APR1400
DESIGN CONTROL DOCUMENT TIER 2

CHAPTER 17
QUALITY ASSURANCE
AND RELIABILITY ASSURANCE

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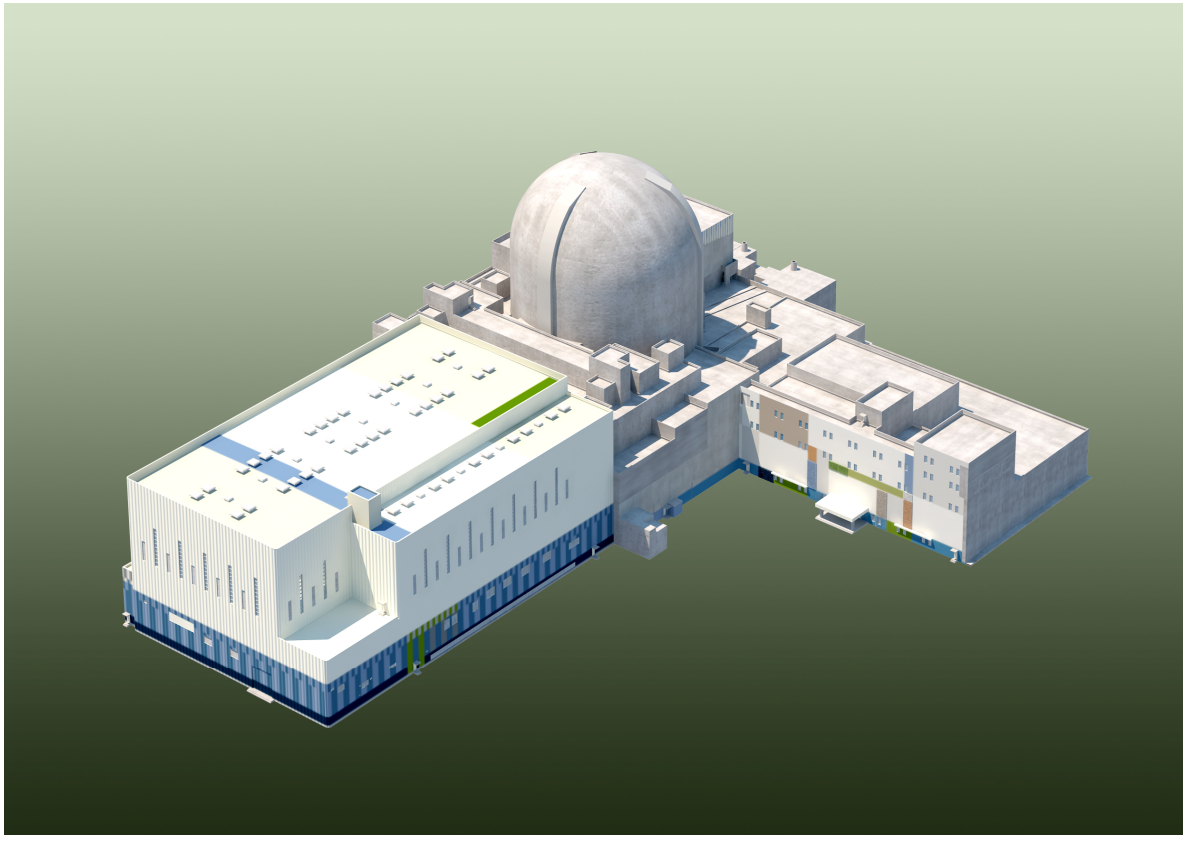

KOREA ELECTRIC POWER CORPORATION
KOREA HYDRO & NUCLEAR POWER CO., LTD

CHAPTER 17 – QUALITY ASSURANCE AND RELIABILITY ASSURANCE

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ACRONYM AND ABBREVIATION LIST

CAP	Corrective Action Program
CCF	Common Cause Failure
FV	Fussell-Vesely
HSS	High-Safety-Significant
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
NEI	Nuclear Energy Institute
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
QAPD	Quality Assurance Program Description
RAP	Reliability Assurance Program
RAW	Risk Achievement Worth
RTNSS	Regulatory Treatment of Non-Safety Systems
SMA	Seismic Margin Analysis
SRM	Staff Requirements Memorandum
SSCs	Systems, Structures, and Components

CHAPTER 17 – QUALITY ASSURANCE AND RELIABILITY ASSURANCE

17.0 Quality Assurance and Reliability Assurance

The quality assurance (QA) program for the APR1400 during the design certification phase is described in Sections 17.1, 17.2, 17.3, and 17.5. The design reliability assurance program for the APR1400 is described in Section 17.4. Information on the APR1400 maintenance rule is provided in Section 17.6.

17.1 Quality Assurance during the Design Certification Phase

Quality assurance (QA) during the design certification phase of the APR1400 is described in Section 17.5.

The COL applicant is to establish and implement a QA program that is applicable to site-specific design activities during the plant construction and operation phases.

17.2 Quality Assurance during the Operations Phase

The COL applicant is to establish and implement a QA program that is applicable to site-specific design activities during the plant construction and operation phases.

17.3 Quality Assurance Program

Quality assurance during the design certification phase of the APR1400 is described in Section 17.5.

The COL applicant is to establish and implement a QA program that is applicable to site-specific design activities during the plant construction and operation phases.

17.4 Reliability Assurance Program

This section presents the design reliability assurance program (RAP) for the APR1400 design.

17.4.1 Introduction

The RAP is implemented according to the Commission's direction provided in the .Staff Requirements Memorandum (SRM) dated June 28, 1995, for Item E, the Reliability Assurance Program (RAP), of SECY-95-132, "A Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs" (Reference 1). The RAP applies to the systems, structures, and components (SSCs), both safety-related and non-safety-related, that are identified as risk-significant (or significant contributors to plant safety). The SSCs within the scope of the RAP (referred to in this section as within-scope SSCs) are identified by using a combination of probabilistic, deterministic, or other methods of analysis, including information obtained from sources such as the probabilistic risk assessment (PRA), severe accident evaluations, industry operating experience, and expert panels.

The purposes of the RAP are to provide reasonable assurance of the following:

a. The reactor is designed, constructed, and operated consistent with the key assumptions and risk insights for the within-scope SSCs.

b. The within-scope SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations.

c. The frequency of transients that challenge these SSCs is minimized.

d. SSC function is reliable when challenged.

The purposes of the RAP can be achieved by implementing the program in two stages. Stage 1 applies to reliability assurance activities that occur before initial fuel load. Stage 1 is referred to as the design reliability assurance program (design RAP). Stage 2 applies to the reliability assurance activities in the operations phase of the plant's life cycle. Only

Stage 1 is described in this section. Stage 2 is not within the scope of the design certification and is to be addressed during the COL stage.

The objective of Stage 1 (the design RAP) is to provide reasonable assurance that the reactor is designed and constructed consistent with the key assumptions (including reliability and availability assumptions in the PRA, when applicable) and risk insights for the within-scope SSCs. This objective can be achieved through the following:

a. Applying the essential elements of the design RAP (i.e., organization, design control, procedures and instructions, records, corrective actions, and audit plans) during design and construction activities. The essential elements provide reasonable assurance that the key assumptions and risk insights are consistent with the reactor design and construction and that the list of within-scope SSCs is appropriately developed, maintained, and communicated to the appropriate organizations.

b. Implementing the appropriate quality assurance (QA) controls related to design and construction (e.g., design, procurement, fabrication, construction, inspection, testing activities) to provide control over activities affecting the quality of the within-scope SSCs. QA controls for safety-related SSCs are established through QA requirements in 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities." The provisions in Part V, "Non-safety-related SSC Quality Controls," of SRP Section 17.5 address graded QA controls for non-safety-related, within-scope SSCs.

The PRA evaluates the APR1400 design response to a spectrum of initiating events to provide reasonable assurance that plant damage has a low probability of occurring and that risk to the public is minimized. The risk-significant SSCs including both safety-related and non-safety related SSCs for the APR1400 design are identified and made available to the design organization.

The APR1400 RAP process is implemented in three phases. During Phase 1, the design certification phase, system information is collected and a system model is developed. The designer, Korea Hydro & Nuclear Power Co., Ltd. (KHNP), is responsible for Phase 1.

The system information and model are used as input to a design phase PRA and review of external events.

The goal of Stage 1 is to provide reasonable assurance that the reactor design meets the purposes specified above through the design, procurement, fabrication, construction, and preoperational testing activities and programs. The results of these activities are provided to an expert panel that identifies risk-significant SSCs using deterministic, probabilistic, and other methods.

During Phase 2, the site-specific phase, the RAP process is applied to the plant site-specific information. Also during Phase 2, the site-specific SSCs and the APR1400 design SSCs are combined into one list.

During Phase 3, the last phase of the RAP, the procurement, fabrication, construction, and preoperational testing are implemented. The site-specific list of SSCs is provided as an input to the RAP during the operations phase, which addresses plant operation and maintenance activities. The objective during this stage is to provide reasonable assurance that the reliability for the SSCs within the scope of the RAP is maintained during plant operations. Phases 2 and 3 are the responsibility of the COL applicant. The COL applicant is to specify the policy and implement procedures to address the specific plant operation and maintenance activities associated with the risk-significant SSCs identified during Phase 1 of RAP.

