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Docket No. 50-443

MEMORANDUM FOR: Charles E. Rossi, Assistant Director
Division of PWR Licensing-A

FROM: Ronald L. Ballard, Chief
Engineering Branch
Division of PWR Licensing-A

SUBJECT: FINAL DRAFT SSER FOR SEABROOK, UNIT 1

We have reviewed the final draft SSER-5 for Seabrook, Unit 1, transmitted on June 18, 1986. The review has been performed by S. Lee, J. Pulsipher, and S. Chan, and coordinated by F. Rinaldi. The pages requiring changes are enclosed.

In addition, the staff has reviewed the CRESS camera-ready copy of Sections 3.9.6 and 3.10. All of these sections are acceptable with the exception of the enclosed marked-up page 3-19.

/s/

Ronald L. Ballard, Chief
Engineering Branch
Division of PWR Licensing-A

Enclosures: As stated

cc: V. Noonan
E. Sullivan
S. Lee
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J. Pulsipher
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D/34

(SEE ATTACHED FOR PREVIOUS CONCURRENCES *)

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Docket No. 50-443

MEMORANDUM FOR: Victor Nerses, Project Manager
PWR Project Directorate #5
Division of PWR Licensing-A

FROM: Charles E. Rossi, Assistant Director
Division of PWR Licensing-A

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Charles E. Rossi, Assistant Director
Division of PWR Licensing-A

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configuration type. Representative envelope models are developed utilizing conservative values of cable tray parameters, thereby facilitating their use to qualify multiple applications. Any support configuration that is not qualified by either testing or the envelope analysis approach will require a unique support evaluation. This evaluation can range in scope from a complete individual support analysis (if the configuration differs significantly from any previously qualified configuration) to an evaluation that addresses any minor difference between the support and a previously qualified configuration.

The anlysis of cable tray support configurations will be evaluated against detailed acceptance criteria. The acceptance criteria consist of the existing criteria included in the FSAR and, as appropriate, some enhancements of the criteria to reflect findings from the Seabrook-specific tests. The staff-approved acceptance criteria were used, unless the test program results dictated a necessary change. Among the key acceptance criteria considered were structural performance criteria (e.g., allowable stresses and strains, capacities of connections, and tray holddown devices as supplemented by test data), system displacement, and interaction criteria.

The final report entitled "Cable Tray Support Qualification Program" provides a more detailed description of the qualification program, qualification methods, qualification criteria, and evaluation procedure. Included as an appendix to the report is a comparison of cable trays at the Seabrook Station with the seismic experience data base of cable trays compiled for other plants.

Evaluation Finding

(1) Qualification by Dynamic Test Program

Three test configurations believed to be the most representative of site conditions are used. They are (a) the trapeze support, (b) the typical floor-to-ceiling support, and (c) the change-in-direction support. Each test configuration is subjected to the following three different load sequences and input levels:

(a) safe shutdown earthquake (SSE) test--one SSE test response spectrum (TRS)

(b) fatigue test--five operating basis earthquake (OBE) TRS followed by one SSE TRS

(c) fragility test--scaled up to 1.2 to 1.5 times the SSE TRS

ANCO Engineers of Culver City, California, performed the dynamic testing of Seabrook cable tray supports for Bechtel Power Corporation. Variables for investigation include types and manufacturers of trays, type and size of tray supports, location of tray splices, number of tray tiers, configuration of support systems, type and spacing of transverse and longitudinal bracings, weight of cables, cable ties, etc.

The testing program demonstrated that the tested cable tray configurations possessed substantial seismic capacity. Testing results have shown that existing connections exhibit substantial additional rotational resistance and the Seabrook cable tray systems exhibit highly damped responses. In summary, the tests have demonstrated that the tested cable trays and supports can perform their safety functions and maintain their structural integrity when subject to design-basis loads. Therefore, use of these test data to qualify the portion of Seabrook cable tray and supports whose configurations are bounded by those of the tested ones is acceptable.

