UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 25 1979

MEMORANDUM FOR: R. J. Bosnak, Chief, Mechanical Engineering Branch, DSS

FROM: P. Y. Chen, Mechanical Engineering Branch, DSS

SUBJECT: TRIP REPORT FOR SEISMIC CRITERIA IMPLEMENTATION REVIEW MEETING WITH PSE&G ON SALEM 2 NUCLEAR GENERATING STATION

The Seismic Qualification Review Team (SQRT) made a site visit to Salem Nuclear Generating Station Unit 2 at Salem, New Jersey, February 26-28, 1979. The purpose of the visit was to conduct an on-site review of the qualification methods and procedures for Seismic Category I mechanical components, electrical instrumentation and control equipment, and their supporting structures. A list of attendees is contained in Attachment I. Equipment selected for more indepth discussion and site inspection are listed in Attachment II. The objectives, findings, and conclusions of the meeting, and the required follow-up actions are summarized as follows:

I. Objectives of the Meeting

Due to changes in seismic qualification criteria such as the revision of IEEE-344, and the issuance of Regulatory Guides 1.100, it is necessary that the staff verify that the components and equipment qualified by previous criteria have adequate margin to perform their intended design function during and after a seismic event.

II. Findings and Conclusions

1. The applicant, Public Service Electric and Gas Co. (PSE&G), presented a brief summary of how the required response spectra for the equipment seismic qualification was obtained and pointed out some of the conservatisms built in the design procedures; such as (a) the damping values used in the Salem plant structure analysis are more conservative than those in the Regulatory Guide 1.60, (b) many items of equipment were qualified to higher elevation spectra than the actual spectra at the installed elevation.

2. The applicant (PSE&G) had originally specified 0.75 g horizontal acceleration (122 feet elevation) for the design of the battery racks. However, the original analysis performed by the vendor used a value of 0.45 g. Our site visit determined that the battery racks are actually located at the 100 ft. level of the auxiliary

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building instead of 122 ft. level assumed in the original equipment specification. Consequently, an appropriate g-level for the battery racks would be 0.67 g in the horizontal direction. At this level of acceleration, the calculated stresses, although higher than originally thought, still fall below the material yield stress. This assures the structural integrity of the battery racks.

3. In reviewing the qualification for Control Centers (GE Model #7700), the NRC staff found that the equipment was qualified for elevation 122 ft. of the Auxiliary Building although actually located at 84 ft. and 78 ft. elevations. The original test was performed for frequency range 10-500 Hz. The applicant was requested to provide additional information to qualify the equipment for the low frequency range (below 10 Hz).

4. The following Wyle reports were reviewed and found acceptable only for Salem Nuclear Generating Station Unit 2 plant specific applications:

   Report Nos.: 42897-1, 42441-1, 42367-1
   43870-1, 43728-1
   43166-1

5. In our review of 600 volt switchgear, the applicant did not provide sufficient information for the NRC staff to complete the review. Therefore, additional information is required.

6. The seismic qualification of the service water pump was reviewed and found acceptable. The applicant was requested to document and submit the qualification summary to the staff.

7. The major components of the diesel generator have been analyzed for structural integrity at the acceleration level higher than the acceleration required at Salem Unit 2. No information was available at the meeting for the NRC staff to conclude that those appurtenances necessary for startup and continued operation of the diesel generator can perform their required function during the earthquake event. Therefore, additional information is required for the NRC staff to complete the review.

8. During the review of the report on the Control Console Tests, the staff found that several post accident monitoring recorders mounted on the console were not included in the tests. The Electrical Branch Technical Position (BTP) EICSB-23 states that the recorders are not required to function within their required accuracy during the safe shutdown earthquakes, but must function within their required accuracy immediately after the ground

motion subsides without requiring any maintenance. Therefore, it is the staff's position that additional information on the seismic qualification of the recorders should be provided to assure that the qualification of the post accident monitoring recorders meet the BTP EICSB-23 requirement.

9. As to the functional verification of some items of electrical equipment, the acceptability status are as follows:

(a) 5 Kilovolt Alternating Current Switchgear

We noted the lack of supporting documentation with regard to the seismic qualification of the following electrical protective devices mounted on the 5 kilovolt switchgear.
.. 12 HFA51A42F (General Electric). Low voltage relay

.. 12 IAC66B6A (General Electric). Time overcurrent relay

.. 12 IAV74A1A (General Electric). Low voltage relay

We request the applicant to provide for our review the test information (including test plan, criteria, procedures, setup, results and conclusions) that demonstrates the capability of these electrical protective devices to perform their safety function before, during, and after seismic shaking. The applicant agreed to provide the information requested.

(b) 28 and 125 Volt Batteries

We noted that the test report mentioned in Table Q7.18-1 of the applicant's response on the subject of seismic qualification did not address how the performance of these batteries was monitored during the seismic testing. The applicant submitted another report (Wyle Laboratories test report number 43291-1) which we found that it satisfactorily demonstrated the performance of these batteries during and after seismic shaking. We advised the applicant to amend Table Q7.18-1 to make reference to this new report. The applicant agreed to do this. We consider this matter of documentation resolved and conclude that the functional aspects of these batteries have been satisfactorily verified during and after seismic testing.

(c) 125 Volt Battery Chargers.

We noted that the input values for voltage and current were not presented in the seismic test report. The applicant was advised that this information is needed to assess the adequacy of the functional verification of this equipment during seismic testing. The applicant agreed to provide this information.

(d) 28 Volt Battery Chargers.

Although the performance of these battery chargers was monitored during seismic testing, it was noted that the test report did not conclude that the test results for this equipment were satisfactory. The applicant agreed to provide information that will indicate that the seismic test results for this equipment were acceptable.

(e) Electrical Penetrations.

