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Your ref: Project Number 740
Our ref: DCP/NRC1873

April 27, 2007

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLN-006, Revision 2

In support of Combined License application pre-application activities, Westinghouse is submitting Revision 2 of AP1000 Standard Combined License Technical Report Number 62. This report identifies and justifies standard changes to DCD Section 3.10 and DCD Appendix 3D in the AP1000 Design Control Document. Changes to the Design Control Document identified in Technical Report Number 62 are intended to be incorporated into FSARs referencing the AP1000 design certification or incorporated into the design certification using supplemental rulemaking when Part 52 is revised to permit revision of the design certification. This report is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in this report is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The purpose for submittal of this report was explained in a March 8, 2006 letter from NuStart to the NRC.

Pursuant to 10 CFR 50.30(b), APP-GW-GLN-006, Revision 2, "Methodology for Qualifying AP1000 Safety-Related Electrical and Mechanical Equipment," Technical Report Number 62, is submitted as Enclosure 1 under the attached Oath of Affirmation.

Please note that Revision 0 of this report was issued on May 22, 2006 under letter DCP/NRC1735. Revision 1 was issued on September 8, 2006 under letter DCP/NRC1773.

It is expected that when the NRC review of Technical Report Number 62 is complete, the changes to the AP1000 DCD identified in Technical Report 62 will be considered approved generically for COL applicants referencing the AP1000 Design Certification.

Questions or requests for additional information related to content and preparation of this report should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Westinghouse requests the NRC to provide a schedule for review of the technical report within two weeks of its submittal.

D079

Very truly yours,

D. J. Hutchings for

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated April 27, 2007

/Enclosure

1. APP-GW-GLN-006, Revision 2 "Methodology for Qualifying AP1000 Safety-Related Electrical and Mechanical Equipment," Technical Report Number 62

cc:	S. Bloom	-	U.S. NRC	1E	1A
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	G. Curtis	-	TVA	1E	1A
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	G. Zinke	-	NuStart/Entergy	1E	1A

ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:)

NuStart Bellefonte COL Project)

NRC Project Number 740)

APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs & Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

W E Cummins

W. E. Cummins
Vice President
Regulatory Affairs & Standardization

Subscribed and sworn to
before me this 27th day
of April 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Debra McCarthy, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Aug. 31, 2009
Member, Pennsylvania Association of Notaries

Debra McCarthy
Notary

ENCLOSURE 1

APP-GW-GLN-006, Revision 2

"Methodology for Qualifying AP1000 Safety-Related Electrical and Mechanical Equipment"

Technical Report 62

F-AP-3.2-1 REV. 0

AP1000 DOCUMENT COVER SHEET

TDC: ________ Permanent File: ________ APY: ________

RFS#: ________ RFS ITEM #: ________

AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLN-006	2	Page 1 of 28	W-A. Sterdis

ALTERNATE DOCUMENT NUMBER: TR62 PSA 4-27-07 WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: **Methodology for Qualifying AP1000 Safety Related Electrical and Mechanical Equipment**

ATTACHMENTS:	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION:
CALCULATION/ANALYSIS REFERENCE:	

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
APP-GW-GLN-006 Rev. ~~1~~ 2 PAG 4/24/07	Microsoft Word	

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Class 3 Documents being transmitted to the NRC require the following two review signatures in lieu of a Form 36.

LEGAL REVIEW J. C. VALENTINE	SIGNATURE/DATE 4/25/2007
PATENT REVIEW 4-25-07	SIGNATURE/DATE 4/24/07

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REVIEWERS Joan E. Drexler	SIGNATURE/DATE 4/24/2007	
VERIFIER	SIGNATURE/DATE	VERIFICATION METHOD Independent
AP1000 RESPONSIBLE MANAGER Kenneth P. Quinn	SIGNATURE*	APPROVAL DATE 4/25/07

* Approval of the responsible manager signifies that document is complete, all required reviews are complete, electronic file is attached and document is released for use.

APP-GW-GLN-006
Revision 2

May 2007

AP1000 Standard Combined License Technical Report

Methodology for Qualifying AP1000 Safety-Related Electrical and Mechanical Equipment

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

Document Number: APP-GW-GLN-006 **Revision Number:** 2

Title: Methodology for Qualifying AP1000 Safety-Related Electrical and Mechanical Equipment

Brief Description of the change (what is being changed and why):

During the detailed development of the AP1000 Plant Equipment Qualification Methodology, it was determined that clarification is required to the AP1000 Design Control Document (DCD) for seismic qualification by analysis to be consistent with the current industry standards and practices. Also, clarification is provided that when qualification by analysis is conducted using the static coefficient method it is performed in a manner that yields conservative results. The methodology of seismic qualification based on test experience will be performed in accordance with Section 9.0 of IEEE 344-1987. The details of the methodology, qualification basis, and supporting data will be executed in accordance with section IV of this report. The updated equipment qualification methodology sections satisfy the AP1000 design criteria and specifications.

I. APPLICABILITY DETERMINATION

This evaluation is prepared to document that the change described above is a departure from Tier 2 information of the DCD (APP-GW-GL-700) that may be included in plant specific FSARs without prior NRC approval.

A.	Does the proposed change include a change to:		
	1. Tier 1 of the AP1000 Design Control Document APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
	2. Tier 2 of the AP1000 Design Control Document, APP-GW-GL-700	☐ NO ☒ YES	(If YES prepare a report for NRC review of the changes)
	3. Technical Specification in Chapter 16 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
B.	Does the proposed change involve:		
	1. Closure of a Combined License Information Item identified in the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a COL item closure report for NRC review.)
	2. Completion of an ITAAC item identified in Tier 1 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare an ITAAC completion report for NRC review.)

☐ The questions above are answered no, therefore the departure from the DCD does not require prior NRC review unless review is required by the criteria of 10 CFR part 52 Appendix D Section VIII B.5.b. or B.5c

II. TECHNICAL DESCRIPTION AND JUSTIFICATION

Changes are made to provide clarification and consistency to the practices of IEEE 344-1987, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

The changes and justifications are listed below:

1. Changes are made to the DCD to address Clause 6, (Analysis) of IEEE 344-1987 which states "The analysis method is not recommended for complex equipment that cannot be modeled to adequately predict its response. Analysis without testing may be acceptable only if structural integrity alone can ensure the design-intended function." To address this requirement in Subsection 3D.6.2 the use of analysis is clarified by deleting a contradictory paragraph. This proposed change brings this subsection to be consistent with IEEE 344-1987. It does not introduce new qualification methods or qualification criteria. In addition, in Subsection E.3.2 the sentence that states that qualification by analysis alone is not permitted is revised to define the circumstances when it is permitted. These proposed changes make this paragraph consistent with IEEE 344-1987. These changes replace the restriction on use of analysis to allow its use in a conservative manner in accordance with the industry practices, IEEE standards and the regulatory guides.

