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VPNPD-95-039
NRC-95-025

10CFR50.4
10CFR50.90

April 25, 1995

Document Control Desk
U. S. NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, DC 20555

Ladies/Gentlemen:

DOCKETS 50-266 AND 50-301
TECHNICAL SPECIFICATIONS CHANGE REQUEST 171
HEATUP AND COOLDOWN LIMIT CURVE EXPIRATION DATE EXTENSION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

On May 26, 1994, we submitted Technical Specifications Change Request 171, "Heatup and Cooldown Limit Curve Expiration Date Extension," which requested amendments to Facility Operating Licenses DPR-24 and DPR-27 for Point Beach Nuclear Plant (PBNP), Units 1 and 2, respectively. The proposed amendments extended the operation of both units with the current heatup and cooldown limit curves in the Technical Specifications to 23.6 effective full power years (EFPY). On January 5, 1995, in accordance with NRC staff's request for background information regarding our May 26, 1995 submittal, we forwarded one copy of WCAP-12794, Revision 2, "Reactor Cavity Neutron Measurement Program For Wisconsin Electric Power Company, Point Beach Unit 1," and one copy of WCAP-12795, Revision 2, "Reactor Cavity Neutron Measurement Program For Wisconsin Electric Power Company, Point Beach Unit 2." On February 27, 1995, you transmitted three questions requesting additional information. Enclosed are non-proprietary responses to your questions.

Please contact us if you have any further questions.

Sincerely,

GMKriem for

Bob Link
Vice President
Nuclear P

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DAW/cms

Enclosure

cc: NRC Regional Administrator
NRC Resident Inspector
Public Service Commission of Wisconsin

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
TECHNICAL SPECIFICATIONS CHANGE REQUEST 171
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

The evaluations documented in WCAP-12794, Revision 2, and WCAP-12795, Revision 2, were completed prior to release of the BUGLE-93, ENDF/B-VI based cross-section library. Subsequent to the release of the BUGLE-93 library, the Westinghouse fluence evaluation methodology was updated and re-benchmarked to incorporate this more accurate data set. Also, an additional set of cavity dosimetry has been withdrawn from each of the Point Beach Nuclear Plant (PBNP) units.

A fluence evaluation of the PBNP units is currently underway to incorporate both the updated methodology and the additional measurement information. Recent experience with the ENDF/B-VI evaluations indicate that the upgrade in methodology will change the plant-specific bias factor but will have a minimal impact on the best estimate fluence projections.

1. How did the licensee establish that the absolute value of fluence is correct?

The fluence evaluations performed for PBNP, Units 1 and 2 (WCAP-12794, Revision 2, and WCAP-12795, Revision 2), were based on the methodology described in WCAP-13390, "Westinghouse Fast Neutron Exposure Methodology for Pressure Vessel Fluence Determination and Dosimetry Evaluation," dated May 1992. This document was submitted in support of the Palisades fluence submittal which was approved on April 15, 1992, via License Amendment 142.

The overall exposure evaluation methodology described in WCAP-13390 is based on the underlying philosophy that, in order to minimize the uncertainties in vessel exposure projections, plant specific neutron transport calculations must be supported by:

1. Benchmarking of the analytical approach.
2. Comparison with power reactor surveillance capsule and reactor cavity industry wide data bases.
3. Comparison with plant specific measurements.

That is, as the progression is made from the use of a purely analytical approach tied to experimental benchmarks to an approach that makes use of industry and plant specific power reactor measurements to remove potential biases in the analytical method, knowledge regarding the neutron environment applicable to a specific reactor vessel is increased, and the uncertainty associated with vessel exposure projections is minimized.

The qualification of the Westinghouse transport methodology consisted of the following three parts:

1. Comparisons with benchmark measurements from the pool critical assembly (PCA) simulator at Oak Ridge National Laboratory (ORNL).

2. Comparisons with a series of power reactor measurements that include data from internal surveillance capsule dosimetry and reactor cavity dosimetry.

3. An analytic sensitivity study investigating the dominant sources of uncertainty in the transport model.

Details of these benchmarking efforts are provided in WCAP-13390.

The results of these studies demonstrate that the overall methodology is capable of providing best estimate fluence evaluations within ±20% 1σ.

