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INFORMAL REPORT

SEABROOK 1 SQRT VISIT REPORT

J. N. Singh
T. L. Bridges
B. L. Harris

EG&G Idaho

Work performed under DOE Contract No. DE-AC07-76ID01570

Prepared for the
U.S. NUCLEAR REGULATORY COMMISSION

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ABSTRACT

EG&G Idaho is assisting the Nuclear Regulatory Commission in evaluating Public Service Company of New Hampshire's program for the dynamic qualification of safety related electrical and mechanical equipment for the Seabrook Station Unit 1. Applicants are required to use test or analysis or a combination of both to qualify equipment, such that its safety function will be ensured during and after the dynamic event, and provide documentation. The review, when completed, will indicate whether an appropriate qualification program has been defined and implemented for seismic Category I mechanical and electrical equipment which will provide reasonable assurance that such equipment will function properly during and after the excitation due to vibratory forces of the dynamic event.

SUMMARY

A seismic qualification review team (SQRT) consisting of engineers from the Equipment Qualification Branch of the Nuclear Regulatory Commission and Idaho National Engineering Laboratory made a site visit to the Seabrook Station, Unit 1 plant of Public Service Company of New Hampshire located near Seabrook, New Hampshire. They observed the field installation and reviewed the qualification reports for twenty-one selected pieces of seismic Category I electrical and mechanical equipment and their supporting structures. Three generic, one equipment specific, and two confirmatory concerns were identified for which additional information is needed in order for the SQRT to complete the review. These are referred to as open items. The review indicated that the equipment was adequately qualified for the dynamic environment pending resolution of the open items.

CONTENTS

TABLE

1. INTRODUCTION

The Equipment Qualification Branch (EQB) of the Nuclear Regulatory Commission (NRC) has the lead responsibility in reviewing and evaluating the dynamic qualification of safety related mechanical and electrical equipment. This equipment may be subjected to vibration from earthquakes and/or hydrodynamic forces. Applicants are required to use test or analysis or a combination of both to qualify equipment essential to plant safety, such that its function will be ensured during and after the dynamic event. These pieces of equipment and how they meet the required criteria are described by the applicant in a Final Safety Analysis Report (FSAR). On completion of the FSAR review, evaluation and approval, the applicant receives an Operating License (OL) for commercial plant operation.

A Seismic Qualification Review Team (SQRT) consisting of engineers from the EQB of NRC and Idaho National Engineering Laboratory (INEL), made a site visit to the Seabrook 1 nuclear power plant of Public Service Company of New Hampshire near Seabrook, New Hampshire, from November 5 through November 8, 1985. The purpose of the visit was to observe the field installation, review the equipment qualification methods, procedures (including modeling technique and adequacy), and documented results for a list of selected seismic Category I mechanical and electrical equipment and their supporting structures. This report, containing the review findings, indicates which of the items are qualified and require no additional documentation. It also identifies some equipment and certain general concerns for which additional information is needed in order for the SQRT to complete the review. These are referred to as open items. The applicant is to further investigate and provide additional documentation to resolve these issues.

Table 1 contains a list of personnel who attended the site visit. Subsequent sections of this report give a brief overview and identify the concerns, followed by the findings, for the selected seismic Category I equipment.

2. NUCLEAR STEAM SUPPLY SYSTEM (NSSS) EQUIPMENT

2.1 3-inch Globe Valve-Air Operated (NSSS-2)

The 3-in. air operated globe valve, supplied by Copes-Vulcan (model 3I88RG) was used for reactor coolant system pressure boundary isolation. This function has now been moved to a Westinghouse EMD supplied 3 in. motor operated gate valve. The decision to move the safety function was made in a meeting with personnel from Westinghouse, UE and C, and Yankee Atomic. The paperwork from the meeting was not finalized at the time of the audit. Therefore, the qualification documentation for the Westinghouse valve was not available at the audit. Therefore the documentation for the Copes-Vulcan valve were reviewed at the audit.

The qualification of the valve was done using a static analysis to demonstrate structural integrity of the valve since no natural frequencies below 33 Hz were identified from hand calculations. (See Copes-Vulcan report 10.3.030, Rev. 5, Seismic Analysis Air Operated Control Valve, January 27, 1984.)

Stresses in the valve body and bolts were shown to be below ASME Section III allowable values in Copes-Vulcan Design Report 10.2.117, Rev. 2, 1 Inch Class 1500, 2 Inch Class 1500, 2 Inch Class 2500, 3 Inch Class 1500 Air Operated Control Valves, December 28, 1979.

Operability of the valve was demonstrated using a static deflection test in Copes Vulcan Procedure No. 4.4.496, Rev. 2, Conducting Seismic Tests on Diaphragm Actuated Valves, October 5, 1981. The deflection used simulated simultaneous accelerations of 4 g vertical and 5.66 g horizontal. The valve leakage rate in the deflected position of 1.8 cc/hr compared to acceptable rate of 9 cc/hr. The opening and closing times were 2.4 sec and 1.0 sec, respectively, compared to a required time of 10 sec for both opening and closing.

Based on the observation of the field installation, review of the qualification documents, and the applicant's response to questions, the 3-in. air operated globe valve is adequately qualified for the prescribed loads.

2.2 Safety Injection System Accumulator Tank (NSSS-3)

The safety injection system (SIS) accumulator tanks (MPL SI-TK-9A) were supplied by Southwest Fabrication and Welding Co. These four tanks were purchased to specification E-spec. 679065 Rev. 3. Each tank provides 1350 cubic feet of storage for emergency core cooling water. The tanks are vertical with base anchorage consisting of 28 2 in. diameter embedded bolts. They are located at elevation -26 ft of the containment building.

These tanks were qualified by analysis performed by Basic Technology, Inc., documented by reports BTI-PJ-75015 Rev. 2, dated September 29, 1975, and BTI-76057 dated June 4, 1976. The stress analysis of these tanks was performed in accordance with the requirements of ASME Code Section III for Class 2 vessels. The tanks were evaluated for dead weight, pressure, nozzle, and seismic inertia loading. The natural frequencies of the tanks were calculated to be 22 Hz horizontal and 71 Hz vertical. The peak horizontal design spectra for SSE is .85 g at 2.5 Hz for a damping value of 4%. The corresponding vertical value is .81 g at 3.5 Hz. The tanks were analyzed statically using a horizontal acceleration of 1.5 g and a vertical acceleration of 1.0 g thus providing a very conservative analysis for seismic loading. The areas of critical stress was determined to be the anchor bolts and support skirt. For the faulted load combination (SSE plus normal loads) the calculated stresses were 7,674 psi for the anchor bolts and 4,868 psi for the support skirt compared to allowables at 26,600 psi and 14,500 psi respectively. It was noted that the tank anchor bolts were 2 inch diameter rather than 2 1/4 diameter listed on the seismic and dynamic qualification summary long form. This discrepancy was also noted by Westinghouse personnel during a walk down inspection prior to the NRC SQRT visit. United Engineers and Constructors, Inc. personnel have performed an independent analysis of the tank and tank anchor bolts using the actual bolt size and determined that anchor bolt strength is adequate.