2. A change to the DCD to have analysis static coefficient requirements consistent with Clause 6.3, (Static Coefficient Analysis) of IEEE 344-1987 which states "A lower static coefficient may be used when it can be shown to yield conservative results" is proposed. Subsection E.6.3.2 describes the use of the static coefficient. Information is added to clarify that use of a static coefficient lower than 1.5 is permissible when it is clearly demonstrated that conservative results are attainable.

3. Changes to the DCD to define the methods to be employed to address the practice of qualification by test experience delineated in Clause 9.2 (Experience Data) of IEEE 344-1987 are proposed. Section 3D.7.6 is updated to define the test experience-based method using previous qualification test data.

4. Editorial changes made to correct typos and add clarifications.

III. DCD MARK-UP

This report includes the revised DCD Section 3.10 and revisions to a number of sections in the DCD Appendix 3D related to seismic qualification of equipment.

3.10 Seismic and Dynamic Qualification of Seismic Category I Mechanical and Electrical Equipment

Safety-related equipment and selected portions of post-accident monitoring equipment are classified as seismic Category I, as discussed in subsection 3.2.1.1. This section addresses the seismic and dynamic qualification of this equipment other than piping and includes the following types:

- 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 certain~~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.

This section presents or references information to demonstrate that mechanical equipment, electrical equipment, instrumentation, and, where applicable, their supports classified as seismic Category I are capable of performing their designated safety-related functions under the full range of normal and accident (including seismic) loadings. This equipment includes devices associated with systems essential to safe shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment or in mitigating the consequences of accidents. The information presented or referenced includes:

- Identification of the seismic Category I instrumentation, electrical equipment, and appropriate mechanical equipment
- Qualification criteria employed for each type of equipment
- Designated safety-related functional requirements
- Definition of the applicable seismic environment
- Definition of other normal and accident loadings
- Documentation of the qualification process employed to demonstrate the required structural integrity and operability of mechanical and electrical equipment and instrumentation in the event of a safe shutdown earthquake (SSE) after a number of postulated occurrences of an earthquake smaller than a safe shutdown earthquake in combination with other relevant dynamic and static loads.

3.10.1 Seismic and Dynamic Qualification Criteria

3.10.1.1 Qualification Standards

The methods of meeting the general requirements for the seismic and dynamic qualification of seismic Category I mechanical and electrical equipment and instrumentation as described by General Design Criteria (GDC) 1, 2, 4, 14, 23, and 30 are described in Section 3.1. The general methods of implementing the requirements of Appendix B to 10CFR50 are described in Chapter 17.

The Nuclear Regulatory Commission (NRC) recommendations concerning the methods employed for seismic qualification of mechanical and electrical equipment are contained in Regulatory Guide 1.100, which endorses IEEE 344-1987 (Reference 1).

[*AP1000 meets IEEE 344-1987, as modified by Regulatory Guide 1.100, by either type testing or analysis or by an appropriate combination of these methods*]* employing the methodology described in Appendix 3D.

The guidance provided in the ASME Code, Section III, is followed in the design of S~~s~~eismic Category I mechanical equipment to achieve the structural integrity of pressure boundary components. In addition, the AP1000 implements an operability program for active valves following Regulatory Guide 1.148, as addressed in subsection 1.9.1 and in Section 3.9.

~~Testing is the preferred method to qualify equipment. Both dynamic and static test approaches are used to demonstrate structural integrity and operability of mechanical and electrical equipment in the event of a safe shutdown earthquake preceded by five earthquakes of a magnitude equal to 50 percent of the calculated safe shutdown earthquake. Test samples are selected according to type, load level, and size, as well as other pertinent factors on a prototype basis.~~

~~Analysis using mathematical modeling techniques correlated to tests performed on similar equipment or structures and verified analytical approaches are used to qualify equipment. Combined analysis and testing is also used to qualify equipment.~~

~~The analytical approach to seismic qualification without testing is used under the following conditions:~~

- ~~If only maintaining structural integrity is required for the safety-related function~~
- ~~If the equipment is too large or heavy to obtain a representative test input at existing test facilities. (The essential control devices and electrical parts of large equipment are tested separately if required.)~~
- ~~If the interfaces (for example, interconnecting cables to the cabinet or other complex inputs) cannot be conservatively considered during testing~~
- ~~If the response of the equipment is essentially linear or has a simple nonlinear behavior that can be predicted by conservative analytical methods.~~

~~A combination of testing and analysis is used when complete testing is not practical.~~

~~Equipment that has been previously qualified by means of test and analysis equivalent to those described herein are acceptable provided that proper documentation is submitted.~~

* NRC Staff approval is required prior to implementing a change in this material; see DCD Introduction Section 3.5.

3.10.1.2 Performance Requirements for Seismic Qualification

An equipment qualification data package (EQDP) is developed for ~~every item of~~these instrumentation and electrical equipment classified as seismic Category I. Table 3.11-1 of Section 3.11 identifies the S~~s~~eismic Category I electrical equipment and instrumentation supplied for the AP1000. Each equipment qualification data package contains a section entitled "Performance Requirements." This ~~specification~~ section establishes the safety-related functional requirements of the equipment to be demonstrated during and after a seismic event. The ~~test~~ required response ~~spectrm~~ spectra employed by the AP1000 for generic seismic qualification ~~is~~ are also identified in the ~~specification~~section.

For active S~~s~~eismic Category I mechanical components, the performance requirements are defined in the appropriate design and equipment specifications. Requirements for active valves and HVAC dampers are discussed in subsection 3.10.2.2. The equipment qualification data packages are referenced in subsection 3.10.4. For other seismic Category I mechanical components, the ~~only~~ performance requirement is to maintain structural integrity under appropriate loading conditions.

