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

DEC 9 1983

NOTE TO: V. Noonan

FROM: J. Knight

SUBJECT: SER FOR WNP-2

With the revised wording on page 2, I now understand the message but the wording in the last paragraph on page 2, and continuing on page 3, is Awful.

An example, "WMA filters failure will result in reduced air flow but still would be able to maintain the temperature below maximum design limit." If we can't do better than this within the resources of the EQB, please contact the technical editors and get some help. Some sort of table or listing would be useful in allowing the reader to follow the correlation between each justification and the categories of equipment related to that justification.

- On page 3, item A.1, "the unique design of containment is alleged to attenuate these loads." This statement followed by reference to the SGE3 review seems to infer that the SGEB acceptance is looked upon with suspicion by the author of this statement. If that is true lets' talk.

- I note that some of the justifications relate to acceptance of alternate systems to accomplish shutdown. Are the proper DSI reviewers on board as to acceptability of this approach? yes R Bernero

- On page 4, second paragraph under item 2, "A procedure, reportedly, is in place ...". Does this infer that we don't really know or that we have been told this is true but have reason to doubt what we have been told?

UNITED STATES
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Docket No. 50-397

MEMORANDUM FOR: Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

FROM: James P. Knight, Assistant Director
Components and Structures Engineering
Division of Engineering

SUBJECT: WASHINGTON NUCLEAR PROJECT 2 INPUT FOR SUPPLEMENTAL SAFETY EVALUATION REPORT

Plant Name: Washington Nuclear Project 2
Docket No.: 50-397
Licensing Stage: OL
Responsible Branch: Licensing Branch No. 2
Responsible Project Manager: R. Auluck
Review Status: Continuing

The enclosed Supplemental Safety Evaluation Report (SSER) was prepared by DE:C&SE, Equipment Qualification Branch.

This covers the following topics.

1.) Seismic and Dynamic Qualification of Seismic Category I Mechanical and Electrical Equipment.

2.) Pump and Valve Operability.

James P. Knight, Assistant Director
Components & Structures Engineering
Division of Engineering

Enclosure: As stated

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Equipment Qualification Branch
Input for
Supplemental Safety Evaluation Report
Washington Nuclear Project 2
Docket No. 50-397

3.10 Seismic and Dynamic Qualification of Seismic Category I Mechanical and Electrical Equipment

3.10.1 Seismic and Dynamic Qualification

Our evaluation of the applicant's program for qualification of safety-related electrical and mechanical equipment for seismic and dynamic loads consists of (1) a determination of the acceptability of the procedures used, standards followed, and the completeness of the program in general, and (2) an audit of selected equipment items to develop the basis for the staff judgment on the completeness and adequacy of the implementation of the entire seismic and dynamic qualification program. The Seismic Qualification Review Team (SQRT) consists of engineers from the Equipment Qualification Branch (EQB) and the Idaho National Engineering Laboratory (INEL, EG&G). The SQRT has reviewed the equipment dynamic qualification information contained in the pertinent Final Safety Analysis Report (FSAR) Sections 3.9.2 and 3.10 and made a plant site visit on November 16 through November 19, 1982 to determine the extent to which the qualification of equipment as installed at Washington Nuclear Project 2, meets the current licensing criteria as described in IEEE 344-1975, Regulatory Guides 1.92 and 1.1000, and Standard Review Plan Section 3.10. Conformance with these criteria are required to satisfy the applicable portions of the General Design Criteria in 1, 2, 4, 14, and 30 of Appendix A to 10 CFR Part 50, as well as Appendix B to 10 CFR Part 50 and Appendix A to 10 CFR Part 100. A representative sample of safety-related electric and mechanical equipment, as well as instrumentation, included in both NSSS and BOP scopes, was selected for the audit. The plant-site visit consisted of

selected for the audit. The plant-site visit consisted of field observations of the actual, final equipment configuration and its installation. This was immediately followed by the review of the corresponding test and/or analysis documents which the applicant maintains in his central files. Observing the field installation of the equipment is required in order to verifying and validate equipment modeling employed in the qualification program.

Based on this audit, both plant generic and specific concerns relating to the seismic and dynamic qualification of equipment at WNP-2 were identified as delineated in the trip report of the SQRT. In subsequent submittals the applicant has developed an acceptable approach to address and resolve WNP-2 generic findings. All of the issues are either resolved or expected to be resolved by fuel load. The applicant has also provided additional information relative to the specific findings and has clarified the details of qualification for the pieces of equipment in question. Before fuel load all safety related equipment is to have been seismicly qualifed.

