Westinghouse Electric Corporation
Water Reactor Divisions
Box 355
Pittsburgh Pennsylvania 15230

NS-EPR-2630

November 12, 1982

Mr. Vincent Noonan
Equipment Qualification Branch Chief
U.S. NRC Phillips Building
7920 Norfolk Avenue
Bethesda, MD 20014

Ref: NS-EPR-2661
9/17/82
(Environmental)
NS-EPR-2667
10/5/82
(Seismic)

Dear Mr. Noonan:

Previously, Westinghouse had submitted responses to the NRC/EG&G Idaho questions on the environmental and seismic aspects of the Westinghouse Environmental Qualification Program. These Westinghouse responses were submitted to the NRC/EG&G Idaho as separate documents. Letter NS-EPR-2661, dated 9/17/82 (Rahe to Rosztoczy) provided response for the environmental questions and letter NS-EPR-2667 dated 10/5/82 (Rahe to Rosztoczy) addressed the seismic questions.

During a subsequent NRC meeting on October 19 and 20, 1980 in Bethesda, the initial NRC/EG&G Idaho questions and Westinghouse responses to those questions were discussed for both seismic and environmental. At that meeting, the NRC EG&G Idaho also provided Westinghouse with "Further Questions" on specific qualification programs. This letter provides an additional response to any of the initial questions which were unresolved or opened and also the "further questions" which were not adequately addressed at that two day meeting. Table 1 (sheets 1-3) provides a concise status for all of the Westinghouse programs being reviewed by the NRC/EG&G Idaho.

While not intending to delay the review schedule established by the August 30, 1982 NRC letter (Shemanski to Rahe), I would appreciate it if the next scheduled meeting (11/16/82), which is intended to be the final meeting to discuss opened items at the NRC, could be rescheduled for Wednesday, December 1, 1982. This is necessary due to the unavailability of key personnel whose attendance at the meeting is essential.

YG01

As a result of this review, it is our intention to make all of the agreed upon revisions to the Equipment Qualification docu ents when these docments are approved by the NRC. In some cases, the docum nts may need revised which would affect the existing revision number. n these cases Westinghouse will provide the NRC/EG&G Idaho with the new revision including corrections for reference in the SER.

If you have any questions or comments, please contact Alex Ball (412-373-5792) or George Butterworth (412-373-5761) of my staff.

Very truly yours,

E. P. Rahe, Manager
Nuclear Safety Department

AB/keg

cc:

G. Bagchi, NRC
P. Shemanski, NRC
R. Borgen, EG&G Idaho
M. Russell, EG&G Idaho

3314Q

Table 1 (Sheet 1 of 3)

EQDPs/EQTRs Submitted For Review	Equipment Description	Environmental Review Status	Seismic Review Status
Revision 5	WCAP-8587, Methodology	Q11, 13, 15, 16 Opened	No Questions Received
EQDP-AE-1, Rev. 3 EQTR-A01A, Rev. 1	Medium Pump Motors	Further Q A, C Opened	Q2, 3 Opened
EQDP-AE-2, Rev. 4 EQTR-A02A, Rev. 1	Large Motors	Further Q A Opened	Q2, 3, 9 Opened
EQDP-AE-3, Rev. 4 EQTR-A03A, Rev. 2	Canned Motors	Q3 Opened Further Q A Opened	Q2, 3 Opened
EQDP-ESE-1, Rev. 3 (Barton) EQTR-E01A, Rev. 1 (Barton)	Pressure Transmitters Group A	All Questions Resolved	Q2, 3 Opened
EQDP-ESE-1B, Rev. 0 (Veritrak) EQTR-E01B, Rev. 0 (Veritrak)	---------- ----------	No Questions Received	No Questions Recieved
EQDP-ESE-2, Rev. 4 EQTR-E02A, Rev. 1 (Barton) EQTR-E02B, Rev. 1 (Veritrak)	Pressure Transmitters Group B	Reviewed, No Questions	All Questions Resolved
EQDP-ESE-3, Rev. 3 (Barton) EQTR-E03A. Rev. 1 (Barton)	DP Transmitters Group A	All Questions Resolved	Q2, 3 Opened
EQDP-ESE-3B, Rev. 0 (Veritrak) EQTR-E03B, Rev. 0 (Veritrak)	---------- ----------	No Questions Received	No Questions Received
EQDP-ESE-4, Rev. 5 EQTR-E04A, Rev. 1 (Barton) EQTR-E04B, Rev. 2 (Veritrak)	DP Transmitters Group B	All Questions Resolved	Q3 Opened
EQDP-ESE-5, Rev. 3 EQTR-E05A, Rev. 1	RTD's - RCS Bypass Manifold	All Questions Resolved	Reviewed, No Questions

Table 1 (Sheet 2 of 3)

EQDPs/EQTRs Submitted For Review	Equipment Description	Environmental Review Status	Seismic Review Status
EQDP-ESE-6, Rev. 4 EQTR-E06A, Rev. 2	RTD's - Well Mounted	All Questions Resolved	Reviewed, No Questions
EQDP-ESE-7, Rev. 4 EQTR-E07A, Rev. 2	RTD's - Fast Response	All Questions Resolved	Reviewed, No Questions
EQDP-ESE-10, Rev. 4 EQTR-E10A, Rev. 2	Nuclear Instrumentation	All Questions Resolved	Q1 Opened
EQDP-ESE-14, Rev. 3 EQTR-E14A, Rev. 1	Indicators	All Questions Resolved	Q3, 15 Opened
EQDP-ESE-13, Rev.3 EQTR-E13A, Rev. 1 EQTR-E13B, Rev. 1	Process Protection System	All Questions Resolved	Q1, 3, 14 Opened
EQDP-ESE-15, Rev. 3 EQTR-E15A, Rev. 1	Recorders	All Questions Resolved	Q3 Opened
EQDP-ESE-16, Rev. 4 EQTR-E16A, Rev. 1 EQTR-E16B, Rev. 2 EQTR-E16C, Rev. 0	Solid State Protection System	All Questions Resolved	Q1, 3 Opened
EQDP-ESE-17, Rev. 2 EQTR-E17A, Rev. 0 EQTR-E17B, Rev. 0	SSPS - 3 Train	All Questions Resolved	Q3 Opened

