint is reached.

FSAR Figure 15.7-05 through Figure 15.7-08 will show the Minimum DNBR Versus Reactivity Insertion Rate for Rod Withdrawal at 10-percent power, 60-percent power and 100-percent power, respectively. Rod withdrawal at power is blocked, however. Should it occur at power, the reactor is tripped fast enough during the control rod withdrawal at-power transient that the ability of the RCS system to remove heat from the fuel rods is not reduced. The overpower transient is terminated by the overtemperature ΔT reactor trip before DNB occurs. With the reactor tripped, the plant returns to a stable condition.

Even if a loss of offsite AC power and the subsequent reactor coolant pump coastdown were to be explicitly modeled, the minimum DNBR is predicted to occur during the time period of the control rod withdrawal transient while at-power prior to the time the reactor coolant pump flow coastdown begins.

GDC 10, 13, 17, 20, 25 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.4.3, Rev 3 Control Rod Mis-operation (System Malfunction or Operator Error)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 13 SRP 13a2.1.4 SRP 13a2.1.8	GDC 10, GDC 13, GDC 20, GDC 25	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.4.3 – General description: this SRP addresses the evaluation of the consequences of a control rod malfunction (either withdrawal or insertion) caused by either a system/component malfunction or an operator error in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the Reactor CRD components may experience similar transients, the difference in the level of risk and challenges to the facility’s safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy evaluates the misalignment or unintended operation (withdrawal or insertion) of both grey rods and fuel rods from a subcritical or low power startup condition as well as from full power condition. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under Reactivity and Power Distribution Anomalies. Atomic Alchemy has determined that single failures resulting in rod withdrawals do not violate specified fuel design limits.

An uncontrolled control rod withdrawal or a fuel rod insertion accident is an uncontrolled addition of reactivity, whereas a control rod insertion or fuel rod withdrawal is a reduction of reactivity to the reactor core. Mechanical failures can only cause either a rod insertion or rod immobility, but not rod withdrawals.

These events can occur with the reactor subcritical, at hot zero power, or at power. This type of event is also a Condition II event (a fault of moderate frequency).

This type of transient can be detected by the following instrumentation:

- Change in the core power level
- Asymmetric power distribution as seen by the in-core or ex-core neutron detectors or core exit thermocouples
- Rod at bottom signal
- Rod deviation alarm
- Rod position indication

Multiple independent alarms, including a bank insertion limit or rod deviation alarm, alert the control room operator well before the postulated transient conditions are approached. The control room operators take actions as required by the Technical Specifications.

For cases of any dropped control rods, (including inadvertent drops of the control rods selected to be inserted as part of the rapid power reduction safety system), analysis shows that the DNBR remains greater than the safety analysis limit value.

For cases of any dropped fuel rods (fully inserted from a prior withdrawal point) or the further withdrawal of fuel rods, analysis shows that the DNBR remains greater than the safety analysis limit value.

For the case of the accidental withdrawal of control rods while the reactor is in the automatic or manual control mode and initially operating at full power analysis shows (see also Atomic Alchemy's SRP 15.4.2 response) that the DNBR remains greater than the safety analysis limit value.

For the cases of misaligned fuel or control rods analysis shows that the DNBR remains greater than the safety analysis limit value.

GDC 10, 13, 20, 25 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.4.4-15.4.5, Rev 2 Startup of an Inactive Loop or Recirculation Loop at an Incorrect Temperature and Flow Controller Malfunction Causing an Increase in BWR Core Flow Rate

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the VIPR, as it is a non-power reactor and does not have inactive or isolated RCS supply loops that could malfunction and introduce additional cooling flow into the light water pool.		

NUREG-0800 SRP 15.4.6, Rev 2 Inadvertent Decrease in Boron Concentration in the Reactor Coolant System (PWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This typical PWR reactor coolant anticipated operational occurrences are either not applicable to the Atomic Alchemy Viper reactor design or pose a substantially reduced risk to impacting the safe operation of the reactor. For example, the Atomic Alchemy RCS, CVC and DHR systems are boron free, therefore increases in RCS inventory only poses a potential temperature decrease which is bounded by other accident analyses in FSAR Chapter 15.		

NUREG-0800 SRP 15.4.7, Rev 2 Inadvertent Loading and Operation of a Fuel Assembly in an Improper Position

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 13 SRP 13a2.1.4 SRP 13a2.1.8	GDC 13	Acceptable

Summary Description of Compliance/Exceptions

SRP 15.4.7 – General description: this SRP addresses the evaluation of the consequences of inadvertent loading of one or more fuel assemblies into improper positions, having a fuel rod with one or more pellets of the wrong enrichment, or having a full fuel assembly with pellets of the wrong enrichment in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPR may experience a similar transient, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy has determined that single failures resulting in an improper fuel rod position do not violate specified fuel design limits.

A 5-percent uncertainty margin is included in the design value of power peaking factor assumed in the analysis of Condition I and Condition II transients.

Atomic Alchemy evaluates the inadvertent loading of an incorrect fuel assembly or loading it into an improper position and subsequently beginning operation. An error in enrichment, beyond the normal manufacturing tolerances, can cause power shapes more peaked than those calculated with the correct enrichments. Also included in the Atomic Alchemy analysis of potential core-loading errors is the inadvertent loading of one or more fuel assemblies requiring burnable poison rods into a new core without burnable poison rods or locating them in wrong positions. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under Reactivity and Power Distribution Anomalies. This event is a Condition III incident (an infrequent fault).

Fuel assembly enrichment errors are prevented by administrative procedures implemented in fabrication. Fuel assembly loading errors are prevented by administrative procedures implemented during core loading. The Atomic Alchemy Technical Requirements Manual administrative program 5.6.12, "Fuel Inspection and Testing Program" will provide testing and inspection plans for new fuel to verify cladding integrity, fuel system dimensions, fuel enrichment, burnable poison concentration, and absorber composition.

In the unlikely event that a loading error occurs, analyses confirm that resulting power distribution effects are either readily detected by the online core monitoring system or are acceptable within the uncertainties allowed between nominal and design power shapes.

GDC 13 – Acceptable; See FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.4.8, Rev 3 Spectrum of Rod Ejection Accidents (PWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
In the Atomic Alchemy VIPR design, the RCS is not pressurized and therefore a rod ejection accident is not a credible transient described in the Atomic Alchemy FSAR Chapter 15 analysis.		

NUREG-0800 SRP 15.4.8.A, Appendix A, Rev 1 Radiological Consequences of a Control Rod Ejection Accident (PWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
In the Atomic Alchemy VIPR design, the RCS is not pressurized and therefore a rod ejection accident is not a credible transient described in the Atomic Alchemy FSAR Chapter 15 analysis.		

NUREG-0800 SRP 15.4.9, Rev 3 Spectrum of Rod Drop Accidents (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy VIPR. This SRP is specific to BWR reactors only.		

NUREG-0800 SRP 15.4.9.A, Appendix A, Rev 2 Radiological Consequences of Control Rod Drop Accident (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy VIPR. This SRP is specific to BWR reactors only.		

NUREG-0800 SRP 15.5.1-15.5.2, Rev 2 Inadvertent Operation of ECCS and Chemical and Volume Control System Malfunction That Increases Reactor Coolant Inventory

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 5.2, SRP 6.2.3, SRP 13	GDC 10, GDC 13, GDC 15, GDC 26	Exceptions as noted.
Summary Description of Compliance/Exceptions		

SRP 15.5.1 – 15.5.2 – General description: this SRP addresses the evaluation of the consequences of inadvertent operation of ECCS and CVC systems that can increase the inventory of the reactor coolant system in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPR may experience a similar transient, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. For example, in both BWR and PWR design, depending on the boron concentration and temperature of the injected water and the response of the automatic control systems, a power level increase may result and, without adequate controls, could lead to fuel damage or over-pressurization event of the RCS system. These are not credible transients in the Atomic Alchemy Chapter 15 accident analysis. The NPUF reactors are located in open to atmosphere light water pools, and boron is not used in any of the coolant systems.

Atomic Alchemy evaluates the inadvertent operation of "ECCS" type (designated as Reactor Decay Heat Removal system – DHR in the Atomic Alchemy design) and the non-safety-related CVC systems resulting in increased inventory of reactor coolant system. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under "Reactor Coolant / Light Water Pool Transients." Both of these events are Condition II incidents (a fault of moderate frequency). The analysis of the DHR inadvertent operation bounds the CVC operational transient.