However, there are nine categories of equipment which were not specifically included among the items reviewed by the SQRT and whose qualification is not expected to be fuly completed by the fuel load date. They are: WMA filters, HPCS diesel generator, MSIVs, SDV modifications, CRD operators, heat trace control panel, spray pond monitors, fatigue and wetwell level monitors. The applicant has provided adequate justification for interim operation for two years. A summary follows. WMA filters failure will result in reduced air flow but still would be able to maintain the temperature below maximum design limit. An alternate independent safe shutdown path through automatic depressurization system (ADS) in conjunction with the residual heat removal (RHR) system for the HPCS is available. Main steam isolation valves (MSIV) are deemed to be adequate for interim operation based on the initial qualification to IEEE-344, 1971, the fail-safe design of valves, and demonstrated

normal and faulted service operability testing as part of the startup system testing program. Only final acceptable documentation is lacking in case of the scram discharge modification (SDV) package. Static analysis of the yoke assembly and successful static deflection operability demonstration test on the CRD air operators are the basis for their adequacy during the interim operation period. Failure of electrical heat trace to the standby service water system cooling lines to the emergency diesel generators can be bypassed with a temperature monitor annunciator in the main control room and operator action will keep water moving in the lines which will prevent freezing until the heat trace becomes functional. Spray pond monitors provide information concerning the water level in the ponds, initiate operation of the nonsafety-related makeup water system and cannot reduce the quantity of water in the ponds and thus will not adversely affect safe shutdown. Fatigue is a relatively long term phenomenon and will not compromise the overall safety for the period of interim operation. The qualified suppression pool narrow range instrumentation system will provide adequate level monitoring in the interim period while wide range instrumentation system is being qualified. There was an additional concern raised by the construction appraisal team (CAT) concerning the use of rigid conduit connections to single electrical equipment enclosures instead of flexible ones. A subsequent analysis performed by the applicant and reviewed by the SQRT, showed that the stresses near the junctions were within allowable limit with the rigid conduit.

The summary of the findings and their resolution are given below:

A. Plant Generic Findings

1. A unique feature of the containment design is that the reactor building foundation is not integral with the containment foundation. Hydrodynamic loads inside containment are included in the qualification of equipment. Outside containment, but inside the reactor building, hydrodynamic loads are not considered as the unque design of containment is alleged to attenuate these loads.

The review of the applicant's submittal by the Structural and Geotechnical Engineering Branch confirmed the adequacy of the loads considered in the qualification: memorandum for A. Schwencer, Chief Licensing Branch No. 2 from G. Lear, Chief, Structural and Geotechnical Engineering Branch, November 4, 1983.

2. Where the valve operator BOP-12 was qualified an assumed g-value was used. Later, in the as-built and as-installed condition an analysis confirmed that the g-value used in the qualificaton was indeed adequate.

   This is also the case with other equipment in this category as far as loads are concerned. A procedure, reportedly, is in place to verify assumed g-values for each case. For the motor operator, the g-value was confirmed to be adequate. The applicant is to confirm the adequacy of all assumed g-values and inform the NRC in writing of the results when this is completed.

   According to the latest submittal (September 19, 1983: GO2-83-844) 72 percent of the effort is complete and the rest is expected to be completed by the fuel load.

3. The motor control center was qualified through single frequency, biaxial input tests. The motor control center has more than one natural frequency below 33 Hz. This technique, in the absence of adequate justification, is not acceptable. A review of cases where single frequency tests have been used in spite of the presence of multiple natural frequencies of the system within the range of 33 Hz is to be made by the applicant. In each case a justification for single frequency testing is to be provided.

A thorough review by the applicant identified four large composite structures for which single frequency testing was used in conjunction with identified multiple modes below ZPA. The qualification tests were of two types: sine beat and sine dwell. The justification based on the margin provided by the applicant is adequate because the RRS for the WNP2 is relatively narrow banded.

B. Specific Issues

1. Pressure Switch (BOP14)

The panel on which this item is mounted was qualified by test. The tests consisted of multi-frequency, multi-axis, random inputs. Test Response Spectra (TRS) from these tests enveloped the initial Required Response Spectra (RRS). Subsequently, based on further investigation, the RRS's were changed resulting in the TRS's not enveloping the RRS's in different regions. An effort was made to analyze this apparent inadequacy based on the natural frequency of the system is estimated as 7.5 Hz. One unenveloped region is around 6.5 Hz which is too close to the system frequency.