The non-safety-related RAP SSCs are subjected to the appropriate QA controls, which are described in Section 17.5 for Phase 1 of the design RAP and in Section 17.5 of the site-specific COL for Phases 2 and 3 of the design RAP.

17.4.2 Scope

The APR1400 RAP identifies risk-significant SSCs and provides key assumptions and risk insights for aspects of plant operation, maintenance, and performance monitoring to provide reasonable assurance of safe, reliable plant operation or to mitigate plant transients or other events that could present a risk to the public. Risk-significant SSCs are identified using the PRA, deterministic method, or other methods of analysis, including industry experience, and the input of the expert panel.

17.4.3 Quality Controls

a. Organization

KHNP is responsible for Phase 1 of the design RAP, as follows:

The Project Manager of the APR1400 project is responsible for establishing and implementing the APR1400 RAP. The Project Manager or designated representative is responsible for providing reasonable assurance that all affected organizations are aware of the RAP, its purpose, and the requirements herein.

The Manager of Plant Safety is responsible for providing reasonable assurance of overall plant safety in the design, including the use of the PRA results and risk insights in the RAP implementation.

The Manager of QA is responsible for providing reasonable assurance that the QA program is implemented properly, which includes design control, procedures and instructions, records, corrective actions, and audits pertaining to the RAP.

The Managers of Design Engineering are responsible for implementing the RAP and providing reasonable assurance that the APR1400 design is consistent with the identified risk-significant RAP SSCs and the associated key assumptions and risk insights from the PRA.

The risk management organization is responsible for requesting the related design engineering sections to review key assumptions in the PRA and to incorporate the comments to provide reasonable assurance that the key assumptions are realistic and achievable. The risk management organization is also responsible for providing the related inputs to the RAP in the design process by participating in the design change process. The risk management organization is also responsible for being involved in the design review.

b. Design control

The list of risk-significant SSCs for the RAP and the associated key assumptions and risk insights from the PRA are maintained by the risk management organization. The list and changes are approved by an expert panel, and the panel provides the information to design engineering and QA staff working on the APR1400 project.

The risk management organization provides reasonable assurance that the design engineering organizations are provided with the list of risk-significant RAP SSCs and the associated key assumptions and risk insights from the PRA, which are addressed in Section 19.1. The design engineering organization reviews the list of risk-significant RAP SSCs and associated key assumptions and risk insights from the PRA. compares this information to their design activities, and provides feedback to the risk management organization to achieve reasonable assurance that the risk-significant RAP SSC and the key assumptions and risk insights from the PRA are reasonably incorporated into the design, construction, and operational activities.

c. Procedures and instructions

The Project Manager of the APR1400 project or designated representative prepares the procedures and instructions used to implement the RAP. The Project Manager of the APR1400 project is responsible for the development, verification, and implementation of the RAP and for providing reasonable assurance that all affected organizations are aware of the RAP.

d. Records

The RAP-related records that are maintained include the following:

1) List of risk-significant SSCs

2) Expert panel meeting minutes/summaries

3) Other QA program records in accordance with the QA Program for the APR1400 (Reference 4).

e. Corrective action

The activities associated with the RAP that are determined to be in error, deficient, or nonconforming are processed through the corrective action program (CAP), which supports the quality assurance procedure.

f. Audit

Audit plans include a consideration of sampling the implementation of the RAP and its procedures to evaluate effectiveness. Audits consider several key aspects of the RAP including the identification of risk-significant RAP SSCs and whether the key assumptions and risk insights from PRA are reasonably incorporated in the design, construction and operational activities.

17.4.4 Integration into Existing Operational Programs

The APR1400 RAP serves as a source for other administrative and operational programs. Certain risk-significant SSCs identified in the RAP may be included in existing operational programs such as Technical Specifications surveillance requirements and provide reasonable assurance that the reliability values assumed in the PRA are maintained throughout the plant life.

During the operations phase, the RAP implements measures that yield continual improvements in the PRA through the plant's existing programs for maintenance or QA. Implementation of the Maintenance Rule requirements in 10 CFR 50.65 (Reference 2) is an example of how the plant could address the enhanced treatment of certain SSCs in the RAP during the operational phase. Per SECY 95-132, the COL applicant is to meet the objectives of the RAP during the operations phase using existing programs such as the Maintenance Rule, in-service testing, and QA. The COL applicant is to address non-safety risk-significant SSCs in the RAP.

17.4.5 Operating Experience

Consideration and use of operating experience is vital to the objective of the RAP. Operating experience is considered along with various PRA analytical and importance

measures when developing a comprehensive risk analysis. The expert panel considers SSC operating history and industry operating experience when assessing SSC risk significance. For example, operating experience indicates that the reliability of motor-driven and turbine-driven pumps may be different.

A review of operating experience may reveal conditions in which previous failures of SSCs in similar design applications have led to functional failures of SSCs. The review of operating experience is not limited to hardware failure but also extends to situations in which human performance led to functional failures of SSCs with a similar system design. For example, the APR1400 design improved SSC reliability by eliminating required operator actions to switch from injection to recirculation, which is typical in conventional PWRs.

17.4.6 Design RAP

As described in Subsection 17.4.2, Phase 1 of the design RAP includes the initial identification of SSCs to be included in the program, implementation of the aspects applicable to design efforts, and the definition of the scope, requirements, and implementation options to be included in the later phases.

17.4.6.1 SSC Identification

During the APR1400 design phase, risk-significant SSCs are identified for inclusion in the scope of the design RAP. A list of risk-significant SSCs is developed and controlled as design input for consideration during the design phase. The list of risk-significant SSCs is initially based on the results of the PRA and the expert panel. For further information on the PRA, refer to Section 19.1. In addition to PRA input, information from U.S. industry operating experience is considered in the identification of risk-significant SSCs. The list of risk-significant SSCs identified during the design phase is updated when the plant-specific PRA is developed.

a. Risk-significant SSC identification

   Importance analysis based on the PRA results

The PRA is used to identify risk-significant SSCs based on risk achievement worth (RAW) and Fussell-Vesely (FV) importance. Risk-significant SSCs are identified using importance criteria of FV importance greater than 0.005 and a RAW greater than 2. In the APR1400 RAP, these criteria have been applied to both single-failure basic events and common cause failure (CCF) basic events. A RAW value of 20 was conservatively selected to reflect the fact that the common cause RAW measures the failure of two or more trains, including the higher likelihood of failure of the second train from common causes, as described in NEI 00-04 (Reference 3). Risk-significant SSCs identified by a RAW greater than 2 for single-failure basic events sufficiently cover the Risk-significant SSCs identified by a RAW greater than 20 for common cause basic events. Component-based FVs are also estimated and used to identify risk-significant SSCs. The RAW and FV criteria are applied to the results of each risk hazard model separately, not to the combined results. For seismic margin analysis (SMA), risk-significant SSCs are identified according to the approach provided by NEI 00-04.

Engineering judgment based on PRA key assumptions and results is used for:

1) SSCs for which RAW/FV values have not been quantified

2) SSCs whose RAW/FV results do not exceed the importance criteria

Risk significance is identified by engineering judgment from the following points of view:

1) Contribution to required mitigation functions during an accident

2) Similarity of the impact of failure with other risk-significant SSCs

3) Impact on risk-significant human actions or signals

For severe accident-management SSCs, SSCs that are required to satisfy the requirements of 10 CFR are evaluated, and key SSCs are identified as risk-significant SSCs (e.g., cavity flooding system isolation valves).

Expert panel discussions and results

A third source in the RAP process for identifying risk-significant SSCs is the use of an expert panel consisting of representatives from Design Engineering, PRA, and other qualified individuals in operations and maintenance who are independent of the PRA group. The expert panel also reviews the categorization of SSCs determined to be non-risk significant based on quantified PRA results (e.g., technical adequacy of the basis used in the categorization, review of defense-in-depth implications, review of safety margin implications). As part of the RAP process, the PRA analytical results, operating experience, and an expert panel process are combined to develop a comprehensive list of risk-significant SSCs.

b. Dominant failure mode identification

For SSCs modeled in the PRA models, the failure modes of SSCs that can impact accident mitigative functions are represented by basic events in fault tree models. The dominant failure modes of SSCs can be determined from PRA models. For SSCs that are not modeled in PRA, dominant failure modes are based on SSCs that have a similar impact on the accident mitigation. The expert panel considers dominant failure modes in order to reflect industry operating experience.