The inadvertent operation of the "ECCS" or CVC in a PWR or BWR is postulated to occur as the result of spurious safety injection signal. In the Atomic Alchemy design, CVC system is not necessary for reducing reactivity (by the addition of boron), so the postulated activation is instead caused by a pump or valve malfunction. The DHR system would only be activated (passively) on a low light water pool level, which would have already caused a reactor trip.

The results of these analyses therefore shows that inadvertent operation of the DHR or CVC systems during power operation does not adversely affect the core or the reactor coolant system, the DNBR always remains above the design limit values. FSAR Figures 15.7-08, 09, 10, and 11 depict the DNBR Transient, Core Heat Flux Transient, Core Nuclear Power Transient and RCS Temperature Transient, respectively for inadvertent operation of the DHR system. Either of these transients do not generate a more serious transient.

GDC 10, 13, 15, 26 – Acceptable; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.6.1, Rev 2 Inadvertent Opening of a PWR Pressurizer Pressure Relief Valve or a BWR Pressure Relief Valve

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy VIPR. It is a non-power reactor and does not have reactor coolant pressure relief valves nor a self-contained pressurized coolant system.		

NUREG-0800 SRP 15.6.2, Rev 2 Radiological Consequences of the Failure of Small Lines Carrying Primary Coolant Outside Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 13	GDC 55, R.G. 1.11	Exceptions as noted.
Summary Description of Compliance/Exceptions		
SRP 15.6.2 – General description: this SRP addresses the evaluation of the consequences of failure of small-bore piping lines that carry reactor coolant outside of the reactor containment boundary in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPR may experience a similar transient, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR. Atomic Alchemy redefines the containment boundary as described in PDC 16, in FSAR Chapter 3, Appendix F. Atomic Alchemy evaluates the failure of small lines carrying primary reactor coolant outside the reactor confinement module building. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under "Reactor Coolant / Light Water Pool Transients." This event is a Condition II incident (a fault of moderate frequency). There are small-bore piping RCS lines carrying primary coolant outside the confinement module building, (e.g., sample lines, and CVC piping to/from the chemical and volume control system). These lines are used only periodically and are provided with automatic isolation valves inside and outside of the confinement module building. Breaks are not postulated within the break exclusion zone (within the confinement boundary and first isolation valve on either side of the boundary).		

ASME III Class 1, 2 and 3 piping are analyzed and supported to withstand safe shutdown earthquake loadings. Mechanistic pipe break evaluations demonstrate that for piping lines meeting the Leak-Before-Break criteria, sudden catastrophic failure of the pipe is not credible. It is demonstrated that piping that satisfies the LBB criteria leaks at a detectable rate from postulated flaws prior to growth of the flaw to a size that would fail. Additionally, Atomic Alchemy piping design avoids intermediate break locations through appropriate piping layout and pipe support design. No breaks are postulated for piping with a nominal diameter of 1 inch or less. Breaks in piping systems designed to requirements other than the ASME III Code, such as ASME-B31.1, are postulated to break at terminal ends and intermediate fittings. Pipe breaks are postulated at intermediate locations between terminal ends only where the piping maximum stress value is exceeded (the RCS system is an open to atmosphere system and therefore intermediate breaks are also not postulated to occur). Because the normal operating RCS system is not at high temperature and pressure the leaked fluid (presumably containing radionuclides, iodines and the noble gases) does not flash to steam and does not become airborne. Therefore, the calculated total effective dose equivalent (TEDE) doses are determined to be extremely low at both the exclusion area boundary and at the low population zone outer boundary. GDC 55 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.6.3, Rev 2 Radiological Consequences of Steam Generator Tube Failure

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy VIPR. It is a non-power reactor and does not have a steam generator.		

NUREG-0800 SRP 15.6.4, Rev 2 Radiological Consequences of Main Steam Line Failure Outside Containment (BWR)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy VIPR. It is a non-power reactor and does not have a steam generator.		

NUREG-0800 SRP 15.6.5, Rev 3 Loss-of-Coolant Accidents Resulting from Spectrum of Postulated Piping Breaks within the Reactor Coolant Pressure Boundary

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.3, SRP 5.2, SRP 6.2.3, SRP 13 SRP 13a2.1.3	10 CFR 50.46, 10 CFR 50.67, 10 CFR Part 100, GDC 13, GDC 35	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.6.5 – General description: this SRP addresses the evaluation of the consequences of loss of reactor coolant at a rate in excess of the capability of the normal reactor coolant makeup system, from various postulated piping breaks in the reactor coolant pressure boundary in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the RCS system may experience a similar transient, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Atomic Alchemy redefines the reactor coolant pressure boundary as described in PDC 14, in FSAR Chapter 3, Appendix F.

Atomic Alchemy evaluates Loss of Coolant Accidents (LOCA) including Large Break (LB) and Small Break (SB) transients. Initiating reactor events of this type are included in FSAR Chapter 15, Section 7, under "Reactor Coolant / Light Water Pool Transients." This is considered a Condition III event (because it is an infrequent fault that may occur during the life of the facility).

FSAR Chapter 3, Section 6, "Protection Against Dynamic Affects Associated with Postulated Pipe Ruptures" will describe the use of "leak-before-break" piping methodology in the Atomic Alchemy piping design. Dynamic effects need not be considered for those segments of piping that are shown mechanistically, within a large margin, not to be susceptible to a pipe rupture. Atomic Alchemy RCS large-bore piping is ASME III Class 1 piping and is analyzed and supported to withstand safe shutdown earthquake loadings. Mechanistic pipe break evaluations demonstrate that for piping meeting the Leak-Before-Break criteria, sudden catastrophic failure of the pipe is not credible. It is demonstrated that piping that satisfies the LBB criteria leaks at a detectable rate from postulated flaws prior to growth of the flaw to a size that would fail. Additionally, Atomic Alchemy piping design avoids intermediate break locations through appropriate piping layout and pipe support design. The RCS piping design incorporates piping bends instead of welded fittings, thus reducing the overall amount of welds and potential leak locations. No breaks are postulated for piping with a nominal diameter of 1-1/2 inch or less.

A design basis SB or LB LOCA in which the reactor core is uncovered is not postulated to occur in the RCS accident analysis. Atomic Alchemy analyzes LOCA transients in which the volume of water in the light water pool is reduced at a faster rate than the normal CVC system makeup water systems can accommodate.

The Atomic Alchemy reactor coolant cold and hot leg piping is routed between the light water pool located in the reactor confinement module and the RCS pump/heat exchanger cavity located in the reactor auxiliary module buildings through water-tight piping chases (provided with HELB hatches for ASME III, XI piping inspections). Two check valves in series are located in each of the two RCS cold leg piping headers. Breaks occurring in the hot leg or either cold leg piping located in the chases (outside the break exclusion zones), will flood the chase but not uncover the reactor core (the volume of the chases are less than the pool volume above the core). Breaks in either the hot leg or cold leg piping located within the Reactor Auxiliary Building in the RCS pump/heat exchanger cavity may flood the cavity (upon failure of both check valves in each cold leg) but will also not uncover the reactor core in the pool (the volume of the RCS pump/Heat Exchanger cavity is less than the volume of water above the reactor core in the pool).

Typically, in a PWR or BWR, a SB or LB LOCA creates a depressurization of the RCS system (creating two phase flow in the piping and leading to a radionuclide steam release into the atmosphere). This event is not credible in the accident analysis of the RCS system because the system is open to the atmosphere and not pressurized. Cladding oxidation and boric acid precipitation are also not credible scenarios in the Atomic Alchemy design basis LOCA analysis.

The postulated sequence of events in the Atomic Alchemy design following either a SB or LB break is the operating RCS pump(s) will run up its pump curve and trip automatically on an overspeed condition, causing the initiation of an "ESF" actuation signal that will in turn scram the reactor. Post-LOCA long term cooling is provided by natural convection alone, maintaining the reactor core and spent fuel light water pool temperature at an acceptable level. Reactivity control design provides sufficient means of holding the reactor core subcritical under LOCA transient conditions and within an appropriate margin for contingencies without the necessity to add a soluble neutron poison.

For conservatism, Atomic Alchemy utilizes the volume of water in the adjacent radioisotope transfer canal as an "emergency core cooling" type of source of decay heat cooling water. The system is designated as the Reactor Decay Heat Removal system (DHR), a safety related Seismic Cat-II system. Following a drop in the light water pool level, passive swing type check valves will open refilling the light water pool. The transfer canal has sufficient volume to refill the light water pool.