Even though the bolts are smaller in size than originally specified by the tank vendor, the bolt material (ASTM A193, Grade B7) yield strength is higher than specified, therefore, the bolts used had a net strength in excess to the specified bolts.

Based on our inspection of the field installation, review of the qualification documents, and the applicant's responses to questions, the SIS accumulators are adequately qualified for the prescribed loads.

2.3 Electric Hydrogen Recombiner Power Supplies (NSSS-4)

The electric hydrogen recombiner (EHR) system is designed to fulfill the requirement of regulatory guide 1.7: Control of Combustible Gas Concentrations in Containment Following a Loss of Coolant Accident. This EHR power supply (tag no. 1-CGC-CP-246A, B) was supplied by Westinghouse per purchase spec. no. 679042. It was manufactured by Halmar Electronics Inc. with serial number 8110453 according to Westinghouse's drawing no. 9556D78. There are a total of two units in the safety system. The unit is located in the control building at the 21 feet 6 inches elevation. The area has mild environment. Seismic loads are considered in the qualification.

This is a vertically floor mounted item. The mounting consists of eight 5/8 inch bolts with a three inch long spacer provided for each of the four corner bolts. It was qualified by tests performed by Westinghouse. The results are in the reports: Electric Hydrogen Recombiner for Water Reactor Containments, no. WCAP-7709L, revision 0, dated July 1971 and Electric Hydrogen Recombiner LWR Containments Supplements Test Number 2, no. WCAP-7709L SUPP. 7, revision 0, dated August 1977. The laboratory mounting consisted of eight 1/2 inch-13UNC4 socket head cap screws. A three inch long spacer was provided for each of the four corner bolts. The difference between the field and laboratory mounting is reconciled by the fact that the field mounting has equal or greater strength than the laboratory mounting.

There were a number of series of tests performed. The first series was resonance search. This was a pseudotriaxial sine sweep with a 0.2 g input. The range of sweep was from 1 to 42 Hz at one octave per minute rate. Resonances detected were 3.5 and 11.0 (front/back), 16 (side/side) and 33 Hz in the vertical direction. There were two other kinds of qualification tests performed. A series of five pseudotriaxial with random inputs tests were done. These were done with generic OBE level spectra. Another series of eleven single frequency sine beat tests with inputs of five beats having ten cycles per beat at several frequencies were performed. The frequencies in hertz were 1.25, 1.75, 2.5, 3.5, 5.7, 9.5, 13, 18, 24.5 and 33.5 plus resonances. These were performed in four orientations; each 90 degrees apart. It was done with generic SSE level requirements. A 2.5 percent of critical damping was used in each case of the TRS generated. TRS in each case adequately envelope the RRS for the location.

Structural integrity and operability were monitored in each case. Only one anomaly, a loose wiring harness, was detected during the qualification test. A strap was added and four subsequent tests were done without further loosening. This modification has been provided to the shipped equipment. Another modification (FDR No. NAHM-10055, 10/27/82) provided alternative terminal blocks to allow for minimum cable bend radius with no significant seismic consequence.

The qualified life of the equipment is 40 years based on adequate and proper maintenance which is in the process of being addressed by the utility. Based on observation of the field installation, review of the qualification documentations and responses of the applicant to our inquiries the electric hydrogen recombiner power supply is adequately qualified for Seabrook Unit 1 location.

2.4 Reactor Water Make-up Valve (NSSS-5)

The reactor make-up water valve (ID no. RMWV-30; model no. N-226-B-ACC-SP) was manufactured and supplied by Walworth according to purchase spec no. 248-41. It was located in Mech. Pen. Area at the -3 ft

10.5 in. elevation. This 3 in. valve was butt welded to the pipe in the reactor make-up water system. Its function is to provide containment isolation. Seismic loads are considered in its qualification. Its qualification is based on a combination of test and analysis. The details of the tests are contained in the report: Report of Test for Nozzle Load--Seismic Testing of One (1) 3 Inch 150 lb Gate Valve With Pneumatic Operator, no. 17062-82N-2, rev. 0, dated February 28, 1983. Acton Environmental Testing Corp. wrote this report and United Engineers & Constructors reviewed it. The analysis portion of the qualification is documented in the Walworth's reports: Seismic Analysis and Natural Frequency Determination Calculations, no. ASF-13, rev. 0, dated February 8, 1983 and Design Stress Report for 3 Inch-150 lb Gate Valve, no. ADSR-16, rev. 0, dated June 21, 1983.

The lowest frequencies from the analysis were calculated to be

s/s = 188.94 Hz, f/b = 54.34 Hz and ν > 33 Hz.

However, the resonance search test indicated the following frequencies

s/s = $\begin{matrix} 10.5 \text{ Hz (closed)} \\ 10.2 \text{ Hz (open)} \end{matrix}$, f/b = 12.2 Hz and ν > 33 Hz .

On inquiry about the very significant difference between the test and analytically calculated frequencies the applicant submitted that the qualification of the valve was mainly based on testing. The analytical model was mainly used for stress calculation where significant conservatism as well as margins exist. This is a satisfactory explanation. The stress results are as follows.

Identification	Location	Loads	Total calculated stresses (psi)	Allowable stresses (psi)	Source of allowables
Bonnet	Neck	Seismic, stem thrust	12,724	25,500	ASME III
Bolting	Bonnet/yoke	Seismic, stem thrust	12,749	21,200	ASME III
Bonnet	Flange	Seismic, stem thrust press.	21,022	25,500	ASME III
Body	Crotch	Nozzle, press.	14,757	25,500	ASME III

These stresses were calculated with 3 g applied at the C.G. in each of the three directions simultaneously. The required g-levels were:

	s/s (g)	f/b (g)	v (g)
OBE	0.46	0.46	0.99
SSE	0.92	0.92	1.98

The tests performed on the valve assembly were a resonance search and a qualification test. Mounting consisted of welding the valve pipe stub to a pipe end and the pipe flange, in turn, being welded to a test fixture. The fixture was then welded to the vibration table. Results of the resonance have already been noted earlier. Qualification was performed with pseudobiaxial sine beat inputs. The specimen was mounted at an angle of 45 degrees. Sine beat tests were performed at the frequencies of 1.0, 1.25, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.3, 8.0, 10.0, 12.5, 16.0, 20.0, 25.0 and 33.0 Hz plus the resonances. Operability and leakage were verified using nitrogen as a pressurizing agent. During the test, the bolts between operator and bonnet were tightened as required. This phenomenon indicated that the bolts would need periodic tightening. On inquiry, the applicant indicated that the vendor installation and maintenance manual F.P. 97601-01 recommends bolt tightening sequence at regular intervals of approximately 12 months.