Table 1 (Sheet 3 of 3)

EQDPs/EQTRs Submitted For Review	Equipment Description	Environmental Review Status	Seismic Review Status
EQDP-ESE-18, Rev. 4 EQTR-E18A, Rev. 1	Static Inverter	All Questions Resolved	Reviewed, No Questions
EQDP-ESE-19, Rev. 3 EQTR-E19A, Rev. 1	Instrument Bus Distribution Panels	All Questions Resolved	Reviewed, No Questions
EQDP-ESE-20, Rev. 4 EQTR-E20A, Rev. 2 EQTR-E20B, Rev. 1	Reactor Trip Switchgear	Q1, 2, 3 Opened	Q3 Opened
EQDP-ESE-21, Rev. 3 EQTR-E21A, Rev. 1	Pressure Sensor	All Questions Resolved	All Questions Resolved
EQDP-ESE-22, Rev. 3 EQTR-E22A, Rev. 1	Power Range 4-Section Excore Detector	All Questions Resolved	Q3 Opened
EQDP-HE2/HE5, Rev. 3 EQTR-H02A/H05A, Rev. 1	Solenoid Valves (One Report)	Q3 opened A Opened	Further Q
EQDP-HE3/HE6, Rev. 3 EQTR-H03A/H06A, Rev. 1	Limit Switch (One Report)	Q2 Opened Further Q A Opened	Q2 Opened
EQDP-HE4, Rev. 3 EQTR-H04A, Rev. 1	Motor Operators	Q1 Opened No Questions	Reviewed,
WCAP-8687, Appendix A1, Rev. 1	Component Aging Program	Further Q A Opened	No Questions Received
WCAP-8687, Appendix A2, Rev. 1	Materials Aging Program	All Questions Resolved	No Questions Received

Methodology For Qualifying Westinghouse WRD
Supplied NSS Safety-Related Electrical Equipment

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP-8587 Revision 5, G. Butterworth and R. B . Miller, April 1982.

2. QUESTION:

In Section 5.2, why is IEEE 323A-1975 mentioned as a guide, when NUREG-0588 is ignored. With the adoption of 10 CFR 50.49, and the upcoming release of Regulatory Guide 1.89, Rev. 1, how will this section be changed to reflect these new criteria?

REPLY:

NUREG 0588 was not issued for guidance at the inception of the Westinghouse program. However, Westinghouse has identified the degree of conformance to NUREG 0588 in WCAP 9790 of the Westinghouse program.

QUESTION 2- NRC Position:

State Westinghouse position on use of WCAP 9790.

REPLY:

Westinghouse has supplied WCAP 9790 to the NRC and EG&G as "Information Only". We request that this WCAP not be included within the scope of this generic review. Commercially, Westinghouse has prepared this WCAP to assist Westinghouse customers/utilities in addressing or providing responses to NUREG-0588 for Category 1 plants.

11. QUESTION:

7.1, Margin - No discussion of time margin is included. Why not? Likewise, voltage and frequency. Why not?

REPLY:

Margin is required to be demonstrated on one parameter during the most severe environments. Westinghouse provides margin on the temperature, pressure, chemical content, radiation TID, seismic amplitude and frequency and therefore does not include an additional time margin requirement. Time margin is not required for aging tests where very conservative techniques are employed. Time is the parameter selected for margin during the abnormal temperature/humidity and voltage/frequency tests. Some additional information on margin is contained in Rev. 5, Section 7.1.

QUESTION 11- NRC Position:

Response inadequate - time margin must be applied.

REPLY:

The Westinghouse application of margin is consistent with the IEEE's Nuclear Power Engineering Committee amplification on this issue, which was endorsed by the NRC in its response to industry comment number 73 on NUREG-0588.

Westinghouse will insert the following statement after the second sentence in the introduction to Section 7.1 of WCAP 8587:

"Consistent with IEEE 323-1974, Westinghouse has included margin into the specification of the generic qualification parameters by either increasing the test levels, number of test cycles, test duration, or a combination of these options as appropriate. Since, however, the Westinghouse generic qualification parameters are selected to envelope a range of reactor and containment designs,

high energy line break sizes, locations etc, the actual margins available for a plant specific application will be larger than those employed by Westinghouse and can be established by the utility. Westinghouse incorporates margin, in defining qualification parameters, as follows:"

In addition Westinghouse will insert a new subsection 7.1.6 as follows and renumber the existing subsections.

"7.1.6 Operability Times

The post accident operability times specified in Section 1.7.1 of each equipment specific Equipment Qualification Data Package (EQDP) have been established to encompass a complete range of break sizes and locations. As a consequence, combination of these operating times with a worst case temperature/ pressure/chemical spray envelope which encompasses all plants referencing this program and a full spectrum of break sizes, represents a significant time margin."

QUESTION 11- Supplement received at 10/19-10/20 NRC meeting

Respond to NRC's amplified position on the one hour requirement, namely:

In the event it is necessary to use time margin evaluation techniques, the following information, as a minimum, will be documented.

1. Application of time margins less than one hour will be justified for each piece of equipment, including any judgements regarding the survivability limits of the equipment.

2. The maximum operability time will be justified with consideration for a spectrum of breaks and the potential need for the equipment later in an event or during recovery operations.

3. It will be demonstrated that failure of the equipment after the maximum operability time will neither mislead the operator to take an improper action nor further degrade the event by causing a failure in systems necessary for mitigation of the event.

4. The margin applied to the minimum operability time when combined with the other test margins will account for the uncertainties associated with the design, production tolerances, testing techniques, and the number of units tested.

REPLY:

The only equipment in the Westinghouse qualification program having an operability time less than one hour are transmitters located inside containment and used for trip functions. In this case, the Westinghouse time specification of 5 minutes is established having considered a full spectrum of breaks. In addition:

Trip Function

The Westinghouse transmitter qualification tests demonstrate that the trip accuracy requirement is maintained for up to 5 minutes and that therefore the requisite trip signal will be generated. Once the signal is generated the signal is 'locked-in' by the protection system and will not reset should the transmitter fail to continue to generate the trip signal at some time after 5 minutes. Thus, all automatic protective actions will proceed irrespective of the performance of the transmitter after 5 minutes.