A master list and summary of seismic qualification of safety-related Seismic Category I electrical and mechanical equipment are maintained as part of the equipment qualification file.

3.10.1.3 Performance Criteria

Seismic and dynamic loading qualification demonstrates that Seismic Category I instrumentation and electrical equipment and active valves and dampers are capable of performing their designated safety-related functions under applicable plant loading conditions, including the safe shutdown earthquake. The qualification also demonstrates the structural integrity of S~~s~~eismic Category I nonactive valves, mechanical supports, and structures. Some permanent deformation of supports and structures is acceptable at the safe shutdown earthquake level, provided that the capability to perform the designated safety-related functions is not impaired.

3.10.2 Methods and Procedures for Qualifying Electrical Equipment, Instrumentation, and Mechanical Components

Testing is the preferred method to qualify equipment. Both dynamic and static test approaches are used to demonstrate structural integrity and operability of mechanical and electrical equipment in the event of a safe shutdown earthquake preceded by five earthquakes of a magnitude equal to 50 percent of the calculated safe shutdown earthquake. Test samples are selected according to type, load level, and size, as well as other pertinent factors on a prototype basis.

Analysis using mathematical modeling techniques correlated to tests performed on similar equipment or structures and verified analytical approaches are used to qualify equipment. Combined analysis and testing is also used to qualify equipment.

The analytical approach to seismic qualification without testing is used under the following conditions:

- If operability can be demonstrated by analysis alone.

- If only maintaining structural integrity is required for the safety-related function.
- If the equipment is too large or heavy to obtain a representative test input at existing test facilities. (The essential control devices and electrical parts of large equipment are tested separately if required.)
- If the interfaces (for example, interconnecting cables to the cabinet or other complex inputs) cannot be conservatively considered during testing.
- If the response of the equipment is essentially linear or has a simple nonlinear behavior that can be predicted by conservative analytical methods.

A combination of testing and analysis is used when complete testing is not practical.

Equipment that has been previously qualified by means of test and analysis equivalent to those described herein are acceptable provided that proper documentation is submitted.

Seismic qualification of S~~s~~eismic Category I instrumentation and electrical equipment is demonstrated by either type testing or a combination of test and analysis. The qualification method employed by the AP1000 for a particular item of equipment is based upon many factors including practicability, complexity of equipment, economics, and availability of previous seismic qualification. The qualification method employed for a particular item of instrumentation or electrical equipment is identified in the individual equipment qualification data package.

For active valves and dampers the AP1000 uses a combination of tests and analyses to demonstrate the structural integrity and operability of such components. Other S~~s~~eismic Category I mechanical equipment is qualified by analysis to demonstrate structural integrity.

The methods of load combination and methods of combining dynamic responses for mechanical equipment are discussed in Section 3.9. For instrumentation and electrical equipment, the only dynamic loads considered in testing are seismic loads and hydrodynamic and vibratory loads where applicable. Other dynamic loads to which instrumentation and electrical equipment may be subjected are enveloped by this testing or are addressed by analysis.

The seismic qualification of ~~Class 1E~~ safety-related equipment ~~and active valves and dampers~~ may be based on properly documented experience data. [*Seismic qualification based on experience is performed in accordance with Section 9.0 of IEEE 344-1987 on a case-by-case basis. In such cases where experience data are used, aspects of the methodology, qualification basis, and supporting data will be properly documented by the Combined License ~~applicant~~holder.*]* The methodology, qualification basis, and reference test data for seismic qualification based on test experience are documented in accordance with the recommended practices

* NRC Staff approval is required prior to implementing a change in this material; see DCD Introduction Section 3.5.

of Sections 9 and 10 of IEEE 344-1987 (see Appendix 3D). Identification of the specific equipment qualified ~~based on~~ using the experience based methodology, ~~and~~ the details of the methodology and the corresponding experience data for each piece of equipment are included in the equipment qualification ~~file~~report. The Combined License ~~applicant~~ holder will identify the specific equipment and include details of the methodology and the corresponding experience data for each piece of equipment.

3.10.2.1 Seismic Qualification of Instrumentation and Electrical Equipment

3.10.2.1.1 Type Testing

For S~~s~~eismic Category I instrumentation and electrical equipment, seismic qualification by test is performed according to IEEE 344-1987. Where testing is used, multifrequency, multiaxis inputs are developed by the general procedures outlined in Appendix 3D. The test results contained in the individual equipment qualification data packages demonstrate that the measured test response spectrum envelops the required response spectrum defined in the equipment qualification data package.

Alternative test methods, such as single-frequency, single-axis inputs for line-mounted equipment, are used in selected cases as permitted by IEEE 344-1987 and Regulatory Guide 1.100. These methods are further described in Appendix 3D.

3.10.2.1.2 Analysis

Seismic qualification by the analysis method can be used to demonstrate qualification for equipment where structural integrity or limitations of deformation provide the safety-related function. Seismic analysis is widely used to demonstrate qualification of equipment where testing is impractical, equipment is easily modeled (no secondary structures) and no complex equipment functions are required.

Analysis may complement tests when needed to extrapolate or interpolate experimental data. Analysis may be used to investigate established failure modes related to structural integrity, fatigue and stress-strain behavior. Two methods of computation are: (1) static equivalent load, which yields conservative results; and, (2) dynamic analysis, which takes into account the dynamic response properties of the structure and which can be suitably represented by linear models.

The analysis method is not recommended for complex equipment that cannot be modeled to adequately predict its response.

3.10.2.1.~~2~~3 Combination of Test and Analysis

The AP1000 ~~also~~ uses a combination of test and analysis to qualify S~~s~~eismic Category I instrumentation and electrical equipment. The test methods are similar to those described for type testing. Available test results are employed in combination with the analysis methods described in IEEE 344-1987 to demonstrate seismic qualification. The analytical methods include both static and dynamic techniques, which are described in detail in Appendix 3D.

3.10.2.2 Seismic and Operability Qualification of Active Mechanical Equipment

Active mechanical equipment is qualified for both structural integrity and operability for its intended service conditions by a combination of test and analysis. These methods address the applicable ~~such~~ loading conditions such as thermal transients, significant flow loads ~~where significant~~, and/or degraded flow conditions ~~if applicable~~. The test and analysis methods utilized in qualification of these components provide adequate confidence of operability under required plant conditions.