In order to provide conclusive data, an in-situ natural frequency test was performed on the control panel. The test report (0740-024-1351: Frequency Test for Hydrogen Recombiner Panel) concludes that the lowest natural frequency is 28.3 Hz which is well above the nonenveloped portion of the RRS. Based on this new test information the item is now considered to be seismically qualified.

In conclusion, based on the SQRT audit findings as well as the review of subsequent submittals including the interim operation justification the staff concludes that an appropriate seismic and dynamic qualification program has been defined and implemented, which provides adequate assurance that such equipment should function properly during and after the excitation vibratory forces imposed by the safe shutdown earthquake. For equipment not qualified and having no justification for interim operation the applicant must confirm to the staff that this equipment is qualified before startup following the first refueling outage.

3.10.2 Operability Qualification of Pumps and Valves

To assure that the applicant has provided an adequate program for qualifying safety related pumps and valves to operate under normal and accident conditions the Equipment Qualification Branch (EQB) performs a two step review. The first step is a review of Section 3.9.3.2 of the FSAR for the description of the applicant's pump and valve operability assurance program. This information is compared to Section 3.10 of the Standard Review Plan. The information provided in the FSAR however is general in nature and not sufficient by itself to provide confidence in the adequacy of the licensee's overall program for pump and valve operability qualification. To provide this confidence, the Pump and Valve Operability Review Team (PVORT), in addition to reviewing the FSAR, conducts an on-site audit of a small representative sample of safety related pumps and valves supporting documentation.

The on-site audit includes a plant inspection to observe the as-built configuration and installation of the equipment, a discussion of the system in which the pump and valve is located and of the normal and accident conditions under which the component must operate, and a review of the qualification documentation (stress reports, test reports, etc.)

The two-step review is performed to determine the extent to which the qualification of equipment, as installed, meets the current licensing criteria as described in the Standard Review Plan 3.10 and conformances with the requirements of GDC 1, 2, 4, 14, and 30 of Appendix A t 10 CFR Part 50, as well as Appendix B to 10 CFR Part 50.

The on-site audit for WNP-2 was performed November 16-19, 1982. A representative sample consisting of 7 valves and 3 pumps was chosen for review. The sample included both NSSS and BOP equipment. During our review a number of concerns were raised. Some of these concerns were satisfactorily resolved by the applicant during the audit by either

supplying additional information or providing additional commitments as appropriate. The remaining concerns and generic findings are summarized below.

Generic Findings

No generic operability concerns resulted from the evaluation of the WNP-2 qualification program for pump and valve operability. One minor area of concern relating to the permanent tagging of plant equipment was discussed with plant personnel and resolved. Permanent tags were in fact being installed on some equipment during the week of the audit.

The results of reviewing the document packages for the unannounced components indicate that the applicant has a good central file system from which he can retrieve documents in a relatively short time. This conclusion was further substantiated after reviewing the applicant's quality assurance filing system.

The PVORT was given an orientation lecture on the WNP-2 computer-based maintenance and surveillance program by the supervisor of maintenance. The program appears to be very comprehensive and incorporates many excellent features. Some of these include: (a) performing maintenance on all components prior to preoperational testing, (b) integrating all pertinent qualification information, (e.g., aging information for age degradable parts) into the maintenance program, and (c) analyzing sub-components upon removal to aid in determining changes in replacement schedules. In keeping with the latter idea, WNP-2 voluntarily participating in the Nuclear Plant Reliability Data System, (NRPDS).

It is concluded that the WNP-2 Supply System Equipment Qualification Group is dealing with the equipment qualification issue in a very positive manner and the results of their efforts are evident in the applicant's Pump and Valve Operability Assurance Program.

Specific Concerns

1. Suppression Pool Outlet Valve, HPCS-V-15, High Pressure Core Spray Suction Isolation Valve

The plant walk-down revealed that the horizontal clearance between the actuator and an adjacent pipe restraint was possibly too small, such that it might affect the operability of the valve under dynamic loads. Also a review of the documentation revealed that the valve was originally qualified to the interim piping criteria. When the final piping analysis was completed and compared to the interim load, a review by the utility found that the loads for this component exceeded those calculated using the interim criteria.