Although the analysis of the core response during either a SB or LB LOCA shows that core integrity is maintained, for the evaluation of the radiological consequences of a LB LOCA accident, it is assumed that a level of core degradation and cladding failure occurs. The release of activity to the reactor auxiliary module building and reactor confinement module building atmosphere consists of two parts. The initial release is the activity contained in the reactor coolant system (released by evaporation, not by flashing to steam) occurs within the reactor auxiliary module building where the large break occurs, followed by the release of the core inventory which would occur in the reactor confinement module where the core is located once it becomes uncovered. The core activity is further divided into a gap release then a core melt in which the bulk of the activity releases.

Atomic Alchemy will perform a sensitivity study for this scenario. Atomic Alchemy is confident that it will be determined that the consequences of radionuclides released into the confinement and auxiliary module buildings following a LOCA that uncovers the core will be bounded (by several degrees of magnitude) for both the duration and quantities of radionuclide released into the

containment building atmosphere during similar severe accident conditions by PWRs and BWRs as noted in NUREG-1465.

Further it is assumed that the sensitivity study will also indicate that the calculated maximum fuel element cladding temperature (i.e., peak cladding temperature (PCT)) will not exceed 2200°F and the calculated total amount of hydrogen generated from the chemical reaction of the cladding with water or steam will not exceed 0.01 times the hypothetical amount that would be generated if all of the metal in all the cladding surrounding the fuel were to react.

10 CFR 50.67, and 10 CFR Part 100 – Acceptable; the location of the Atomic Alchemy facility will be situated on [

] PROP The calculated offsite doses for the Atomic Alchemy Reactors from a BDBE are well within the 10 CFR 100 guidelines. Severe Accidents are addressed in FSAR Chapter 19. FSAR Table 15.A-01, "Accident Dose Criteria" will describe the exclusion area boundary, low population zone, and release duration from all postulated Atomic Alchemy transients including SB and LB LOCA's. FSAR Tables 15.A-04 through 15.A-11 will provide the Dispersion Factors (χ/Q) for offsite, control room, technical support center, and each module building.

10 CFR 50.46 – Exceptions as noted; The VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling. It relies on natural convection for decay heat or residual heat removal. The Atomic Alchemy design, however, will provide an additional "emergency core cooling" type safety related system (designated as Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy passive "emergency core cooling" system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components.

GDC 13, 35 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.6.5.A, Appendix A, Rev 1 Radiological Consequences of a Design Basis Loss-of-Coolant Accident Including Containment Leakage Contribution

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 5.2, SRP 11.1.1, SRP 11.1.6, SRP 13 SRP 13a2.1.3	10 CFR 100.11, R.G. 1.3, R.G. 1.4	N/A

Summary Description of Compliance/Exceptions
SRP 15.6.5, Appendix A – General description: this SRP addresses the evaluation of the consequences from additional individual contributions to the total radiological consequences from various release paths of loss of reactor coolant accidents in pressurized water reactor (PWR) and boiling water reactor (BWR) designs. Additional paths considered are: • Appendix A: Containment leakage, including the contribution from containment purge valves during closure. • Appendix B: Post-LOCA leakage from ESF systems outside containment. • Appendix C: Post-LOCA hydrogen purge from containment (deleted) • Appendix D: MSIV Leakage (for BWR plants only) This SRP is not applicable to the Atomic Alchemy facility design. The additional path presented in SRP 16.6.5 Appendix A is not a credible additional path in the Atomic Alchemy facility design. Since the RCS is not pressurized during operations a LOCA does not cause the reactor coolant water to flash to steam nor is there a buildup of pressure within the reactor confinement module building. The design of the reactor confinement and reactor auxiliary module buildings prevent the rapid, uncontrolled release of radioactive material to the environment. The Atomic Alchemy reactor confinement module and auxiliary module buildings establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the design conditions important to safety are not exceeded for as long as postulated accident conditions require. FSAR Chapter 15, Appendix A – Evaluation Models and Parameters for Analysis of Radiological Consequences of Accidents will describe the inhalation dose (committed effective dose equivalent), immersion dose (effective dose equivalent), total dose (total effective dose equivalent) for all facility module buildings, offsite, MCR and TSC. FSAR Table 15.A-01, "Accident Dose Criteria" will describe the exclusion area boundary, low population zone, and release duration from all postulated Atomic Alchemy transients including SB and LB LOCA's.

NUREG-0800 SRP 15.6.5.B, Appendix B, Rev 1 Radiological Consequences of a Design Basis Loss-of-Coolant Accident: Leakage from Engineered Safety Feature Components Outside Containment

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.3, SRP 11.1.1, SRP 11.1.5, SRP 13 SRP 13a2.1.3	10 CFR 100.11, R.G. 1.3, R.G. 1.4	N/A
Summary Description of Compliance/Exceptions		
SRP 15.6.5, Appendix B – General description: this SRP addresses the evaluation of the consequences from additional individual contributions to the total radiological consequences from various release		

paths of loss of reactor coolant accidents in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Additional paths considered are: • Appendix A: Containment leakage, including the contribution from containment purge valves during closure. • Appendix B: Post-LOCA leakage from ESF systems outside containment. • Appendix C: Post-LOCA hydrogen purge from containment (deleted) • Appendix D: MSIV Leakage (for BWR plants only) This SRP is not applicable to the Atomic Alchemy facility design. The additional path presented in SRP 16.6.5, Appendix B is not a credible additional path in the Atomic Alchemy NPUF design. The VIPR core and spent fuel is located in the light water pool. It does not require any post-accident active systems for cooling and relies on natural convection for decay heat or residual heat removal. There is no recirculation of cooling water that would pass to an exterior location outside of either the reactor confinement or rector auxiliary module buildings.

NUREG-0800 SRP 15.6.5.D, Appendix D, Rev 1 Radiological Consequences of a Design Basis Loss-of-Coolant Accident: Leakage from Main Steam Isolation Valve Leakage Control System

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 6.2.3, SRP 11.1.1, SRP 11.1.5, SRP 13	10 CFR 100.11, R.G. 1.3, R.G. 1.4	N/A
Summary Description of Compliance/Exceptions		
SRP 15.6.5, Appendix D – General description: this SRP addresses the evaluation of the consequences from additional individual contributions to the total radiological consequences from various release paths of loss of reactor coolant accidents in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. Additional paths considered are: • Appendix A: Containment leakage, including the contribution from containment purge valves during closure. • Appendix B: Post-LOCA leakage from ESF systems outside containment. • Appendix C: Post-LOCA hydrogen purge from containment (deleted) • Appendix D: MSIV Leakage (for BWR plants only) This SRP is not applicable to the Atomic Alchemy facility design. The additional path presented in SRP 16.6.5 Appendix D is not credible additional paths in the Atomic Alchemy NPUF design. The Atomic Alchemy reactors are non-power and do not have main steam piping in its design.		

NUREG-0800 SRP 15.7.3, Rev 2 Postulated Radioactive Releases Due to Liquid-Containing Tank Failures

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1.7, SRP 11.2.3, SRP 13 SRP 13a2.1.7	10 CFR Part 20, GDC 60, NUREG-0133, NUREG-0016, NUREG-0017	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.7.3 – General description: this SRP addresses the evaluation of the consequences from tanks and associated components which could contain radioactive liquids outside containment and evaluates the consequences of single failures involving these tanks and components in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPR and radioisotope process systems may experience similar transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Flow rates and activities (BWR and PWR) provided in NUREG-0016 and NUREG-0017 respectively, are not applicable to the radwaste streams produced by the Atomic Alchemy Reactors and radioisotope processes.

The Atomic Alchemy Technical Specifications program 5.6.7, "Chemical Process Safety and Surveillance Program" and 5.6.7.1, "Explosive Gas and Storage Tank Radioactivity Monitoring Program" conform to 10 CFR 70.61, 10 CFR 70.62, and 10 CFR 70.64.

Early guidance to relocate the Radiological Effluent Technical Specifications (RETS) were published in NURE6-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants." Detailed guidance to effect a transfer of the RETS to the Offsite Dose Calculation Manual (ODM) was given in Generic Letter 89-01 Appendix C.

The Atomic Alchemy Offsite Dose Calculation Manual Program is based on NEI ODCM Template 07-09A, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description." The equations and methods used in the ODCM program are based on those presented in NUREG-0 133, Regulatory Guide 1.109, Regulatory Guide 1.111, and Regulatory Guide 1.113

The Atomic Alchemy ODM program 5.6.3, "Radiological Environmental Monitoring Program (REMP)" examines the radiological constituents that Atomic Alchemy Reactors and Radioisotope processing activities could release to the environment. The Atomic Alchemy REMP monitors radiological contaminants from both air and liquid point sources, as well as collects and analyzes environmental samples from numerous locations throughout the site and the surrounding area. Offsite monitoring involves collecting and analyzing samples of air, river water, soil, sediment, vegetation, milk, food products, fish, and other media from many locations. Atomic Alchemy analyzes these samples for

radioactive contaminants to monitor any effects the facility has on the environment and to assess long-term trends of the contaminants in the environment.

