



Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6306
Direct fax: 412-374-5005
e-mail: sterdia@westinghouse.com

Your ref: Project Number 740
Our ref: DCP/NRC1985

August 31, 2007

Subject: AP1000 COL Responses to Requests for Additional Information (TR #16)

In support of Combined License application pre-application activities, Westinghouse is submitting responses to NRC requests for additional information (RAI) on AP1000 Standard Combined License Technical Report 16, APP-GW-GLR-031, Rev. 1, Seismic Qualification Using Test Experience-Based Method for AP1000 Safety Related Equipment. These RAI responses are submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in the responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The responses are provided for requests for additional information RAI-TR16-EMB2-01 through RAI-TR16-EMB2-08 and RAI TR16-ICE-01 through RAI-TR16-ICE-05. These responses complete all requests to date for Technical Report 16.

Pursuant to 10 CFR 50.30(b), the responses to requests for additional information on Technical Report 16 is submitted as Enclosure 1 under the attached Oath of Affirmation.

Questions or requests for additional information related to the content and preparation of these responses 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.

Very truly yours,

A handwritten signature in black ink, appearing to read 'A. Sterdis'.

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

/Attachment

1. "Oath of Affirmation," dated August 31, 2007

/Enclosure

1. Responses to Requests for Additional Information on Technical Report No. 16

cc:	D. Jaffe	- U.S. NRC	1E	1A
	E. McKenna	- U.S. NRC	1E	1A
	S. Adams	- Westinghouse	1E	1A
	G. Curtis	- TVA	1E	1A
	P. Grendys	- Westinghouse	1E	1A
	P. Hastings	- Duke Power	1E	1A
	C. Ionescu	- Progress Energy	1E	1A
	D. Lindgren	- Westinghouse	1E	1A
	A. Monroe	- SCANA	1E	1A
	M. Moran	- Florida Power & Light	1E	1A
	C. Pierce	- Southern Company	1E	1A
	E. Schmiech	- Westinghouse	1E	1A
	G. Zinke	- NuStart/Entergy	1E	1A
	M. Ahmed	- Westinghouse	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

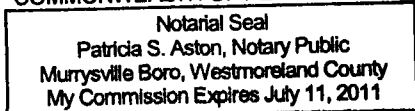
W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs & Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set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



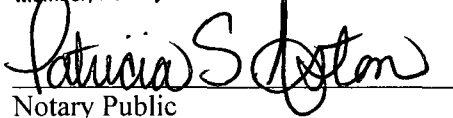
W. E. Cummins
Vice President
Regulatory Affairs & Standardization

Subscribed and sworn to
before me this 31st day
of August 2007.

COMMONWEALTH OF PENNSYLVANIA



Member, Pennsylvania Association of Notaries


Notary Public

ENCLOSURE 1

Responses to Requests for Additional Information on Technical Report No. 16

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-01
Revision: 0

Question:

In Section III, Position, of the subject report, Westinghouse (WEC) stated that it may use the Test Experience-Based Seismic Qualification methods described in Section 9 of IEEE Std 344-1987 for demonstrating seismic qualification of Class 1 E equipment subject to meeting WEC qualification methodology, customer requirements and clarification and exceptions identified in the regulatory requirements of the US NRC. WEC further stated that it will not use earthquake experience in demonstrating seismic qualification of safety related equipment because functional operability is not clearly established or documented during the earthquake event. WEC is requested to:

- (1) For AP1000, state any difference between the "Class 1 E equipment" and the "safety related equipment" used in the TR 16 report or DCD. Identify and provide the list of those mechanical and electrical equipment that the Test Experience-Based Seismic Qualification Method is to be used for API 000, from, for example, Tables 3.2-1 and 3.1 1-1 of DCD; and
- (2) clarify whether WEC Position stated above applies to all AP1000 safety related mechanical equipment.

Note: As delineated in the draft Revision 3 of RG 1.100, the seismic qualification by using experience data (earthquake or test experience data) for a reference equipment class is generally not acceptable to the NRC staff for certain active equipment. Therefore, the use of experience-based approach for a class of equipment is not encouraged.