The reconciliation of the assumed g-loading with as built condition remains open. This should be confirmed when completed. Another issue of concern is the evaluation of life-span of nonmetallic parts.

Based upon the observation of the field installation, review of qualification documents, and applicant's response to questions, this item is adequately qualified pending confirmation of the generic issues mentioned above.

2.5 8-inch Motor Operated Gate Valve (NSSS-6)

The 8-in. motor operated gate valve (MPL No. RHR-8716A, B; model No. 8GM74FE.B) was supplied by Westinghouse. These two valves were purchased to specification G-678852. The motor operators for these valves are Limitorque model SMB-00. The valves are line mounted using full penetration nozzle welds at elevation -21'8" of the auxiliary building. The operators are bolted to the valve bodies with eight 5/8 in. diameter bolts. This active valve is in the RHR piping system.

Westinghouse qualified the valve by a combination of testing and analysis. The valve analysis, Westinghouse report No. 5405, rev 1, dated May 5, 1980, was performed in accordance with the requirements of ASME code section III for class 2 valves. Loading in this analysis included pressure, nozzle loads, and operator seismic inertia loading. The maximum calculated stresses were determined to be 7,770 psi compared to an allowable of 31,425 psi. Demonstration of operability of the valve was accomplished by static deflection tests of 4 inch and 12 inch similar valves with operators. Test loading consisted of 4.5 g seismic inertia loading of the operator, 2,500 psi pressure, and nozzle loads which resulted in attached piping bending stress of 3/4 of material yield strength. This testing is documented by Westinghouse report No. 4995, dated January 28, 1977.

Qualification of the Limitorque motor operators was accomplished by single frequency, single axis testing documented by Westinghouse report No. WCAP-8687 supplement 2-HO4A dated September 1983. The operator was tested to 7.75 g in each direction over the frequency range of 2 to 35 Hz. Operability of the operator was demonstrated with no observed failures or anomalies.

Based on our inspection of the field installation, review of the qualification documents, and the applicant's responses to questions, the 8 in. motor operated gate valves are adequately qualified for the prescribed loads.

2.6 Reactor Trip Switchgear (NSSS-7)

The reactor trip switchgear, supplied by Westinghouse (model no. DS-416) is located in the control building at elevation 21 ft 6 in. The switchgear provides the reactor trip function.

The reactor trip switchgear circuit breakers were qualified by test as reported in Westinghouse report EQDP-ESE-20, Rev. 5, Reactor Trip Switchgear (DS-416 Circuit Breakers), March 1983. Other parts of the switchgear were qualified by test in Westinghouse report EQDP-ESE-62A, Rev. 0, Auto Shunt Trip Panel and Shunt Trip Attachment for Reactor Trip Switchgear (DS-416 Circuit Breakers), December 1984. A 0.2 g pseudotriaxial sine sweep from 1 to 50 Hz with a sweep rate of 1 octave/minute was performed and the following natural frequencies were identified: S/S--between 5 to 6.8 Hz; F/b--between 10 and 12.5 Hz; V--33 Hz. Multifrequency pseudotriaxial input from 1 to 33 Hz was used in the qualification testing of the switchgear. Five OBE tests and 4 SSE tests were run with the TRSs enveloping the Seabrook specific RRSs for all tests. The damping was 5 percent. Thermal aging was performed and a qualified life of 5 years was established. The equipment functioned before, during, and after all tests.

The switchgear was bolted to the test table. The bolt holes on the switchgear are slotted. The actual plant mounting was done by welding the switchgear to a channel embedded in the concrete floor. More sine sweep testing was performed and reported in Westinghouse report EQ&T-EQA-502, Seismic Confirmation of Welded Base Reactor Trip Switchgear and Static Inverter for Seabrook Units 1 and 2 Application, October 1983. The following natural frequencies were found: S/S--10 Hz; f/b--15 Hz; V > 33 Hz. The welded base was shown to be stronger than the bolted base. Some slippage was also expected in the slotted bolt holes. Operability was not monitored during the welded base tests. Therefore the TRS was derated in the region from 9 to 20 Hz. Spot derating of a TRS is not acceptable. However, if the maximum derating factor of 2.32, as reported in Westinghouse Calculation RTS-D, S.O. no. NAH-149, RTS Welded Base, October 13, 1983, is applied to the whole TRS, the TRS envelops the Seabrook RRS at all frequencies. Therefore, the testing is considered adequate.

Based on the observation of the field installation, review of the qualification documents, and the applicant's response to questions, the reactor trip switchgear is adequately qualified for the prescribed loads.

2.7 Reactor Vessel Level Instrumentation System 8086 Cabinet (NSSS-8)

The reactor vessel level instrumentation system (RVLIS) cabinets and associated devices (MPL No. 1-MM-CP-486A) were supplied by Westinghouse with model No. 1726E11. Two of these cabinets will be located at elevation 75 ft of the control building. At the time of the site visit these cabinets were not available for inspection, however, the floor embedments where these cabinets are to be placed was inspected and the cabinet installation drawing was provided for review. The purpose of the RVLIS is to provide reactor vessel liquid level information after a seismic event. These systems are passive during the seismic event.

These cabinets and associated devices were qualified by testing performed by Westinghouse, documented by report WCAP 8687 supplement 2, E53A, dated March 1983. Testing of the cabinet and devices consisted of a low level resonance search test and 5 OBE level and 8 SSE level pseudo triaxial tests. The input motion for the OBE and SSE tests was sine beat over the frequency range of 1-33 Hz. The cabinet natural frequencies were determined to be 12-13 Hz side to side, 14-15 Hz front to back, and rigid vertical. Peak SSE RRS values for elevation 75 of the control building are 3.7 g at 5-6 Hz in the N-S direction, 3.1 g at 8-10 Hz in the E-W direction, and 6.0 g at 8-10 Hz vertical. These RRS values correspond to 4% damping. For 5% damping the SSE peak TRS values enveloped 9.3 g in the frequency range of 5-10 Hz for all three directions.

Anomalies were observed at the beginning of the tests. An electrical malfunction occurred due to frayed wires and a cold solder joint and a loose fuse holder resulted in intermittent loss of 15 volt power. These items were repaired and the tests were started over and completed without any additional electrical anomalies. Assembly and inspection procedures were modified and implemented to provide assurance that the anomalies would not reoccur in this equipment in the plants. An additional anomaly observed was a cracked weld in a horizontal door jam. This had no effect on operability or structural adequacy of the cabinet and therefore required no corrective action.

Based on our review of the installation drawing and the qualification documents and the applicant's responses to questions, the RVLIS is adequately qualified for the prescribed loads.