The Atomic Alchemy ODM program 5.6.4, "Process Control Program (PCP)" will describe the administrative and operational controls used for the solidification of liquid or wet radioactive wastes and the dewatering of wet radioactive wastes. Its purpose is to assure that the final disposal waste product meets applicable Federal, State and Disposal Site waste form requirements for burial at a 10 CFR Part 61 licensed Low-Level Waste (LLW) disposal.

GDC 60 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.7.4, Rev 1 Radiological Consequences of Fuel Handling Accidents

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 11.1.1, SRP 13 SRP 13a2.1.4	10 CFR Part 100, GDC 61	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.7.4 – General description: this SRP addresses the evaluation of the adequacy of system design features and plant procedures provided for the mitigation of the radiological consequences of accidents that involve damage to spent fuel in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPRs and radioisotope process systems may experience similar transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

The fuel handling transient is defined as the dropping of a fuel assembly (new or spent) such that all fuel rodlets in the dropped assembly has its cladding breached so that the activity in the fuel/cladding gap is released. The Atomic Alchemy confinement module building, and light water pool are designed to seismic Category I requirements, providing integrity in the event of an SSE. The spent fuel storage racks are located at the far end of the light water pool, in a deeper cavity away from the reactor core to further prevent a credible external missile from reaching the stored fuel assemblies as well as the storage racks becoming uncovered during a LOCA transient. The fuel handling equipment is designed to prevent the handling equipment from falling onto the fuel in the reactor core or that is stored in the spent fuel area of the light water pool. Administrative controls and equipment operating limits are also incorporated in the fuel handling operations to prevent transients.

Atomic Alchemy's confinement module building does not require a dose mitigating ESF system. The Reactor Confinement Module Filtration System (RCF) is a non-safety-related, seismic Cat-II system. The purpose of the filtration system is to control normal operating releases and assist in maintaining a negative pressure with respect to the environment and adjacent module buildings. It is not necessary for accident mitigation or confinement isolation.

The shuffling of spent fuel takes place underwater. Therefore, activity releases are first dissolved by the light water pool's column of water above the storage racks. This has no effect on the releases of noble gases but there is a significant removal of elemental iodine. After the activity escapes from the water pool, it is assumed that it is released directly to the environment within a 2-hour period. Activity released from the pool is assumed to pass directly to the confinement module building environment. The radiological consequences of a postulated fuel handling transient at the exclusion area and low population zone boundaries are well within the exposure guideline values of 10 CFR Part 100, paragraph 11. The light water pool is designed so that a safe water level is maintained above the core and spent fuel assemblies for at least 72 hours following either a SB or LB LOCA, that level is sufficient to dissipate decay heat removal without AC power. After 72 hours the light water pool will continue to dissipate decay heat by natural convection alone for both the reactor core and the spent fuel for at least 30 days. Atomic Alchemy FSAR Chapter 15, Appendix A, "Evaluation Models and Parameters for Analysis of Radiological Consequences of Accidents" will describe the dose calculation models for offsite, control room, technical support center, reactor module, reactor auxiliary module, radioisotope module, target fabrication module, and radwaste module buildings. FSAR Tables 15.A-04 through 11 provide the (χ/Q) dispersion factors for the above locations. GDC 61 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.7.5, Rev 2 Spent Fuel Cask Drop Accidents

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Not applicable to the Atomic Alchemy NPUF. The spent fuel is not stored or moved in casks.		

NUREG-0800 SRP 15.8, Rev 2 Anticipated Transients Without SCRAM

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.5.1, SRP 4.5.2, SRP 4.5.3, SRP 13	10 CFR 50.46, 10 CFR 50.62, GDC 12, GDC 14, GDC 16, GDC 35, GDC 38, GDC 50	Exceptions as noted.

Summary Description of Compliance/Exceptions

SRP 15.8 – General description: this SRP addresses the evaluation of Anticipated Transients Without Scram (also known as the ATWS Rule) in pressurized-water reactor (PWR) and boiling-water reactor (BWR) designs. In instances where the VIPRs may experience similar AOO transients the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

10 CFR 50.46 – Exceptions as noted; The VIPR core and spent fuel located in the light water pool does not require any post-accident active systems for cooling; it relies on natural convection for decay heat or residual heat removal. The Atomic Alchemy design, however, will provide an additional "emergency core cooling" type safety related system (designated as Reactor Decay Heat Removal – DHR) that functions independent of onsite or offsite AC power supplies, assuming single active failures. The Atomic Alchemy passive "emergency core cooling" system also does not rely on the non-safety-related diesel-generators or the 1E UPS power system for electrical power to either actuate or operate the various DHR system components.

10 CFR 50.62 – the ATWS Rule applies to power reactors, so it is not applicable, however the Atomic Alchemy instrumentation architecture will conform to NUREG/CR-6303. Control functions, reactor trip functions, engineered safety features functions, and monitoring & indication functions are divided into three levels containing: non-safety systems, safety systems, and non-safety diverse systems. The Atomic Alchemy Diverse Actuation System (IDA) reduces the probability and consequences of a postulated ATWS. The Atomic Alchemy IDA system will be designed to meet the quality guidelines established by Generic Letter 85-06, "Quality Assurance Guidelines for ATWS Equipment that is not Safety-Related."

GDC 12, 14, 16, 35, 38, 50 – Exceptions as noted; see FSAR Chapter 3, Appendix F for Atomic Alchemy's principal design criteria and compliance with the GDCs.

NUREG-0800 SRP 15.9 (Initial Issuance) Boiling Water Reactor Stability

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
Not applicable to the VIPR. The it is a non-power reactor.

16. TECHNICAL SPECIFICATIONS

NUREG-0800 SRP 16.0, Rev 3 Technical Specifications

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 4.2, SRP 4.2.1, SRP 4.2.2, SRP 4.2.3, SRP 4.2.4, SRP 4.2.5, SRP 4.3, SRP 4.4, SRP 4.5.1, SRP 4.5.2, SRP 5.2, SRP 6.2.3, SRP 12.4, SRP 12.5, SRP 12.6, SRP 12.7, SRP 14 SRP 14b	10 CFR 50.34(b)(6)(vi), 10 CFR 50.36, 10 CFR 50.36a, 10 CFR 50.36(c)(1)(i)(A), 10 CFR 50.36(c)(1)(ii)(A), 10 CFR 50.36(c)(2), 10 CFR 50.36(c)(3) 10 CFR 52.47(a)(11), 10 CFR 52.79(a)(30)	Exceptions as noted.

Summary Description of Compliance/Exceptions
SRP 16.0 – General description: this SRP states that an applicant for a construction permit (CP) under 10 CFR Part 50 is required by 10 CFR 50.34(a)(5) to include in the preliminary safety analysis report (PSAR) "an identification and justification for the selection of those variables, conditions, or other items which are determined as the result of preliminary safety analysis and evaluation to be probable subjects of T/S for the facility, with special attention given to those items which may significantly influence the final design." The CP applicant may also propose T/S in Section 16 of the PSAR. Atomic Alchemy intends to take an exception to the submission of the actual facility's technical specifications, bases, technical requirements manual and offsite dose calculation manual as part of their PSAR submission and construction permit application. Instead, Atomic Alchemy will only submit the PSAR Chapter 16, Technical Specifications chapter, which will describe limited conditions for operation, screening criteria for variables, as well as define screening criteria for safety systems

settings, surveillance frequencies, completion times, safety limits, radioisotope process variables, their respective control points, operational modes, and design features.

Guidance for developing the Technical Specifications' formatting for non-power light water reactors is provided in NUREG-1537, which invokes the format in ANSI/ANS-15.1. The ANS-15.1 Standard guidance was reviewed as part of the creation of the Atomic Alchemy T/S. Although Atomic Alchemy's non-power light water reactors do not have an applicable Standard Technical Specification (STS) format to follow, Atomic Alchemy will create a hybrid T/S format based on the format of the Standard Technical Specification (STS) found in NUREG-1431. Supplemental formatting as outlined in ANSI/ANS-15.1 is incorporated when deemed appropriate.