This equipment has been seismically qualified by analysis which the NRC staff has found acceptable. We noted that the design of any one electrical penetration is such that the integrity of the penetration assembly carrying electrical conductors will be impaired if a fault current condition is not clear within a specified time. Hence, each safety or non-safety circuit that penetrates containment has independent primary and backup fault protective devices (breakers) to preclude a single failure from impairing the integrity of a penetration. In view of this, we indicated that the capability of the primary and backup protective devices to interrupt a fault which occurred inside containment as a result of a seismic event must be demonstrated during the seismic qualification of this equipment. The cable raceway system within the containment is seismically designed and this alleviates the concern for a detrimental electrical fault at the penetration terminals during a seismic event. On the basis that the design provides for all cable trays inside the containment to be seismically supported, we conclude that it is no need to perform additional tests to verify the interrupting fault capability of the penetration protective devices as part of the seismic qualification of this equipment. However, we will verify as part of the environmental qualification review that tests and/or analyses have been performed to demonstrate that the electrical penetration assemblies can withstand fault currents for the specified period of time before the fault is cleared by protective breakers.

(f) Diesel Generator Control Cabinets.

This equipment has been seismically qualified by test which the NRC staff has found acceptable. However, we noted the lack of supporting documentation with regard to the seismic qualification of the following electrical protective relay mounted on the cabinets.

.. 112 CFD22AD1A (General Electric). Differential Protection Relay

We requested the applicant to provide for our review the test information (including test plan, criteria, procedures, setup, results, and conclusions) that demonstrates the capability of this protective relay to perform its safety function before, during, and after seismic shaking. The applicant agreed to provide the information requested.

10. For the seismic qualification of Moore Transmitters and Controllers (Wyle Report 44215-1) it was reported that some anomalies occurred during the tests. The applicant is requested to provide the information to justify the acceptance for use in the Salem Unit 2.

III. Follow-up Actions

Based on our findings and conclusions, the following actions and additional information are requested for the Salem Unit 2 review:

1. Provide the test input curves (Figure 1A, 13A, and 25A of the test report) for the qualification of the Control Centers as discussed in Item II.3. Provide additional information to qualify the equipment for the low frequency range (below 10 Hz).

2. Provide additional information to support the seismic qualification of the 600 volt switchgears as discussed in Item II.5.

3. Update Table Q7.18-1 to include all the Westinghouse reports that Salem 2 has referenced for the NSSS equipment at the plant. Verify that the equipment that were tested in those reports are applicable for the equipment actually installed at the plant.

4. Submit the seismic qualification summaries for:

   (1) Service Water Pump

   (2) 4" - 1500 lbs. Gate valve.

5. Submit the additional information for staff review to address the concerns as outlined in Item II.7.

6. Provide additional information to satisfy the concerns as noted in Item II.8.

7. Provide information to address the concerns as discussed in Item II.9.

8. Provide information as described in Item II.10.

IV. Environmental Qualification of Equipment by EICSB/NRC

During the site visit, the staff also verified some of the temperature monitoring devices installed in the safety equipment room area to assure that the environment is maintained within the temperature range for which the equipment is qualified to operate. The applicant informed the staff that the temperature monitoring devices have not been installed in the switchgear room area at present time, but it will be installed prior to the initial criticality of the plant. The NRC inspection and enforcement office will verify the completion of the installation of these temeprature monitoring devices.

Pei-Ying Chen

P. Y. Chen
Mechanical Engineering Branch
Division of Systems Safety

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Attachment I

Attendance List

Seismic Qualification Review Team Site Visit

Salem Unit 2

February 26-28, 1979

Name	Organization
Stew Ebneter	NRC: IE, Region I
Pei-Ying Chen	NRC/DSS/MEB
Randal M. Stephens	NRC/DSS/MEB
Kulin D. Desai	NRC/DSS/MEB
Hulbert C. Li	NRC/DSS/ICSB
Jose A. Calvo	DITTO/PSB
Robert W. Skwarek	PSE&G Licensing
John P. Gaguardi	PSE&G Controls
Richard Bashall	PSE&G Controls
*R. A. Burricelli	PSE&G, Asst. Proj. Mgr.
Frank Shen	PSE&G Structural
T. N. Taylor	PSE&G (Mechanical)
J. J. Schubel	PSE&G (Controls)
T. F. Superior	PSE&G, Electrical
O. P. Wong	Assoc. Tech. Inc. (PSE&G)
A. J. Gilrain	PSE&G, Electrical Division
*Joe Wroblewski	PSE&G, Controls

*Part Time

Attachment II

SEISMIC QUALIFICATION REVIEW

Salem Unit #2

(1) Control Centers GE Model #7700

(2) Control Room Recorder Panels - #2RP1 by Westinghouse

(3) 5 KV switchgear

(4) 600 V switchgear (Low Voltage AC and DC switchgear)

(5) Battery Racks

(6) 28 Volt and 125 Volt Batteries

(7) 28 Volt and 125 volt Battery Charger

(8) Electrical Penetrations

(9) Vital Instrument Bus Static Inverters

(10) Report - WCAP 7817

(11) Battelle Report dated 4/27/73

(12) Wyle Report 42897-1

(13) Wyle Report 42441-1

(14) Wyle Report 42367-1

(15) Wyle Report 43870-1

(16) Wyle Report 42215-1

(17) Wyle Report 43728-1

(18) Wyle Report 43166-1

(19) Service Water Pump

(20) 4" - 1500 lbs. Gate Valve

(21) Diesel Generator with Appurtenances

MEETING SUMMARY DISTRIBUTION

Docket File (50-311)
~~NRC PDR~~
Local PDR
TIC
NRR Reading
LWR #3 File
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E. Case
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NRC Participants:

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BCC: Applicant & Service List