2.8 Nuclear Instrumentation System Cabinet (NSSS-11)

Nuclear instrumentation system (NIS) cabinet (model no. 1062E37G03, tag no. 1N1-CP-0016) was manufactured and supplied by Westinghouse according to purchase specification no. 953266. It was located in the control building at the 75 feet elevation. The mounting consisted of 3/16 inch welds in the front and rear (minimum 3 inches at corner columns

and 6 inches at the center columns). This vertically floor mounted four bay cabinet has common top and bottom rails. They are also bolted together on its sides. It provides alarm function, secondary control function of indicating reactor status during startup, power operation and overpower trip protection. Seismic loads are considered in qualification. Its qualification is based on tests performed by Westinghouse and documented in reports: Seismic Testing of Electrical and Control Equipment (PG&E Plants), no. WCAP-8021 rev. 0, dated May 1973 and Equipment Qualification Data Package--Nuclear Instrumentation System (NIS) Console, no. WCAP-8587, EQDP-ESE-10, rev. 5, dated March 1983.

The laboratory mounting was different than the field in that it was bolted to the test with eight 3/4 inch diameter A307 bolts (4 bolts per bay). However, this field mounting was shown to be at least as strong and rigid as the laboratory mounting. It was only a two bay configuration which was tested. Two series of tests were performed on this unit. The first was a resonance series with single axis 0.2 g sine sweep in each of the equipment principal axis. The sweep was from 1 to 35 Hz at a rate of one octave per minute. The following resonances were indicated:

s/s	f/b	v
5.0-7.7 Hz	5.0-7.7 Hz	>33 Hz

Subsequently, single axis sine beat tests were performed in the three axis directions. The sine beat consisted of five beats with ten cycles per beat and performed at frequencies of 1.25, 1.75, 2.5, 3.5, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35 Hz plus resonances. These tests had adequate intensities to envelope the required response spectra. A damping of five percent was used in the generation of TRS against a four percent RRS.

The operability was demonstrated through another test sequence done by Westinghouse documented in the report: Seismic Operability Demonstration Testing of the Nuclear Instrumentation System Bistable Amplifier no. WCAP 8830 dated October 1976. During this series of tests, the cabinet fell off the table due to abnormally high input, however, the equipment in it still functioned satisfactorily.

In the sine beat series, the drawer latch mechanism failed which was modified for satisfactory performance in the shipped unit. This was done by bolting the drawer face plate to the cabinet.

Based upon our observation of the field installation, review of qualification reports and applicant's responses to our questions, the NIS cabinet is adequately qualified for Seabrook application having a qualified life of five years.

2.9 Safeguards Test Cabinet (NSSS-12)

The safeguards test cabinet, supplied by Westinghouse (model no. 1065E21) is located in the control building at elevation 75 ft. The safeguards test cabinet supplies power to the control panel.

The safeguards test cabinet was qualified by test as discussed in Westinghouse report WCAP-8687, supp. 2E16C, Rev. 0, Equipment Qualification Test Report Two-Bay Safeguards Test Cabinet (Seismic Design Verification Testing), April 1982. A 0.2 g resonance search was performed from 1 to 50 Hz with a sweep rate of 1 octave/minute. The following natural frequencies were found: S/S--between 19 and 21 Hz; f/b--between 17.5 and 21.5 Hz; V--33 Hz. The qualification testing, as reported in Westinghouse report EQDP-ESE-16, Rev. 5, Solid State Protection System (SPSS) Two Train (Three and Four Bay) and Safeguard Test Cabinet, March 1983, was done using pseudotriaxial multifrequency input to the test table. Five OBE tests were performed followed by 1 SSE. The TRSs used in all tests enveloped the Seabrook specific RRSs. The damping was 4 percent. The safeguards test cabinet was operable before, during, and after all tests. Environmental aging has been performed and a qualified life of 5 years has been established.

The tests were performed with the cabinet bolted to the test table. The cabinet is welded to a channel which is embedded in the concrete in the plant. UE and C found stresses in the welds to be satisfactory for the

peak SSE and OBE accelerations taken from the floor spectra at that location. (See UE and C computation sheet--SBMAG-CO-01, Issue no. 1, Data Sheet NSS.387-1E, Safeguard Test Cabinets.)

Based on our observation of the field installation, review of the qualification reports and the applicant's response to our questions, the safeguards test cabinet is considered adequately qualified for the prescribed loading.

2.10 Instrument Bus Power Supply: Static Inverter (NSSS-13)

The static inverter (drawing no. 4950C70) was supplied by Westinghouse according to purchase spec. no. G676573, rev. 5. It is located in the control building at the 21 foot 6 inch elevation. It is mounted vertically on the floor with 1/4 inch fillet welds 3 inches long at four places (two in the front and two in the rear). It is a part of the reactor protection system. The input can be either a 480 V ac 3-phase or 125 V dc from battery. Its output is 118 V ac 60 Hz power to an instrument bus distribution panel that provides power to instrumentation monitoring and indicating various plant parameters. Seismic loads are considered in the qualification.

The static inverter was qualified through tests performed on a similar unit. Tests were performed by Westinghouse and documented in their reports: Seismic Testing of Electrical and Control Equipment (High Seismic Plants), no. WCAP 7821 rev. 0 dated December 1971 with its supplement 5 dated September 1976 and Equipment Qualification Data Package--Instrument Bus Power Supply (Static Inverter), WCAP 8587/EQDP-ESE-18, rev. 5 dated March 1983. The laboratory mounting consisted of four 5/8 inch A307 bolts. There were two series of tests performed. The first was a resonance series. It was a single axis sine sweep from 1 to 35 Hz at a sweep rate of one octave per minute in each of the equipment principal axes. It indicated the following frequencies:

s/s	f/b	v
6.8 Hz	6.8 Hz	33 Hz

The second series was single axis sine beat tests. The sine beat consisted of 5 beats with ten cycles per beat. These tests were performed at a minimum of eleven frequencies per test direction. Structural integrity and operability were verified with two anomalies. Large capacitors mounted on a V-shaped bracket vibrated loose and there were broken welds in the frame base. However, the unit maintained its operability regardless of the mechanical failures. Mild environment tests per WCAP-8587, supp. 1, EQDP-ESE-18 were also done. The qualified life based on the aging of the weakest link of the unit is five years. The tests performed are adequate. The results are acceptable. An auditable link between the field and tested unit which was lacking at the time of review was subsequently provided in document: Auditable Link Document for Seabrook 1, no. EQAL-NAH, Rev. 4 dated December 1985.

Based upon observation of the field installation, review of qualification documents, and responses of the applicant to our questions, the unit is adequately qualified for Seabrook 1 site.

3. BALANCE OF PLANT (BOP) EQUIPMENT

3.1 36-inch Butterfly Valve (BOP-1)

The 36-in. butterfly valve, supplied by Posi-Seal is located in the containment building at elevation 21 ft 6 in. The model number was not shown on the valve itself and, therefore, could not be compared against the number given on the long form. The valve is used to isolate the containment. A large Matryx air actuator is mounted on top of the valve with the center line of the actuator horizontal and perpendicular to the center line of the pipe. A bracket constructed from 3 x 3 x 3/8 in. angle connects the long end of the actuator to the pipe.