Westinghouse Response:

1. The report is applied to safety-related equipment. It will not be applied for active valves, I&C equipment or equipment located in harsh environment.
2. Westinghouse may use the proposed approach in limited cases and where ample qualification test data of a narrow cluster of similar equipment manufactured by same vendor is available and documented in accordance with IEEE Std 344. Most safety-related equipment will be qualified using specific test or combined test and analysis.

Westinghouse agrees with NRC regarding using earthquake data base. Westinghouse will only use test experience of similar equipment that were conducted in accordance with IEEE Std 344. Additional component tests may be performed to verify component operability if existing test data cannot clearly establish this requirement.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-02
Revision: 0

Question:

As stated in Section V.C (page 3 of 11) of APP-GW-GLR-31, Revision 1 (TR 16), the IEEE 344-1987 standard identifies four subsections in demonstrating similarity of equipment within a reference class (e.g., Motor Control Center, MCC) to be used for comparison with a candidate equipment to be qualified. Appendix A of TR 16 provides the existing eight MCC seismic test data in establishing the "Reference MCC-Class" of equipment. WEC is requested to:

- (1) Define precisely the Reference MCC-Class of equipment in details, including the list of all components, subcomponents, and attachments to be included in the Reference MCC-Class;
- (2) List all the components, subcomponents, and attachments in each of the eight MCCs, respectively, in the seismic test experience database, and for each component, subcomponent, and attachment, identify the following information: manufacturer, model number, material, support condition, location in the cabinet, installation orientation, and natural frequencies; and
- (3) Justify that the definition of the Reference MCC-Class specified in response to Item (1) above is supported by the similarities from the eight MCC test data provided in response to Item (2) above.

Westinghouse Response:

The information provided in the TR is intended to represent an example of how the process may be applied when used. Westinghouse agrees with the NRC request and will provide the information necessary to demonstrate similarity within the tested units and to the candidate equipment when the method is employed. The type of specific details which the NRC is requesting have not been compiled at this time. Westinghouse does not intend to define a generic reference MCC-Class of different vendor's designs that would be applied for all vendor's MCCs to be qualified.

When the test experience method is applied, the information requested will be provided in the qualification report. Please refer to Section 1.2 in the TR, Assumptions and Clarifications No. 4, No. 6 and No. 9. In particular, Clarification No. 9 states:

"A list of MCC components tested and qualified during the seismic test programs will be compiled and compared with candidate equipment components. If components on candidate equipment are not well represented by tested and qualified components, supplementary component seismic test including proper aging will be performed."

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Similarity of candidate equipment to tested equipment will be verified as part of the qualification efforts. When using the method, Westinghouse will show that the structural design, elements and features of the candidate equipment are similar and well represented by the tested equipment. Westinghouse will also show that components on candidate equipment are qualified by existing test experience data. If components can't be shown qualified based on the experience, then additional component testing will be performed in accordance with IEEE Std 344-1987.

Please refer to Clarification No. 4 in the TR which states:

"The candidate MCC structural design is represented by the reference test programs. Drawings and/or inspection of the candidate MCC design will be reviewed to confirm that the candidate MCC design is represented by the reference class."

Reference:

1. APP-GW-GLR-031 (TR16), Revision 1, "Seismic Qualification Using Test Experience-Based Method for AP1000 Safety Related Equipment"

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-03
Revision: 0

Question:

Appendix B of TR 16 provides the existing six Transformer seismic test data in establishing the Reference Transformer-Class of equipment. WEC is requested to provide similar information for the Reference Transformer-Class of equipment as those requested for the Reference MCC-Class in Items (1), (2), and (3) in RAI-TR16-EMB2-2 above.

Westinghouse Response:

The information will be provided in the qualification report. Please refer to Section 1.2 of TR-16, Assumptions and Clarifications, No. 4, No. 6 and No. 9 and Westinghouse response to RAI-TR16-EMB2-02.

Reference:

1. APP-GW-GLR-031 (TR16), Revision 1, "Seismic Qualification Using Test Experience-Based Method for AP1000 Safety Related Equipment"

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-04
Revision: 0

Question:

The TR 16 report indicated that for the Westinghouse test experience-based method, a composite experience response spectra (ERS) will be generated using the frequency-by-frequency mean of Test Response Spectra (TRS) from minimum of five independent successful equipment test programs. The Staff notes that the adequacy of the use of five or other number of independent items as the database to define a reference equipment class will depend on the complexity of the equipment, including components and subcomponents, and how the similarity of the members of the reference class was established. The WEC use of the frequency-by-frequency mean of successful test response spectra to represent a respective composite ERS for the Reference MCC-Class and the Reference Transformer-Class of equipment is not adequate.