Information to Operator

The transmitter qualification verifies that equipment failures do not occur in a period up to 1 hour and 5 minutes after initiation of the accident. In fact, the qualification verifies that the transmitters will continue to operate for at least 4 months post-accident while maintaining the accuracy requirement specified for post accident monitoring instrumentation.

13. QUESTION:

Appendix B, Subprogram A, Item 11 - Shelf life for some types of gaskets and other materials is limited. It should not be a blanket assumption that aging starts upon plant startup, but rather an equipment specific analysis that determines this. Please comment.

REPLY:

Some materials do have a recommended shelf life. It is generally considered acceptable to use this material anytime during this shelf life period and our position is that as long as this guideline is followed, then the aging clock as defined by a qualification program should begin on plant start-up or equipment energization and the acceptable shelf life period will not significantly detract from the total qualified life. Additional information on aging start assumptions is contained on Page B-14 of Rev. 5.

QUESTION 13- NRC Position:

Response inadequate- modify "aging clock startup" discussion.

REPLY:

Add the following to WCAP 8587 Section 6.9

"Based on recommended storage environments the "shelf life" of any equipment item is not typically a significant portion of the defined qualified life. For example, ambient temperatures during storage do not approach the operating temperatures assumed for aging calculations. Therefore, as long as equipment is in storage and not energized, any reduction in qualified life is not appropriate unless storage conditions are much greater than recommended or the storage time becomes dramatically extended. In such cases the Utility should verify the adequacy of the qualified life established by Westinghouse.

15. QUESTION:

Appendix B, Subprogram, Item 17 - Electronic circuitry is susceptible to radiation below 10^4 rads - Has this been taken into consideration?

REPLY:

(This is Item 18 in Rev. 5)
Performance of electronic circuitry when subject to radiation exposure is factored into the design of the equipment. All failures due to normal radiation background can be considered random (same as thermal effects) unless high radiation sensitivity is known, in which case other components would be selected. The Westinghouse qualification program addresses the effect of a causitive event (seismic) that could potentially cause common mode failures in irradiated hardware. Appendix C provides the basis for the Westinghouse position.

QUESTION 15- NRC Position:

Response inadequate- modify.

REPLY:

Electronic components are selected for electrical performance at specified radiation values. When this total dose is absorbed over a long period of time, some random failures can be expected. Common mode failures could only result if the dose were applied quickly and then perhaps a qualification test would be required address this concern. However, the only question that a qualification program for non-HELB environments need to address is whether any low level radiation induced mechanical degradation can occur which could cause the electrical performance to change during or following a seismic event. The threshold value was established based on a review of potential degradation of mechanical properties

after exposure to radiation. Appendix C documents that no material was found to have mechanical degradation below 10^4 rads and therefore the electrical performance of components could not be affected.

16. QUESTION:

Appendix B, Subprogram B, Item 32 - 1st option - reduced qualified life - If inclusion in Subprogram B is based on non-susceptability to any identifiable aging mechanism, then reduction of qualified life cannot be a viable option.

REPLY:

(This Item 33 in Rev. 5)
Agree in principle. The reduction in qualified life is intended to apply to those materials where extrapolation of existing data to the projected qualified life of the equipment items may be questionable.

QUESTION 16- NRC Position:

Should Appendix B, Subprogram B, item 33 "reduced qualified life" be deleted. Also, clarify which subprogram ESE-14, 19, 20 and 21 are included in.

REPLY:

Yes. "Reduced qualilfied life" will be deleted from item 33.

Also, WCAP 8587 Appendix B item 17, 28 and 34 which discuss Subprograms B and C will be clarified as to what they represent. In addition, Tables B-1 and B-2 of WCAP-8587 and EQDPs ESE-14, 19, and 20 and 21 of WCAP-8587 Supplement 1 will be modified to indicated which subprogram they are included in.

Medium Pump Motors (Outside Containment)

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP-8587 Revision 4, G. Butterworth and R. B. Miller, January 1981.

b. "Equipment Qualification Data Package, Medium Pump Motors (Outside Containment)". EQDP-AE-1 Revision 2, June 1981.

c. "Equipment Qualification Test Report, Insulation Class H (Environmental and Seismic Testing)." WCAP-8687 Supp. 2-A01A, D. C. Nowak.

Further Questions:

A. QUESTION:

Section 5.2 of the EQTR states "Utilizing an Arrhenius plot per IEEE Standard 117-1974,..." The Arrhenius methodology is the preferred method of addressing accelerated aging, however, it appears that IEEE-117-1974 only utilizes the 10°C rule.

REPLY:

IEEE-117-1974 does not only utilize the 10° C rule but includes a method of developing an Arrhenius plot for random wound motor insulation which is what Westinghouse has used in this qualification program. (See paragraph 1.2 of IEEE-117-1974).

The EQTR (Section 5.2) will be revised as follows:

"Utilizing asn Arrhenius type plot developed in accordance with IEEE standard 117-1974, the 6,336 hours of aginat at 225°C is equivalent to several times the required 40 years at 130°C. The 130°C represents a 90°C rise above an ambient of 40°C. The activation energy for the insulation system is 1.3."

C. QUESTION:

Clarification of the 12 hour time specified for Abnormal Conditions in Section 1.7 is needed. Does the 12 hours correspond to:

a. 12 hours per design year
b. 12 hours per year
c. 12 hours per loss of HVAC, etc.

REPLY:

The basis for the 12 hour test is to demonstrate the capability of equipment to operate under the potentially high humidity conditions that may result from a loss of HVAC (i.e. item c). This approach has been used consistently across the Westinghouse programs described in WCAP 8587 for equipment located in a mild environment. The selection of 12 hours is consistent with current operating practices and Technical Specification limits and represents a reasonable time for the operators to take action to restore HVAC or provide temporary supplies.

Westinghouse has verified that a limited number (i.e. less than 5) of losses of HVAC of this duration per annum does not affect the qualified life established by Westinghouse in the EQDP, which is calculated assuming a mean in-service temperature.