The valve and actuator were qualified by test in Foreign Print 90615 Issue 1, Butterfly Valve Seismic Vibration Test Report, January 12, 1976. Wyle Laboratories (see Wyle test report 54598) tested a 30 in. valve with the actuator mounted on top with the centerline of the actuator parallel to the centerline of the pipe. No bracket was installed on the valve that was tested. The testing showed many frequencies below 33 Hz: s/s--31 Hz, f/b--12, 14, 20, 30, 36 Hz and V-14, 29 Hz. Single frequency biaxial 3 g sine dwell tests were run for 30 seconds at 12, 14, 20, 29, 30, 32, 36, and 40 Hz both in phase and out of phase. The valve was operated during some of the tests. No natural frequencies below 33 Hz were identified for the valve itself. (See Foreign Print 91723 Issue 1, Nuclear Seismic Analysis, report no. 11473, Rev. B, Posi-Seal International, Inc., June 29, 1983.)

The bracket was added to make the valve/actuator assembly stiffer and to remove all natural frequencies less than 33 Hz.

In Foreign Print 91157 Issue 8, Butterfly Valves Nuclear Seismic Analysis and Addendum A, 10/31/85, Posi-Seal performed hand calculations to show that the lowest natural frequency for the field mounting is 33.9 Hz. No other qualification testing was performed since no natural frequencies were identified below 33 Hz.

The reviewer accepted the single frequency qualification testing based on the following discussion. The 36" pipe section is very short and was therefore considered rigid. The actuator then sees the floor spectra with no amplification. The peaks of the horizontal and vertical spectra for 2% damping are 2.03 g at 3-4 Hz and 1.75 g at 10-12 Hz respectively. The lowest natural frequencies vertical and front/back are probably the movement of the long end of the actuator. These movements have been restrained by the bracket. Assuming that the next lowest frequency is 20 Hz f/b the acceleration is only about 0.6 g. For higher frequencies the acceleration decreases. Therefore not much multimodal contribution is expected and the single frequency qualification testing is adequate.

The qualified life of the valve seal was found to be 5 years based on thermal aging of the seal. It was also specified that the seal must be replaced if the seal is exposed to radiation. The qualified life stated on the long form was 24 years. This comment was relayed to the utility as a request to verify the maintenance procedures.

Based on the observation of the field installation, review of the qualification documents, and the applicant's response to questions, the 36 in. butterfly valve is adequately qualified for the prescribed loads.

3.2 Control Switch (BOP-3)

The control switch (Model No. GE-SB1, Cat. No. 184B8816G1X2; MPL no. CP-CS-6601-1) was manufactured by General Electric and supplied by York Electro Panel Control Co. according to the purchase spec. no. 170-1. It was located in the control room at the 75 feet elevation of the control building. This switch was mounted on a panel with three screws, its standard mounting. It is a part of the rod control and position system. It is intended to be used in tripping the reactor manually from the main control board.

The qualification of this switch is based on tests performed on a similar switch in a similar configuration. Details of the tests are in the reports: Seismic Simulation Test Program on Electrical Control Panel, no. 45657-1, rev. 0, dated July 23, 1981 by Wyle Laboratories and Final Report--Seismic Qualification Test of Main Control Board Zone E, no. 80127-407, rev. 0, dated August 28, 1981 by Analytical Engineering Associates, Inc. These two reports were reviewed by United Engineers and Constructors. Seismic loads were considered in the qualification.

The tests were performed with the switch mounted on the panel with screws. The panel in turn was welded to the shaker table with 1/4 inch fillet weld five inches long both inside and outside. There were two series of tests performed. The first series was resonance search. It was a single axis, sine sweep from 1 to 50 Hz in horizontal and 1 to 87 Hz in the vertical direction with a 0.1 g magnitude. The sweep rate was one octave per minute. The following resonances were indicated for the mounting locations:

s/s	f/b	v
18 Hz	12 Hz	21 Hz

Subsequently a series of qualification tests were performed. The inputs were random, independent biaxial. TRS were generated for each test. Two and three percent damping values, respectively, were used in TRS generation for OBE and SSE. The same values of damping were used for the RRS. There were five OBE and one SSE level tests performed. The TRS envelop the RRS satisfactorily in each case. Structural adequacy and operability were verified. No anomaly was detected. The specimen was aged before the seismic tests.

There were additional tests performed on the switches by General Electric Company. The details are in the report: IEEE Qualification Report for SBI Switches, no. F.P. 73385, rev. 0, dated July 26, 1981. In these tests, the switches were mounted in its standard mounting and placed on the table. The inputs were random and independent biaxial. There were

five OBE and one SSE level tests performed. The damping values were five and three percent, respectively, for the TRS and RRS. Aging was also performed on the specimen prior to seismic tests. Structural adequacy and operability were verified. No anomaly was detected.

Based on the observation of the field installation and review of the qualification documents the control switch is adequately qualified for the Seabrook location.

3.3 Computing Device (BOP-4)

The computing device (model no. NLP; MPL No. EDE-AY-9700) was manufactured and supplied by Westinghouse according to the purchase spec. no. 174-2. This card was mounted in a cabinet with two 10-32 "wiz-lock" bolts. The cabinet is located in the control building at the 75 feet elevation. It is a part of the electrical distribution emergency system. Its function is signal conversion for monitoring diesel generator output current.

The seismic qualification of the computing device is based on tests performed on a similar unit. Details of the tests are in the report: Equipment Qualification Test Report Process Protection System (Supplemental Testing of Printed Circuit Cards), no. WCAP-8687 supp. 2-E13C, rev. 0, dated August 1984 by Westinghouse. It was reviewed by United Engineers & Constructors. The mounting configuration was identical to that used in the 7300 series two bay cabinet test, i.e., 10-32 "Wiz-lock" bolts. There were resonance tests performed but the resonances were not noted in the Westinghouse's report. For the qualification, pseudotriaxial, phase coherent, random for OBE and pseudobiaxial, phase coherent, random for SSE inputs were utilized. There were five OBE and one SSE level tests performed. A four percent damping was used in the RRS in comparison to a five percent in the TRS. The TRS were compared to the Westinghouse's generic RRS. The TRS enveloped this generic RRS adequately. However, Seabrook specific RRS exceeds the Westinghouse's generic RRS. In response to a question on this apparent drawback, the applicant (through Westinghouse) indicated that a subsequent test had since been performed which showed the adequacy of the tests with respect to the Seabrook

specific RRS. Further that the report was under revision reflecting the qualification of the device to be adequate. During the series of tests performed, there were two PC cards which did not function properly during the first and second cycles of the test. They were replaced and passed subsequent tests.

Based upon the observation of the field installation, review of the qualification documents and particularly the responses to the questions, the computing device is adequately qualified for Seabrook site.

