



Enclosure 1 to AAL-2021-009

**Response to NRC's Additional Information Needed Comments
Related to the Principal Design Criteria Topical Report
Submission for Atomic Alchemy's Non-Power Production and
Utilization Facility**

ATOMIC ALCHEMY INC.

Dated October 25, 2021

NRC AIN NUMBER	ATOMIC ALCHEMY NUMBER	ATOMIC ALCHEMY RESPONSE
NRC AIN #1	AAL-021-009-01	Response Enclosed – See Page 2
NRC AIN #2	AAL-021-009-02	Response Enclosed – See Page 3
NRC AIN #3	AAL-021-009-03	Response Enclosed – See Page 4

NRC AIN #1**NRC Letter Date: August 31, 2021 (ADAMS Accession Package No. ML ML1201A196)****NRC Acceptance Review of Atomic Alchemy's Principal Design Criteria (PDC) Topical Report (TR)**

Text of NRC Question: *"The AAPDC TR is not clear on Atomic Alchemy's (AA) expectations for NRC review. The cover letter (ML21269A043) states AA's expectations for NRC review as follows: (a) the NRC accepts Atomic Alchemy's proposed principal design criteria as meeting the requirements of 10 CFR 50.34(a)(3)(i) for its forthcoming construction permit application and PSAR submittal, (b) the NRC accepts Atomic Alchemy's proposed principal design criteria as meeting the requirements of 10 CFR 70.64 for its forthcoming construction permit application PSAR submittal, and (3) the NRC agrees that the intended design approach and implementation of Atomic Alchemy's principal design criteria is acceptable. However, the AAPDC TR states that AA's expectation is upon review of these principal design criterion is NRC acceptance that the design criterion meets 10 CFR 50.34(a)(3)(i) for its forthcoming construction permit application and PSAR submittal. Because AA's expectations for NRC review are inconsistent in the cover letter and AAPDC TR, the NRC staff needs AA to provide a clear and concise review scope for the TR."*

Atomic Alchemy Response AAL-021-009-01:

Atomic Alchemy will provide its expectations in the cover letter only in its submission of the revised Topical Report (TR).

To briefly explain in this response, this is not just an acceptance review of select principal design criteria (PDC). The secondary objective of the submitted Topical Report (TR) is to provide the NRC with a preliminary component of Atomic Alchemy's overall regulatory GAP analysis with respect to 10 CFR 50 Appendix A.

Because there is no "general design criteria" to assist in developing a PDC for the non-power reactor of a Non-power Production Utilization Facility (NPUF) in the Title 10 Regulations nor found in NUREG-1537 Part 1 or ISG NUREG-1537 Part 1, a general expectation of the NRC review and approval can be summarized that sufficient NRC review is applied to both the Atomic Alchemy developed PDC (derived from the modifications to General Design Criteria (GDC) of 10 CFR 50, Appendix A, and 10 CFR 70.64 respectively), as well as a review and concurrence of the light-water reactor 10 CFR 50 Appendix A GDC that have been excluded from consideration due to non-applicability as part of Atomic Alchemy's regulatory GAP analysis. The specific Atomic Alchemy expectations of the scope of the NRC review will be promulgated in the cover letter only.

NRC AIN #2**NRC Letter Date: August 31, 2021 (ADAMS Accession Package No. ML ML1201A196)****NRC Acceptance Review of Atomic Alchemy's Principal Design Criteria (PDC) Topical Report (TR)**

Text of NRC Question: *"The AAPDC TR does not specify whether the criterion presented in the TR is AA's proposed design criteria for the planned facility. While the AAPDC TR presents compliance information with 10 CFR Part 50, Appendix A, "General Design Criteria," the AAPDC TR does not clearly propose principal design criteria. 10 CFR Part 50, Appendix A is to be used as guidance in developing principal design criteria for reactor types different than light-water power reactors."*

Atomic Alchemy Response AAL-021-009-02:

To reiterate the response to AIN #1, since the staff does not establish "general" design criteria for non-power reactors from which an acceptable concurrence of applicable criteria can be arrived at, Atomic Alchemy performed a regulatory GAP analysis of all GDC of 10 CFR 50 Appendix A and all Baseline Design Criteria (BDC) of 10 CFR 70.64 that could potentially be applicable to its overall NPUF design. Then, subsequently derived its own set of principal design criteria concurrent to that analysis. In TR Rev 0, Atomic Alchemy described which GDC and/or BDC criterion would be acceptable as Atomic Alchemy PDC as written, and which elements of its NPUF design were outside the framework of these GDC and BDC and therefore necessitated modifications to either the GDC or BDC for use as Atomic Alchemy's PDC and identified which criteria being rejected and deemed not applicable for use as Atomic Alchemy's PDC along with the justification for each of these three determinations.

Also, in some situations Atomic Alchemy intends to modify the scope of the GDC and/or BDC to be more inclusive of specific design characteristics of the NPUF while in other situations the scope of the language was reduced in line with the level of risk and challenges to the NPUF safety limits which are significantly less than would be encountered for either a PWR or BWR design.

Atomic Alchemy concedes the staff's point that its TR Revision 0 was not formatted in the best possible way to present both the rationale of the elimination process (regulatory GAP analysis component) along with the finalized information, as it was not readily discernable at first glance to the staff's reviewers.

Atomic Alchemy has revised the TR to make it more readily apparent to the NRC which GDC it accepts as written and which it will choose to depart from, along with providing the specific revised language for each departure and the justification (both of which were not originally provided in TR Revision 0).

NRC AIN #3**NRC Letter Date: August 31, 2021 (ADAMS Accession Package No. ML ML1201A196)****NRC Acceptance Review of Atomic Alchemy's Principal Design Criteria (PDC) Topical Report (TR)**

Text of NRC Question: *"The AAPDC TR does not describe a methodology or approach to identify the need for principal design criteria outside the general regulatory framework of 10 CFR Part 50, Appendix A."*

Atomic Alchemy Response AAL-021-009-03:

Atomic Alchemy disagrees with part of this assessment by the staff but concedes again as mentioned in the response to AIN #2, that due to the formatting and presentation of a large amount of information condensed into a singular section, this was not readily discernable to the reviewers.

The TR Revision 1 has been modified¹ to more clearly state the methodology used along with a summary of the comparative analysis of the design basis of its NPUF in developing the PDC.

The overview of the selected and revised GDC and BDC sections that will comprise the Atomic Alchemy PDC is now presented in a separate table in the TR, while the regulatory GAP analysis and development of each PDC (comprised of both the original GDC language and departure PDC language) with respective justification and related compliance is now presented in Appendix A to the TR (a variation of the TR Appendix will be included in the PSAR).

With respect to developing design criteria outside the regulatory framework of the standard GDC and BDC, this was actually addressed (as stated in response to AIN #2) in the Revision 0 submittal, but it was buried individually in each compliance section, rather than presented separately in each section.

Atomic Alchemy has evaluated the design basis of the entire NPUF facility with respect to developing its PDC and as a result it will depart in some instances from the specific language of the GDC and/or BDC. Atomic Alchemy describes in the revised supplemental TR the intended departure language from the GDC and/or BDC for selected cases, in order to expand the scope of either as to include specific NPUF design features and characteristics that are outside the regulatory framework of either 10 CFR 50 Appendix A, or 10 CFR 50.64. This has now been further developed in TR Revision 1 to state the modified language more clearly for each Atomic Alchemy PDC as well as just stating the justification and compliance.

¹ Additionally a table of system acronyms and abbreviations have been added to the TR