EQDP AE-2 EQTR A02A

Large Pump Motors (Outside Containment)

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP 8587 Revision 4, G. Butterworth and R. B. Miller, January 1981.

b. "Equipment Qualification Data Package, Large Pump Motors (Outside Containment)", EQDP-AE-2, Revision 3, July 1981.

c. "Equipment Qualification Test Report, Westinghouse LMD Motor Insulation (Environmental Testing)," WCAP 8687 Supp. 2-A02A, A. A. Anderson.

Further Questions:

A. QUESTION:

Clarification of the 12 hour time specified for Abnormal Conditions in Section 1.7 is needed. Does the 12 hours correspond to:

a. 12 hours per design year
b. 12 hours per year
c. 12 hours per loss of HVAC, etc.

REPLY:

The basis for the 12 hour test is to demonstrate the capability of equipment to operate under the potentially high humidity conditions that may result from a loss of HVAC (i.e. item c). This approach has been used consistently across the Westinghouse programs described in WCAP 8587 for equipment located in a mild environment.

The selection of 12 hours is consistent with current operating practices and Technical Specification limits and represents a reasonable time for the operators to take action to restore HVAC or provide temporary supplies.

Westinghouse has verified that a limited number (i.e. less than 5) of losses of HVAC of this duration per annum does not affect the qualified life established by Westinghouse in the EQDP, which is calculated assuming a mean in-service temperature.

Chempump Canned Motor Pump
(Outside Containment)

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment", WCAP-8587 Revision 5, G. Butterworth and R. B. Miller, April 1982.

b. "Equipment Qualification Data Package, Chempump Canned Motor Pump (Outside Containment)," EQDP-AE-3, March 1982, Revision 4.

c. "Equipment Qualification Test Report, Chempump Canned Motor Pump (Outside Containment), (Environmental and Seimsic Testing)," WCAP-8687 Supp. 2-A03A, Revision 2, Philip S. Marinkovich, March 1982.

3. QUESTION:

Section 5.1.2 of the EQTR states that the Thermal Aging of the insulation was performed using the ten degree rule. Why was this method used vice the preferred Arrhenius method?

REPLY:

Thermal aging was performed using the ten degree rule because the ten degree rule is an accepted method used in the motor industry for motor insulation testing per IEEE-117-1974.

QUESTION 3- NRC Position:

Why is 10°C rule used vice the preferred Arrhenius method as in EQTR A02A.

REPLY:

EQTR A03A Section 5.1.3 will be revised to include activation energies for each material. The life of each material will be determined utilizing the Arrhemium method.

Further Questions:

A. QUESTION:

Clarification of the 12 hour time specified for Abnormal Conditions in Section 1.7 is needed. Does the 12 hours correspond to:

a. 12 hours per design year
b. 12 hours per year
c. 12 hours per loss of HVAC, etc.

REPLY:

The basis for the 12 hour test is to demonstrate the capability of equipment to operate under the potentially high humidity conditions that may result from a loss of HVAC (i.e. item c). This approach has been used consistently across the Westinghouse programs described in WCAP 8587 for equipment located in a mild environment. The selection of 12 hours is consistent with current operating practices and Technical Specification limits and represents a reasonable time for the operators to take action to restore HVAC or provide temporary supplies.

Westinghouse has verified that a limited number (i.e. less than 5) of losses of HVAC of this duration per annum does not affect the qualified life established by Westinghouse in the EQDP, which is calculated assuming a mean in-service temperature.

Environmental Qualification For
Instrument Bus Distribution Panel

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment", WCAP-8587, Revision 4, G. Butterworth and R. B. Miller, January 1981.

b. "Equipment Qualification Data Package, Instrument Bus Distribution Panel," EQDP-ESE-19, Revision 2, September 1980.

c. "Equipment Qualification Test Report, Instrument Bus Distribution Panel (Normal and Abnormal Temperature and Humidity Testing)," WCAP-8687 - Supp 2 - E19A, M. Yalich, September 1980.

6. QUESTION:

The specified load (section 1.1)[b] is 7.5 KVA. Yet the test was for 119V max @ 55 amperes (Table III)[c]. Verify that the test load was 7.5 KVA (the reactive load was not indicated).

REPLY:

The test set-up was for the inverter output to be loaded with about 6.5 KVA, 0.8 PF load (85% of rated capacity), which is the approximate load during accident conditions. Previous discussions with the NRC Staff have assured us that this is the appropriate test condition (McDonald to Satterfield, Memorandum 1/31/79).

QUESTION 6- NRC Position:

Please provide memorandum letter.

REPLY:

McDonald to Satterfield, memorandum 1/31/79 is included as Attachment A.

Environmental Qualification For
Instrument Bus Distribution Panel

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment", WCAP-8587, Revision 4, G. Butterworth and R. B. Miller, January 1981.

b. "Equipment Qualification Data Package, Instrument Bus Distribution Panel," EQDP-ESE-19, Revision 2, September 1980.

c. "Equipment Qualification Test Report, Instrument Bus Distribution Panel (Normal and Abnormal Temperature and Humidity Testing)," WCAP-8687 - Supp 2 - E19A, M. Yalich, September 1980.

6. QUESTION:

The specified load (section 1.1)[b] is 7.5 KVA. Yet the test was for 119V max @ 55 amperes (Table III)[c]. Verify that the test load was 7.5 KVA (the reactive load was not indicated).

REPLY:

The test set-up was for the inverter output to be loaded with about 6.5 KVA, 0.8 PF load (85% of rated capacity), which is the approximate load during accident conditions. Previous discussions with the NRC Staff have assured us that this is the appropriate test condition (McDonald to Satterfield, Memorandum 1/31/79).

QUESTION 6- NRC Position:

Please provide memorandum letter.

REPLY:

McDonald to Satterfield, memorandum 1/31/79 is included as Attachment A.

Reactor Trip Switchgear

References:

a. Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP-8587, Revision 4, G. Butterworth and R. B. Miller, January 1981.

b. "Equipment Qualification Data Package, Reactor Trip Switchgear (DS-416 Circuit Breakers)", EQDP-ESE-20, Rev. 3, July 1981.

c. "Equipment Qualification Test Report, Reactor Trip Switchgear (Operational Cycling and Normal and Abnormal Temperature and Humidity Testing)," WCAP-8687 Supplement 2, E20A, Revision 1, C. F. Faust III and M. Yalich, July 1981.

d. "Equipment Qualification Test Report, Reactor Trip Switchgear (Seismic Qualification Testing)," WCAP-8687 Supplement 2, E20B, Revision 1, C. E. Faust III, D. T. Tang and M. Yalich, July 1981.