In the application of this methodology on a plant specific basis, the qualification results are combined with all available plant specific measurement data to define the biases and uncertainties required to provide projections of the best estimate neutron exposure of the particular pressure vessel.

2. **How did the licensee compare the dosimetry from the surveillance capsules, which are behind the thermal shield, to that in the cavity, where the dosimetries are behind the thermal shield and the pressure vessel?**

Using the Westinghouse neutron exposure methodology, the best estimate exposure of the reactor pressure vessel is developed using a combination of absolute plant specific transport calculations and all available plant specific measurement data. In the case of the two PBNP units, the measurement database is considerable, including 4 internal surveillance capsule measurements and 12 mid-plane cavity measurements for each unit. That is, a 16-point measurement database exists for each PBNP unit. In addition, the use of cavity dosimetry gradient measurements provides a measure of the magnitude and spatial distribution of the flux reduction introduced by the presence of part-length hafnium absorbers on the core periphery.

Combining the measurement database with the plant specific calculations, the best estimate vessel exposure is obtained from the following relationship:

$$\Phi_{\text{Best Est.}} = K \, \Phi_{\text{Calc.}}$$

where: $\Phi_{\text{Best Est.}}$ = The best estimate fast neutron exposure at the location of interest.

K = The plant specific measurement/calculation (M/C) bias factor derived from all available surveillance capsule and reactor cavity dosimetry data.

$\Phi_{\text{Calc.}}$ = The absolute calculated fast neutron exposure at the location of interest.

The approach defined in the above equation is based on the premise that the measurement data represent the most accurate plant specific information available at the locations of the dosimetry, and, that the use of the measurement data on a plant specific basis essentially removes biases present in the analytical approach and mitigates the uncertainties that would result from the use of analysis alone.

That is, at the measurement points, the uncertainty in the best estimate exposure is dominated by the uncertainties in the measurement process. At locations within the pressure vessel wall, additional uncertainty is incurred due to the analytically determined relative ratios among the various measurement points and locations within the pressure vessel wall.

Relative to PBNP, the derived plant specific bias factors for the neutron flux ($E > 1.0$ MeV) were 1.07 for Unit 1 and 1.15 for Unit 2. Bias factors of this magnitude are fully consistent with prior industry experience using the ENDF/B-IV based SAILOR cross-section library in the plant specific transport calculations.

3. How did the licensee estimate the fluence uncertainties?

The use of the bias factor derived from the measurement database acts to remove plant-specific biases associated with the definition of the core source, actual versus assumed reactor dimensions, and operational variations in water density within the reactor. As a result, the overall uncertainty in the best estimate exposure projections within the vessel wall depend on the individual uncertainties in the measurement process, the uncertainty in the dosimetry location, and in the uncertainty in the calculated ratio of the neutron exposure at the point of interest to that at the measurement location.

The uncertainty in the derived neutron flux for an individual measurement is obtained directly from the results of a least squares evaluation of dosimetry data. The least squares approach combines individual uncertainty in the calculated neutron energy spectrum, the uncertainties in dosimetry cross-sections, and the uncertainties in measured foil-specific activities to produce a net uncertainty in the derived neutron flux at the measurement point. The associated uncertainty in the plant specific bias factor, K, derived from the 16-point measurement database, depends on the total number of available measurements as well as on the uncertainty of each measurement. Because of the dependence on the size of the overall database, plants that have incorporated supplemental reactor cavity dosimetry will generally have a lower uncertainty than plants with measurements from internal surveillance capsules alone.

The positioning uncertainties for dosimetry are taken from parametric studies of sensor position performed as part of the analytical sensitivity studies included in the qualification of the methodology. The uncertainties in the exposure ratios relating dosimetry results to positions within the vessel wall are again based on the analytical sensitivity studies of the vessel thickness tolerance for the cavity data and on downcomer water density variations and vessel inner radius tolerance for the surveillance capsule measurements. Thus, this portion of the overall uncertainty is controlled entirely by dimensional tolerances associated with the reactor design and by the operational characteristics of the reactor.

The net uncertainty in the bias factor is combined with the uncertainty from the analytical sensitivity study to define the overall fluence uncertainty at the pressure vessel wall.

In the case of PBNP, the derived uncertainties in the bias factor and the additional uncertainty from the analytical sensitivity studies combine to yield net uncertainties of ±12% for Unit 1 and ±11% for Unit 2.