Qualification methods used for active valves and dampers are described in this subsection. The qualification methods used for control rod drive mechanisms and snubbers are described in Section 3.9. 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 limits defined in the design specification for each valve when subjected to design loading.

Safety-related active valves, listed in Table 3.11-1, are required to function at the time of an accident. Tests and analyses are conducted to qualify active valves providing confidence that these valves operate during a seismic event. ~~Confidence is provided that these valves operate during a seismic event. Tests and analyses are conducted to qualify active valves.~~

The safety-related valves are subjected to a series of type tests or actual tests before service and during the plant life. Before installation, the following tests are performed: body hydrostatic test to ASME Code, Section III, requirements, back-seat and main seat leakage tests, disc hydrostatic tests, and operational tests to verify that the valve opens and closes within stroke time requirements. For the qualification of motor operators for environmental conditions, see Section 3.11. After installation, the valves undergo system level hydrostatic tests, construction acceptance tests, and preoperational tests. Where applicable, periodic in-service inspections and operations are performed in-situ to verify the functional capability of the valve. On active valves, an analysis of the extended structure is performed for static equivalent seismic safe shutdown earthquake loads applied at the center of gravity of the extended structure. The maximum stress limits used for active Class 1, 2, and 3 valves are compared to acceptable standards in the ASME Code. Valve discs are evaluated for maximum design line pressure and maximum differential pressure resulting from plant operating, transient, and accident conditions. Feedwater line valve discs are evaluated, using appropriate ASME Code, Section III limits, for the effect of dynamic loads by considering the effect of an equivalent differential pressure. The equivalent differential pressure is developed from a transient analysis based on wave mechanics that includes consideration of system arrangement and valve closing dynamics. Valve operating conditions are included as part of the valve design specification and are used to evaluate the valve disc. Additional information is provided on the controlled-closure, feedwater check valve in subsection 10.4.7.2.2.

In addition to these tests and analyses, representative valves of each design type having extended structures are subjected to static pull tests and nozzle load tests as appropriate. These tests verify operability of a rigid valve (natural frequency equaling or exceeding 33 hertz) during a simulated plant faulted-condition event by demonstrating operational capabilities within the specified limits. A representative valve of a specific design type is identified for this testing by the specification (for example, globe valve, motor-operated valve) for that particular type of valve. A further subdivision of design is based upon the valve size, pressure rating, type of operator, and previous operability testing to evaluate the need for additional testing of a particular design type. The testing procedures are described in Appendix 3D.

The accelerations used for the static valve qualification are equivalent, as justified by analysis, to 6.0g in two orthogonal horizontal directions and 6.0g vertical. For testing, the required input motion (RIM) curve shall be consistent with the profile of Figure 6 of IEEE 382-1996 (Reference 2), with the acceleration magnitude increased to 6.0g. ~~These values are derived from the test response spectra in IEEE 382-1996.~~ The piping design maintains the operator accelerations to these levels. If the natural frequency of the valve is less than 33 hertz, a dynamic analysis of the valve is performed to determine the equivalent ~~acceleration~~ loads to be applied during the static test.

Valves that are safety related but are classified as not having an extended structure, such as check valves and safety valves, are considered separately.

Check valves are characteristically simple in design. Their operation is not affected by seismic accelerations or the maximum applied nozzle loads. These valves are designed so that once the structural integrity of the valve is verified using standard methods, the capability of the valve to operate is demonstrated by its design features. The valve also undergoes in-shop hydrostatic and seat leakage tests, and periodic in situ valve exercising and inspection to verify the functional capability of the valve.

The pressurizer safety valves are qualified by the following procedures (these valves are also subjected to tests and analysis similar to check valves): stress and deformation analyses of critical items that affect operability for faulted condition loads, in-shop hydrostatic and seat leakage tests, and periodic in situ valve inspection. In addition to these tests, a static load equivalent to that applied by the faulted condition is applied at the top of the bonnet, and the fluid pressure is increased until the valve mechanism actuates. Successful actuation within the design requirements of the valve demonstrates its over-pressurization safety capabilities during a seismic event.

Safety-related active ~~dampers~~ valves mounted in HVAC ductwork used to isolate main control room areas during design events are listed in Table 3.11-1. These ~~dampers~~ valves are qualified to operate on demand using electro-hydraulic operators.

Using these methods, the safety-related valves ~~and dampers~~ are qualified for operability during a faulted event. These methods conservatively simulate the seismic event and demonstrate that the active valves and dampers perform their safety-related function when necessary.

3.10.2.3 Valve Operator Qualification

Active valve motor operators, position sensors, and solenoid valves are seismically qualified according to IEEE 382-1996, as discussed in the appropriate equipment qualification data packages.

3.10.2.4 Seismic Qualification of Other Seismic Category I Mechanical Equipment

For seismic Category I mechanical equipment not defined as active, the AP1000 uses analysis to demonstrate structural integrity. The analysis methods are described in Sections 3.7 and 3.9 and in Appendix 3D.

3.10.3 Method and Procedures for Qualifying Supports of Electrical Equipment, Instrumentation, and Mechanical Components

The equipment qualification data packages identify the equipment mounting employed for qualification and establish interface requirements for the equipment to provide confidence that subsequent in-plant installation does not ~~prejudice~~ degrade the established qualification. Interface requirements are defined based on the test configuration and other design requirements. Dynamic coupling effects resulting from mounting the component according to these interface criteria are considered in the qualification program.

Information concerning the structural integrity of pressure-retaining components, their supports, and core supports is presented in Section 3.9.

The following bases are used in the design and analysis of cable tray supports and instrument tubing supports:

- The methods used in the seismic analysis of cable tray supports are described in Appendix 3F.
- The S~~s~~eismic Category I instrument tubing systems are supported so that the allowable stresses permitted by ASME Code, Section III, are not exceeded when the tubing is subjected to the loads specified in Section 3.9.

3.10.4 Documentation

The results of tests and analyses verifying that the criteria established in subsection 3.10.1 are satisfied, employing the qualification methods described in subsections 3.10.2 and 3.10.3, are included in the individual equipment qualification data packages and test reports. The ~~Combined License applicant is responsible for maintaining the~~ equipment qualification file is maintained during the equipment selection and procurement phase (see subsection 3.11.5).

Seismic qualification of equipment is documented in equipment qualification data packages, test reports, analysis reports, and calculation notes. Appendix 3D provides guidance in this area.