The damage potential of equipment under testing varies depending on the combination of input motion and the equipment item exhibiting a particular malfunction, and is difficult to quantify. The resonant frequency corresponding to a given malfunction is mostly unknown and this frequency for each piece of equipment of the same class can be significantly different. There could be multiple malfunction mechanisms for components and subcomponents which need to be considered in comparing the response spectra. Therefore, an equipment capacity factor has to be considered to cover the uncertainties in high level testing for an equipment class. The equipment capacity factor of 1.4 for ERS is used in the ASCE Standard, ASCE/SEI 43-05 (Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities), and was based on an industry report, UCR-CR-120813, "Meeting Performance Goals by use of Experience Data," by Michael W. Salmon and Robert P. Kennedy, December 1, 1994. Therefore, the ERS shall be a lower bound of the experience TRS set, or a spectrum with the frequency-by-frequency mean divided by 1.4 of the TRS set from successful tests without malfunction. WEC is requested to revise its definition for the composite ERS to be used for AP1000 equipment.

Westinghouse Response:

Establishing the ERS for a group of similar qualified test units requires engineering understanding of the test units, the details of the test programs, the test methods, the results, the qualification test levels, the candidate equipment and many different aspects of the qualification efforts. Applying an increase factor to the floor requirements may be used when the confidence in the test data is not very high. It is our opinion that these various test aspects need to be studied as part of the determination of the ERS when the method is used. Westinghouse is reviewing the methodology for determining the ERS in light of the NRC comments. Westinghouse position will be issued at a later date.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Reference:

1. APP-GW-GLR-031 (TR16), Revision 1, "Seismic Qualification Using Test Experience-Based Method for AP1000 Safety Related Equipment"

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-05
Revision: 0

Question:

For characterization of the Reference MCC-Class in Appendix A of the TR 16, the use of 1/3 octave of the average dominant natural frequency is too broad in frequency range for establishing the dynamic similarity of the Reference MCC-Class members, and is not acceptable. WEC is requested to redefine the Reference MCC-Class of equipment using 1/6 octave of the average dominant natural frequency for establishing the dynamic similarity in natural frequencies for the Reference MCC-Class members.

For characterization of the Reference Transformer-Class in Appendix B of the TR 16, no physical sizes (dimensions) nor dominant natural frequencies and mode shapes were defined. Therefore, the dynamic similarity of the Reference Transformer-Class members was not demonstrated. WES is requested to provide the needed information.

Westinghouse Response:

Westinghouse intends to comply with the 1/6 octave criteria should this method be applied. Justifications will be provided in cases where 1/6 octave criteria are not met when this method is applied.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-06
Revision: 0

Question:

Section X, DCD Mark-Up, of the TR 16 report, stated that ".... Identification of the equipment qualified based on experience is provided in APP-GW-GLR-31, Revision 1 (Reference 2). This portion of the COL information item is complete." This statement is not accurate. Reference 2 provided only two examples (MCC and Transformer). The COL information is incomplete. WEC is requested to clarify the statement and to provide a schedule in DCD for completing the COL information for the equipment identified in response to RAI-TR16-EMB2-01.

The mark-up also indicated that "The Combined License holder will include experience data for each piece of equipment using experience-based equipment qualification in the equipment qualification file prior to fuel load. This portion of the COL information item is deferred." It is the NRC staff position that the "Combined License holder" should be revised to "Combined License applicant," and that all the data for the experience-based seismic qualification of equipment should be submitted to the NRC for staff review and approval prior to the issuance of the COL license.

Westinghouse Response:

Equipment selection and qualification is not required prior to the COL license. ITAAC exists in Tier 1 Chapter 2 of the DCD that require the COL holder to produce evidence of equipment qualification. For example: Section 2.6.3, Class 1E dc and Uninterruptible Power Supply System, Table 2.6.3-3, item 2, on page 2.6.3-8 indicates that seismic category I equipment identified in Table 2.6.3-1 can withstand seismic design basis loads without loss of safety function. The associated inspection, test analyses and acceptance criteria are also delineated in the adjacent columns of the table.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-07
Revision: 0

Question:

In Appendix A and Appendix B, for investigation of seismic qualification of MCC and Transformer, respectively, References 4 thru 17 are not described.