The content of the Atomic Alchemy Technical Specifications meets the requirements of 10 CFR 50.34(b)(6)(vi), 10 CFR 50.36, 10 CFR 50.36a, 10 CFR 70.61(b), (c), (d), (e) and (f).

The Atomic Alchemy T/S content differs from 10 CFR 50.36 and 10 CFR 70.61 only as necessary to reflect technical differences between the "typical" power reactor design and the Atomic Alchemy non-power reactor design.

Additional Technical Specifications for the radioisotope, radiochemical, and chemical processing that is conducted outside of the reactor module buildings in the Atomic Alchemy facility are also derived from the Accident Analysis in FSAR Chapter 15 and will be contained in the same technical specifications as the reactor related T/S. The evaluation of the processes indicates that certain limits on process variables and engineered or administrative control measures are necessary to demonstrate safe operation of the radioisotope production facility:

- Any radioisotope process related instrumentation that is used to detect and indicate in the control room;
- a significant abnormal degradation of a radioisotope process;
- any radioisotope process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analyses that either assumes the failure of or presents a challenge to the integrity of a radiological or chemical product barrier;
- any radioisotope structure, system or component that is part of a primary success path and/or which functions or actuates to mitigate a design basis accident or transient; will be evaluated for inclusion into the Technical Specifications or Technical Requirements Manual.

The screening criteria of 10 CFR 50.36(c)(2)(ii) has been used to identify the reactor structures, systems, and their respective design operating parameters for which Limiting Conditions for Operation (LCOs) have been created in the Atomic Alchemy Technical Specifications.

The surveillance frequency completion times specified in the Atomic Alchemy Technical Specifications have been developed based on a conservative approach to plant safety and are well within the bounding times denoted in both NUREG-1431 and ANSI/ANS 15.1 meeting the requirements of 10 CFR 50.36(c)(3). The methodology of developing conservative completion times for those Atomic Alchemy Technical Specifications for which no comparable ANSI/ANS 15.1 or NUREG-1431 system/function exists will be addressed in the FSAR.

The calculated setpoint for a protective action, providing the minimum acceptable safety margin considers process uncertainty, overall measurement uncertainty, and the transient phenomena of the process instrumentation, is defined as the "limiting safety system setting" (LSSS). These will be developed based on the requirements of 10 CFR 50.36(c)(1)(ii)(A). In FSAR Chapter 15, Chapter 7.0, "Evaluation of Fault Sequences and Accident Scenarios," consequences of accidents that occur in a reactor module are analyzed for their potential impact on the radioisotope process area and conversely accidents that occur in the radioisotope process area are analyzed for their impact on any of the four operating reactors. Additionally, in that chapter, any potential impact from ongoing construction activities is also analyzed. Each respective technical specification LCO (either reactor or radioisotope process) will also include any additional requirements in their respective LCO action statements to address operations in other reactor or radioisotope systems and components. The NPUF design features and administrative controls will also be described in the PSAR Chapter 16 submittal as part of the CP application. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0800 SRP 16.1, Rev 1 Risk-informed Decision Making: Technical Specifications

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 16.1 – Not applicable; this SRP addresses developing risk-informed applications for a licensing basis change that considers engineering issues and applies risk insights. Atomic Alchemy Design and Licensing Basis is based on a deterministic qualitative approach rather than a probabilistic quantitative approach.		

17. QUALITY ASSURANCE

NUREG-0800 SRP 17.1, Rev 2 Quality Assurance During the Design and Construction Phases

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.1, SRP 12.2, SRP 12.5, SRP 12.6, SRP 12.9,	10 CFR 50 Appendix A, 10 CFR 50.55a, 10 CFR 50.55(e), 10 CFR 50.34(a)(7),	N/A

	R.G. 1.28, ANSI N45.2	

Summary Description of Compliance/Exceptions

SRP 17.1 – General description: this SRP states that prior to docketing a CP application, the NRC performs a substantive review of the applicant's QA program description relative to ongoing design and procurement activities. SRP Sections 17.1 and 17.2 provide guidelines for review of QA programs based upon American National Standards Institute (ANSI) N45.2, “Quality Assurance Program Requirements for Nuclear Power Plants.” SRP Section 17.3 will provide guidelines for review of a QAPD developed following American Society of Mechanical Engineers (ASME) Standards NQA-1, “Quality Assurance Program for Nuclear Facilities,” and NQA-2, “Quality Assurance Requirements for Nuclear Facility Applications.”

Atomic Alchemy has submitted its QAPD (AA0-VIPR-20-QAPD (NP) Rev 0) as a topical report to the NRC in Atomic Alchemy letter (AAL-2020-003) dated 10-16-2020.

Atomic Alchemy’s QAPD follows the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, “Quality Assurance Program Requirements for Nuclear Facilities” and QME-1-2017, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants.” Therefore, this SRP is not applicable.

NUREG-0800 SRP 17.2, Rev 2 Quality Assurance During the Operations Phase

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.1, SRP 12.2, SRP 12.5, SRP 12.6, SRP 12.9	10 CFR 50 Appendix A, 10 CFR 50.55a, 10 CFR 50.55(e), 10 CFR 50.34(a)(7), R.G. 1.33, ANSI N45.2	N/A

Summary Description of Compliance/Exceptions

SRP 17.2 – General description: this SRP addresses both the "offsite" and "onsite" QA controls to be applied to those activities that may affect the quality of items important to safety during the operation, maintenance, and modification of a nuclear power plant. SRP Sections 17.1 and 17.2 provide guidelines for review of QA programs based upon American National Standards Institute (ANSI) N45.2, “Quality Assurance Program Requirements for Nuclear Power Plants.” SRP Section 17.3 will provide guidelines for review of a QAPD developed following American Society of Mechanical Engineers (ASME) Standards NQA-1, “Quality Assurance Program for Nuclear Facilities,” and NQA-2, “Quality Assurance Requirements for Nuclear Facility Applications.”

Atomic Alchemy has submitted its QAPD (AA0-VIPR-20-QAPD (NP) Rev 0) as a topical report to the NRC in Atomic Alchemy letter (AAL-2020-003) dated 10-16-2020. Atomic Alchemy's QAPD follows the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, "Quality Assurance Program Requirements for Nuclear Facilities" and QME-1-2017, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants." Therefore, this SRP is not applicable.

NUREG-0800 SRP 17.3, Rev 0 Quality Assurance Program Description

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.1, SRP 12.2, SRP 12.5, SRP 12.6, SRP 12.9	ASME NQA-1, ASME NQA-2 ASME QME-1	Acceptable
Summary Description of Compliance/Exceptions		
SRP 17.3 – General description: this SRP provides guidelines for review of a QAPD developed following American Society of Mechanical Engineers (ASME) Standards NQA-1, "Quality Assurance Program for Nuclear Facilities," (which superseded NQA-2) and QME-1 "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants" . Atomic Alchemy has submitted its QAPD (AA0-VIPR-20-QAPD (NP) Rev 0) as a topical report to the NRC in Atomic Alchemy letter (AAL-2020-003) Agencywide Documents Access and Management System (ADAMS) Accession No. ML20290A978, dated October 16, 2020. The Atomic Alchemy QAPD establishes the quality assurance program and assigns major functional responsibilities for design, procurement, construction, operating, maintenance, and testing activities. The Atomic Alchemy QAPD satisfies this SRP as well as the requirements of 10 CFR 70 Subpart G and 10 CFR 71 Subpart H by Atomic Alchemy's commitment to follow the guidelines of the American Society of Mechanical Engineers (ASME) Quality Assurance (QA) standard NQA-1-2017, "Quality Assurance Program Requirements for Nuclear Facilities" and QME-1-2017, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants." FSAR Chapter17, Section 2, "Quality Assurance During the Preliminary Design and Application Phase," Section 3, "Quality Assurance During the Final Design and Construction Phase" and Section 4, "Quality Assurance During Plant Operations Phase" will describe the implementation of the necessary design control measures that assure that the applicable Title 10 regulatory requirements and design bases for procurement, fabrication, installation, construction, maintenance, surveillances and testing of structures, systems, and components in the facility have been correctly translated into specifications, drawings, procedures, and instructions, and that appropriate quality standards have been specified in the design documents.		

NUREG-0800 SRP 17.4, Rev 1 Reliability Assurance Program (RAP)

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
This SRP is only applicable to DC and COL license applicants. It is not applicable to the Atomic Alchemy 10 CFR Part 50 application.		