3.10.5 Standard Review Plan Evaluation

A summary describing the Standard Review Plan differences in regard to seismic and dynamic qualification of mechanical and electrical equipment is provided subsection 1.9.2.

3.10.6 Combined License Information Item on Experienced-Based Qualification

[*The Combined License applicant will address, as part of the Combined License application, identification of the equipment qualified based on experience and include details of the methodology and the corresponding experience data. The corresponding experience data for each piece of equipment will be included in the equipment qualification file.*]*

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* NRC Staff approval is required prior to implementing a change in this material; see DCD Introduction Section 3.5.

3.10.7 References

1. IEEE 344-1987, ~~"~~"Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

2. IEEE 382-1996, "IEEE Standard for Qualification of Actuators for Power-Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants."

Appendix 3D

3D.2 Scope

Changed the first paragraph as follows for editorial corrections and Reference to Section 3.7 for treatment of Seismic Category II equipment:

> The qualification criteria, methods, and environmental conditions described ~~herein~~ constitute the methodology that ~~has been~~is adopted to comply with the ~~forenamed~~ standards for the AP1000. This methodology applies to safety-related, Sseismic Category I electrical and mechanical equipment and is also utilized for certain monitoring equipment. Seismic Category II equipment is ~~not~~ also within the scope of this program. The criteria used for the design of Seismic Category II structures, systems, and components are discussed in Section 3.7.

3D.4.1.2 NRC Regulatory Guides

Revised 5th paragraph as follows:

> Regulatory Guide 1.73, "Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants" – The guide endorses, with certain qualifications, IEEE 382-1972. The AP1000 equipment qualification program employs recommendations of Regulatory Guide 1.73, but gives preference to the guidance of IEEE 382-~~1985~~1996, where it is necessary to supplement the guidance of IEEE 323 or 344 in specifying qualification plans for electric valve operators.

3D.6.2 Analysis

Revised first two paragraphs of Subsection 3D.6.2 to read as follows:

> The AP1000 equipment qualification program uses analysis for seismic qualification of equipment if the primary requirement is the demonstration of structural integrity during a seismic event. For equipment that performs an active or dynamic function, seismic qualification by analysis may also be used (See Section E.3 of Attachment E). However, the similarity between a qualified test unit and an as-supplied unit ~~must be~~is demonstrated unless otherwise justified. ~~(See Section E.3 of~~

~~Attachment E.) subsection~~ Subsection 3.9.2.2 describes the qualification requirements for safety-related mechanical equipment where a fluid pressure boundary is involved. For those mechanical components that are not pressure boundaries, analysis is performed in compliance with the applicable industry design standard. Where age-sensitive materials, such as gaskets and packing, are used in the assembly of mechanical equipment, the aging of these materials is normally evaluated based on an item-by-item review of the aging characteristics of the material. (See subsection 3D.6.2.3.)

~~The AP1000 equipment qualification program does not establish seismic and environmental qualification of Class 1E electrical or electromechanical equipment for design basis event conditions on the bases of analyses alone. Analysis is employed to supplement testing or to provide verification that the test results are applicable. The following subsections provide examples of the necessary and sufficient conditions under which analysis will be applied in the qualification of safety-related equipment for the AP1000.~~

Changes to Attachment E of Appendix 3D

E.1 Purpose

Changed the first paragraph as follows:

The following is the methodology used to seismically qualify Seismic Category I mechanical and electrical equipment for the AP1000 equipment qualification program. Qualification work covered by this appendix meets the applicable requirements of IEEE 344-1987 and 382-~~1985~~1996.

Removed the second paragraph as follows:

~~The design and mounting of non-safety-related equipment located in close proximity of seismic Category I equipment is not covered by this document.~~

E.2 Definitions

Added the following two new sections:

E.2.3 Seismic Category II Equipment

Seismic Category II equipment is that equipment whose continued function is not required but whose failure could reduce the functioning of Seismic Category I structures, systems and components to an unacceptable level. Seismic Category II equipment must be capable of maintaining structural integrity so that a seismic event up to and including a SSE does not cause such a failure.

E.2.4 Non-seismic Equipment

Equipment designated as Non-seismic does not require seismic qualification.

Re-numbered the following to sections to allow for inserting Sections E.2.3 and E.2.4.

E.2.~~3~~5

E.2.~~4~~6

Revise the last sentence of Appendix 3D Attachment E, Subsection E.3.2 as follows:

E.3.2 Use of Qualification by Analysis

Changed the last paragraph as follows:

> Seismic qualification of safety-related electrical equipment by analysis alone is not recommended for complex equipment that cannot be modeled to adequately predicts its response. Analysis without testing may be acceptable provided structural integrity alone can provide the design-intended function.~~permitted.~~

E.5 Qualification by Test

Revised first paragraph of Subsection E.5 as follows:

> Seismic qualification testing is the preferred method for electrical, mechanical, and electromechanical equipment. Seismic testing is performed and input generated as specified in IEEE 344-1987. The nature of the test input used depends on whether the equipment is hard mounted or line mounted. The test program consists of the following elements, as applicable: environmental aging ~~(if required)~~, mechanical aging, vibrational aging, and safe shutdown earthquake testing. For those cases where the equipment is also subject to a loss of coolant or a high-energy line break accident, these accidents are simulated on the same qualification specimen after completion of the testing previously discussed. (See Sections 3D.4.4 and 3D.7.4.)

E.5.2 Qualification of Line Mounted Equipment

Changed the first paragraph as follows:

> Line-mounted equipment, because of the dynamic filtering characteristics of its mounting, is effectively subject to single frequency input. This condition is common for valves and sensors supported by piping systems, cable trays, and duct systems. This equipment is qualified consistent with the requirements of IEEE 382-~~1985~~1996.

Revised Subsection E.5.2.1 as follows:

E.5.2.1 Seismic Qualification Test Sequence

Change the section as follows:

The seismic qualification process is broken down into the following steps:

1. Mount the equipment on a rigid test fixture and perform a resonant search test to demonstrate that the equipment is structurally rigid (fundamental frequency greater than 33 hertz) and does not amplify the seismic motions acting at the ~~valve~~ equipment mounting interface.

2. Perform single frequency testing on the line-mounted equipment.

3. Perform multifrequency, multiaxis testing on the equipment, if appropriate.

4. If a valve assembly is seismically qualified, additional testing is needed:

~~4.~~a. Perform a static pull test on the valve.

