May 25, 2000

Mr. Nathan L. Haskell, Director
Licensing and Performance Assessment
Palisades Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

SUBJECT: PALISADES PLANT - REQUEST FOR ADDITIONAL INFORMATION REGARDING REACTOR PRESSURE VESSEL NEUTRON FLUENCE EVALUATION (TAC NO. MA8250)

Dear Mr. Haskell:

By letter dated February 21, 2000, Consumers Energy Company forwarded revised neutron fluence estimates for the reactor pressure vessel at the Palisades Plant, including Westinghouse Report WCAP-15353, "Palisades Reactor Pressure Vessel Neutron Fluence Evaluation," for the NRC staff's review and approval. The letter also requests that the NRC staff endorse a new date, 2014, as the date that the Palisades reactor vessel will reach the pressurized thermal shock screening criteria.

The NRC staff finds that additional information, identified in the enclosure, is needed to complete this review.

The enclosure was faxed to Mr. Robert Vincent of your organization on May 12, 2000, to determine a response date. On the basis of my telephone discussions with Mr. Vincent on May 23, 2000, a mutually acceptable response date is July 7, 2000, which is expected to provide for completion of the NRC staff's review by September 30, 2000.

Sincerely,

/RA/

Darl S. Hood, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure: Request for Additional Information

cc w/encl: See next page

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REQUEST FOR ADDITIONAL INFORMATION
PALISADES PLANT
REGARDING WCAP-15353

By letter dated February 21, 2000, Consumers Energy Company (the licensee) forwarded Westinghouse Report WCAP-15353, "Palisades Reactor Pressure Vessel Neutron Fluence Evaluation," Revision 0, for NRC review and approval. The letter also requested that the NRC endorse a new date, 2014, at which the licensee estimates that the Palisades reactor vessel will reach the pressurized thermal shock screening criteria. The NRC staff finds that the following additional information is needed regarding WCAP-15353:

(1) One of the updates in WCAP-15353 uses CASMO-4 for the calculation of the neutron source. However, the CASMO-4 qualifications for this particular application are not discussed. In this instance, it is the prediction of the flux slope at the outer fuel assemblies that matters. How was CASMO-4 benchmarked with respect to the prediction of the slope in the outer assemblies?

(2) The 3-D synthesis model enables the prediction of the fast neutron flux in locations off the core's mid-plane. The data from the core top and core bottom are not counted in the final evaluation. Performance at these locations seems to be poor--see for example, Table 4.3-11. Similar results have been obtained elsewhere (e.g., WCAP-14284 and WCAP-12794). One of the stated objectives of the 3-D synthesis was to "...address concerns regarding the axial leakage effects..." Since no attempt was made to justify these deviations or to address the leakage concerns, what is the purpose of these measurements?

(3) On page 1-2, it is stated that in order to minimize the uncertainties, neutron transport calculations must be compared to industry-wide power reactor databases. Where are the results of these comparisons?

(4) On page 2-1, it is stated that "At each of the azimuthal locations selected for core midplane spectra measurements..." How and where in WCAP-15353 were these spectral measurements analyzed and how were they used?

(5) On page 2-3, it is stated that high purity iron and cobalt foils provide a check on the chemical analysis of Type 304 stainless steel:

   (1) Where is this check carried out and what was the conclusion?

   (2) Given the magnitude of uncertainty associated with dosimetry, is dosimetry a proper means to check chemical composition?

(6) On page XVII, the azimuthal reactor pressure vessel fluence values at the end of Cycle 14 are listed and the Cycle 15 flux is presented in Table 6.1-15. Please provide the Cycle 15 and the remaining effective full-power seconds to allow the determination of the proposed fluence value at the end of license (including any currently proposed extension of the license's expiration date).

ENCLOSURE

(7) On page 3-4, it is reported that water density effects in the outer fuel assemblies were calculated using the thermal-hydraulic model in SIMULATE. What are the results of this analysis and what temperature was used for the calculation of the water density? Was mixing accounted for in SIMULATE? Could another code like THINC produce more accurate results?