NUREG-0800 SRP 17.5, Rev 1 Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicants

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	10 CFR 50 Appendix B	N/A
Summary Description of Compliance/Exceptions		
SRP 17.5 – General description: this SRP outlines a standardized QA program for DC, ESP, CP, OL and COL applicants and holders. SRP Section 17.5 is based on Title 10 of the Code of Federal Regulations (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Atomic Alchemy has submitted its QAPD (AA0-VIPR-20-QAPD (NP) Rev 0) as a topical report to the NRC in Atomic Alchemy letter (AAL-2020-003) dated 10-16-2020. While this SRP is not applicable, the Atomic Alchemy QAPD does meets the requirements of Regulatory Guide 1.28, Rev 5, "Quality Assurance Program Criteria (Design and Construction)," and Regulatory Guide 1.33, Rev 3, "Quality Assurance Program Requirements (Operations)." These regulatory guides describe methods that the staff considers acceptable for complying with the provisions of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," for establishing and implementing a quality assurance (QA) program for the design and construction of nuclear power plants and fuel reprocessing plants.		

NUREG-0800 SRP 17.6, Rev 2 Maintenance Rule

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.9	10 CFR 50.65 10 CFR 52.79(a)(15), R.G. 1.160	Acceptable

Summary Description of Compliance/Exceptions
SRP 17.6 – General description: this SRP outlines the requirements for a maintenance rule program. Atomic Alchemy has submitted its QAPD (AA0-VIPR-20-QAPD (NP) Rev 0) as a topical report to the NRC in Atomic Alchemy letter (AAL-2020-003) dated 10-16-2020. In QAPD Table 2, Atomic Alchemy provides commitment AA0-RC-0015 to include a Maintenance Rule Program (QAPD Part V, to be submitted with the FSAR). 10 CFR 50.65, Regulatory Guide 1.160, positions C.1 through C.4 – Acceptable; the BOP systems that are included in the Atomic Alchemy maintenance rule program (see QAPD Part V, FSAR Chapter 13, Appendix A and QAPD commitment AA0-RC-0015 in Table 2) are scoped based on meeting one or more of four specific criteria in 50.65(b)(2) and in accordance with NUMARC 93-01 guidance. Atomic Alchemy will assemble an Expert Panel (QAPD Section 2.1.10) that will determine the SSCs to be included in its Maintenance Rule program. The program applies to safety-related and non-safety-related SSCs identified as being significant to safety. A deterministic approach and industry lessons learned is used as the guide in the analysis to determine the safety significance of non-safety-related components and systems. 10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

18. HUMAN FACTORS ENGINEERING

NUREG-0800 SRP 18.0, Rev 3 Human Factors Engineering

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.1, SRP 7.6, SRP 7.2, SRP 10.3,	10 CFR 50.34(f)(2)(ii), 10 CFR 50.34(f)(2)(iii), 10 CFR 50.34(f)(2)(iv), 10 CFR 50.34(f)(2)(v), 10 CFR 50.34(f)(2)(xi), 10 CFR 50.34(f)(2)(xii), 10 CFR 50.34(f)(2)(xvii), 10 CFR 50.34(f)(2)(xviii), 10 CFR 50.34(f)(2)(xix), 10 CFR 50.34(f)(2)(xxi), 10 CFR 50.34(f)(2)(xxiv), 10 CFR 50.34(f)(2)(xxvi), 10 CFR 50.34(f)(2)(xxvii), 10 CFR 50.34(f)(3)(i), 10 CFR 50.54(i) to (m), 10 CFR 52.47,	Acceptable

	10 CFR 52.47(a)(8), 10 CFR 52.79, NUREG-0696, NUREG-0700, NUREG-0711, NUREG-1220, NUREG-1764, NUREG-1791, NUREG-1852, NUREG/CR-6838, NUREG/CR-7190, R.G. 1.97	

Summary Description of Compliance/Exceptions

SRP 18.1– General description: this outlines the review for human performance requirements in applicant's operating license applications.

Atomic Alchemy FSAR Chapter 13, Appendix A, will describe the Human Factors/Performance Program which meets the requirements of 10 CFR 50.34(f) and the guidance of NUREG-0711. FSAR Chapter 18, "Human Factors Engineering" will also describe this.

10 CFR 50.34(f) – Exceptions as noted; Atomic Alchemy addresses TMI Action items in a separate Appendix in the FSAR. See FSAR Chapter 1, Appendix C, "Compliance with 10 CFR 50.34(f)." Provided below are the relevant SRP 18.1 regulations compliance/exceptions:

(2)(ii) – Acceptable; Atomic Alchemy QAPD Criterion V, Section 5.5.1 addresses the procedural improvement process using the Focus Area Self-Assessment program which evaluates the overall effectiveness of implementing procedures in meeting pre-established goals and intended outcomes.

(2)(iii) -acceptable, see FSAR Figure 18.8-01 and 18.8-02 for layouts of the Atomic Alchemy Reactor Modules Main Control Room and the adjacent Radioisotope Modules Main Control Room.

(2)(iv) – Acceptable; using the Common Q platform, Atomic Alchemy will provide a Safety Parameter Display System (ISP) information is provided to and used by the operator to monitor and maintain the safety of the facility throughout operating conditions that include anticipated operational occurrences and accident and post-accident conditions.

(2)(v) -acceptable, the Atomic Alchemy I&C system will provide BISI (Bypassed or Inoperable Status Indication) indication in the control room if a safety system is inoperable or bypassed in accordance with IEEE 338.

(2)(xi) – Not applicable; there are no safety related relief valves in the Atomic Alchemy piping design.

(2)(xii) – Not applicable; there is no AFW system in the Atomic Alchemy piping design.

(2)(xvii) – Exceptions as noted; the Versatile Isotope Production Reactor (VIPR) is situated in an open-to-atmosphere light water pool. The containment structure is redefined by Atomic Alchemy for

an NPUF in PDC 16 (FSAR Chapter 3, Appendix F). The potential for hydrogen or combustible gas buildup greater than 10% is not a credible transient in the Atomic Alchemy FSAR Chapter 15 accident analysis. Technical Specifications Program 5.6.5, “Radiation Protection Program” administratively controls sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points.

(2)(xviii) – Exceptions as noted; the Atomic Alchemy Reactor is not a PWR or BWR. Important safety related reactor and radioisotope process variables will be defined in FSAR Chapter 16. Using the Common Q platform I&C architecture, Atomic Alchemy provides the In-Core Instrumentation System (IIC) (will be described in FSAR Chapter 7, Section 4) to monitor reactor core cooling.

(2)(xix) – Acceptable; Using the Common Q platform I&C architecture, Atomic Alchemy provides the Post-Accident Monitoring and Sampling System (IPA) (will be described in FSAR Chapter 7, Section 4).

(2)(xxi) – not applicable to the VIPR, as this is a BWR specific requirement.

(2)(xxiv) – Not applicable; the VIPR is not a BWR. Post-accident parameters are monitored and recorded by the IPA system.

(2)(xxvi) – Acceptable; The reactor coolant leakage detection systems are selected and designed in accordance with the guidelines of regulatory guide 1.45. See FSAR Chapter 13, Appendix A, Reactor Coolant System (RCS) Leak Detection Program. Also see Technical Specification Administration Section 5.6.4 “RCS and Light Water Pool Leakage Rate Testing Program” and Limited Conditions of Operation LCO 3.3.10 “RCS Leakage Detection Instrumentation” (RLD), LCO 3.4.6 “RCS Operational Leakage (RLD),” and LCO 3.7.6 Reactor Coolant/Light Water Pool Leak Collection System (RLC).

(2)(xxvii) – Acceptable; the Atomic Alchemy nominal range of radiation detector parameters are provided in FSAR Table 11.06-01 “Radiation Monitor Detector Parameters” and Table 11.06-02, “Area Radiation Monitor Detector Parameters.”

(3)(i) – Acceptable; Atomic Alchemy design engineers have been involved in reviewing industry experiences from a variety of sources such as NRC Bulletins, Licensee Event Reports, NRC request for information letters, NPUF holders of operating licenses, NPUF public meetings, NPUF PSAR submittals, and Federal Register information. Lessons learned experience was incorporated into the design of the Atomic Alchemy during the development of its Facility Requirements Document (FRD).