~~5.~~b. Perform a static seismic analysis using a verified model of the valve and its extended structure to demonstrate that the valve has adequate structural strength to perform its safety-related function without exceeding the design allowable stresses specified in ASME Code, Section III, Subsection NB, NC, or ND for pressure-retaining parts, as appropriate, and Subsection NF for nonpressure-retaining boundary parts. Limiting extended structure stress to the material yield strength minimizes deflections which could interfere with valve stroke function.

E.5.2.2 Line Vibration Aging

Revised Subsection E.5.2.2 as follows:

Line-mounted equipment may be subject to operational vibrations resulting from normal plant operations. The potential fatiguing effect of this vibrational aging is simulated as part of the qualification program. This requirement is satisfied by subjecting the equipment to a sine sweep from 5 to 100 to 5 hertz at an acceleration level of 0.75g or such reduced acceleration at low frequencies to limit the double amplitude to 0.025 inch as specified in Section 5.3.~~1~~a Part III of IEEE 382-~~1985~~1996.

E.5.2.3 Single Frequency Testing

Change the paragraph as follows:

The single frequency testing acceleration waveform is either sine beat or sine dwell applied at one-third octave frequency intervals as specified in IEEE 382-19~~85~~96. Each dwell has a time length adequate to permit performance of functional testing, with a minimum time of 15 seconds. To account for the three-dimensional nature of the seismic event, the test input level is taken as the square root of two times the required input motion (RIM) level specified in IEEE 382. The level includes the 10 percent test margin. Each test series is performed using single axis input. The test series is performed successively in each of three orthogonal axes.

E.5.2.5 Static Pull Testing of Active Valves

Changed title to: **E.5.2.5 Static ~~Pull~~ Deflection Testing of Active Valves**

Also made the following changes to the section:

The seismic testing just discussed is normally performed only on the valve operator and the attached appurtenances. If the valve assembly is rigid, the operability of the valve assembly during a postulated seismic event may be demonstrated by performing a static pull test using a peak acceleration value equivalent to a triaxial acceleration of 6g. If the valve assembly is determined to be flexible, a supplemental analysis of the seismic response of the flexible valve and its supporting piping is performed to determine the actual acceleration level present at the center of gravity of the valve assembly.

The valve is placed in a suitable test fixture with the operator and appurtenances mounted and oriented as in the normal valve assembly installation. The valve is mounted so that the extended structure is freestanding and supported only by the valve nozzles. The valve is positioned so that the horizontal and vertical load components simulating the three-dimensional nature of the seismic event produce a worst-case stress condition in the valve extended structure.

During testing, the valve shall be internally pressurized and nozzle loads applied. Static loads simulating dead weight and seismic loads are applied to the extended structure. The tests are normally performed at ambient temperature. These loads simulate to the extent feasible the load distribution acting on critical parts of the valve assembly. The valve is actuated using the actuator system seismically qualified according to IEEE 382-~~1985~~1996. The valve assembly is cycled from its normal to the desired safety-related position within the time limits defined in the equipment specification. Leakage measurements are made, where required, and compared to the allowable values specified in the valve design specification.

E.6.3.1 Response Analysis

Changed the section title to: **Response Spectrum Analysis**

E.6.3.2 Static Coefficient Method

Revised the section as follows:

As an alternative to the response spectrum method, the static coefficient method of analysis may be used. In this method the frequencies of the equipment are not determined, but a static analysis is performed, assuming that a peak acceleration equal to 1.5 times the peak spectral acceleration given in the applicable required response spectrum acts on the structure as described in Subsection E.6.2.

Static coefficient of 1.5 takes into account the combined effects of multifrequency excitation and multimode response for equipment and structures which can be represented by a simple model. A lower static coefficient may be used when it can be demonstrated that it will yield conservative results.

E.6.3.3 Time History

Revise the title to: **Time History Analysis**

Revised the section as follows:

The time-history method of analysis is the preferred method of analysis when the equipment exhibits significant nonlinear behavior or when it is necessary to generate response spectra for specific component mounting locations in the equipment. The acceptable methods that are used to develop the seismic time histories are discussed in Regulatory Guide 1.122, ASME Code, Section III, Appendix N, and in Section 6.2 of IEEE 344-1987. Other analytical methods may be used to generate in-equipment response spectra provided that they are verified to produce accurate and/or conservative results.

Added Subsection E.7 "Qualification by Test Experience"

E.7 Qualification by Test Experience

E.7.1 Introduction and Purpose

Section 9.0 of IEEE 344-1987 provides guidelines for seismic qualification using experience based data. The qualification of equipment may be accomplished by justifying their similarity with previously qualified equipment that has been qualified at equal or more severe seismic requirements. Similarity of equipment characteristics and of the excitation environment is established by techniques that can be technically justified. Differences in designs and manufacturing techniques are considered as part of the technical justification supporting similarity.

The purpose of this section is to define the methodology for seismic qualification of equipment based on test experience-based data for a group of previously tested equipment in compliance with IEEE 344-1987. The sections that follow define the process to be employed to meet the experience-based requirements set forth in Section 9 of IEEE 344-1987 and provide descriptions of how the requirements will be met when performing test experience-based qualification.

E.7.2 IEEE 344-1987, Section 9.2: Experience Data

Section 9.2 of IEEE 344-1987 provides three sources for experience data. They are identified as follows:

1. Analysis or test data from previous qualification programs

2. Documented data from equipment in facilities that have experienced earthquakes

3. Data from operating dynamic loading or other dynamic environments

Westinghouse may use existing test data or combined test and analysis qualifications as a basis for test experience-based qualification. Earthquake experience and/or operating dynamic loads are not considered as qualification approaches for the AP1000 safety-related equipment.

E.7.2.1 IEEE 344-1987, Section 9.2.1: Previous Qualification

Section 9.2.1 of IEEE 344-1987 states that existing dynamic and seismic qualification programs of equipment in the nuclear industry can be used to develop an experience data base. The standards also indicate that to utilize an experience data base, the input motions to which the equipment was previously qualified must have been clearly documented, together with pertinent qualification parameters, such as resonance frequencies, damping, and responses throughout the equipment.

Test programs of similar types of equipment will be used as the basis for qualification using the test experience-based approach. Only test programs where the identified requirements have been documented will be used.