17.4.6.2 Expert Panel

An expert panel is responsible for the final selection of the SSCs included in the RAP. The expert panel consists of a minimum of four people and includes at least one person with experience in design engineering, PRA, operations and maintenance, and QA. Industry operating experience and the expert panel are part of the deterministic approach and other processes. Engineering judgment is used in considering the addition of SSCs to the RAP. Qualifications of the voting members of the expert panel are defined in the Expert Panel Implementing Procedure for APR1400 Reliability Assurance Program and are as follows:

a. Minimum of 6 years of experience in the nuclear industry

b. Minimum of 4 years of experience in a relevant discipline such as engineering or operations

17.4.6.3 Phase 1 RAP Implementation and SSCs Included

Implementation of Phase 1 of the RAP is the responsibility of KHNP as it applies to the reactor design process. The SSCs included in this phase are listed in Table 17.4-1. The boundary for the SSCs listed in the table is defined as follows:

a. The RAP SSC boundaries are evaluated consistent with the SSCs in the corresponding sections of the DCD.

b. The RAP SSC boundary is specific to the component and/or structure under consideration and does not include any supporting or backup SSCs.

c. The RAP SSC boundary modeled in the PRA is consistent with the SSC boundary definition used in the APR1400 PRA (refer to Section 19.1), which is consistent with the available generic failure data.

Phase 1 RAP activities provide reasonable assurance that the key assumptions and risk insights from PRA, as identified in Section 19.1, are appropriately reflected in Table 17.4-1.

17.4.7 ITAAC for the Design RAP

Tier 1 inspections, tests, analyses, and acceptance criteria (ITAAC) are proposed to verify that the design phase RAP provides reasonable assurance that the plant is designed and constructed in a manner that is consistent with the key assumptions and risk insights for risk-significant SSCs. The list of risk-significant SSCs for ITAAC is prepared by introducing the plant's site-specific information to the list shown in Table 17.4-1 in Phase 2 of the RAP. The ITAAC are established to provide reasonable assurance that the APR1400 design has been subjected to the applicable reliability assurance activities for all risk-significant within-scope RAP SSCs when the COL is issued.

17.4.8 Combined License Information

COL 17.4(1) The COL applicant is to develop and implement Phases 2 and 3 of the design RAP, including QA requirements. In Phase 2, the plant's site-specific information is to be subjected to the design RAP process, and the site-specific risk-significant SSCs are combined with the APR1400 design risk-significant SSCs into one list for the plant. Phase 2 is to be performed during the COL application phase and updated/maintained during the COL license holder phase. In Phase 3, procurement, fabrication, construction, and test specifications for the SSCs within the scope of the RAP provide reasonable assurance that key assumptions, such as equipment reliability, are realistic and achievable. The QA requirements are implemented during the procurement, fabrication, construction, and pre-operation testing of the SSCs within the scope of the RAP. Phase 3 is to be performed during the COL license holder phase and prior to initial fuel loading. The COL applicant is to propose a method for incorporating the objectives of the reliability assurance program into other programs for design or operational errors that degrade non-safety-related, risk-significant SSCs.

COL 17.4(2) The COL applicant is to develop and implement the RAP in the operations phase in which RAP activities are integrated into the existing operational program (e.g., Maintenance Rule, surveillance testing, in-service inspection, in-service testing, QA). The RAP in the operations phase also includes the process for providing corrective actions for design and operational errors that degrade non-safety-related SSCs within the scope of the RAP. A description of the proposed method for developing /integrating the operational RAP into operating plant programs (e.g., Maintenance Rule, quality assurance) is to be performed during the COL application phase. The development/integration of the O-RAP is performed during the COL license holder phase and prior to initial fuel loading. All SSCs identified as risk-significant within the scope of the design RAP are categorized as high-safety-significant (HSS) within the scope of the initial Maintenance Rule. Integration of reliability assurance activities into existing operational programs also addresses the establishment of:

a. Reliability performance goals for risk-significant SSCs consistent with the existing maintenance and quality assurance processes on the basis of information from the design RAP (for example, implementation of the Maintenance Rule following the guidance contained in NRC RG 1.160 is one acceptable method for establishing performance goals if SSCs are categorized as HSS within the scope of the Maintenance Rule program).

b. Performance and condition monitoring requirements to provide reasonable assurance that risk-significant SSCs do not degrade to an unacceptable level during plant operations.

17.4.9 References

1. SECY 95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Design," U.S. Nuclear Regulatory Commission, May 1995.

2. 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," U.S. Nuclear Regulatory Commission, August 2007.

3. NEI 00-04, "10 CFR 50.69, SSC Categorization Guideline," Nuclear Energy Institute Rev. 0, July 2005.

4. APR1400-K-Q-TR-11005-NP, Revision 1, "KHNP Quality Assurance Program Description (QAPD) for the APR1400 Design Certification," KHNP, May 2012.

Table 17.4-1 (1 of 27)

Risk-Significant Within-Scope RAP SSCs

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
1	AF	TP01A	AF Turbine-Driven Pump 1A	Level 1, Level 2, Flood, Fire, Seismic
2	AF	TP01B	AF Turbine-Driven Pump 1B	Level 1, Level 2, Flood, Fire, Seismic
3	AF	MDP02A	AF Motor-Driven Pump 2A	Level 1, Fire, Seismic
4	AF	MDP02B	AF Motor-Driven Pump 2B	Level 1, Fire, Seismic
5	AF	CV1003A	AF Motor-Driven Pump 2A Discharge Check Valve	Level 1, Level 2, Fire
6	AF	CV1003B	AF Motor-Driven Pump 2B Discharge Check Valve	Level 1, Level 2, Fire
7	AF	CV1004A	AF Turbine-Driven Pump 1A Discharge Check Valve	Level 1, Level 2, Fire
8	AF	CV1004B	AF Turbine-Driven Pump 1B Discharge Check Valve	Level 1, Level 2, Fire
9	AF	CV1007A	AF Motor-Driven Pump 2A Discharge Check Valve	Level 1, Level 2, Fire
10	AF	CV1007B	AF Motor-Driven Pump 2B Discharge Check Valve	Level 1, Level 2, Fire
11	AF	CV1008A	AF Turbine-Driven Pump 1A Discharge Check Valve	Level 1, Level 2, Fire
12	AF	CV1008B	AF Turbine-Driven Pump 1B Discharge Check Valve	Level 1, Level 2, Fire
13	AF	CV1012A	AF Motor-Driven Pump 2A Mini-flow Line Check Valve	Level 1, Level 2, Fire
14	AF	CV1012B	AF Motor-Driven Pump 2B Mini-flow Line Check Valve	Level 1, Level 2, Fire
15	AF	CV1014A	AF Turbine-Driven Pump 1A Mini-flow Line Check Valve	Level 1, Fire
16	AF	CV1014B	AF Turbine-Driven Pump 1B Mini-flow Line Check Valve	Level 1, Fire

Table 17.4-1 (2 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
17	AF	MV043	AF Motor-Driven Pump 2A Discharge Isolation Valve	Level 1, Level 2, Fire
18	AF	MV044	AF Motor-Driven Pump 2B Discharge Isolation Valve	Level 1, Level 2, Fire
19	AF	MV045	AF Turbine-Driven Pump 1A Discharge Isolation Valve	Level 1, Level 2
20	AF	MV046	AF Turbine-Driven Pump 1B Discharge Isolation Valve	Level 1, Level 2
21	AF	SOV0035	AF Motor-Driven Pump 2A Discharge Modulation Valve	Level 2, Fire
22	AF	SOV0036	AF Motor-Driven Pump 2B Discharge Modulation Valve	Level 2, Fire
23	AF	SOV0037	AF Turbine-Driven Pump 1A Discharge Modulation Valve	Level 1
24	AF	SOV0038	AF Turbine-Driven Pump 1B Discharge Modulation Valve	Level 1
25	AF	78-15D-AF-X	AF System Piping in Room 078-A15D	Flood
26	AT	AOV009	AF Turbine-Driven Pump 1A Turbine Steam Supply Isolation Valve	Level 1, Level 2
27	AT	AOV010	AF Turbine-Driven Pump 1B Turbine Steam Supply Isolation Valve	Level 1, Level 2
28	AT	CV1020A	AF Turbine-Driven Pump 1A Turbine Steam Supply Check Valve	Level 1, Level 2
29	AT	CV1020B	AF Turbine-Driven Pump 1B Turbine Steam Supply Check Valve	Level 1, Level 2

Table 17.4-1 (3 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
30	AX	AFWST	Auxiliary Feedwater Storage Tank	Expert Panel
31	AX	CV1600	Demineralized Water Line Check Valve	Level 1, Level 2
32	CC	MP01A	Component Cooling Water Pump 1A	Level 1, Level 2, Fire, Seismic
33	CC	MP01B	Component Cooling Water Pump 1B	Level 1, Level 2, Fire, Seismic
34	CC	MP02A	Component Cooling Water Pump 2A	Level 1, Level 2, Fire, Seismic
35	CC	MP02B	Component Cooling Water Pump 2B	Level 1, Level 2, Fire, Seismic
36	CC	HE01A	Component Cooling Water Heat Exchanger 1A	Level 1, Level 2, Fire, Seismic
37	CC	HE01B	Component Cooling Water Heat Exchanger 1B	Level 1, Level 2, Fire, Seismic
38	CC	HE02A	Component Cooling Water Heat Exchanger 2A	Level 1, Level 2, Fire, Seismic
39	CC	HE02B	Component Cooling Water Heat Exchanger 2B	Level 1, Level 2, Fire, Seismic
40	CC	HE03A	Component Cooling Water Heat Exchanger 3A	Level 1, Level 2, Fire, Seismic
41	CC	HE03B	Component Cooling Water Heat Exchanger 3B	Level 1, Level 2, Fire, Seismic
42	CC	CV1001	Component Cooling Water Pump 1A Discharge Check Valve	Level 1, Level 2, Fire
43	CC	CV1002	Component Cooling Water Pump 1B Discharge Check Valve	Level 1, Level 2, Fire
44	CC	CV1003	Component Cooling Water Pump 2A Discharge Check Valve	Level 1, Level 2, Fire
45	CC	CV1004	Component Cooling Water Pump 2B Discharge Check Valve	Level 1, Level 2, Fire