1. QUESTION:

It appears that both the environmental and the seimsic testing did not account for the 260V AC $\pm$ 10 percent, 3-phase power that must be interrupted on a breaker trip. This must be included in testing so that the total clearing time (including extinguishing of any arc) is accounted for. The power must be cycled so that any aging effects such as pitting, corrosion, etc., will be accounted for in response time and operability tests.

REPLY:

The manufacturer has data and experience of years of operation of interrupt capability. The aging affects of a power cycle can be accounted for in response time.

The specification requirement is that the power be interrupted, after initial signal, in 10 cycles of 60 cycles (equal to 167 m sec). The 50 percent point is 83.5 m sec, which translates that a new unit must be at least 83.5 m sec to meet specification limits after or near its end of life.

The nominal value measured was about 50 m sec, which is more than acceptable. These were measured after 1000 mech cycles.

QUESTION 1- NRC Position:

Response is inadequate to justify lack of power interruption cycling.

REPLY:

Previous testing of the DS circuit breaker line has indicated that neither mechanical or electrical aging of the breaker is significant with respect to its performance during a seismic event. Response time data taken before and after mechanical (1500 cycles) and electrical (800 cycles @ 2000 amps) aging showed a 3 millisecond change. Since mechanical wear seemed a more significant aging mechanism for this test sequence, 1000 cycles was performed simulating expected 40 year performance. Since no significant change is response time has ever been noted, electrical cycling was not performed on the 1600 amp breaker (maximum average load less than 425 amps).

2. QUESTION:

Section 2.9[b] indicates that the breakers are all metalic. This is used to justify non-thermally aged equipment in the seismic test, yet, Section 2.2.1[c] identifies nylon and phenolic coil spools. Provide further justification for using non-aged equipment for the seismic tests.

REPLY:

The breakers were not included in this test since they are all primarily metallic and the non-metallic material were evaluated by material analysis. Aging effects are subject to results of Appendix B, Subprogram C.

QUESTION 2- NRC Position:

Was rated current and voltage supplied during response test to account for arc extinguishment?

REPLY:

Rated current and voltage was not applied during the qualification program. Qualification programs are developed to check parameters that could potentially be degraded by aging or design basis events. The arc extinguishment is accomplished by arc chutes which do not degrade except from the arcing. Any time delay associated with arc extinguishment is covered by the original design and is not degraded by normal or abnormal environments or design basis events.

3. QUESTION:

Provide a schematic diagram of the test setups of Section 5.1[c] and Section 4.1[d].

REPLY:

These items are available at Westinghouse for audit.

QUESTION 3-NRC Position:

Please provide schematics during meeting.

REPLY:

Section 6.1 of each report describes the operations performed during the inspection tests. The drawings listed in Section 2.0 of each report are available for your review at Westinghouse. If a review of these drawings is not convenient, Westinghouse could respond to a more specific question.

Safety-Related Solenoid Valves

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP 8587, Revision 5, G. Butterworth and R. B. Miller, April 1982.

b. "Equipment Qualification Data Package, Safety-Related Solenoid Valves (Qualification Group A), (Qualification Group B)," EQDP-HE-2/HE-5, Revision 3, March 1982.

c. "Equipment Qualification Test Report, ASCO Solenoid Valves (Environmental and Seismic Testing), (Inside and Outside Containment)," WCAP-8687, Supp. 2 H02A/H05A, Revision 1, W. V. Cesarski, March 1982.

3. QUESTION:

Section 5.4 of the EQTR states that the 0.94ev values was the maximum value used in the Arrhenius Equation. Table 3 lists this value as being the minimum value. Clarification is needed on this.

REPLY:

Based on an activation energy review of the aging affected materials in the valve, 0.94 is lowest ev for any specific material on the valves material list. The higher the ev number, the less thermal aging is done and subsequently the less conservatism is assumed in the calculation. Therefore, the lowest ev number is used to maximize conservatism.

QUESTION 3-NRC Position:

If maximum conservatism is the desired meaning, then it should be used instead of the minimum ev value.

REPLY:

Westinghouse test report H02A/H05A, Paragraph 5.4, page 12, seventh line of the first paragraph, change "maximum" to "most conservative".

Safety-Related Externally Mounted Limit Switches

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP 8587, Revision 5, G. Butterworth and R. B. Miller, April 1982.

b. "Equipment Qualification Data Package, Safety-Related Externally Mounted Limit Switches, (Qualification Group A)," EQDP HE-3, Revision 2, March 1981.

c. "Equipment Qualification Test Report, Namco Externally Mounted Valve Limit Switches, (Environmental and Seismic Testing)," WCAP-8687, Supp. 2-H03A, W. V. Cesarski, March 1981.

2. QUESTION:

When using the Arrhenius Method, choosing a smaller activation energy will result in a more conservative approach. Section 5.4 ofthe EQTR states however, the 0.8 ev value was the maximum value applicable to these materials. Please clarify this contradiction.

REPLY:

Same NRC comment as on ASCO valves. See reply to HE-2 question 3.

QUESTION 2- NRC Position:

If maximum conservatism is the desired meaning, then it should be used instead of the minimum ev value.

REPLY:

Westinghouse test report H03A/H06A, Paragraph 5.4, page 11, seventh line of the first paragraph, change "maximum" to "most conservative".

EQDP HE-4 EQTR H04A

Limitorque Electric Motor Operator

References:

a. "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety-Related Electrical Equipment," WCAP 8587, Revision 5, G. Butterworth and R. B. Miller, April 1982.

b. "Equipment Qualification Data Package, Safety-Related Limitorque Valve Electric Motor Operators (Qualification Group B)," EQDP HE-4, Revision 3, March 1983.

c. "Equipment Qualification Test Report, Limitorque Electric Motor Operator (Environmental and Seismic Testing), (Outside Containment), (Non-HELB Environments)," WCAP-8687, Supp. 2 H04A, Revision 1, K. Deluse, March 1982.