E.7.2.2 IEEE 344-1987 Section 9.2.2: Earthquakes

This section will not be used.

E.7.2.3 IEEE 344-1987 Section 9.2.3: Other Experience

This section will not be used.

E.7.3 IEEE 344-1987 Section 9.3: Similarity

Section 9.3 of IEEE 344-1987 provides guidelines for showing similarity of candidate equipment and previously tested and qualified equipment. The standard identifies that the qualification process for equipment is comprised of the following basic factors:

1. Excitation

2. Physical system (dynamic properties and operability)

3. Dynamic response

Section 9.3 of IEEE 344-1987 identifies that the equipment qualification levels, experience response spectra (ERS), can be used to qualify similar equipment when the equipment seismic requirements are equal to or enveloped by the ERS. The standard also states that when at least two or more dynamically similar items have been qualified to different excitations they may be both shown to be qualified to a composite ERS. The composite ERS may be used for qualification of candidate equipment.

The IEEE 344-1987 standard identifies the following four subsections in demonstrating similarity:

E.7.3.1 IEEE 344-1987 Section 9.3.1 Excitation

Similarity of excitation is described in Section 9.3.1. The section requires that test input is at least 15 seconds of strong motion duration. Also, ½ SSE test levels are documented as part of experience data or lack of fatigue effects is justified.

To meet the above requirements and establish test experience input motions for tested equipment, the following requirements are met.

1. The test input motion is multi-frequency and meets the relevant requirements in the IEEE 344-1987 standard.

2. The test input motion is characterized by the test response spectra in the front-to-back, side-to-side and vertical directions.

3. The test input is recorded at the mounting points of the equipment.

4. The test input motion has broadband response spectra shape with an amplified region of one octave or more. If the test response spectra of the equipment are narrowband, the peak spectral acceleration in the narrowband region is reduced by a factor of 0.7.

5. The test input motion is biaxial or triaxial. If equipment is susceptible to cross-coupling effects, a reduction factor of 0.7 is considered for a biaxial test response spectra.

E.7.3.2 IEEE 344-1987 Section 9.3.2: Physical Systems

Section 9.3.2 of the standard indicates that similarity can be established by comparing the pre-dominant resonant frequencies and mode shapes.

E.7.3.3 IEEE 344-1987 Section 9.3.3: Dynamic Response

Section 9.3.3 of the standard provides information to evaluate and extend the equipment physical response during testing to other similar systems.

To meet the requirements specified above and establish similarity of candidate equipment to tested equipment (physical systems and dynamic response), certain inclusion rules and prohibited features are applied to tested and candidate equipment. This confirms that candidate equipment and tested equipment are similar and share a narrow range of physical, functional, dynamic characteristics, and electrical performance that has been demonstrated during testing. The inclusion rules and prohibited features are listed below. They are verified during the process of developing test experience-based composite ERS and establishing the qualification of candidate equipment based on test experience.

Inclusion Rules

a. Physical characteristics
b. Design details
c. Dynamic characteristics
d. Functions
e. Equipment type
f. Manufacturer
g. Weight
h. Structural and mechanical designs details
i. Design features
j. Size and shape
k. Vintage
l. Capacity rating
m. Load path
n. Mounting
o. Industry practices
p. Materials
q. Dominant natural frequencies
r. Moveable sub-assemblies
s. Attached items or components
t. Modifications

Prohibited Features

Prohibited features are design details, materials, construction features, or installation characteristics that have resulted in seismic weaknesses leading to the equipment being incapable of performing its intended safety function(s) or maintaining structural integrity. A list of related prohibited features based on testing is compiled and addressed. The bases for their resolution are explained. Failure data from other sources may also be considered and included in the prohibited features list. The list includes prohibited features that would contribute to fatigue failure from low cycle loads from a combination of a number of ½ SSE and SSE events.

E.7.3.4 IEEE 344-1987 Section 9.3.4: Operability

Section 9.3.4 indicates that experience data must provide documented evidence to support the demonstration of proper operability of the equipment during and after the seismic tests. The experience data provides sound evidence that the equipment performed as required in a similar electrical system.

This last requirement in section 9 is fulfilled by showing that the safety-related components on the candidate equipment are seismically tested and qualified in the existing test programs. If not, then additional seismic testing of the components to their seismic demands will be performed.

E.7.4 Process for Qualification of Candidate Equipment Based on Test Experience Data

The Westinghouse process for qualification of candidate equipment based on test experience data involves the following five steps:

1. Characterization of test motions experienced by the tested equipment

2. Establishment of the composite ERS based on the actual test inputs

3. Characterization of tested equipment

4. Comparison of candidate equipment to tested equipment

5. Documentation of the qualification process

The above requirements for the use of the test experience for seismic qualification of equipment are met by the following:

- The existing qualification programs and experience test data meet the requirements in IEEE 344-1987 standards.

- The test excitation is at least 15 seconds of strong seismic motion, documented in the existing test reports and the qualification seismic levels are defined.

- Similarity of the candidate equipment to tested and qualified equipment is demonstrated by showing the physical systems and their dominant natural frequencies to be similar.

- The vibration aging seismic requirements and SSE RRS of the AP1000 are enveloped by the respective composite 1/2 SSE and SSE ERS of the tested equipment over the frequency range of interest (typically 1-33 Hz). If the RRS is not enveloped, it is justified.

- The vibration aging seismic requirements and SSE RRS of the AP1000 used for comparison with respective composite ½ SSE and SSE ERS are applicable to the in-structure response spectrum at the mounting location of the candidate equipment. This RRS, as defined in the qualification specification, is derived from the SSE. Peak broadening of the RRS to account for uncertainty or variation of location is permitted if the actual response spectrum at the mounting location is narrow banded.

- The vibration aging seismic requirements and SSE RRS of the AP1000 used for comparison with the respective composite ½ SSE and SSE ERS are computed for the same damping value as the composite ERS. Westinghouse uses 5% critical damping in the generation of TRS in seismic qualification test programs. When the damping values of the RRS and the composite ERS are different, additional guidance in 5.3.2 of IEEE 344-1987 may be used for making the comparison.