Table 17.4-1 (4 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
46	CC	MV021	Component Cooling Water Heat Exchanger 3A Discharge Valve	Expert Panel
47	CC	MV022	Component Cooling Water Heat Exchanger 3B Discharge Valve	Expert Panel
48	CC	MV023	Component Cooling Water Heat Exchanger 3A Discharge Valve	Expert Panel
49	CC	MV024	Component Cooling Water Heat Exchanger 3B Discharge Valve	Expert Panel
50	CC	MV025	Component Cooling Water Heat Exchanger 3A Discharge Valve	Expert Panel
51	CC	MV026	Component Cooling Water Heat Exchanger 3B Discharge Valve	Expert Panel
52	CC	MV027	Component Cooling Water Heat Exchanger Bypass Valve	Expert Panel
53	CC	MV028	Component Cooling Water Heat Exchanger Bypass Valve	Expert Panel
54	CC	MV097	CS Heat Exchanger 1A CCW Inlet Valve	Level 1, Level 2
55	CC	MV098	CS Heat Exchanger 1B CCW Inlet Valve	Level 1, Level 2
56	CC	MV131	Essential Chiller 2A CCW Outlet Valve	Level 1, Fire
57	CC	MV132	Essential Chiller 2B CCW Outlet Valve	Level 1, Fire
58	CC	MV143	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
59	CC	MV144	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire

Table 17.4-1 (5 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
60	CC	MV145	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
61	CC	MV146	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
62	CC	MV147	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
63	CC	MV148	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
64	CC	MV149	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
65	CC	MV150	Component Cooling Water Non-Safety Load Line Isolation Valve	Level 1, Level 2, Fire
66	CC	MV181	EDG 1C CCW Inlet Valve	Level 1, Level 2, Fire
67	CC	MV182	EDG 1D CCW Inlet Valve	Level 1, Level 2, Fire
68	CC	MV191	EDG 1A CCW Inlet Valve	Level 1, Level 2, Fire
69	CC	MV192	EDG 1B CCW Inlet Valve	Level 1, Level 2, Fire
70	CC	MV351	Shutdown Cooling Heat Exchanger 1A CCW Inlet Valve	LPSD
71	CC	MV352	Shutdown Cooling Heat Exchanger 1B CCW Inlet Valve	LPSD
72	CC	MV383	Essential Chiller 1A CCW Outlet Valve	Expert Panel
73	CC	MV384	Essential Chiller 1B CCW Outlet Valve	Expert Panel
74	CC	TK01A	Component Cooling Water Surge Tank 1A	Level 1, Level 2, Flood, Fire
75	CC	TK01B	Component Cooling Water Surge Tank 1B	Level 1, Level 2, Flood, Fire
76	CD	TK01	Condensate Deaerator Storage Tank A	Level 1
77	CD	TK02	Condensate Deaerator Storage Tank B	Level 1

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Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
78	CS	PP01A	Containment Spray Pump 1A	Level 1, Level 2, Fire, Seismic
79	CS	PP01B	Containment Spray Pump 1B	Level 1, Level 2, Fire, Seismic
80	CS	HE01A	Containment Spray Heat Exchanger 1A	Level 1, Level 2, Seismic
81	CS	HE01B	Containment Spray Heat Exchanger 1B	Level 1, Level 2, Seismic
82	CS	HE02A	Containment Spray Mini-flow Line Heat Exchanger 2A	Seismic
83	CS	HE02B	Containment Spray Mini-flow Line Heat Exchanger 2B	Seismic
84	CS	CV1001	Containment Spray Pump 1A Discharge Check Valve	Level 1
85	CS	CV1002	Containment Spray Pump 1B Discharge Check Valve	Level 1
86	CS	CV1007	Containment Spray Heat Exchanger 1A Discharge Check Valve	Level 1, Level 2
87	CS	CV1008	Containment Spray Heat Exchanger 1B Discharge Check Valve	Level 1, Level 2
88	CS	MV001	Containment Spray Heat Exchanger 1A Discharge Isolation Valve	Level 1, Level 2
89	CS	MV002	Containment Spray Heat Exchanger 1B Discharge Isolation Valve	Level 1, Level 2
90	CS	MV003	Containment Spray Heat Exchanger 1A Discharge Isolation Valve	Level 1, Level 2
91	CS	MV004	Containment Spray Heat Exchanger 1B Discharge Isolation Valve	Level 1, Level 2
92	CV	PP03	Auxiliary Charging Pump (PP03)	Level 1, Level 2, Seismic
93	CV	CV334	Auxiliary Charging Pump Discharge Check Valve	Level 1

Table 17.4-1 (7 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
94	CV	CV189	IRWST Return Line Check Valve	Level 1, Level 2
95	CV	MV509	IRWST Return Line Isolation Valve (Normally Closed)	Level 1, Level 2
96	CV	MV553	IRWST Return Line Isolation Valve (Normally Open)	Level 1, Level 2
97	CV	VV126	IRWST Refill Line Manual Isolation Valve	Level 1, Level 2
98	CV	VV649	IRWST Refill Line Manual Isolation Valve	Level 1, Level 2
99	CV	TK02	Boric Acid Storage Tank (BAST)	Level 1
100	DA	AACTG	AAC Gas Turbine Generator	SBO, Level 1, Level 2, Seismic
101	DA	PP01	AAC Fuel Oil Transfer Pump	SBO, Fire
102	DA	PP02	AAC Fuel Oil Transfer Pump	SBO, Fire
103	DA	CV1005	AAC Fuel Oil Transfer Pump Discharge Check Valve	SBO, Expert Panel
104	DA	CV1007	AAC Fuel Oil Transfer Pump Discharge Check Valve	SBO, Expert Panel
105	DA	TK01	AAC Fuel Oil Storage Tank	SBO, Expert Panel
106	DA	TK02	AAC Fuel Oil Day Tank	SBO, Expert Panel
107	DC	BC01A	Class 1E 125V DC Battery Charger 1A	Level 1, Level 2, Seismic
108	DC	BC01B	Class 1E 125V DC Battery Charger 1B	Level 1, Level 2, Seismic
109	DC	BC01C	Class 1E 125V DC Battery Charger 1C	Level 1, Level 2, Seismic
110	DC	BC01D	Class 1E 125V DC Battery Charger 1D	Level 1, Level 2, Seismic

Table 17.4-1 (8 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
111	DC	BC02A	Class 1E 125V DC Standby Battery Charger 2A	Level 1, Seismic
112	DC	BC02B	Class 1E 125V DC Standby Battery Charger 2B	Level 1, Seismic
113	DC	BC02C	Class 1E 125V DC Standby Battery Charger 2C	Level 1, Seismic
114	DC	BC02D	Class 1E 125V DC Standby Battery Charger 2D	Level 1, Seismic
115	DC	BT01A	Class 1E 125V DC Battery 1A	Level 1, Level 2, Fire, Seismic
116	DC	BT01B	Class 1E 125V DC Battery 1B	Level 1, Level 2, Fire, Seismic
117	DC	BT01C	Class 1E 125V DC Battery 1C	Level 1, Level 2, Fire, Seismic
118	DC	BT01D	Class 1E 125V DC Battery 1D	Level 1, Level 2, Fire, Seismic
119	DC	MC01A	Class 1E 125V DC Bus 1A	Level 1, Level 2, Flood, Fire, Seismic
120	DC	MC01B	Class 1E 125V DC Bus 1B	Level 1, Level 2, Flood, Fire, Seismic
121	DC	MC01C	Class 1E 125V DC Bus 1C	Level 1, Level 2, Flood, Fire, Seismic
122	DC	MC01D	Class 1E 125V DC Bus 1D	Level 1, Level 2, Flood, Fire, Seismic
123	DC	MC01M	Non-Class 1E 250V DC Bus 1M	Level 1, Level 2
124	DC	MC01N	Non-Class 1E 250V DC Bus 1N	Level 1, Level 2
125	DE	AV006	Radioactive Drain System - Containment Isolation Valve	Level 2