3.4 Emergency Feedwater Pump and Turbine (BOP-5)

Turbine

The emergency feedwater water pump turbine (model no. GS-2N; MPL no. FW-TD-2) was manufactured by Terry Turbine and supplied by Ingersoll-Rand Company according to purchase spec. no. 238-10. It was located in the emergency feedwater pumphouse at the 27 feet elevation. In the field the turbine will be attached to a skid with taper pins and guide blocks. The guide blocks were to be welded with 1/4 inch continuous weld. They were not complete yet. The skid to floor mounting consisted of eight 3/4 inch anchor bolts. This turbine and pump is a part of the emergency feedwater system which provides feedwater to the steam generator during loss of heat sink, due to line break, loss of normal feedwater and reactor/turbine trip. The redundancy is a motor driven pump (MPL No. 1-FW-P-37B).

The seismic qualification of this turbine is based on a combination of tests and analysis. The testing part of the qualification was done by Wyle Laboratories as documented in the report: Seismic Testing On One GS-2 Turbine, no. 58038, rev. 0, dated April 21, 1976. The report was reviewed by United Engineers and Constructors (UE&C). The analysis part was done by Ingersoll-Rand documented in the report: GS-2N Qualification Report for Ingersoll-Rand (Supplementary Analysis), no. TM-105, rev. 0, dated September 24, 1979. It was also reviewed by United Engineers and Constructors.

For the test, the turbine was bolted with six 1 inch bolts to a 1 inch plate test fixture. There were two series of tests performed. The first was a resonance search. It was done with 0.2 g magnitude sinusoidal frequency sweep at one octave per minute. The following resonances were indicated below 35 Hz:

s/s	f/b	v
15, 21 & 27 Hz	22, 32 Hz	22.32 Hz

The qualification tests consisted of pseudobiaxial random inputs. The required ZPA were:

	s/s	f/b	v
OBE	0.47 g	0.39 g	1.39 g
SSE	0.74 g	0.64 g	1.60 g

The tests ZPA were

	s/s	f/b	v
OBE	2.0 g	2.0 g	3.0 g
SSE	2.0 g	3.0 g	3.2 g

TRS were generated for each case. Two percent damping was used for both TRS and RRS. For OBE and SSE, TRS do not envelop the Seabrook RRS for the vertical direction between about the 16 to 26 Hz region. The equipment has resonant frequency in this region. On inquiry, it was revealed that UE&C was aware of the situation and in the process of resolving it. However, there are a number of anomalies (too many to enumerate) as reported in the Wyle Laboratory report. Some of them appear to indicate modifications and changes. A satisfactory disposition of all of them is to be confirmed.

The analysis part consists of static coefficient method with a two dimensional model for stresses. The calculated stress in the #9 taper pins at the base of the turbine with seismic, nozzle and deadweight is 48127 psi against an allowable of 52200 psi.

Pump

The pump (model no. NH, MPL no. 1-FW-P-37A) was manufactured and supplied by Ingersoll-Rand Company (IRC) according to the purchase spec. no. 238-10. It is also skid mounted as the turbine but has #10 taper pins.

The qualification of the pump is based on analysis performed by (PDCI) Polytecnic Design Co. Inc. The details are in the report: Seismic Qualification, 4 x 9 NH-10 Emergency Feedwater Pump by PDCI and Structural Integrity and Operability Analysis of 4 x 9 NH-10 Turbine Driven Emergency Feedwater Pump, No. EAS-TR-8001, rev. 1, dated June 25, 1984. The frequency calculations show that the pump is relatively rigid. Therefore, a static analysis has been used to calculate the stresses and deflections. A finite element technique with isoparametric 3-D solid elements with the ANSYS computer code is used for analysis. Seismic loads in conjunction with other loads are considered in the analysis. The calculated stress in the pump shaft is 7430 psi against an allowable of 7500 psi (Ingersoll-Rand Design Criteria). The total shaft deflection at the seal is calculated to be 0.004 inch against manufacturer allowable of 0.005 inch. This indicates that the pump is structurally adequate and can operate.

Based on the observation of the field installation, review of the qualification reports and responses to the questions provided by the applicant, the turbine and pump assembly is qualified for Seabrook 1 application pending confirmation the following:

a. The anomalies as reported in the Wyle report are satisfactorily resolved, and

b. Seismic qualification of the temporary 3-inch drain line (which may be a permanent fix) is performed and found adequate.

3.5 4-inch Motor Operated Globe Valve (BOP-6)

The 4-in. motor operated globe valves (MPL No. MS-V-204, 205, 206, 207) were supplied by Rockwell International with vendor serial

No. BE 728. The four valves were purchased to specification No. 248-65. The valve's motor operators are Limitorque model no. SMB-00-10. The valves are line mounted (full penetration welds) in 4 inch bypass lines around the main steam isolation valves. The operators are bolted to the valve bodies with eight 5/8 in. diameter bolts.

The valve was qualified by a combination of test and analysis performed by Rockwell International. The valve was analyzed in accordance with the requirements of ASME Code Section III for class 2 valves. This analysis is documented by report no. RAL-3142. A three dimensional computer model of the 4 inch bypass piping, valve and operator was developed to determine its natural frequency. It's natural frequency was determined to be 39.5 Hz from this analysis. A static deflection test was performed on a similar valve and operator assembly to demonstrate operability of the valve. This test consisted of imposing nozzle loads on the valve and displacements on the operator corresponding to seismic inertia loading. This testing was documented by test report no. RAL-1073.

The operator was qualified separately testing documented by Limitorque report No. B0058. The operator was tested using single axis sine dwell test for the frequency range of 5 to 35 Hz. The operator was bolted directly to a rigid test table. No natural frequencies were found below 33 Hz. The test acceleration levels were all above 3 g's and up to 6 g's horizontal and 3.2 g vertical at 35 Hz. Operability of the operator was demonstrated, with no observed failures or anomalies.

Based on our inspection of the field installation, review of the qualification documents, and the applicant's responses to questions, the 4 in. globe valve and operator are adequately qualified for the prescribed loads.

3.6 Neutron Flux Signal Processor (BOP-7)

The neutron flux signal processor, supplied by Gamma-Metrics (model 900043-101), is located in the control building at elevation

21 ft-6 in. The model number shown on the long form did not match that shown on the actual piece of equipment. The processor gives the operator an indication of neutron flux and shutdown margin.

The processor was qualified by test in Foreign Print 73327 Issue 2, Wyle Laboratories test report 58826, Rev. A, RCS Series Seismic Test Report, 5/23/83. A 0.2 g sine sweep test from 1 to 40 Hz with a sweep rate of one octave per minute was performed and two natural frequencies below 33 Hz were identified. They were 20 Hz S/S and 26 Hz vertical. No f/b resonances below 33 Hz were found. Qualification testing was done using a biaxial random motion input containing frequencies from 1 to 50 Hz with incoherent phasing. Three different mounting orientations of the processor with 90 degree angle rotations from each other were used to simulate motion in each direction. Five OBE tests and 1 SSE test were performed in each orientation. The damping values used for OBE and SSE were 2 and 3 percent, respectively. Each TRS for all tests enveloped the Seabrook specific RRSs for both OBE and SSE.