Confirmation that the valve was requalified to the new loads was to be provided to the staff before fuel load. In addition, the applicant was to provide justification that clearance between the valve actuator and the adjacent pipe restraint would not affect valve operability during dynamic loads.

The applicant has provided confirmation by letter (G02-83-1087) dated November 23, 1983 that valve HPCS-V-15 has been qualified using the final piping analysis results. This qualification was for seismic as well as other dynamic loads which affect valve operability. In addition, following an analysis of the available clearance the applicant is modifying the pipe restraint to provide increased clearace for valve motion. The applicant has committed to complete this modification prior to fuel load. The staff considers this response acceptable and this concern is closed.

2. Rockwell 26-Inch Globe Valve, MS-V-22C, Main Steam Isolation Valve

During the plant walk-down several problems were noted: (a) the accumulator was not installed, (b) the installed solenoid valves were not qualified for the environment and (c) the valve was scheduled to be completely disassembled for cleaning. These problems were discussed with the start-up engineer and it was determined that the valve, as viewed, was obviously not ready for operation. The valve, having been on-site for a number of years, (note: valve was built in 1973), was to be completely refurbished prior to testing. This would include installation of environmentally qualified solenoid valves.

The documentation review revealed that the qualification of the assembly for operability under accident conditions was based on two analyses by Rockwell, RAL-2006, Rev. 1 and RAL-1002, Rev. 2. A test report, RAL-1004, Rev. 0, was also provided for a similar valve, (i.e., a 20-inch Rockwell Model 1612Y). RAL-1004 stated that the valve has operated with a 0.820-inch deflection. An analysis of the WNP-2 valve calculated a maximum deflection of only 0.270 inches. In addition, it was learned that a seismic test on a similar actuator for a Rockwell 24-inch valve was being reviewed by General Electric to determine if the results of that test could be used to qualify the WNP-2 actuator by similarity. A discussion with the engineer in charge of power ascension testing added confidence concerning the operability of the valve assembly under design conditions. He stated that the valve is to be tested (i.e., closed against flow) at three different power levels--aproximately 30%, 50% and 85%. In addition, all the MSIVs will be closed simultaneously at 100% steam flow. A complete report on the results of the power ascension tests will be available three months after completion.

While MS-V-22C was not operable, our findings indicated that adequate plans were in place to ensure that the valve assembly would be qualified for operability prior to the power ascension tests. The power ascension tests would then verify operability under normal plant conditions. However, the staff required that the results of the on-going review of a Rockwell seismic test on a similar 24-inch actuator be provided prior to fuel load. In addition, confirmation that the solenoid valves on the actuators of all MSIVs have been replaced with qualified units was to be provided prior to fuel load.

The applicant has provided confirmation by letter (G02-83-1092) dated November 23, 1983 that valve MS-V-22C was shown to be qualified based on the planned seismic qualification similarity analysis. The final documentation of this analysis however will not be available prior to fuel loading, therefore the applicant decided to conduct a series of in-situ static deflection tests at the maximum loading which would affect valve operability. The valve was successfully stroked while deflected in the weakest bending axis by this loading. The operating times of the valve were within specificatin limits before, during and after the tests. In addition the applicant has provided a justification for interim operation of the valve by letter (G02-83-1025) dated November 4, 1983.

The applicant has also committed by letter (G02-83-1092) dated November 23, 1983 to replace the solenoid valves on the actuators of the inboard main steam isolation valves (MS-V-22A, B, C and D) with qualified valves prior to fuel loading. The outboard units (MS-V-28A, B, C, and D) are listed on Table B of the applicant's justification for interim operation (G02-83-590) dated June 30, 1983. These units are scheduled for replacement with qualified solenoid valves prior to the first refueling outage. The staff considers the above responses acceptable and this concern is closed.

In conclusion, based on the PVORT audit findings as well as the review of subsequent submittals including the interim operation justifications the staff concludes that the applicant's pump and valve operability program for WNP-2 meets the criteria described in the Standard Review Plan 3.10 (NUREG-0800). For equipment not qualified and having no justification for interim operation but expected to be qualified before fuel load, confirmation must be received by the staff that this equipment is qualified before power ascension can begin.

For that equipment not qualified but having a justification for interim operation the applicant must confirm to the staff that this equipment is qualified before startup following the first refueling outage.