(2) Qualification by Envelope Analysis

The staff evaluated the proposed use of envelope analysis to qualify a class of cable tray supports that exhibits similar configurations. Because the analysis method involves development of representative enveloped models and conservative treatment of seismic analysis parameters (e.g., amplified response spectra, tray support height, number of tiers, hardware type, and cable loading), the results obtained should be applicable to the class of supports categorized as belonging to a group. Therefore, the proposed use of the envelope analysis is acceptable, provided the grouping of supports is implemented and documented in a conservative manner.

(3) Qualification by Support-Unique Evaluation

Qualification of support configurations that are not bounded by the Seabrook-specific full-scale tests and not amenable to the use of the envelope analysis are implemented via support-unique analysis. The analytical procedure for such an analysis will comply with the seismic analysis and design criteria previously approved by the staff. As applicable, it will also utilize the support connection performance data obtained from the tests in refining the development of finite element models for the seismic response analysis. Such an approach is acceptable because it ensures that supports thus qualified in conformance with the FSAR acceptance criteria will maintain their safety functions and structural integrity as well as exhibit seismic responses consistent with those observed in the Seabrook-specific system tests.

(4) Use of 20% Damping in Seismic Qualification Analysis

The applicant has demonstrated the applicability of a 20% damping value for Seabrook-specific cable tray supports through full-scale cable tray tests and a comparative study of Seabrook cable tray behavior with those of the Bechtel data-base-tested cable trays. On the basis of the reviews of the technical justifications presented by the applicant, the staff concludes that the use of 20% damping for Seabrook-specific cable tray supports when subject to input acceleration levels of 0.35 g or greater for OBE and SSE conditions is acceptable.

(5) Comparison of Seabrook Cable Tray Seismic Responses With Those of Seismic Experience Data Bases of EQE Inc.

The staff has reviewed Appendix A to the Seabrook Cable Tray Support Qualification Program. The appendix provides a comparison of cable tray systems at Seabrook with cable trays in the seismic experience data base compiled by an applicant consultant, EQE Inc. Staff review found that (a) all parameters associated with the seismic capacity of Seabrook cable trays are enveloped by data base cable trays, (b) most data base cable tray systems have experienced seismic loads comparable to or greater than the seismic design-basis loads for Seabrook cable tray systems, (c) cable tray systems constructed according to

6 ENGINEERED SAFETY FEATURES

6.2 Containment Systems

6.2.1 Containment Functional Design

6.2.1.1 Containment Analysis

In the SER, the staff reviewed and found acceptable the applicant's analysis of the peak containment atmosphere pressure and temperature that would occur during a loss-of-coolant accident (LOCA). By letter dated May 17, 1986, and by Amendment 58 to the FSAR, the applicant revised this analysis.

The principal changes were in the following initial conditions assumed as input to the analysis:

(1) Initial containment pressure was changed from 0.5 psig to 1.5 psig.

(2) Initial refueling water storage tank (RWST) temperature was changed from 86°F to 98°F; this resulted in a change in containment spray temperature during the injection phase from 88°F to 100°F.

The applicant's purpose in making these changes was to justify higher limits in the limiting conditions for operation in the Technical Specifications for these parameters (containment pressure and RWST temperature). This would provide greater operational flexibility for the plant.

As a result of this revised analysis, the calculated peak containment pressure increased from 46.1 psig to 49.6 psig. However, because the containment design pressure capability is 52.0 psig, this is acceptable.

Therefore, the staff finds the applicant's revised LOCA pressure and temperature analysis acceptable.

10 CFR 50.55a(g)(3). The detailed evaluation supporting this conclusion is provided in Appendix M to this supplement.

The initial inservice inspection program has not been submitted by the applicant. This program will be evaluated, as a condition to the license, on the basis of 10 CFR 50.55a(g)(4), which requires that the initial 120-month inspection interval shall comply with the requirements in the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) on the date 12 months before the date of issuance of the operating license. This program will be evaluated after the applicable ASME Code edition and addenda can be determined and before the first refueling outage when inservice inspection commences.

APPENDIX F

NRC STAFF CONTRIBUTORS

The NRC staff members listed below were principal contributors to this report.