One anomaly occurred during one of the SSE tests. The shaker table reached its maximum stroke capability in the vertical direction resulting in a shock impact to the test specimen. However, no structural damage occurred during any of the tests and the processor functioned before, during, and after all tests. The test mounting adequately simulated the field mounting.

A shutdown margin isolator and 4 other isolators are mounted to a circuit board inside the processor. The shutdown margin isolator was loosely mounted to the circuit board but the other isolators appeared to be tighter. All of the isolators must be operational for the processor to perform its function during testing. The processor did function during testing and, furthermore, the vendor stated that the unit tested was identical to the one in the plant.

Irradiation tests and extreme temperature and humidity tests have been performed for aging considerations. However, a qualified life has not yet been established for the processor. Impell Corporation performed the environmental testing but the report is still under review by UE and C. The environmental testing is reported in Foreign Print 73326 Issue 2, RCS Series Qualification Test Report, April 1983.

Based on the observation of the field installation, review of the qualification documents, and the applicant's response to questions, the neutron flux signal processor is adequately qualified for the prescribed loads.

3.7 Vibration Monitoring Control Panel (BOP-11)

The vibration monitoring control panel, supplied by Technology for Energy Corp., is located in the control building at elevation 75 ft. The model number was not shown on the panel itself and could only be found by referring to the drawing. The model number shown on the drawing was the number included on the long form. This panel indicates the position of the pressurizer relief valves to the operator.

The TEC model 1414 valve flow monitor is a bank of controls mounted on the TEC model 158 cabinet. The TEC model 158 cabinet at Seabrook was built before November 1983 and the cabinet tested was slightly different. Foreign Print 73784 Issue 1, Addendum A to Seismic Qualification Test Report 30080-TR-02 discusses the differences and concludes that there is no reduction in seismic integrity for the 158 cabinet, compared to the one tested. Foreign Print 72975 Issue 1, Test Report TEC 1430-4 Valve Flow Monitor System, September 1981 discusses the testing program. Five OBE and 1 SSE tests were performed. The TRS exceeded the RRS at all frequencies for all tests. The valve flow monitor system was functional before, during, and after the tests. No abnormalities occurred during testing.

The Model 158 cabinet was bolted in the test and welded in the plant. UE and C has a program in progress to evaluate the differences in bolted and welded mounting conditions. It is felt that the evaluation program is adequate.

Based on our observation of the field installation, review of the qualification reports and the applicant's response to our questions, the vibration monitoring control panel is considered adequately qualified for the prescribed loading.

3.8 18-inch Feedwater Isolation Valve (BOP-14)

The 18-in. feedwater isolation valve (MPL no. FW-V-30) was supplied by Borg-Warner Co with model no. 73890. Four of these valves were purchased to specification No. 248-36. These valves are pneumatic-hydraulic operated 18 inch, 900 lb rated gate valves. They are line mounted with full penetration welds at elevation 8'-3" of the mainstream feedwater pipe chise. The valves are horizontal with vertical actuators.

Qualification of these valves was performed by a combination of testing and analysis. The valves were analyzed in accordance with the requirements for ASME code section III for class 2 valves. The valve analysis is documented by Borg Warner Report no. 73890 dated July 15, 1982. The valve body maximum calculated stresses were 24,610 psi compared to an allowable stress of 42,000 psi. The valve and operator were tested for operability by a static deflection test which included nozzle loads and operator loads simulating 3.0 g seismic inertia loading. This test is documented by Borg Warner report no. OTP73890 dated Dec 1, 1980.

The valve operator was qualified for seismic loading by separate biaxial random motion tests. The SSE test motion was in excess of 10 g and the TRS enveloped the plant generic RRS for line mounted equipment for all frequencies above 4 Hz. The operator was subjected to 5 SSE tests and 1 OBE test in each test direction (horizontal 1/vertical and (horizontal 2/vertical). Operability of the operator was demonstrated. A total of four anomalies were observed during the qualification of the

operator. They were 1) "O" ring seals were nicked, 2) hydraulic fluid absorbed moisture, 3) "O" ring seal took a set, and 4) a solenoid valve rupture disc ruptured. Design and maintenance procedure changes for the operator were incorporated to prevent reoccurrence of these anomalies. These were 1) the nicked o-ring was determined to have occurred at installation or upon removal and required no design change, 2) the hydraulic fluid was changed every 50 hours during environmental testing and the maintenance procedures were modified to require the oil to be changed every 2 years which corresponds to the accelerated aging test duration of 50 hours, 3) the o-ring seal design was modified to provide a better seal, 4) the solenoid valve rupture disc was determined not to be required and the design was changed to remove the rupture disc.

Based on our inspection of the field installation, review of the qualification documents, and the applicant's responses to questions, this valve and operator are adequately qualified for the prescribed loads.

3.9 6-inch Motor Operated Gate Valve (BOP-15)

The 6-in. motor operated gate valve (MPL No. CBS-V-38) was supplied by Walworth Co. with serial no. A 3699. It was purchased to specification No. 248-41. The motor operator for this valve is a Limitorque model No. SMB-000-5. The valve is line mounted using full penetration welds at elevation 22'-3" of the tank farm. The motor operator is bolted to the valve body with sixteen 5/8 in. diameter bolts. This valve is an active valve located in the containment spray system.

The valve was qualified by a combination of analysis and testing. The valve was analyzed in accordance to the requirements of ASME code section III for class 2 valves. The valve body stress was calculated to be 20,292 psi compared to a code allowable of 26,250 psi. The valve and operator assembly was tested by Action Environmental Testing corporation. The tests consisted low level resonance search and pseudobiaxial sine beat tests. The resonances found were 27.5 Hz side to side, 30.5 Hz, front to back, and rigid vertical.

The pseudo biaxial tests were performed for the frequency range from 4 Hz to 33 Hz with an acceleration level of 3.0 g in all test directions. The valve was mounted with an imposed nozzle load of 33,810 in-lbs for these tests. The valve was tested in 4 positions to account for the use of coherent test motion. Operability of the valve and operator was demonstrated with no observed failures or anomalies.

The operator was also qualified by a separate test report by Limitorque (Test Report B 0058). See BOP-6 for the details of that testing.

Based on our inspection of the field installation, review of the qualification documents, and the applicant's responses to questions this valve and operator are adequately qualified for the prescribed loads.