1. QUESTION:

Section 5.4 of test report state maximum ev value as 0.9. When using Arrhenius method, the minimum value is the more conservative approach. Please clarify this.

REPLY:

Same NRC comment as on HE-2 ASCO valves and HE-3 NAMCO limit switches. See reply to HE-2 question 3.

QUESTION 1- NRC Position:

If maximum conservatism is the desired meaning, then it should be used instead of the minimum ev value.

REPLY:

Westinghouse test report H04A, Paragraph 5.4, page 10, seventh line of the first paragraph, change "maximum" to "most conservative".

No Initial NRC/EG&G Idaho Questions

Further Questions:

A. QUESTION:

Justify 120 cycles of operation for mechanical aging in Section 3.1.1.C. Many components may be operated much more than this.

REPLY:

Electric mechanical components in protection systems do not operate frequently. The number of cycles is accumulated through monthly periodic testing and conservatively doubling the number for a five year period yields 120 cycles. Relays of this type are designed for many times this number of operations. Although these few cycles are not considered a significant part of the design life of these components the mechanical cycling is performed to complete the qualification sequence.

1. QUESTION:

The Equipment Qualification Data Packages listed below make reference to test reports which were not submitted. In order to complete the review, the reports are required.

EQDP Number	Description	Missing Report Reference Numbers*
ESE-10	Nuclear Instrumentation System (NIS) Console	28 through 34
ESE-13	Process Protection System	35, 36, 37
ESE-16	Solid State Protection System (SSPS) Two Train (Three and Four Bay) and Safeguards Test Cabinet	32, 34, 38 through 47
ESE-18	Instrument Bus Power Supply (Static Inverter)	30, 34, 38, 41, 42, 45, 46, 48, 49
ESE-19	Instrument Bus Distribution Panel	34, 46, 49

*Reference numbers are for the reference list included in this document

REPLY:

All of the below requested reference documents with the exception of reference 34 (ST-STA-218) have been submitted to the NRC for their review.

ESE-10	WCAPs 7397-L(P)/7817(NP), 7536-L(P)/7821(NP), 8021(NP), 8830(P)/8831(NP), ST-STA-218
ESE-13	WCAPs 8828(P)/8829(NP), 7817 Supp. 4(NP), 7821 Supp. 3(NP)
ESE-16	WCAPs 8021(NP), ST-STA-218, 7817 Supp. 2(NP), 7817 Supp. 3(NP), 7821 Supp. 1(NP), 7821 Supp. 2(NP), 8673(P)/8674(NP), 8694(P)/8655(NP), 8373(NP), 7817 Supp. 7, 7821 Supp. 5(NP), 8021 Supp. 1(NP),
ESE-18	WCAPs 7536-L(P)/7821(NP), ST-STA-218, 7817 Supp. 2(NP), 7821 Supp. 2(NP), 8673(P)/8674(NP), 7817 Supp. 7(NP), 7821 Supp. 5(NP), 7397-L(P)/7817(NP), 7821 Supp. 2 Addendum 1(NP)
ESE-19	ST-STA-218, 7821 Supp. 5(NP), 7821 Supp. 2 Addendum 1(NP)

Reference 48 from the list of references submitted by the NRC should be Reference 28.

Document ST-STA-218 (Reference 34 of attached listing) which is referenced in EQDPs ESE-10, 13, 16, 18, and 19 has not been submitted to the NRC. This document was created by Westinghouse as a customer convenience to enable the utility to independently establish a method to compare plant specific seismic requirements to the generic test levels. This document, ST-STA-218, does not provide a basis for qualification but summarizes information which is available in other Westinghouse topical reports such as WCAPs 7817, 7821, and 8021. If you feel this document is still necessary for your review, Westinghouse will provide it.

QUESTION 1- NRC Position:

EG&G will notify Westinghouse of WCAPs needed to continue the review.

REPLY:

No Westinghouse action until list of WCAPs is received.

ESE-10	WCAPs 7397-L(P)/7817(NP), 7536-L(P)/7821(NP), 8021(NP), 8830(P)/8831(NP), ST-STA-218
ESE-13	WCAPs 8828(P)/8829(NP), 7817 Supp. 4(NP), 7821 Supp. 3(NP)
ESE-16	WCAPs 8021(NP), ST-STA-218, 7817 Supp. 2(NP), 7817 Supp. 3(NP), 7821 Supp. 1(NP), 7821 Supp. 2(NP), 8673(P)/8674(NP), 8694(P)/8655(NP), 8373(NP), 7817 Supp. 7, 7821 Supp. 5(NP), 8021 Supp. 1(NP),
ESE-18	WCAPs 7536-L(P)/7821(NP), ST-STA-218, 7817 Supp. 2(NP), 7821 Supp. 2(NP), 8673(P)/8674(NP), 7817 Supp. 7(NP), 7821 Supp. 5(NP), 7397-L(P)/7817(NP), 7821 Supp. 2 Addendum 1(NP)
ESE-19	ST-STA-218, 7821 Supp. 5(NP), 7821 Supp. 2 Addendum 1(NP)

Reference 48 from the list of references submitted by the NRC should be Reference 28.

Document ST-STA-218 (Reference 34 of attached listing) which is referenced in EQDPs ESE-10, 13, 16, 18, and 19 has not been submitted to the NRC. This document was created by Westinghouse as a customer convenience to enable the utility to independently establish a method to compare plant specific seismic requirements to the generic test levels. This document, ST-STA-218, does not provide a basis for qualification but summarizes information which is available in other Westinghouse topical reports such as WCAPs 7817, 7821, and 8021. If you feel this document is still necessary for your review, Westinghouse will provide it.

QUESTION 1- NRC Position:

EG&G will notify Westinghouse of WCAPs needed to continue the review.

REPLY:

No Westinghouse action until list of WCAPs is received.

2. QUESTION:

Analyses have been used in qualifying the equipment listed below but have not been included in the topical reports. These are required for completion of the review.