Westinghouse Response:

Appendix A, page A14 of A64 lists eight references documenting the seismic testing of the MCC assemblies. The table includes eight references listed. These references are same references (Reference 4 through Reference 11) listed on pages 7 and 8 of 11.

Appendix B, page B14 of B48 lists six references documenting the seismic testing of the transformer assemblies. The table includes six references listed. These references are same references (Reference 12 through Reference 17) listed on pages 7 and 8 of 11.

The following statements will be added to Appendix A and Appendix B.

Appendix A, page A14 of A64:

"The table lists eight references documenting the seismic testing of the MCC assemblies. These references are the same references (Reference 4 through Reference 11) listed on pages 7 and 8 of 11."

Appendix B, page B14 of B48:

"The table lists six references documenting the seismic testing of the transformer assemblies. These references are same references (Reference 12 through Reference 17) listed on pages 7 and 8 of 11."

Design Control Document (DCD) Revision:
None

PRA Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Technical Report (TR) Revision:

The following statements will be added to Appendix A and Appendix B.

Appendix A, page A14 of A64:

"The table lists eight references documenting the seismic testing of the MCC assemblies. These references are the same references (Reference 4 through Reference 11) listed on pages 7 and 8 of 11."

Appendix B, page B14 of B48:

"The table lists six references documenting the seismic testing of the transformer assemblies. These references are same references (Reference 12 through Reference 17) listed on pages 7 and 8 of 11."

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-EMB2-08
Revision: 0

Question:

Recent ground motion studies for some hard rock sites indicated that the resulting seismic inputs to structures, systems, and components (SSCs) contain high frequency (HF) excitations. For seismic qualification of mechanical and electrical equipment, there are some safety-related active components in nuclear power plants that have been qualified by IEEE 344 type tests with intentional HF contents to account for concurrent BWR hydrodynamic loads. However, vast majority of the existing seismic test data available in the industry are those tested with input frequencies up to 33 Hz, although the test response spectra (TRS) may have shown the zero period acceleration (ZPA) of up to 100 Hz.

The inadvertent HF contents shown in ZPA, due to ball-joints and kinematic linkages of shake tables, present in the seismic qualification of equipment by IEEE 344 type tests for the past 30 years are the noise signals which may not have the proper frequency contents with sufficient energy to be compatible with the amplified region of the RRS at high frequencies. In order for existing qualification test data to be valid for resolving HF concerns, the adequacy of the frequency content and the stationarity of the frequency content of the synthesized waveform used for the tests has to be demonstrated. The frequency content of the Fourier transform of the test waveform or the frequency content of the Power Spectral Density (PSD) of the test waveform must be compatible with the amplified portion of the RRS. Guidelines on frequency content and stationarity can be found from Annex B to IEEE 344-2004.

In view of the above concerns, the test experience data for MCCs and Transformers presented in TR 16 (APP-GW-GLR-031, Revision 1) for the purpose of illustrating the seismic qualification using test experience-based method for API 000 safety related equipment may not be acceptable for the application.

In addition to the concerns about the HF effects on the seismic qualification of equipment, the NRC staff has serious reservations, from the review of the two examples (MCCs and Transformers) presented in TR 16, about the WESC's method of establishing the similarity among the members of a reference equipment class as evidenced in various RAIs shown above. Unless WESC can provide additional examples with a more extensive technical basis for allowing its use, WEC is requested to reconsider the use of experienced-based method of seismic qualification for Class 1 E equipment.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Westinghouse Response:

The high frequency seismic input is an industry issue which is currently being discussed between the industry and the NRC. Resolution of the issue may affect how this test experience method is applied and what plants are able to use the test experience method.

Once this industry issue is resolved, Westinghouse will re-visit and update this response as appropriate.

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None



Westinghouse

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-ICE-01
Revision: 0

Question:

The staff needs to establish or confirm similarity, described by inclusion rules, among the previously tested and qualified equipment that are similar. Provide MCC specifications and drawings that list all components, physical dimension of cubicles, weights, and design parameters (i.e., voltage levels, rating of buses, interfaces, and interrupting ratings etc) for all MCCs tested. In addition, the staff noticed that all tested MCCs were 125V MCC, 600 Volt MCC assemblies. Explain how the similarity for 125VAC MCC will be extended to the candidate 125VDC MCC in Appendix A.