10 CFR 50.54(i) through 10 CFR 50.54(m) – Acceptable; administrative controls are in place to ensure that only qualified SRO and RO personnel can manipulate any apparatus or mechanisms that may affect the reactivity or power level of the Atomic Alchemy reactors. See QAPD Section 1.1.2, “Nuclear Services Training Group.” Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in this 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, “Selection, Qualification, and Training of Personnel for Nuclear Power Plants” and ANSI/ANS 15.4-2016, “Selection and Training of Personnel for Research Reactors” criterion. Also see regulatory commitment AA0-RC-0004, “NPUF Operator Training and Requalification Program” in QAPD Table 2,

VIPR Operator and Radioisotope Process Operator Training and Requalification Program will be in place within 3 months of the issuance of an operating license. Atomic Alchemy implements additional training requirements and requalification for radioisotope process workers and hot cell and glove box operators.

NUREG-1791, NUREG/CR-6838, and 10 CFR 50.54(m)(2)(i) – Exceptions as noted; the Atomic Alchemy facility design is based upon the operation of up to four small, non-power reactors from a single main control room (MCR), which is a configuration not specifically addressed by the Table in 10 CFR 50.54(m)(2)(i) and SRP 13.1.2-3 Table 1. In SECY-11-0098, NRC Staff recommended "a twostep approach to address operator staffing requirements for SMRs. The Atomic Alchemy HFE program analyzes and defines the minimum number and qualifications of licensed control room operators. Therefore, Atomic Alchemy intends to request an exemption to 10 CFR 50.54(m)(2)(i) minimum requirements.

10 CFR Part 52 criterion – COL and DC license applications code requirements are not applicable to the Atomic Alchemy license application, which is being submitted for a construction license under 10 CFR Part 50.

NUREG-0696 – Acceptable; the Atomic Alchemy offsite emergency operations facility and technical support center will comply with the guidance in NUREG-0696, "Functional Criteria for Emergency Response Facilities." The human system interface in the "Technical Support Center (TSC) (onsite)," "Operational Support Center (OSC) (onsite)," and "Emergency Operations Center Module Building (offsite) (EOM)" are derivatives of the main control room human system interfaces. Only monitoring and shutdown control functions are provided in any of the emergency response facilities.

NUREG-0700, and NUREG-0711 -acceptable, the Atomic Alchemy Human Factors/Performance Program (see FSAR Chapter 13, Appendix A), will conform to the 12 elements of NUREG-0711.The elements of the design process provide a structured top-down system analysis using accepted human factors engineering (HFE) principles. The design of the main control room and the other operation and control centers reflect state-of-the-art human factors principles. The Atomic Alchemy HFE program analyzes and defines the minimum number and qualifications of licensed control room operators. Deterministically important human actions are identified from the operator actions that are credited in the Atomic Alchemy FSAR Chapter 15 transient analyses and from operator actions that are identified in the diversity and defense-in-depth (D3) coping analyses (see also Atomic Alchemy response to SRP 18-A). Subject matter experts will review each transient event scenario described in the FSAR Chapter 15 transient analyses and D3 coping analyses and extract the deterministically important human actions. This SME group will perform a Detailed Control Room Design Review (DCRDR) to identify and correct deficiencies. See FSAR Figure 18.8-01 and 18.8-02 for layouts of the Atomic Alchemy Reactor Modules Main Control Room and the adjacent Radioisotope Modules Main Control Room.

NUREG-1220 – Acceptable; see QAPD Section 1.1.2, "Nuclear Services Training Group." Personnel proficiency is established and maintained by training, examination/testing, and/or certification based upon the requirements of the activity. Acceptance criteria are developed to determine If individuals are properly trained and qualified. Training for positions identified in 10 CFR 50.120 is accomplished according to programs accredited by the National Nuclear Accrediting Board of the

National Academy of Nuclear Training that implements a systematic approach to training. Training programs incorporate ANSI/ANS 3.1-2014, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants" and ANSI/ANS 15.4-2016, "Selection and Training of Personnel for Research Reactors" criterion. NUREG-1764 – Acceptable; changes to operator actions that are credited in the Atomic Alchemy accident analysis are non-risk informed which includes the use of generic risk information to determine the safety significance of the human actions being evaluated. A qualitative evaluation of the human action, and an integrated assessment will be made to determine the appropriate level of human factors engineering to be reviewed. NUREG-1852 – Not applicable; this NUREG applies to facilities who requested exemption from the requirements of Paragraph III.G.2 of Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979." Regulatory Guide 1.97, position C.1 through C.8 – Acceptable; Atomic Alchemy uses the latest revision of IEEE-497. This version is not endorsed by a regulatory guide, but its use should not result in deviation from the design philosophy otherwise stated in this Regulatory Guide. The variables to be monitored are selected according to usage and need in the Plant Emergency Response guidelines to be developed in the FSAR Chapter 13, Appendix B, "Emergency Plan." See FSAR Chapter 7, Section 7, subsection, "Variable Categories, Classifications and Requirements" for a description of type F variables that are monitored by the Operations and Control Systems (IOC).

NUREG-0800 SRP 18-A Guidance for Crediting Manual Operator Actions in Diversity and Defense-in-Depth (D3) Analyses

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 12.3, SRP 12.4	N/A	Acceptable
Summary Description of Compliance/Exceptions		
SRP 18-A – General description: this section contains no acceptance criteria for compliance. This Appendix defines a methodology, applicable to both existing and new reactors, for evaluating manual operator action as a diverse means of coping with Anticipated Operational Occurrences and Postulated Accidents (AOO/PA) that are concurrent with a software Common Cause Failure (CCF). Atomic Alchemy does not rely on operator actions as a diverse means of defense in depth. No operator actions are necessary for a minimum of 72 hours following a design basis event. The design of the facility is passive, in that no operator actions are required to ensure reactivity control, core heat removal, or reactor confinement, reactor auxiliary or radioisotope process module building isolation integrity. The Atomic Alchemy I&C architecture is based on the Common Q Westinghouse platform which is defined in Topical Report WCAP-16097, which was approved by the NRC. The Westinghouse Common Q diversity and defense-in-depth assessment methodology is consistent with the NRC staff		

position in this SRP, BTP 7-19 and NUREG/CR-6303. Atomic Alchemy follows this methodology for its facility-specific diversity and defense-in-depth (D3) assessment. See FSAR Chapter 7, Section 2, "Identification of Safety Criteria" for a description of the Atomic Alchemy D3 evaluation which assesses the defense-in-depth and diversity of the proposed digital instrumentation and control systems, and if a postulated software common cause failure (CCF) could disable a safety function, then a diverse digital means, is documented so that the diverse means is unlikely to be subject to the same digital CCF and will be able to perform the same required function.

19. SEVERE ACCIDENTS

NUREG-0800 SRP 19.0, Rev 3 Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 19.0 – General description: this SRP only applies to Design Certification (DC) and Combined Operating Licenses (COL) applicants. The Atomic Alchemy construction license is submitted under 10 CFR Part 50. A deterministic qualitative approach rather than a probabilistic quantitative approach is used for the design of the facility and any changes to the design.		

NUREG-0800 SRP 19.1, Rev 3 Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 19.1 – General description: this SRP only applies to Design Certification (DC) and Combined Operating Licenses (COL) applicants. The Atomic Alchemy construction license is submitted under 10 CFR Part 50. A deterministic qualitative approach rather than a probabilistic quantitative approach is used for the design of the facility. Future Atomic Alchemy License Amendment Requests (LAR) will be based on deterministic evaluations of potential increases to CDF and LRF in addition to determining the following: • Significant increase in the probability or consequences of an accident previously evaluated • Possibility of a new or different kind of accident from any accident previously evaluated • Involve a significant reduction in a margin of safety		

NUREG-0800 SRP 19.2 (Initial Issuance) Review of Risk Information Used to Support Permanent Plant-Specific Changes to the Licensing Basis: General Guidance

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 19.2 – General description: this SRP only applies to Design Certification (DC) and Combined Operating Licenses (COL) applicants. The Atomic Alchemy construction license is submitted under 10 CFR Part 50. A deterministic qualitative approach rather than a probabilistic quantitative approach is used for the design of the facility. Future Atomic Alchemy License Amendment Requests (LAR) will be based on deterministic evaluations of potential increases to CDF and LRF in addition to determining the following: • Significant increase in the probability or consequences of an accident previously evaluated • Possibility of a new or different kind of accident from any accident previously evaluated • Involve a significant reduction in a margin of safety		

NUREG-0800 SRP 19.3, Rev 0 Regulatory Treatment of Non-Safety Systems (RTNSS) for Passive Advanced Light Water Reactors

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
SRP 19.3– General description: this SRP only applies to Design Certification (DC) and Combined Operating Licenses (COL) applicants. The Atomic Alchemy construction license is submitted under 10 CFR Part 50. A deterministic qualitative approach rather than a probabilistic quantitative approach is used for the design of the facility. Reliability/availability (R/A) missions are a set of requirements related to the performance of a safety related function. Atomic Alchemy safety related SSCs adequately provide assurance that they can accomplish their safety related tasks, as defined by a deterministic analysis. The Atomic Alchemy facility does not identify any RTNSS systems in its design scope therefore this SRP is not applicable.		