Table 17.4-1 (9 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
126	DG	EDG A	Emergency Diesel Generator A	Level 1, Level 2, LPSD, Fire, Seismic
127	DG	EDG B	Emergency Diesel Generator B	Level 1, Level 2, LPSD, Fire, Seismic
128	DG	EDG C	Emergency Diesel Generator C	Level 1, Level 2, LPSD, Fire, Seismic
129	DG	EDG D	Emergency Diesel Generator D	Level 1, Level 2, LPSD, Fire, Seismic
130	DO	PP01A	Diesel Fuel Oil Transfer Pump 1A	Level 1, Level 2, Seismic
131	DO	PP01B	Diesel Fuel Oil Transfer Pump 1B	Level 1, Level 2, Seismic
132	DO	PP01C	Diesel Fuel Oil Transfer Pump 1C	Level 1, Level 2, Seismic
133	DO	PP01D	Diesel Fuel Oil Transfer Pump 1D	Level 1, Level 2, Seismic
134	DO	PP02A	Diesel Fuel Oil Transfer Pump 2A	Level 1, Level 2, Seismic
135	DO	PP02B	Diesel Fuel Oil Transfer Pump 2B	Level 1, Level 2, Seismic
136	DO	PP02C	Diesel Fuel Oil Transfer Pump 2C	Level 1, Level 2, Seismic
137	DO	PP02D	Diesel Fuel Oil Transfer Pump 2D	Level 1, Level 2, Seismic
138	DO	CV1005A	Diesel Fuel Oil Transfer Pump 1A Discharge Check Valve	Level 1, Level 2, Fire
139	DO	CV1005B	Diesel Fuel Oil Transfer Pump 1B Discharge Check Valve	Level 1, Level 2, Fire
140	DO	CV1005C	Diesel Fuel Oil Transfer Pump 1C Discharge Check Valve	Level 1, Level 2, Fire
141	DO	CV1005D	Diesel Fuel Oil Transfer Pump 1D Discharge Check Valve	Level 1, Level 2, Fire

Table 17.4-1 (10 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
142	DO	CV1007A	Diesel Fuel Oil Transfer Pump 2A Discharge Check Valve	Level 1, Level 2, Fire
143	DO	CV1007B	Diesel Fuel Oil Transfer Pump 2B Discharge Check Valve	Level 1, Level 2, Fire
144	DO	CV1007C	Diesel Fuel Oil Transfer Pump 2C Discharge Check Valve	Level 1, Level 2, Fire
145	DO	CV1007D	Diesel Fuel Oil Transfer Pump 2D Discharge Check Valve	Level 1, Level 2, Fire
146	DO	LS3025A	Diesel Fuel Oil Day Tank Level Switch	Fire
147	DO	LS3025B	Diesel Fuel Oil Day Tank Level Switch	Fire
148	DO	LS3025C	Diesel Fuel Oil Day Tank Level Switch	Fire
149	DO	LS3025D	Diesel Fuel Oil Day Tank Level Switch	Fire
150	DO	TK01A	Diesel Fuel Oil Storage Tank A	Level 1, Level 2, Fire, Seismic
151	DO	TK01B	Diesel Fuel Oil Storage Tank B	Level 1, Level 2, Fire, Seismic
152	DO	TK01C	Diesel Fuel Oil Storage Tank C	Level 1, Level 2, Fire, Seismic
153	DO	TK01D	Diesel Fuel Oil Storage Tank D	Level 1, Level 2, Fire, Seismic
154	DP	HS071A	Diverse Protection System (DPS) Manual Trip Push Button	ATWS, Expert Panel
155	DP	HS071B	Diverse Protection System (DPS) Manual Trip Push Button	ATWS, Expert Panel
156	DP	PLC1	Diverse Protection System (DPS) Signal Processor	ATWS, Expert Panel
157	DP	PLC2	Diverse Protection System (DPS) Signal Processor	ATWS, Expert Panel

Table 17.4-1 (11 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
158	FP	055-05-FP-X	4 in and 6 in FP piping in stairwell 055-A05D	Flood
159	FP	78-01D-FP-M	4 to 8 in FP piping in room 078-A01D	Flood
160	FP	78-10C-FP-M	4 to 8 in FP piping in room 078-A10C	Flood
161	FP	78-19A-FP-M	2.5 to 8 in FP piping in room 078-A19A	Flood
162	FP	78-19A-FP-X	2.5 to 8 in FP piping in room 078-A19A	Flood
163	FP	78-19B-FP-X	1 to 8 in FP piping in room 078-A19B	Flood
164	FP	78-31A-FP-M	4 in and 8 in FP piping in room 078-A31A	Flood
165	FP	78-31A-FP-X	4 in and 8 in FP piping in room 078-A31A	Flood
166	FP	78-44B-FP-X	2 to 8 in FP piping in room 078-A44B	Flood
167	FP	100-10B-FP-X	3 in and 8 in FP piping in room 078-A10B	Flood
168	FP	100-20A-FP-X	2.5 in to 12 in FP piping in room 100-A20A	Flood
169	FP	100-22A-FP-X	4 in and 6 in FP piping in room 100-A22A	Flood
170	FP	100-37B-FP-X	2.5 in to 4 in FP piping in room 100-A37B	Flood
171	FP	120-11B-FP-X	8 in FP piping in room 120-A11B	Flood
172	FP	137-09C-FP-X	4 to 8 in FP piping in room 137-A09C	Flood
173	FP	137-13B-FP-M	1 in and 1.5 in FP piping in room 137-A13B	Flood
174	FP	137-29B-FP-X	4 to 8 in FP piping in room 137-A29B	Flood

Table 17.4-1 (12 of 27)

Index	System [1]	SSC ID	SSC Description	Within-Scope Basis [2]
175	FW	CV1026	Startup Feedwater Pump Discharge Check Valve	Level 1
176	FW	MP07	Startup Feedwater Pump	Level 1, Level 2
177	FW	MV093	Startup Feedwater Pump Discharge Isolation Valve	Level 1
178	FW	ZV058	Startup Feedwater Pump Discharge Stop Check Valve	Level 1
179	GW	SV002	Gaseous Radwaste System - Containment Isolation Valve	Level 2
180	GW	-	Key SSCs in Gaseous Waste Management System	Expert Panel
181	HG	PAR	Passive Autocatalytic Recombiners	Level 2
182	HG	Igniter	Hydrogen Igniters	Expert Panel
183	IP	IN01A	Class 1E 120V AC Inverter 1A	Level 1, Level 2, Fire, Seismic
184	IP	IN01B	Class 1E 120V AC Inverter 1B	Level 1, Level 2, Fire, Seismic
185	IP	IN01C	Class 1E 120V AC Inverter 1C	Level 1, Level 2, Fire, Seismic
186	IP	IN01D	Class 1E 120V AC Inverter 1D	Level 1, Level 2, Fire, Seismic
187	IW	CFS Valves - MV001/002/ 003/004	Cavity Flooding System Isolation Valves	Level 2
188	MS	MSIV- EV011, EV012, EV013, EV014	Main Steam Isolation Valves (MSIVs)	Level 1, Level 2

Table 17.4-1 (13 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
189	MS	MSSV-1301/1303/1305/1307/1309/1302/1304/1306/1308/1310/1311/1313/1315/1317/1319/1312/1314/1316/1318/1320	Main Steam Safety Valves (MSSVs)	Level 1, Level 2
190	MS	AOV109/110	Auxiliary Feedwater Pump Turbine Steam Supply Valves	Level 1, Level 2
191	NB	SW01M	Non-1E 4.16KV Switchgear	Level 1, Level 2
192	NB	SW02N	Non-1E 4.16KV Switchgear	Level 1, Level 2
193	NB	SW03N-F2	Non-1E 4.16KV Switchgear PCB	Level 1, Level 2
194	NB	SW03N-G2	Non-1E 4.16KV Switchgear PCB	Level 1, Level 2
195	NG	LC05N	Non-1E 480V Load Center	Level 1, Level 2
196	NG	LC10M	Non-1E 480V Load Center	Level 1, Level 2
197	NG	TR05N	Non-1E 480V Load Center Transformer	Level 1, Level 2
198	NG	TR10M	Non-1E 480V Load Center Transformer	Level 1, Level 2
199	NH	MC03M	Non-1E 480V MCC	Level 1, Level 2
200	NH	MC20N	Non-1E 480V MCC	Level 1, Level 2
201	NP	SW02N	Non-1E 13.8KV Switchgear Bus	Level 1
202	NP	TR02M	Standby Auxiliary Transformer (SAT)	Fire
203	NP	TR02N	Standby Auxiliary Transformer (SAT)	Fire
204	PF	SW01A	Class 1E 4.16KV Switchgear	Level 1, Level 2, Flood, Seismic
205	PF	SW01B	Class 1E 4.16KV Switchgear	Level 1, Level 2, Flood, Seismic
206	PF	SW01C	Class 1E 4.16KV Switchgear	Level 1, Level 2, Flood, Seismic