- The candidate equipment is within the inclusion rules of tested equipment.
- The candidate equipment excludes the prohibited features of the tested equipment.
- The safety function of the candidate equipment including the enclosed or attached devices or subassemblies, if applicable, during and/or after the earthquake is demonstrated by the tested equipment or additional test data.
- The equipment mounting is similar or equivalent to the tested and qualified mounting configurations or is evaluated in accordance with the qualification specification requirements.
- Since equipment capacity may change with vintage, candidate equipment of newer vintage than the tested equipment shall be evaluated for any significant changes in the design, materials, or fabrication that could reduce its seismic capacity compared to the tested equipment.
- The qualification of the candidate equipment is documented in accordance with the requirements of IEEE 344-1987, Section 10.

E.7.5 Limitations

In addition qualification using test experience is limited by the following considerations. If these limitations exist, then seismic qualification using other acceptable methods is considered.

1. Some complex equipment such as microprocessor-based systems, relays and potentiometers may be difficult to qualify using the experience based method.
2. Insufficient number of independent test items.
3. For pressure boundary components, the capability of the component to perform the specified pressure retaining functions in combination with an earthquake is addressed separately using appropriate criteria.
4. Applications that required equipment to be exposed to harsh environment or aging (e.g., IEEE 323) prior to or during an earthquake require special consideration.

Sections E.7, E.7.1, E.7.2, E.7.2.1, E.7.2.2

Renumbered the sections to allow for inserting Section E.7.

E.~~7~~8

E.~~7~~8.1

E.~~7~~8.2

E.~~7~~8.2.1

E.~~7~~8.2.2

V. REGULATORY IMPACT

A. FSER IMPACT

There is no impact on the FSER. The changes in the equipment qualification methodology have no effect on design function. This change has no effect on analysis or analysis method. This change has no effect on Tier 1 information.

B. SCREENING QUESTIONS (Check correct response and provide justification for that determination under each response)

1. Does the proposed change involve a change to an SSC that adversely affects a DCD described design function? ☐ YES ☒ NO

   There is no change to a design function of any safety related equipment.

2. Does the proposed change involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled? ☐ YES ☒ NO

   The clarifications in the equipment qualification methodology have no effect on operation of the reactor coolant system. The clarifications have no effect on the initiation or operation of the passive core cooling system.

3. Does the proposed activity involve revising or replacing an DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses? ☐ YES ☒ NO

   The changes to the equipment qualification methodology do not require changes to the evaluation of the response to postulated accident conditions. The changes to the equipment qualification methodology do not require changes to the structural or safety analysis of any safety related equipment.

   The removal of a statement that qualification by analysis alone is not used is not a change in methodology since it is in conflict with information in Appendix 3D on requirements for qualification by analysis.

4. Does the proposed activity involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD? ☐ YES ☒ NO

   The changes to the equipment qualification methodology do not require an additional test or experiment or changes to testing.

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C. EVALUATION OF DEPARTURE FROM TIER 2 INFORMATION (Check correct response and provide justification for that determination under each response)

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.b. The questions below address the criteria of B.5.b.

1. Does the proposed activity result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   Since there is no change to the equipment qualification methodology that could affect the plant design or operations, there are no new accident initiators and no effect on the frequency of evaluated accidents.

2. Does the proposed activity result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   Since there is no change to the equipment qualification methodology that could affect the plant design or operations, there is no effect on malfunctions of structures, systems, or components. The operating conditions for the reactor coolant system and passive core cooling system are not altered.

3. Does the proposed activity result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   The clarifications in the qualification methodology have no effect on the operation, performance, and pressure boundary integrity of the safety related equipment. Therefore, there is no increase in the calculated release of radioactive material during postulated accident conditions.

4. Does the proposed activity result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   The clarifications in the qualification methodology have no effect on the design functions or reliability of the safety related equipment or other components and operation of the passive core cooling system. Therefore, there is no increase in the calculated release of radioactive material due to a malfunction of an SSC.

5. Does the proposed activity create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO

   The clarifications in the equipment qualification methodology have no effect on the operation, performance, and pressure boundary integrity of the plant equipment. The response of the safety related equipment and the passive core cooling system to postulated accident conditions is not altered by the changes. The changes do not introduce any additional failure modes. Therefore, there is no possibility of an accident of a different type than any evaluated previously in the DCD.

6. Does the proposed activity create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO

   The changes have no effect on the design functions of the safety related equipment or operation of the passive core cooling system. Therefore, there are no additional failure modes or the possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously.

7. Does the proposed activity result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered? ☐ YES ☒ NO

   There is no change to the design function of the safety related equipment. The criteria to provide for pressure boundary integrity are not exceeded or altered.

8. Does the proposed activity result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses? ☐ YES ☒ NO

   The changes are provided as clarification to the equipment qualification methodology of safety related equipment. A paragraph stating analysis alone is not used was removed since it was in conflict with information in Appendix 3D defining the conditions under which the analysis method may be used. Since the requirements for qualification using analysis are included in Appendix 3D, deleting the conflicting paragraph is not a change in methodology. The method described is consistent with IEEE standards and industry practice and employed in a manner that yields conservative results and have been approve by the NRC for qualification of equipment in operating nuclear plants. The changes have no impact on the evaluation methodology for the pressure boundary integrity.

☒ The answers to the evaluation questions above are "NO" and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.b

☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

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D. IMPACT ON RESOLUTION OF A SEVERE ACCIDENT ISSUE

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.c. The questions below address the criteria of B.5.c.

1. Does the proposed activity result in an impact features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below. ☐ YES ☒ NO

   The systems and components identified in the DCD Subsection1.9.5 and Appendix 19 B that mitigate severe accidents are not impacted by a change in equipment qualification methodology.

2. Is there is a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed and determined to be not credible could become credible? ☐ YES ☐ NO ☒ N/A

3. Is there is a substantial increase in the consequences to the public of a particular severe accident previously reviewed? ☐ YES ☐ NO ☒ N/A

☒ The answers to the evaluation questions above are "NO" or are not applicable and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.c

☐ One or more of the ~~he~~ answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

E. SECURITY ASSESSMENT

1. Does the proposed change have an adverse impact on the security assessment of the AP1000. ☐ YES ☒ NO

   The change in equipment qualification methodology will not alter barriers or alarms that control access to protected areas of the plant. The change in equipment qualification methodology will not alter requirements for security personnel. Therefore, the change in equipment qualification methodology does not have an adverse impact on the security assessment of the AP1000.