NUREG-0800 SRP 19.4, Rev 0 Strategies and Guidance to Address Loss-of-Large Areas of the Plant Due to Explosions and Fires

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 13 (MHA) SRP 13a2.1.9	10 CFR 50.54(hh)(2), 10 CFR 50.34(i),	Acceptable

SRP 13a2.1.10	10 CFR 50.155	

Summary Description of Compliance/Exceptions

SRP 19.4– General description: the Atomic Alchemy reactors are not located in a vessel or containment type structure; they are located within a light water pool that is located inside a reactor confinement module building. The reactor confinement structure is Seismic Cat-I, built to ACI 349, and AISC-N690 standards. Because of the inherent significant design differences, loss of large area type accidents that result in consequences such as ex-vessel, high pressure melt ejection (HPME), In-Vessel steam explosion etc., are not feasible in the Atomic Alchemy reactor design. In instances where the NPUF design may be similarly affected by the postulated power reactor severe accident transients, the difference in the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Instead of referring to a Maximum Hypothetical Accident (MHA) in its SAR, Atomic Alchemy will use "Beyond Design Basis Events" (BDBE) severe transients as the postulated accident scenario whose potential consequences are shown to exceed and bound all other credible design basis events. Atomic Alchemy uses the BDBE (instead of calling it the MHA) to demonstrate that the maximum consequences of operating the reactor at a specific site remain within acceptable limits. Atomic Alchemy identifies one BDBE scenario, the loss of large area caused by a fire.

The design and location of three-hour, 5-psid fire barriers, including walls, floors, fire dampers, doors, equipment access door, and penetration seals within the reactor confinement module, reactor auxiliary module, radioisotope module buildings are key design features for the protection of the reactor light water pool from the effects of a large area fire.

There is no equipment necessary to provide decay heat removal to the reactor core or spent fuel other than the integrity of the light water pool.

Atomic Alchemy incorporates administrative controls to reduce the damage to spent fuel from a LOLA by strategically dispersing higher decay power fuel amongst the older low decay power fuel by symmetrically surrounding the highest decay power fuel (from the most recent offload) with that of low decay power.

A design-specific assessment (Loss of Large Area – LOLA, FSAR Chapter 19, Appendix A) of the effects on the Atomic Alchemy facility of the beyond design basis consequences of a large area fire will be performed using the methodology [

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The Atomic Alchemy analysis will identify the design features and functional capabilities that demonstrate:

- Enhanced firefighting capabilities
- Actions to minimize the release of radioactive materials
- The reactor core remains cooled
- Light water pool integrity is maintained

- Radwaste storage integrity is maintained
- The dispersion of radionuclides remains within the limits of 10 CFR 20 Subpart D

10 CFR 50.54(hh), 10 CFR 50.34(i), 10 CFR 50.155 – Acceptable; while the following is stated in 10 CFR 50.155, Part IV, subsection D: "*This proposed rule would not apply to applicants for, or holders of, an operating license for a non-power reactor under 10 CFR part 50. Non-power reactor licensees would not be subject to this proposed rule because non-power reactors pose lower radiological risks to the public from accidents than do power reactors because: (1) The core radionuclide inventories in non-power reactors are lower than in power reactors as a result of their lower power levels and often shorter operating cycle lengths; and (2) non-power reactors have lower decay heat associated with a lower risk of core melt and fission product release in a loss-of-coolant accident than power reactors.*"

Atomic Alchemy will nevertheless evaluate the facility because at the time of the regulation was formulated, NPUF designs did not include multiple reactors, spent fuel pools, and radioisotope process production systems, structures and components on a single site.

The Atomic Alchemy facility will utilize both FLEX Support guidelines (FSG) and Severe Accident Guidelines (SAMG) to establish indefinite coping capability to prevent radioisotope SNM damage as well as damage to the reactor core and spent fuel storage and to maintain the confinement functions of the impacted module buildings by using combinations of installed equipment, on-site portable equipment, and pre-staged off-site resources.

NUREG-0800 SRP 19.5, Rev 0 Adequacy of Design features and functional capabilities identified and described for withstanding Aircraft Impacts

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
SRP 13 (MHA) SRP 13a2.1.9	10 CFR 50.150, R.G. 1.217, R.G. 1.214	Acceptable
Summary Description of Compliance/Exceptions		

SRP 19.5 – General description: the Versatile Isotope Production Reactor (VIPR) is not located in a vessel or containment type structure; it is located within a light water pool inside a reactor confinement module building and is below grade. Below grade portions of the Atomic Alchemy facility are not susceptible to a direct impact by an aircraft. Elevations or portions of elevations may be screened from aircraft impact if intervening or adjacent structures meet the design requirements of NEI 07-13. The reactor confinement structure and radioisotope process structure are Seismic Cat-I, built to ACI 349, and AISC-N690 standards. Because of the inherent significant design differences, aircraft impacts (malevolent or accidental) will have a reduced effect on the functional capabilities of the NPUF SSCs and the level of risk and challenges to the facility's safety limits are significantly less than either a PWR or BWR.

Instead of referring to a Maximum Hypothetical Accident (MHA) in its SAR, Atomic Alchemy will use "Beyond Design Basis Event" (BDBE) severe transients as the postulated accident scenario whose

potential consequences are shown to exceed and bound all credible design basis events. Atomic Alchemy uses the BDBE (instead of calling it the MHA) to demonstrate that the maximum consequences of operating the reactor at a specific site remain within acceptable limits. The postulated scenario of SRP 19.5 is bounded by the BDBE scenario of SRP 19.4.

The design and location of three-hour, 5-psid fire barriers, including walls, floors, fire dampers, doors, equipment access door, and penetration seals within the reactor confinement module, reactor auxiliary module, radioisotope module buildings are key design features for the protection of reactor light water pool from the impact of a large commercial aircraft.

There is no equipment necessary to provide decay heat removal to the reactor core or spent fuel other than the integrity of the light water pool.

For the postulated aircraft impact event, required operator actions occur prior to the aircraft impact, upon notification of a potential threat the reactors and radioisotope processes are placed in safe shutdown mode.

A design-specific assessment (Aircraft Impact Analysis – AIA, FSAR Chapter 19, Appendix B) of the effects on the Atomic Alchemy facility of the beyond design basis impact of a large commercial aircraft will be performed in accordance with 10 CFR 50.150(a) to identify the design features and functional capabilities that demonstrate:

- Actions to minimize the release of radioactive materials
- The reactor core remains cooled
- Light water pool integrity is maintained
- Radwaste storage integrity is maintained
- The dispersion of radionuclides remains within the limits of 10 CFR 20 Subpart D

10 CFR 50.54(h)(h), 10 CFR 50.34(i), 10 CFR 50.155 – Acceptable; the Atomic Alchemy facility utilizes both FLEX Support guidelines (FSG) and Severe Accident Guidelines (SAMG) to establish indefinite coping capability to prevent radioisotope SNM damage as well as damage to the reactor core and spent fuel storage and to maintain the confinement functions of the impacted module buildings by using combinations of installed equipment, on-site portable equipment, and pre-staged off-site resources.

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Regulatory Guide 1.217, positions C.1 through C.3 – Acceptable; Atomic Alchemy will follow the methodology provided in NEI 07-13 for creating the AIA.

20. ENVIRONMENTAL REPORT

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A

Summary Description of Compliance/Exceptions
Atomic Alchemy will address this in its PSAR along with its application for a construction license.

21. HIGH ENRICHED TO LOW ENRICHED URANIUM CONVERSIONS

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Atomic Alchemy will address this specific NUREG-1537, Part 2 SRP in its PSAR along with its application for a construction license.		

22. FINANCIAL QUALIFICATIONS

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
Atomic Alchemy will address this specific NUREG-1537, Part 2 SRP in its PSAR along with its application for a construction license.		

APPENDICES TO NUREG-0800 SRP

Appendix I Integrated Impacts

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
N/A		

Appendix II Potential Impacts

NUREG-1537 part 2, SRP Number	Corresponding Title 10 Regulations, Regulatory Guides, and/or GDCs	Atomic Alchemy Position
N/A	N/A	N/A
Summary Description of Compliance/Exceptions		
N/A		