Name	Title	Review Branch
Goutam Bagchi	Section Leader	Engineering
S. Chan		
P. Om Chopra	Senior Electrical Engineer	Electrical, Instrumentation and Control Systems
Cleary		
Lawrence Croker		
Richard J. Eckenrode	Human Factors Engineer	Electrical, Instrumentation and Control Systems
Robert J. Giardina	Mechanical Engineer	Plant Systems
John J. Hayes	Nuclear Engineer	Plant Systems
Sanford Israel	Senior Reliability and Risk Analyst	Facility Operations
Karsch		
~~Robert Kirkwood~~	~~Senior Task Manager~~	~~Engineering Issues~~
Lazevnick		
Sam Lee		
Chang-Yang Li	Mechanical Engineer	Plant Systems
Lobel ~~Mark~~ Lyon		
Mauck Victor Nerses	Senior Project Manager	Project Directorate #5
Donald J. Perotti	Emergency Preparedness Specialist	Emergency Preparedness
James C. Pulsipher	Mechanical Engineer	Engineering

waterbox of the residual heat remover (RHR) heat exchanger (2 heat exchangers--2 nozzles each).

Reason for Relief: Table IWC-2500-1, Examination Category C-B requires a volumetric examination of nozzle welds in vessels whose thickness exceeds 1/2 in. nominal size. The applicant states that, in the case of the Seabrook RHR heat exchangers, the weld geometries for the inlet and outlet nozzles do not have a configuration that can be examined with ultrasonic techniques. Therefore, the preservice volumetric examination requirement will be fulfilled by the construction radiography, and ultrasonic examination techniques will be developed so that maximum coverage will be achieved at the first refueling outage.

The applicant reported that the subject welds received the ASME Code, Section III volumetric and surface examinations during fabrication, as well as the construction hydrostatic test.

Staff Evaluation: The staff has reviewed the applicant's submittal including Figure 1, which shows the configuration of the RHR heat exchanger nozzle-to-shell welds. The staff does not agree that these welds have a configuration that would prevent 100% examination with ultrasonic techniques. However, the staff considers the ASME Code, Section III volumetric and surface examinations along with the construction hydrostatic test adequate to ensure the preservice structural integrity, provided that the ultrasonic examinations are completed at the first refueling outage. Compliance with the specific requirements of Section XI at this time would result in hardships or unusual difficulties without a compensating increase in the level of quality and safety.

H. Relief Request PR-8, Examination Category C-F, Pressure Retaining Welds in the Containment Building Spray Piping

Code Requirement: Section XI, Table IWC-2500-1, Examination Category C-F, Item C5.20 requires a 100% surface and volumetric examination on Class 2 piping welds over 1/2 in. nominal wall thickness.

1. Relief Request PR-9, Examination Category C-F, Pressure Retaining Class 2 Piping and Piping Branch Connection Welds

Code Requirement: Section XI, Table IWC-2500-1, Examination Category C-F, Items C5.21 and C5.22 require a 100% surface and volumetric examination on Class 2 pressure retaining piping welds over 1/2 in. nominal wall thickness; Item C5.31 requires a 100% surface examination on pressure retaining pipe branch connection welds.

Code Relief Request: Relief is requested from performing 100% of the preservice Code-required volumetric examination on Item C5.21 and C5.22 welds (2 welds) listed in Table 1 of Relief Request PR-9.

Relief is also requested from performing 100% of the FSAR augmented examination commitment (volumetric examination) on the 7 branch connection welds (Item C5.31) listed in Table 1 of Relief Request PR-9. The applicant reports that the Code-required surface examination was completed on these welds.

Reason for Request: Geometric configuration, permanent obstructions, and/or structural interferences prohibit 100% examination coverage of the Code-required volume on 2 welds and 100% examination coverage of the FSAR augmented examination volume on 7 welds listed in Table 1 of Relief Request PR-9.

Staff Evaluation: The staff has reviewed the applicant's submittal including Table 1, which identifies the welds for which relief is being requested, the Code item number, the examination angle and technique being used, the configuration of the weld, and the percentage of the Code- or FSAR augmented examination-required volume that was examined. In addition, the applicant reported that the subject welds received the ASME Code, Section III volumetric examination during fabrication and the construction hydrostatic test.