(8) What was the size of the photofission correction reported on page 3-15? Was the associated γ-flux calculated?

(9) On page 3-15, it is stated that FERRET has "...assigned uncertainties and correlations..." What are the values and why are they relevant to this application? On page 3-18, it is stated that the values are "liberal enough" to fit the measured data for all practical applications. Are these values the product of judgment and selection or the product of some arithmetic or mathematical operation? These uncertainty assignments are stated to be a product of FERRET applications, but page 3-17 appears to indicate that they originated in Mearker's LEPRICON. Please clarify.

(10) In Tables 4.2-6 to 4.2-8, 4.2-13 to 4.3-15, etc., the actual location of the foils and chains do not have the symmetry implied by their first quadrant equivalent (FQE). What is the meaning of the average FQE 30 °?

(11) In Tables 4.3-1 to 4.3-22, the least squares adjusted value is frequently outside the range of the measured and calculated values. Please explain why this is acceptable and why it is physically meaningful. The values of ^{59}Co(n,γ) and ^{59}Co(n,γ)Cd seem to be problematic (here as well as in other WCAPs). Why are these values acceptable and what are the acceptance criteria? What would be the effect if they were discarded?

(12) Table 4.3-11 (and to a lesser degree, Table 4.3-18) are out of range compared with the other measurements. Although they are not counted in the final value, they appear to be indicative of some calculational or measurement problem. Please explain.

(13) The "M/C" values in Tables 4.3-1 to 4.3-22 give a direct comparison of the measured and calculated sensor reaction rates. What was the statistical basis for accepting or rejecting measurements for inclusion in the least squares adjustment procedure?

(14) Regarding Section 6.2 of WCAP-15353:

(1) What methods were used in the benchmark comparisons whose results are quoted on page 6-27? What are the systematic components (i.e., bias) and the random components that result in the quoted 3 percent for each case?

(2) What methods were used in the analytic sensitivity studies? What were the fluence sensitivity and the estimate of the expected uncertainty that gave the quoted results?

(3) What is included under "Other Factors" and how was this uncertainty estimated? Are there any correlations among the components?

(4) How have the benchmark uncertainties been incorporated into the overall calculated fluence uncertainty? Are there correlations?

(5) Do the dosimeter evaluations in Figure 6.2-1 include the uncertainty in the flux spectrum after the least squares adjustment?

(15) What is the bottom line of your submittal dated February 21, 2000 (i.e., what is the projected calculated limiting-element inside-surface fluence value at the end of the current operating license, and for the currently proposed extension of the license's expiration date?) What are the corresponding "measured" values? What is the projected reference temperature for pressurized thermal shock (RT_{PTS})?

(16) Regarding page 6 of Attachment 1 of your letter of February 21, 2000, how was the ultrasonic flow measurement (UFM) used to determine the 2% underpower operation? What error, if any, is associated with the UFM? What data demonstrate the UFM correction?

(17) In your letter of February 21, 2000, forwarding WCAP-15353, Revision 0, you request that the NRC staff approve that "the Palisades reactor vessel is not expected to reach the PTS [pressurized thermal shock] screening criteria until 2014." Per the PTS Rule (Title 10 of the Code of Federal Regulations Part 50 Section 61), PTS evaluations are characteristically made and reviewed relative to the expiration date of a facility's operating license (see in particular 10 CFR 50.61(a)(6) on end-of-life fluence). As such, the NRC staff requests that you provide an appropriately detailed evaluation for each Palisades beltline material (citing copper and nickel compositional values, fluence values, margin terms, the relevance of any reactor pressure vessel surveillance data to the assessment, etc.) to demonstrate what their RT_{PTS} values will be at the expiration of your current operating license. By separate application dated April 27, 2000, you have also requested an amendment to recapture Palisades' period of construction by extending the current operating license by four years (i.e., from March 14, 2007, to March 24, 2011). Therefore, you should also submit an evaluation for each beltline material for the end of the operating license, including the proposed construction period recapture.

cc:

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