Reference	Revision	Section	Page	Description
EQDP-AE-1	3	4.1	15	Medium Pump Motors (Outside Containment)
EQDP-AE-2	4	4.0	20	Large Pump Motors (Outside Containment)
EQDP-AE-3	4	4.1	16	Chempump Canned Motor Pump (Outside Containment)
Supp2-E01A	1	4.2.3	7	Barton Pressure Transmitters--Group A
Supp2-E03A	1	4.2.3	7	Barton Differential Pressure Transmitters--Group A
Supp2-H03A	1	2.0	2	NAMCO Externally Mounted Limit Switches

REPLY:

This addresses AE-1, AE-2, and AE-3 references:

Analysis has been used in qualifying the Large pump motors, Medium pump motors, and Chempump canned motor pumps. The analysis technique utilized for each motor type is generic in nature. Generic seismic loads have been used for each analysis, however, in most cases there are specific motor reports for each utility. This is due to variations in motor frame sizes, speed, voltage, driven loads, etc. Attachments 2, 3 and 4 are representative reports for the Large pump motors, Medium pump motors, and Chempump canned pumps.

This addresses E01A, and E03A references:

The Barton Pressure Transmitters (Group A) and Differential Pressure Transmitters (Group A) have been qualified by testing as defined in Supp. 2-E01A and Supp. 2-E03A, respectively. Analysis has been performed as identified in Section 4.2.3 merely to determine the correct torque to be used for installation of the transmitters.

This addresses H03A reference:

This is an analysis that demonstrates that a particular mounting orientation and method of mounting results in the highest stresses in the mounting fasteners/switch mounting threads and is available for review. The report will be changed to read: (page 2, paragraph 3)" all seven limit switches tested had the most severe mounting configuration. The most severe case is the side mounted switch because this configuration uses two fasteners while the back mounted switch has four fasteners. The center of gravity of the switch is farther away from the fasteners in the sidemount configuration. During the testing the switches were operated/actuated in both . . ."

QUESTION 2- NRC Position:

EG&G Idaho will review the Westinghouse reply. Opened to further discussion.

REPLY:

No Westinghouse action. Pending NRC/EG&G evaluation.

3. QUESTION:

Demonstrate for the equipment listed below that the single orientation used for OBE testing represents a worst case orientation.

Reference	Revision	Section	Page	Description
Supp2-A01A	1	5.5	9	Medium Pump Motor Class H Insulation
Supp2-A02A	1	5.5	9	Large Pump Motor (LMD) Insulation
Supp2-A03A	2	5.3.1	8	Chempump Canned Motor Pump
Supp2-E01A	1	5.3.5	14	Barton Pressure Transmitters-- Group A
Supp2-E03B	1	5.3.5	13	Barton Differential Pressure Transmitters-- Group A
Supp2-E04A	1	5.1	6	Barton Differential Pressure Transmitters-- Group B
Supp2-E04B	2	5.1	6	Veritrak Differential Pressure Transmitters-- Group B

Reference	Revision	Section	Page	Description
Supp2-E13A	1	5.3.2	8	Process Protection System
Supp2-E13B	1	5.3.1	9	Process Protection System
Supp2-E14A	1	5.2.1	7	Indicators
Supp2-E15A	1	5.2.1	7	Recorders
Supp2-E16C	0	5.1	5	Two Bay Safeguards Test Cabinet
Supp2-E17B	0	5.1	7	Three Train Solid State Protection System
Supp2-E20B	1	5.1	5	Reactor Trip Switchgear
Supp2-E22A	1	5.5.3.1	29	Four Section Power Range Detector

REPLY:

Westinghouse employes OBE testing in the initial orientation of testing. The OBE testing consists of 5 OBE tests with the equipment principal horizontal axes mounted 45° to the input excitation direction. In addition, the drive axis is mounted at a vertical incline of 35.26° from the horizontal plane. The above arrangement allows the simultaneous excitation of the equipment three (3) principal axes with the same seismic magnitude.

OBE testing is performed prior to SSE testing to fatigue the equipment and place it in a condition it may experience prior to SSE. Using this approach Westinghouse feels the equipment has been fatigued simultaneously in all three (3) of its principal axes.

Westinghouse believes this meets the intent of IEEE-344-75.

QUESTION 3- NRC Position:

NRC is concerned that use of 5 OBE's in the first test orientation is not sufficient to fatigue the equipment for the other test orientations.

REPLY:

As stated in the 10/19/82 meeting, Westinghouse believes that the method of employing 5 OBE's in the first test orientation is more than sufficient to achieve the pre-SSE fatiguing of the test item. This is based primarily on the following reasons.

(a) The Westinghouse method of testing achieves tri-axial response of the test item due to the orientation of the equipment at 45° with respect to the horizontal projection of the drive axis of the test table. This triaxial response fatigues both the critical structural members as well as the devices mounted in the test item. The existense and severity of the tri-axial response is evident from the accelerometers mounted on the test item in each of the test item principal response axes.

(b) The Westinghouse test input is approximately 5-7 times more severe, with respect to strong motion cycles, than real earthquakes. Preliminary evidence of this was presented at the 10/19/82 meeting using current Westinghouse research related to the damage potential of earthquake waveforms.

(c) Regarding the example suggested by EG&G of a member whose weak axis is oriented 90° to the horizoantal drive-axis, Westinghouse firmly believes, based on our lengthy experience in both the design and qualification of equipment, that this theoretical situation does not realistically exist in equipment. Cabinet structure members as well as the devices mounted within, are all oriented with respect to a F-B, S-S, & V global coordinate system. Furthermore test data from tests conducted since late 1969 shows that the significant modes of equipment response also occur along these global F-B, and S-S axes. Therefore, using the Westinghouse method of testing all significant test item responses are achieved and occur along these axes.

Based on our experience in the design and testing of equipment, we have not encountered a physical example of the concern expressed by NRC. We request that the NRC provide further clarification of their concern in the form of a specific example which they know occurs in equipment of the type tested under the Westinghouse program.

9. QUESTION:

The accelerometer locations depicted in Figures 13 and 14 of Supplement2-A02A (Reference 6) do not appear to provide assurance that no resonances occurred in the stator core during the resonance testing. Absence of resonance in the stator core is required for justification of the static analyses for that area described in Section 4.1 of EQDP-AE-2.