Table 17.4-1 (14 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
207	PF	SW01D	Class 1E 4.16KV Switchgear	Level 1, Level 2, Flood, Seismic
208	PF	SW01A-H2	Class 1E 4.16KV Switchgear PCB (UAT)	Level 1, Level 2, Fire
209	PF	SW01B-H2	Class 1E 4.16KV Switchgear PCB (UAT)	Level 1, Level 2, Fire
210	PF	SW01C-C2	Class 1E 4.16KV Switchgear PCB (UAT)	Level 1, Level 2, Fire
211	PF	SW01D-G2	Class 1E 4.16KV Switchgear PCB (UAT)	Level 1, Level 2, Fire
212	PF	SW01A-A2	Class 1E 4.16KV Switchgear PCB (SAT)	Fire
213	PF	SW01B-A2	Class 1E 4.16KV Switchgear PCB (SAT)	Fire
214	PF	SW01C-A2	Class 1E 4.16KV Switchgear PCB (SAT)	Fire
215	PF	SW01D-J2	Class 1E 4.16KV Switchgear PCB (SAT)	Fire
216	PF	SW01A-G2	Class 1E 4.16KV Switchgear PCB (AAC)	Level 1, Level 2
217	PF	SW01B-B2	Class 1E 4.16KV Switchgear PCB (AAC)	Level 1, Level 2
218	PF	SW01C-E2	Class 1E 4.16KV Switchgear PCB (AAC)	Level 1, Level 2
219	PF	SW01D-D2	Class 1E 4.16KV Switchgear PCB (AAC)	Level 1, Level 2
220	PG	LC01A	Class 1E 480V Load Center	Level 1, Level 2, Flood, Fire, Seismic
221	PG	LC01B	Class 1E 480V Load Center	Level 1, Level 2, Flood, Fire, Seismic
222	PG	LC01C	Class 1E 480V Load Center	Level 1, Level 2, Flood, Fire, Seismic
223	PG	LC01D	Class 1E 480V Load Center	Level 1, Level 2, Flood, Fire, Seismic

Table 17.4-1 (15 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
224	PG	LC02	Class 1E 480V Load Center	Level 1, Seismic
225	PG	LC02A	Class 1E 480V Load Center	Fire
226	PG	LC02B	Class 1E 480V Load Center	Fire
227	PG	LC02C	Class 1E 480V Load Center	Fire
228	PG	LC02D	Class 1E 480V Load Center	Fire
229	PG	TR01A	Class 1E 480V Load Center Transformer	Level 1, Level 2, Flood, Fire, Seismic
230	PG	TR01B	Class 1E 480V Load Center Transformer	Level 1, Level 2, Flood, Fire, Seismic
231	PG	TR01C	Class 1E 480V Load Center Transformer	Level 1, Level 2, Flood, Fire, Seismic
232	PG	TR01D	Class 1E 480V Load Center Transformer	Level 1, Level 2, Flood, Fire, Seismic
233	PG	TR02A	Class 1E 480V Load Center Transformer	Fire
234	PG	TR02B	Class 1E 480V Load Center Transformer	Fire
235	PG	TR02C	Class 1E 480V Load Center Transformer	Fire
236	PG	TR02D	Class 1E 480V Load Center Transformer	Fire
237	PH	MC01A	Class 1E 480V Motor Control Center (MCC)	Level 1, Level 2, Fire, Seismic
238	PH	MC01B	Class 1E 480V Motor Control Center (MCC)	Level 1, Level 2, Fire, Seismic
239	PH	MC01C	Class 1E 480V Motor Control Center (MCC)	Level 1, Level 2, Fire, Seismic
240	PH	MC01D	Class 1E 480V Motor Control Center (MCC)	Level 1, Level 2, Fire, Seismic
241	PH	MC02A	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
242	PH	MC02B	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic

Table 17.4-1 (16 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
243	PH	MC02C	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
244	PH	MC02D	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
245	PH	MC03A	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
246	PH	MC03B	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
247	PH	MC03C	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
248	PH	MC03D	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
249	PH	MC04C	Class 1E 480V Motor Control Center (MCC)	Level 1, Level 2, Fire, Seismic
250	PH	MC04D	Class 1E 480V Motor Control Center (MCC)	Level 1, Level 2, Fire, Seismic
251	PH	MC05A	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
252	PH	MC05B	Class 1E 480V Motor Control Center (MCC)	Fire, Seismic
253	RC	MV130/131, MV132/133, MV134/135, MV136/137	POSRV Pilot Valves	Seismic
254	RC	POSRVs V200, V201, V202, V203	Pressurizer Pilot Operated Safety Relief Valves (POSRVs)	Level 1, Level 2, Seismic
255	RC	PT102A/B/C/D	Pressurizer Low Pressure Transmitters	Fire
256	RG	SOV410/412	Pressurizer Gas Vent Line Isolation Valves	Expert Panel
257	RG	SOV411/413	Pressurizer Gas Vent Line Isolation Valves	Expert Panel
258	RG	SOV415/417	Reactor Vessel Gas Vent Line Isolation Valves	Expert Panel

Table 17.4-1 (17 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
259	RG	SOV414/416	Reactor Vessel Gas Vent Line Isolation Valves	Expert Panel
260	RG	SOV418	Reactor Vessel Gas Vent Line RDT Discharge Isolation Valve	Expert Panel
261	RG	SOV419/420	Reactor Vessel Gas Vent Line IRWST Discharge Isolation Valves	Expert Panel
262	RP	TCB-A1/B1/C1/D1	Reactor Trip Circuit Breakers A1/B1/C1/D1	Level 1, ATWS
263	RP	TCB-A2/B2/C2/D2	Reactor Trip Circuit Breakers A2/B2/C2/D2	Level 1, ATWS
264	SI	CV100	Safety Injection Pump 2A/2C IRWST Return Line Check Valve	Level 1, Level 2, Fire
265	SI	CV101	Safety Injection Pump 2B/2D IRWST Return Line Check Valve	Level 1, Level 2, Fire
266	SI	CV113	Safety Injection Pump 2D Injection Line Check Valve	Level 1, Level 2, LPSD, Fire
267	SI	CV123	Safety Injection Pump 2B Injection Line Check Valve	Level 1, Level 2, LPSD, Fire
268	SI	CV133	Safety Injection Pump 2C Injection Line Check Valve	Level 1, Level 2, LPSD, Fire
269	SI	CV143	Safety Injection Pump 2A Injection Line Check Valve	Level 1, Level 2, LPSD, Fire
270	SI	CV157	Containment Spray Pump 1A IRWST Suction Line Check Valve	Level 1, Level 2, Fire
271	SI	CV158	Containment Spray Pump 1B IRWST Suction Line Check Valve	Level 1, Level 2, Fire
272	SI	CV159	Shutdown Cooling Pump 1A IRWST Suction Line Check Valve	Level 1, Fire
273	SI	CV160	Shutdown Cooling Pump 1B IRWST Suction Line Check Valve	Level 1, Fire

Table 17.4-1 (18 of 27)

Index	System (1)	SSC ID	SSC Description	Within Scope Basis (2)
274	SI	CV168	Shutdown Cooling Heat Exchanger 1B Discharge Line Check Valve	Expert Panel
275	SI	CV178	Shutdown Cooling Heat Exchanger 1A Discharge Line Check Valve	Expert Panel
276	SI	CV217	Safety Injection Line Check Valve - DVI Nozzle 1B	Level 1, Level 2, LPSD, Fire
277	SI	CV227	Safety Injection Line Check Valve - DVI Nozzle 2B	Level 1, Level 2, LPSD, Fire
278	SI	CV237	Safety Injection Line Check Valve - DVI Nozzle 2A	Level 1, Level 2, LPSD, Fire
279	SI	CV247	Safety Injection Line Check Valve - DVI Nozzle 1A	Level 1, Level 2, LPSD, Fire
280	SI	CV404	Safety Injection Pump 2A Discharge Check Valve	Level 1, Level 2, Fire
281	SI	CV405	Safety Injection Pump 2B Discharge Check Valve	Level 1, Level 2, Fire
283	SI	CV446	Safety Injection Pump 2D Discharge Check Valve	Level 1, Level 2, Fire
284	SI	CV424	Safety Injection Pump 2A Mini-flow Line Check Valve	Level 1, Level 2, Fire
285	SI	CV426	Safety Injection Pump 2B Mini-flow Line Check Valve	Level 1, Level 2, Fire
286	SI	CV448	Safety Injection Pump 2D Mini-flow Line Check Valve	Level 1, Level 2, Fire
287	SI	CV451	Safety Injection Pump 2C Mini-flow Line Check Valve	Level 1, Level 2, Fire
288	SI	CV540	Safety Injection Pump 2D Discharge Check Valve	Level 1, LPSD, Fire
289	SI	CV541	Safety Injection Pump 2B Discharge Check Valve	Level 1, LPSD, Fire

Table 17.4-1 (19 of 27)