Westinghouse Response:

The information provided in the TR is intended to represent an example of how the process may be applied when used. Westinghouse agrees with the NRC request and will provide the information necessary to demonstrate similarity within the tested units and to the candidate equipment when the method is employed.

Westinghouse intends to establish similarity of candidate equipment to a narrow well defined cluster of similarly tested equipment manufactured by the similar vendors in accordance with Sections 9.3 of IEEE Std 344-1987 and consistent with current industry practices.

Westinghouse will establish the required similarity of the structure and components as requested by NRC in the equipment qualification reports. The similarity efforts will be performed in accordance with Section 9.3 of IEEE Std 344-1987. Westinghouse will show that the candidate equipment structure is similar to the MCC structures tested and qualified in the existing test programs. Westinghouse will also show that the components on the candidate equipment are the same as or similar to the components tested and qualified on the MCC test units. Additional component testing may be conducted in accordance with IEEE Std 344-1987 if components are not qualified by existing test reports. The inclusion rules are listed in Appendix A (pages A6 through A9 of A64) and Appendix B (pages B6 through B7 of B48).

Our experience is that the 125 VAC and 125 VDC MCC assemblies use similar basic structures. They are constructed of similar structural elements, connected side-by-side using similar techniques and mounted to the floor in a similar manner. If the structures are different then new test program will be conducted. Both DC and AC components have been tested and qualified. If the DC components on the candidate equipment are not similar to the DC components tested and qualified meeting all acceptance and functional requirements, then the candidate equipment components will be tested and qualified in a new test program.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-ICE-02
Revision: 0

Question:

As stated "equipment capacity may change with vintage," the staff agrees that the candidate (i.e., newer vintage) equipment should be compared for any significant changes in design, materials, or fabrication that are different from that of those tested and qualified equipment. We recognized that all tested MCC vintages vary from 1978-92. We are not certain all MCC design details and construction features remained the same over the years, as stated in the report. For example, new MCCs are most likely to include microprocessors, and digital components. Thus, the staff believes that it could affect portions of inclusion rules (e.g., weight, mountings, and natural frequencies) that were discussed establishing similarities in TR16. Since availability of dc system during and after earthquake is a must for AP1000, establishing similarity is important among the same vintage (candidate and the tested and qualified) equipment. Thus, WEC should consider updating experience test data with recently manufactured MCC equipment test data, rather than using the old MCC test data.

Westinghouse Response:

The example provided includes the MCC assemblies test data available to Westinghouse at this time. We agree that vintage is a consideration when establishing similarity and to be addresses as part of the inclusion rules in Section C.3, Page 4 of 11, of the TR. This effort will be performed when the candidate equipment is defined and similarity evaluation is performed. Westinghouse will review the changes made to the MCC test unit structures and the candidate equipment structure to capture the changes and vintage differences. If the changes are determined to impact the structural capabilities and performance of the equipment, then additional tests or analysis will be performed. Similar efforts will be performed for the components. New component testing will be conducted in accordance with IEEE Std 344-1987 for candidate equipment components which were not tested or qualified on the referenced test units.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-ICE-03
Revision: 0

Question:

As for the transformer example (Appendix B), we agree that the proposed methodology may be applied for the same size and similar capacity transformers. However, we noticed the referenced class contained six transformers where the capacities ranged from 750 KVA to 2000 KVA. The staff notes that all those (six) transformers had different physical sizes, capacities, weights, vintages, mountings, and natural frequencies. The staff also reviewed the comments provided for all those transformers previously tested under similarity rules. The staff can not agree with the WEC evaluation or how it applied similarity rules for those transformers. Provide additional justifications. In addition, maintaining continuity was defined as a success criterion for the qualification test, there was an electrical arcing which is susceptible to develop an energetic fault. The staff views that internal arcing of transformer No.1 should have been considered failure and it should have been excluded from the experience data file. Explain why the transformer No.1 was included from the experience data.

Westinghouse Response:

Westinghouse agrees with NRC observations that the range of test transformer sizes varies. We therefore included several limitations and clarifications in Section 1.2 (Assumptions and Clarifications), Page B2 of B48. Additional justifications and additional test data will be provided when the method is applied.