3.10 Diesel Generator Relay Control Panel (BOP-16)

The diesel generator relay control cabinets (MPL no. DG-CP-36, 37) were supplied by Colt Industries with model no. 11-871-638. These two cabinets and associated devices were purchased to specification no. 201-1. The cabinets a supported off the diesel generator skids at elevation 21'-6" of the diesel generator building. The cabinet is supported to the diesel generator skip by four gusset supports which are welded to the skid and angle frame around the exterior back of the cabinet.

The relay control cabinet and associated devices were qualified by testing performed by Wyle Laboratories and documented by report No. 44011-1 dated May 24, 1978. Test mounting was more flexible than field mounting of the cabinet in that the angle framework was not included. Gussets were welded directly to the cabinet for testing. Testing consisted of 5 OBE level and 1 SSE level test in each test direction. The tests were biaxial phase incoherent random motion tests. The TRS enveloped the RRS for each test. Operability of the devices was demonstrated however two anomalies were observed. A cracked insulator and a broken bolt were found. Adequate justification for these anomalies was not provided.

Based on our inspection of the field installation, review of the qualification documents, and the applicant's response to questions, the diesel generator relay control is adequately qualified for the prescribed loads pending adequate justification is provided for the test anomalies.

3.11 Pressure Switch (BOP-17)

The pressure switch, supplied by Detroit Switch (model 222-10) is mounted on the diesel generator at elevation 21 ft-6 in. This switch regulates lube oil flow to the diesel engine.

The pressure switch was a surprise item and the long form and qualification documentation were examined only for completeness. A thorough review of the documentation was not performed. The qualification package appeared complete but it is still under review by UE and C.

4. FINDINGS AND CONCLUSION

The review of the Seabrook Station, Unit 1 will be completed when the following open items are closed.

4.1 Generic Issues

4.1.1

During the field observation of the nuclear instrumentation system cabinet it appeared that the clearance between this unit and the adjacent solid state protection system train B was not adequate. On inquiry, it was further learned that this problem was associated with many other cabinets as well. However, the applicant was aware of the problem and indicated that the analysis and resolution of the problem was being actively pursued.

A final and satisfactory resolution of this problem, on generic basis, should be confirmed to the NRC.

4.1.2

During the documentation review of the reactor make-up water valve (RMWV-30: NSSS-5), it was discovered that the g-loading assumed for the valve qualification has not been reconciled with the as-built condition. This is true for other valves as well. However, the applicant indicated that a program was already in place and in progress to do the reconciliation.

NRC should be informed when the program is completed.

4.1.3

The evaluation of the life-span of nonmetallic parts for the 3-inch valve-air operated has not been performed. This problem exists with many other equipment items.

It should be performed and confirmed to the NRC as to its completion.

4.2 Equipment Specific Issues

4.2.1

The review of the report prepared by Wyle Laboratories of the tests performed on the diesel generator relay control cabinet (BOP-16), revealed a number of anomalies. These are detailed in the report.

In order for the item to be adequately qualified, these anomalies should be satisfactorily resolved.

4.3 Confirmatory Issues

4.3.1

The Wyle Laboratories tests on the emergency feedwater pump turbine (Terry Turbine: BOP-5) reported a substantial number of anomalies (too many to enumerate here). Some of them appear to need field modifications. A confirmation of satisfactory disposition of all the anomalies is required.

4.3.2

During the field observation of the emergency feedwater pump turbine (BOP-5), it was found that a temporary 3-inch drain line was installed. It was also reported that the line might become a permanent fix.

Seismic adequacy of the line should be established if it became a permanent fix. This should be confirmed to the NRC.

4.4 Conclusion

Based on our review, we conclude that, pending resolution of all open items, an appropriate qualification program has been defined and implemented for the seismic Category I mechanical and electrical equipment

which will provide reasonable assurance that such equipment will function properly during and after the excitation due to the vibratory forces imposed by safe shutdown earthquake in combination with normal operating loads.

TABLE 1. LIST OF ATTENDEES

V. Nerses	NRC/NRR/DL/LB#3	
C. D. Greiman	UE&C/EQTF	
K. C. Robertson	UE&C	
H. Flora	UE&C	
D. A. Mehta	UE&C	Phila.
S. N. Caruso	UE&C	Seabrook
J. P. Namburd	UE&C	Phila.
J. J. Parisano	UE&C	Phila.
K. M. Kalawadia	UE&C	Phila.
H. J. McGiuley	UE&C	Phila.
J. A. Herrera	UE&C	Phila.
J. D. Brundt	UE&C	Phila.
E. Pilhuj	UE&C	Phila.
V. W. Sanchez	NHY	SB
J. W. Stacey	YNSD	Feam.
L. Cerra	CP&L	N. Carolina
R. E. White	YNSD	
R. K. Tucker	YNSD	Fram.
N. D. Romney	NRC/DE/EQB	
G. Bagchi	NRC/DE/EOB	
J. N. Singh	EG&G Idaho Inc.	
T. L. Bridges	EG&G Idaho Inc.	
B. L. Harris	EG&G Idaho Inc.	
R. E. Cyr	NHY Seabrook	
J. L. Cade	NHY Seabrook	
S. H. Dunphy	UE&C Seabrook	
H. M. Stronberg	EG&G Idaho Inc.	
Clark Kido	EG&G Idaho	
Tony Chung	EG&G Idaho	
George O'Connor	YSND	
D. Ruscitto	NRC Resident Inspector	NRC
A. Cerne	Sr. Res. Insp.	NRC
G. Sessler	Engineering Services	NHY
W. Dickson	Engineering Services	NHY
J. Martin	Tech Services	NHY
W. F. Gurein	Westinghouse Nuclear Safety	
C. G. Draughon	W. Mgr., I&C Syst. Lic., N.	Safety Dept.
R. M. Span	W. Nuclear Safety	
G. Rigamonti	UE&C	
D. Maidrand	YNSD	Asst. Pro. Mgr.
D. McLain	NHY	Startup Mgr.
R. P. Neustadter	UE&C	Phila. I&C SDE
E. Skolnick	UE&C	Phila. Mag.
T. C. Feignebaum	NHY	IRT Leader
R. C. Julian	YAEC/QA	Review Supervisor
R. E. Gillette	Asst. Constr. QA Mgr.	NHY
G. F. McDonald	Constr. QA Mgr.	NHY
N. J. DeLoach	YNSD Proj. Mgr.	YNSD

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13 ABSTRACT (200 words or less)

EG&G Idaho, Inc., is assisting the Nuclear Regulatory Commission in evaluating Public Service Company of New Hampshire's program for the dynamic qualification of safety related electrical and mechanical equipment for Seabrook 1 nuclear power plant. Applicants are required to use test or analysis or a combination of both to qualify equipment, such that its safety function will be insured during and after the dynamic event, and provide documentation. The review, when completed, will indicate whether an appropriate qualification program has been defined and implemented for seismic Category I mechanical and electrical equipment which will provide reasonable assurance that such equipment will function properly during and after the excitation due to vibratory forces of the dynamic event.

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