On the basis of the above, the staff concludes that a significant percentage of the Code- or FSAR augmented examination-required volumetric examination has been performed and that the components would have to be redesigned in order to

complete the remainder. Therefore, the staff concludes that the limited preservice volumetric examinations and the Section III fabrication examinations, along with the hydrostatic test, provide an acceptable level of preservice structural integrity and that compliance with the specific requirements of Section XI would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety.

IV CONCLUSIONS

On the basis of the foregoing, pursuant to 10 CFR 50.55a(a)(3), the staff has determined that certain Section XI-required preservice examinations are impractical. The applicant has demonstrated that either (1) the proposed alternatives would provide an acceptable level of quality and safety or (2) compliance with the requirements would result in hardships or unusual difficulties without a compensating increase in the level of quality and safety.

The staff's evaluation has not identified any practical method by which the existing Seabrook Unit 1 can meet all the specific preservice inspection requirements of Section XI of the ASME Code. Requiring compliance with all the exact Section XI-required inspections would delay the startup of the plant in order to redesign a significant number of plant systems, obtain sufficient replacement components, install the new components, and repeat the preservice examination of these components. Examples of components that would require redesign to meet the specific preservice examination provisions are the reactor pressure vessel, the reactor coolant pump discharge nozzle, and a number of the piping and component support systems. Even after the redesign efforts, complete compliance with the preservice examination requirements probably could not be achieved. However, the as-built structural integrity of the existing primary pressure boundary has already been established by the construction code fabrication examinations.

On the basis of its review and evaluation, the staff concludes that the public interest is not served by imposing certain provisions of Section XI of the ASME Code that have been determined to be impractical. Pursuant to 10 CR 50.55a(a)(3), relief is allowed from these requirements, which are impractical to implement.

V REFERENCES

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code), Nuclear Code Case N-408, "Alternative Rules for Examination of Class 2 Piping." July 1, 1980.

---, Section II, "Material Specifications for Ferrous and Nonferrous Materials."

---, Section III, "Construction and Installation Requirements."

---, Section XI, 1977 Edition including addenda through Summer 1978.

---, Section XI, Article IWV, 1977 Edition including addenda through Summer 1978.

Note to editor: the date is not important in this appendix. Please leave blank. (The date varies with the component.)

valves smaller than 2 in. have been included in its valve operability qualification program.

Applicant Response The appropriate sections of the Seabrook FSAR have been revised by Amendment 56, resolving this generic issue.

(3) At the conclusion of the PVORT audit, it was apparent that a complete list of active valves had not been provided in the FSAR. The applicant was to confirm that all active valves are correctly identified in the FSAR.

Applicant Response The safety-related BOP and NSSS valves have been identified in FSAR Tables 3.9 (B)-25 and 3.9 (N)-11 by Amendment 56. This issue is resolved.

(4) At the time of the audit, most construction tests had already been completed. However, the hot functional tests were still in progress. The applicant was to confirm that all preservice tests that are required before fuel load have been completed.

Insert 1

Applicant Response The applicant did not meet this requirement but committed to complete the preservice testing before commercial operation. The staff finds this acceptable and will verify that the commitment is met.

(5) At the time of the audit, approximately 10% to 15% of all pumps and valves important to safety had not been qualified. The applicant shall confirm that all pumps and valves important to safety are properly qualified and installed. In addition, the applicant shall provide written confirmation that the original loads used in tests or analyses to qualify pumps and valves important to safety are not exceeded by any new loads, such as those imposed by a loss-of-coolant accident (LOCA) (hydrodynamic loads) or as-built conditions.

Insert 2

Applicant Response The applicant has committed to complete the qualification of all safety-related active pumps and valves before fuel load. The applicant has confirmed that this commitment was met by letter dated June 13, 1984.

?

INSERT 1

In a letter dated June 24, 1986, the applicant stated that preservice testing of a component as required by ASME Boiler and Pressure Vessel Code, Section XI, will be complete prior to the operability mode requirement specified for that component in the Technical Specifications, i.e., all preservice tests on pumps and valves will be completed prior to fuel load.

INSERT 2

In a letter dated June 24, 1986, the applicant stated that all pumps and valves requiring qualification are now qualified. All required loads have been considered ~~and as-built conditions have been considered~~ and as-built conditions have been reconciled to the original design. Based on this information, the staff considers this issue to be resolved.