Clarification No. 3 states the following:

"The candidate transformer's structural design is represented by the reference test programs. Drawings and/or inspection of the candidate transformer's structural design will be reviewed to confirm that the candidate transformer's structure is represented in the reference class."

It is also important to recognize that although the transformers vary in size, the core and coil method of their supports to the transformer base exhibit similar concepts. Eliminating large transformers from the group may also eliminate the need for certain enhancements that small transformers could benefit from. For example, removing this transformer from the group may also remove the need to either support the top of the core and coil in the horizontal direction or stiffening the base to reduce the amount of motion at the top. Our point is that we wanted to capture all enhancements needed from the full range and apply them appropriately in the candidate (smaller) transformer. That will provide a much better product based on actual test results.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

The Wyle test report indicated that arcing was observed during the full high level tests with no additional information to determine its source or cause. The Wyle test report also indicated it did not affect the performance of the transformer. The report states the following:

"It was demonstrated that the specimen possessed sufficient integrity to withstand, without compromise of structure or electrical function, the prescribed simulated seismic environment. However, internal arcing was visually detected during the seismic simulation and post test inspection revealed minor damage to the transformer section of the specimen."

In addition, summary of the electrical testing of the transformer insulation and high pot electrical testing of both the primary and secondary circuits before and after testing indicated the following:

Failure occurred: No
Specimen Passed: Yes

The electrical check sheets are signed and approved. The report is also signed and approved and certified by an Alabama Professional Engineer.

Westinghouse used the report as a part of the experience test data to make sure that the full range of transformer sizes has been evaluated and any enhancements needed are implemented in the candidate transformer. Removing this report from the group would have removed this point of caution and weakened the approach. We also included Clarifications No. 5 and 6 in the TR which stated the following.

5. All structural enhancements made to the MCC test units in the reference class are implemented in the final design of the candidate MCC. Drawings and/or inspection of the MCC design will be performed to confirm that any weak design areas have been strengthened and all modifications made to the MCC test units have been implemented.
6. No components that experienced anomalies during testing in the reference test programs are being used in the MCC final design. This will be confirmed prior to approving the design or issuing the qualification report.

Westinghouse will use this test to implement enhancements to the candidate transformer only. Westinghouse will not consider the test data of this transformer when this method is applied in the seismic qualification of the candidate transformer.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-ICE-04
Revision: 0

Question:

Provide lists of safety-related (electrical and mechanical) equipment that would be grouped as a reference equipment class under the proposed experience based method under DCD and explain what is the criteria used for each reference equipment class.

Westinghouse Response:

Westinghouse may use this method on a limited basis, when adequate test data of similar equipment is available and when the stated NRC concerns are addressed in the qualification reports. Westinghouse is currently finalizing the safety-related equipment designs and selecting vendors. When this process is completed it will be possible to determine which equipment may be a candidate for seismic qualification by test experience.

Design Control Document (DCD) Revision:

None

PRA Revision:

None

Technical Report (TR) Revision:

None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR16-ICE-05
Revision: 0

Question:

For a given (minimum of) five experience data for a sample size for the experience based equipment qualification, explain how it will provide sufficient confidence for establishing similarity rules used for developing ERS and TRS?

Westinghouse Response:

It is our engineering judgment that five test samples of similar design, same manufactures and qualified in accordance with IEEE Std 344 provides a high level of confidence of the test data. For any safety-related equipment that may be qualified by test experience, Westinghouse will confirm the following:

1. The candidate equipment structure is similar to the tested and qualified test units in accordance with Section 9.3 of IEEE Std 344-1987. Drawings, sketches, catalogs, photos and other technical data will be used to show that the tested equipment represents the candidate equipment structure. This will be documented in the qualification reports. If similarity can't be established, then this method will not be used.
2. Safety-related components on candidate equipment are similar to components tested and qualified on the test units. If this can't be shown, then components operability of candidate equipment will be qualified by an additional component test that meets the requirements set forth in IEEE Std 344-1987.
3. Westinghouse intends to use test programs that were conducted in accordance with IEEE Std 344. The ERS will be developed as the frequency by frequency mean of the seismic qualification test levels with certain limitations as discussed in our response to NRC RAI-TR16-EMB2-04. No earthquake data will be used.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