REPLY:

The following paragraph will be added to Section 5.5 of test report A02A: "The intent of the resonance search was not to demonstrate that there is a lack of frequencies for the motor assembly in the 1-33 Hz range. The large motors are demonstrated to be rigid by the performance of tests at the manufacturer facility utilizing an electromagnetic shaker to excite the motor from 5 Hz to greater than 33 Hz. The responses are monitored with accelerometers and velocity pickups and recorded. Bump tests performed by the manufacturer are also used to confirm the fundamental motor frequencies are greater than 33 Hz."

The following editorial changes will be made:

Para 5.5: Delete "The stator was then rotated 45° to test position one.

Figure 6: Delete "and Resonance Search" from the title:

Figure 8: The title will be revised to: Stator Mounted for Seismic Testing and Resonance Search in Test Position 1.

List of Figures: The title of Figure 6 and 8 will be revised.

QUESTION 9- NRC Position:

Provide a copy of the manufacturers report that confirms the motor frequencies.

REPLY:

Westinghouse will provide a typical motor report that confirms the motor frequencies by means of a "bump test" and "electromagnetic shaker test". This report will be submitted to the NRC/EG&G Idaho by November 19, 1982.

14. QUESTION:

Spectra generated for the qualification of the PPS cabinets and associated electronic equipment should include consideration of permutations of the following:

a. tests in all four positions on the test table

b. tests of all three weight distributions (full, eccentric, and empty)

c. tests results from all locations in the cabinet where equipment can be mounted

d. tests of both two and three bay cabinets.

The RRSs to which the cabinets are qualified should be enveloped by TRSs for all permutations of a and b above. Equipment RRSs, to which cabinet mounted equipment are qualified, should envelope spectral results for all permutations of a through d above. Cabinet mounted equipment RRSs (obtained from the tests) should be enveloped by spectra from all four test positions. Any spectra presented in Supplement 2-E13A and -E13B which do not meet these enveloping requirements should be justified.

REPLY:

Westinghouse has considered the effects of items (a) through (d) in generating a worst case device response spectrum associated with the two and three bay cabinets. Testing of all permutations of items (a) through (d) are judged not to be required to define a worst case device response spectrum. The subject cabinets were tested to insure their structural integrity in their worst configuration (fully loaded). Additional tests of empty and eccentrically loaded configurations were also performed for the purpose of generating the most conservative in-equipment response spectrum. The envelope of

the in-equipment response spectra, as presented in the report, is minimally sensitive to the orientation of the cabinet on the test table. Therefore, using test data from one position for the full, eccentric, and empty testing weight configurations, for each of the cabinets, is conservative and represents the maximum probable seismic response for all configurations.

QUESTION 14- NRC Position:

a) Provide SSE spectra for either the 2-Bay 7300 Cabinet identified in WCAP-8687 Supp. 2 - E13A Revision 1 for the accelerometer which contributes most to the device response spectrum envelope.

b) Provide clarification of the floor spectra to which the 7300 Process Protection System is qualified.

REPLY:

a) Attachment B, Figures 1.0 thru 4.0, are the SSE response spectra at 5% equipment damping in the side-to-side direction at the top of the 3-bay 7300 cabinet for the four test orientations. This direction and location was the main contributor in the generation of the worst case device response spectrum.

b) WCAP-8587 "Methodology for Qualifying Westinghouse WRD Supplied NSSS Safety Related Electrical Equipment" identifies in Section 7.2.9 that presently the Process Protection sets are based on single-frequency, single axis seismic testing. Westinghouse is in the process of changing the system qualification basis using the multiple-frequency, multiple-axis seismic test program identified in WCAP-8687 Supp. 2-E13A. In doing so, devices are being seismic tested to the envelope worst case response of the 2-Bay and 3-Bay 7300 cabinets. Under this program we have, for convenience identified in Figures 42 and 46 of EQTR E13A the principle axes floor response spectrum for which the systems are respectively qualified.

15. QUESTION:

Provide further justification that the testing performed demonstrates that the voltage indicators are adequately qualified for seismicity (refer to Supplement 2-E14A). Note that 1/2 of the meters tested failed the full test series and 1/3 failed to pass either successful SSE test. These are the best results from the three test series performed. The fatigue argument made in Section 6 is not convincing because 1/3 of the meters failed in the first four SSE tests performed.

REPLY:

As explained in Section 6.3, the failures of #2107 and 2112 were attributed to fatiguing due to overtesting. Since they did survive at least one SSE, the results are considered successful. No. 2108 probably should not have been tested since the as received error was large. However, the significant factor to be assumed during the seismic event is the additional change in deviation from prior to the test. The deviations during the test from the original calibration were not significant so the data was accepted. The results including this meter demonstrate five out of six successes with one marginal failure. This conclusion provides an acceptable result to claim these devices are qualified.

QUESTION 15- NRC Position:

EG&G Idaho will reevaluate the Westinghouse reply.

REPLY:

No Westinghouse action. Pending NRC EG&G evaluation.

Further Questions:

29. QUESTION:

Discuss vibration aging of valve accessories (HE-2/HE-5 ASCO Solenoid Valves and HE-3/HE-6 NAMCO Limit Switches) in regard to the dynamic loads imposed on these items by operation of the valve.

REPLY:

The valve accessories were subjected to vibration aging by applying sinusoidal motion by exposing the units to 0.75g (or reduced accelerations at low frequencies to not exceed 0.025 inch double amplitude) with the frequency sweeping for 5-200-5 hz at a rate of 2 octaves/min. Ninety (90) minutes of vibration was applied on each of three orthogonal axes. Test units were operated during this time at 15 minute intervals.

This vibration aging is in accordance with the requirements of IEEE 382-1980 and provides a vibratory enviriomment which is representative of normal plant-induced vibration. The test induces a reasonable amount of vibratory aging on the component before the OBE and SSE testing.

The valve accessories discussed herein are typically rigidly mounted on motor operated and air operated valves. The closing times for the motor operated valves are onthe order of 10 seconds or more. The closing times for the air operated valves are approximately two seconds. Operating loads are induced on the actuators and eventually these accessories by the opening and closing of the valve are small compared to overall seismic loads of the OBE and SSE. The 0.75g accelerations utilized in the vibration aging for 90 minutes duration on each of three orthogonal axes envelope these normal operating loads.