Index	System (1)	SSC ID	SSC Description	Within Scope Basis (2)
290	SI	CV542	Safety Injection Pump 2C Discharge Check Valve	Level 1, LPSD, Fire
291	SI	CV543	Safety Injection Pump 2A Discharge Check Valve	Level 1, LPSD, Fire
292	SI	CV568	Shutdown Cooling Pump 1A Discharge Check Valve	Level 1, Fire
293	SI	CV569	Shutdown Cooling Pump 1B Discharge Check Valve	Level 1, Fire
294	SI	PP01A	Shutdown Cooling Pump 1A	Level 1, Level 2, LPSD, Fire, Seismic
295	SI	PP01B	Shutdown Cooling Pump 1B	Level 1, Level 2, LPSD, Fire, Seismic
296	SI	HE01A	Shutdown Cooling Heat Exchanger 1	LPSD, Seismic
297	SI	HE01B	Shutdown Cooling Heat Exchanger 2	LPSD, Seismic
298	SI	HE02A	Shutdown Cooling Mini-flow Line Heat Exchanger 1	Seismic
299	SI	HE02B	Shutdown Cooling Mini-flow Line Heat Exchanger 2	Seismic
300	SI	PP02A	Safety Injection Pump 2A	Level 1, Level 2, LPSD, Fire, Seismic
301	SI	PP02B	Safety Injection Pump 2B	Level 1, Level 2, LPSD, Fire, Seismic
302	SI	PP02C	Safety Injection Pump 2C	Level 1, Level 2, LPSD, Fire, Seismic
303	SI	PP02D	Safety Injection Pump 2D	Level 1, Level 2, LPSD, Fire, Seismic

Table 17.4-1 (20 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
304	SI	MV616	Safety Injection Pump 2D Discharge Isolation Valve	Level 1, Level 2, LPSD, Fire
305	SI	MV626	Safety Injection Pump 2B Discharge Isolation Valve	Level 1, Level 2, LPSD, Fire
306	SI	MV636	Safety Injection Pump 2C Discharge Isolation Valve	Level 1, Level 2, LPSD, Fire
307	SI	MV646	Safety Injection Pump 2A Discharge Isolation Valve	Level 1, Level 2, LPSD, Fire
308	SI	MV302	Safety Injection Pump 2A/2C Mini-flow Line Isolation Valve	Fire
309	SI	MV303	Safety Injection Pump 2B/2D Mini-flow Line Isolation Valve	Fire
310	SI	MV395	Safety Injection Pump 2A/2C Mini-flow Line Isolation Valve	Fire
311	SX	PP01A	Essential Service Water Pump 1A	Level 1, Level 2, Fire, Seismic
312	SX	PP01B	Essential Service Water Pump 1B	Level 1, Level 2, Fire, Seismic
313	SX	PP02A	Essential Service Water Pump 2A	Level 1, Level 2, Fire, Seismic
314	SX	PP02B	Essential Service Water Pump 2B	Level 1, Level 2, Fire, Seismic
315	SX	CV1001	Essential Service Water Pump 1A Discharge Check Valve	Level 1, Level 2, Fire
316	SX	CV1002	Essential Service Water Pump 1B Discharge Check Valve	Level 1, Level 2, Fire
317	SX	CV1003	Essential Service Water Pump 2A Discharge Check Valve	Level 1, Level 2, Fire
318	SX	CV1004	Essential Service Water Pump 2B Discharge Check Valve	Level 1, Level 2, Fire
319	SX	FT01A	Essential Service Water Debris Filter 1A	Level 1, Level 2, Fire
320	SX	FT01B	Essential Service Water Debris Filter 1B	Level 1, Level 2, Fire
321	SX	FT02A	Essential Service Water Debris Filter 2A	Level 1, Level 2, Fire

Table 17.4-1 (21 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
322	SX	FT02B	Essential Service Water Debris Filter 2B	Level 1, Level 2, Fire
323	SX	FT03A	Essential Service Water Debris Filter 3A	Level 1, Level 2, Fire
324	SX	FT03B	Essential Service Water Debris Filter 3B	Level 1, Level 2, Fire
325	SX	MV071	Ultimate Heat Sink Cooling Tower 1A Discharge Line Control Valve	Level 1, Level 2
326	SX	MV072	Ultimate Heat Sink Cooling Tower 1A Discharge Line Bypass Valve	Level 1, Level 2
327	SX	MV073	Ultimate Heat Sink Cooling Tower 1B Discharge Line Control Valve	Level 1, Level 2
328	SX	MV074	Ultimate Heat Sink Cooling Tower 1B Discharge Line Bypass Valve	Level 1, Level 2
329	SX	AH01A	Ultimate Heat Sink Cooling Tower Fan 1A	Level 1, Level 2, Fire
330	SX	AH01B	Ultimate Heat Sink Cooling Tower Fan 1B	Level 1, Level 2, Fire
331	SX	AH02A	Ultimate Heat Sink Cooling Tower Fan 2A	Level 1, Level 2, Fire
332	SX	AH02B	Ultimate Heat Sink Cooling Tower Fan 2B	Level 1, Level 2, Fire
333	VD	HV12A	EDG Room Emergency Cubicle Cooler - Quadrant A	Level 1, Level 2, LPSD, Fire, Seismic
334	VD	HV12B	EDG Room Emergency Cubicle Cooler - Quadrant B	Level 1, Level 2, LPSD, Fire, Seismic
335	VD	HV12C	EDG Room Emergency Cubicle Cooler - Quadrant C	Level 1, Level 2, LPSD, Fire, Seismic
336	VD	HV12D	EDG Room Emergency Cubicle Cooler - Quadrant D	Level 1, Level 2, LPSD, Fire, Seismic
337	VD	HV13A	EDG Room Emergency Cubicle Cooler - Quadrant A	Level 1, Level 2, LPSD, Fire, Seismic
338	VD	HV13B	EDG Room Emergency Cubicle Cooler - Quadrant B	Level 1, Level 2, LPSD, Fire, Seismic

Table 17.4-1 (22 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
339	VD	HV13C	EDG Room Emergency Cubicle Cooler - Quadrant C	Level 1, Level 2, LPSD, Fire, Seismic
340	VD	HV13D	EDG Room Emergency Cubicle Cooler - Quadrant D	Level 1, Level 2, LPSD, Fire, Seismic
341	VG	AH01A	Essential Service Pump Room Fan 1A	Level 1, Fire, Seismic
342	VG	AH01B	Essential Service Pump Room Fan 1B	Level 1, Fire, Seismic
343	VG	AH02A	Essential Service Pump Room Fan 2A	Level 1, Fire, Seismic
344	VG	AH02B	Essential Service Pump Room Fan 2B	Level 1, Fire, Seismic
345	VG	Y1002A	Essential Service Pump Room Fan 1A - Exhaust Damper	Fire
346	VG	Y1002B	Essential Service Pump Room Fan 1B - Exhaust Damper	Fire
347	VG	Y1011A	Essential Service Pump Room Fan 2A - Exhaust Damper	Fire
348	VG	Y1011B	Essential Service Pump Room Fan 2B - Exhaust Damper	Fire
349	VK	Y1301A	Auxiliary Building Controlled Area I ECCS Equipment Room ACU Exhaust Damper	Seismic
350	VK	Y1301B	Auxiliary Building Controlled Area II ECCS Equipment Room ACU Exhaust Damper	Seismic
351	VO	HV31A	Essential Chiller 1A Room Cubicle Cooler	Level 1, Level 2
352	VO	HV31B	Essential Chiller 1B Room Cubicle Cooler	Level 1, Level 2
353	VO	HV32A	Essential Chiller 2A Room Cubicle Cooler	Level 1, Level 2
354	VO	HV32B	Essential Chiller 2B Room Cubicle Cooler	Level 1, Level 2

Table 17.4-1 (23 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
355	VO	HV33A	Auxiliary Feedwater Motor-Driven Pump 2A Room Cubicle Cooler	Level 1, Level 2, Fire
356	VO	HV33B	Auxiliary Feedwater Motor-Driven Pump 2B Room Cubicle Cooler	Level 1, Level 2, Fire
357	VO	TE085A	Auxiliary Feedwater Motor-Driven Pump 2A Room Temperature Transmitter	Level 1, Level 2, Fire
358	VO	TE086B	Auxiliary Feedwater Motor-Driven Pump 2B Room Temperature Transmitter	Level 1, Level 2, Fire
359	VQ	2014/2016 /2024	Reactor Containment Building Purge System – Leak Rate Test Line Valves	Level 2
360	VU	AH60	AAC Gas Turbine Generator Room High Volume Exhaust Fan (including temperature control instrumentation)	SBO, Expert Panel
361	VU	AH61	AAC Gas Turbine Generator Room High Volume Exhaust Fan (including temperature control instrumentation)	SBO, Expert Panel
362	WM	VV1201A	Raw Water Pump Supply Isolation Manual Valve	Level 1, Level 2
363	WM	VV1205	Raw Water Pump Discharge Isolation Manual Valve	Level 1, Level 2
364	WM	VV1220	Raw Water Pump Discharge Isolation Manual Valve	Level 1, Level 2
365	WM	VV1700	Raw Water Pump Discharge Isolation Manual Valve	Level 1, Level 2
366	WO	PP01A	Essential Chilled Water Pump 1A	Level 1, Level 2, Fire, Seismic

Table 17.4-1 (24 of 27)

Index	System (1)	SSC ID	SSC Description	Within Scope Basis (2)
367	WO	PP01B	Essential Chilled Water Pump 1B	Level 1, Level 2, Fire, Seismic
368	WO	PP02A	Essential Chilled Water Pump 2A	Level 1, Level 2, Fire, Seismic
369	WO	PP02B	Essential Chilled Water Pump 2B	Level 1, Level 2, Fire, Seismic
370	WO	CV1010A	Essential Chilled Water Pump 1A Discharge Check Valve	Level 1, Fire
371	WO	CV1010B	Essential Chilled Water Pump 1B Discharge Check Valve	Level 1, Fire
372	WO	CV1014A	Essential Chilled Water Pump 2A Discharge Check Valve	Level 1, Fire
373	WO	CV1014B	Essential Chilled Water Pump 2B Discharge Check Valve	Level 1, Fire
374	WO	CH01A	Essential Chilled Water Chiller 1A (includes evaporator, compressor, condenser and associated piping)	Level 1, Level 2, Fire
375	WO	CH01B	Essential Chilled Water Chiller 1B (includes evaporator, compressor, condenser and associated piping)	Level 1, Level 2, Fire
376	WO	CH02A	Essential Chilled Water Chiller 2A (includes evaporator, compressor, condenser and associated piping)	Level 1, Level 2, Fire
377	WO	CH02B	Essential Chilled Water Chiller 2B (includes evaporator, compressor, condenser and associated piping)	Level 1, Level 2, Fire
378	WO	TK01A	Essential Chilled Water Compression Tank 1A	Level 1, Level 2, Flood, Fire
379	WO	TK01B	Essential Chilled Water Compression Tank 1B	Level 1, Level 2, Flood, Fire

Table 17.4-1 (25 of 27)

Index	System [1]	SSC ID	SSC Description	Within Scope Basis [2]
380	WO	TK02A	Essential Chilled Water Air Separator Tank 2A	Level 1, Level 2, Flood, Fire
381	WO	TK02B	Essential Chilled Water Air Separator Tank 2B	Level 1, Level 2, Flood, Fire
382	FP	-	Fire Protection Pumps and Associated SSCs	Fire Protection, Expert Panel
383	Light Load Handling System	-	Key SSCs in Light Load Handling System	Expert Panel
384	Liquid Waste Management System	-	Key SSCs in Liquid Waste Management System	Expert Panel
385	Control Room HVAC System	-	Main Control Room Air Handling Units (AHUs) and Air Cleaning Unit (ACU)	Expert Panel
386	-	-	Containment Building	Expert Panel
387	-	-	Containment Equipment Hatch	Level 2
388	-	-	Remote Shutdown Console (RSC)	Expert Panel

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(1) System codes table

System Codes	System Description
AF	Auxiliary Feedwater System
AT	Auxiliary Feedwater Pump Turbine System
AX	Auxiliary Feedwater Storage and Transfer System
CC	Component Cooling Water System
CD	Condensate System
CS	Containment Spray System
CV	Chemical and Volume Control System
DA	AAC Gas Turbine Generator
DC	DC Distribution System
DE	Radioactive Drain System
DG	Emergency Diesel Generator System
DO	Diesel Fuel Oil Transfer System
DP	Diverse Protection System
FP	Fire Protection System
FW	Feedwater System
GW	Gaseous Waste Management System
HG	Containment Hydrogen Control System
IP	Instrument Power System
IW	In-Containment Water Storage System
MS	Main Steam System
NB	Non Class 1E 4.16KV System
NG	Non Class 1E 480V Load Center System
NH	Non Class 1E 480V MCC & Low Voltage System
NP	13.8KV Power System
PF	Class 1E 4.16KV System
PG	Class 1E 480V Load Center System
PH	Class 1E 480V MCC & Low Voltage System
RC	Reactor Coolant System
RG	Reactor Coolant Gas Vent System
RP	Reactor Protection System
SI	Safety Injection/Shutdown Cooling System

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System Codes	System Description
SX	Essential Service Water System
VD	Emergency Diesel Generator Area HVAC System
VG	ESW Intake Structure/CCW heat Exchanger Building HVAC System
VK	Auxiliary Building Controlled Area HVAC System
VO	Auxiliary Building Clean Area HVAC
VQ	Reactor Containment Building Purge System
VU	Miscellaneous Building HVAC System - (AAC GTG)
WM	Makeup Demineralizer System
WO	Essential Chilled Water System

(2) Codes table for scope basis explanations.

Scope Basis	Description
Level 1	Results of Level 1 PRA at full power
Level 2	Results of Level 2 PRA at full power
LPSD	Results of Low Power and Shutdown Level 1 PRA
Flood	Results of Level 1 Internal Flooding PRA
Fire	Results of Level 1 Internal Fire PRA
Seismic	Results of Seismic Margin Analysis (based on qualitative analysis)
Expert Panel	Decision made by the RAP expert panel
ATWS	Per 10 CFR 50.62 and Generic Letter 85-06, “Quality Assurance Guidance for ATWS Equipment That Is Not Safety Related”
Fire Protection	Per 10 CFR 50.48 and Regulatory Position 1.7, “Quality Assurance,” in RG 1.189, “Fire Protection for Operating Nuclear Power Plants”
SBO	Per 10 CFR 50.63 and Regulatory Position 3.5, “Quality Assurance and Specific Guidance for SBO Equipment That Is Not Safety Related,” and Appendix A, “Quality Assurance Guidance for Non-Safety Systems and Equipment,” in RG 1.155, “Station Blackout”

Note: Risk criteria for Level 1, Level 2, LPSD, Flood and Fire PRAs are as follows:

FV > 0.005 for independent basic events,
RAW > 2.0 for independent basic events, or
RAW > 20 for common cause events.

1. SX (including UHS) and VG are parts of the conceptual design information (CDI), and the within scope SSCs applicability will follow the conditions specified in Section 1.8.
2. Potential within scope SSCs associated with loss of large area (LOLA) and aircraft impact assessment (AIA) described in Sections 19.4 and 19.5 are not included in this table.

17.5 Quality Assurance Program Description

KHNP is the applicant for the APR1400 design certification. The QA program for the APR1400 design certification is described in Topical Report APR1400-K-Q-TR-11005-NP, Revision 1, "KHNP Quality Assurance Program Description (QAPD) for the APR1400 Design Certification" (Reference 1). The QAPD is based on the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants" ASME NQA-1-2008, and NQA-1a-2009 Addenda, "Quality Assurance Program Requirements for Nuclear Facilities," as endorsed by NRC RG 1.28, Revision 4, "Quality Assurance Program Criteria (Design and Construction)" (References 2, 3, 4, and 5).

The QAPD has been prepared to comply with the guidance in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (Reference 6). The Nuclear Energy Institute (NEI) 06-14, Revision 9, "Quality Assurance Program Description (QAPD)" template has been used as a reference in preparing the QAPD (Reference 7).

The QAPD is a top-level document that describes the quality assurance policy, functional responsibilities, and administration control among organizations that perform the design activities for the APR1400 project. The applicant and its suppliers commit to conform to the QAPD. The QAPD applies the requirements of 10 CFR 50, Appendix B, for safety-related SSCs.

Selected elements of the QAPD are applied to SSCs that are important to safety but are not considered safety-related SSCs. These SSCs are defined as non-safety-related SSCs. The controls applied non-safety-related SSCs are defined as augmented quality assurance controls. Representative examples of augmented SSCs are anticipated transients without scram (ATWS), station blackout, fire protection, seismic Category II SSCs, and risk-significant non-safety-related SSCs determined by the design RAP described in Section 17.4. Specific elements of the QAPD are applied to each augmented SSC in a selective manner to accommodate its characteristics or critical attributes for plant safety.

Procedures establish practices for certain activities that are common to KHNP organizations that perform these activities. Procedures are developed to provide reasonable assurance that activities are controlled and performed in a manner that meets the requirements of the

QAPD. Organization-specific procedures establish implementation requirements and may be used to implement particular work activities.

17.5.1 Combined License Information

COL 17.5(1) The COL applicant is to establish and implement a QA program that is applicable to site-specific design activities related to the plant construction and operation phases.

17.5.2 References

1. APR1400-K-Q-TR-11005-NP, Rev. 1, "KHNP Quality Assurance Program Description (QAPD) for the APR1400 Design Certification," KHNP, May 2012.

2. 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

3. ASME NQA-1-2008, "Quality Assurance Program Requirements for Nuclear Facilities," March 2008.

4. ASME NQA-1a-2009 Addenda, "Addenda to ASME NQA-1-2008 Quality Assurance Program Requirements for Nuclear Facilities," August 2009.

5. NRC RG 1.28, Rev. 4, "Quality Assurance Program Criteria (Design and Construction)," U.S. Nuclear Regulatory Commission, June 2010.

6. NUREG-0800, 17.5, Rev. 0, "Quality Assurance Program Description – Design Certification, Early Site Permit and New License Applicants," U.S. Nuclear Regulatory Commission, March 2007.

7. NEI 06-14, Rev. 9, "Quality Assurance Program Description (QAPD)," Nuclear Energy Institute, May 2010.

17.6 Maintenance Rule

The combined license applicant is responsible for the establishment and implementation of a Maintenance Rule according to 10 CFR 50. 65.

17.6.1 Combined License Information

COL 17.6(1) The COL applicant is to provide in its Final Safety Analysis Report a description of the Maintenance Rule program and a plan for implementing it to meet the requirements of 10 CFR 50.65.