

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

January 16, 1980

Director, Nuclear Reactor Regulation Att Mr Dennis L Ziemann, Chief Operating Reactors Branch No 2 US Nuclear Regulatory Commission Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 -PALISADES PLANT - FUEL CLAD SWELLING AND RUPTURE DURING A LOCA

In response to the NRC letter of November 9, 1979 concerning fuel cladding swelling and rupture during a LOCA, Consumers Power Company has reviewed the documentation submitted by our fuel vendor (Exxon Nuclear Company). This review was done in conjunction with the staff's new fuel cladding swelling and rupture models to verify the correctness of the representations made in our behalf.

As a result of our review, there is one area in which it was not clear that the generic analysis by our vendor was bounding with respect to fuel used in the Palisades Plant. A Plant Specific Analysis of the effects of the staff's models on the LOCA analysis was requested from ENC. The results of this analysis have been reviewed by Consumers Power Company. Consumers Power Company concurs with the conclusion that the use of the staff's model reduces calculated peak cladding temperatures for all Palisades fuel types; and that, therefore, the previous ECCS calculations for the Palisades Plant are conservative and continue to be valid.

The manner in which this problem was handled is of great concern to Consumers Power Company. Having reviewed the Draft Report NUREG-0630, it can be understood that the staff's new clad swelling and flow blockage model is a useful empirical correlation. It is also understandable that the model is, of necessity, based upon several nonrigorous engineering judgments and, to a significant degree, nonprototypical data. It is not understood why previously approved empirical correlations, like those of ENC, should be compared to the staff's empirical model rather than to the set of all experimental data. In this instance, the ENC correlation was found to be more conservative than the staff model. Consumers Power Company is concerned, however, that future NRC

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requests of this type could unnecessarily create a licensing problem if an empirical correlation is found to be slightly less conservative in comparison to a staff model even though it adequately bounds all experimental data.

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David P Hoffman Nuclear Licensing Administrator

CC JGKeppler, USNRC

Enclosure

CONSUMERS POWER COMPANY

BIG ROCK POINT

and

PALISADES PLANTS

Dockets 50-155 and 50-255 Licenses DPR-6 and DPR-20

At the request of the Commission and pursuant to the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974, as amended, and the Commission's Rules and Regulations thereunder, Consumers Power Company submits the attached information prepared by Exxon Nuclear Company, Inc regarding compliance with 10 CFR 50.46 in light of newly proposed NRC clad swelling and rupture models. Consumers Power Company has reviewed the information prepared by Exxon Nuclear Company has reviewed the information prepared by Exxon Nuclear Company, Inc and concurs with the conclusions presented therein.

CONSUMERS POWER COMPANY

R B DeWitt, Vice President Nuclear Operations

Sworn and subscribed to before me this 16th day of January, 1980.

SALTEIL

Dorothy H Bartkus, Notary Public Jackson County, Michigan

My commission expires March 26, 1983.

ATTACHMENT I TO CONSUMERS POWER COMPANY AFFIRMATION OF JANUARY 16, 1980 EFFECT OF PROPOSED NRC CLAD SWELLING AND RUPTURE MODEL ON PALISADES ECCS ANALYSES

In response to NRC concerns, this letter provides specific information on the impact of the newly proposed NRC Clad Swelling and Rupture Model⁽¹⁾ on ENC's ECCS analyses for Palisades. Use of the NRC model is found to reduce calculated peak cladding temperatures (PCTs). Hence, prior ENC ECCS calculations for Palisades are conservative and continue to be valid.

The change in calculated PCTs when the NRC model for clad swelling and rupture is used in place of the ENC model is given in Table 1 for the applicable fuel types. The calculations are for the ENC CD=0.6 DEG/PD limiting break at Palisades (2, 3). The calculations were made for the limiting applicable exposure for each fuel type. Thus, for ENC Type E/G fuel and Combustion Engineering Type D fuel, both which have one or more cycles of exposure, the limiting case considered is end-of-life exposure⁽⁴⁾. For the new ENC Type H fuel, the applicable limiting case is beginning-of-life. The present sensitivity calculations were made in accordance with ENC's approved WREM-II PWR ECCS Evaluation Model^(5, 6). The fuel rod internal pressure corresponds to the ENC model⁽⁷⁾ for nominal conditions. In view of the reduced PCT with the NRC clad swelling and rupture model, the current linear heat generation rate limits at Palisades insures conformance to 10 CFR 50.46.

References

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- 1. D. A. Powers and R. O. Meyer, "Cladding Swelling and Rupture Models for LOCA Analysis", Draft NUREG-0630, November 8, 1979.
- 2. "LOCA Analysis for Palisades at 2530 MWt Using the ENC WREM-II FWR ECCS Evaluation Model", XN-NF-77-24, July, 1977 transmitted to NRC by Consumers Power Company letter dated July 28, 1977.
- 3. "LOCA Analysis of Palisades Type D Fuel at 2530 MWt Using the ENC WREM-II PWR ECCS Evaluation Model", XN-NF-77-24, Supplement 1, August, 1977 transmitted to NRC by Consumers Power Company letter dated August 17, 1977.
- Letter, R. J. Ehlers (ENC) to W. J Beckius (CPCo), "Fission Gas Release Study and Uncertainty Analyses for Palisades Batch D and E Fuels", March 20, 1978. Information provided by this letter was transmitted to NRC by Consumers Power Company letter dated May 23, 1978.
- 5. "Exxon Nuclear Company WREM-Based Generic PWR ECCS Evaluation Model", XN-75-41:
 - a. Volume I, July, 1975
 b. Volume II, August, 1975
 c. Volume III, Revision 2, August, 1975
 d. Supplement 1, August, 1975
 e. Supplement 2, August, 1975
 f. Supplement 3, August, 1975
 g. Supplement 4, August, 1975
 h. Supplement 5, Revision 5, October, 1975
 i. Supplement 6, October, 1975
 j. Supplement 7, November, 1975
- "Exxon Nuclear Company WREM-Based Generic PWR ECCS Evaluation Model Update ENC WREM-II", XN-76-27, July, 1976; Supplement 1, September, 1976; Supplement 2, November, 1976.
- "Flow Blockage and Exposure Sensitivity Study for ENC D. C. Cook Unit 1 Reload Fuel Using ENC WREM-II Model", SN-76-51; Supplement 1, January, 1977; Supplement 2, February, 1978; Supplement 3, April, 1978.

Effect of NRC Rupture and Flow Blockage Model

on ENC ECCS Analyses for Palisades

Fuel Type	ENC Reload H	ENC Type E/G	C.E. Type D
Peak Pellet Exposure (MWD/MTM)	0	45,000	45,000
Heatup Rate at Rupture (°C/S)	7.0	2.0	3.0
PCT Impact of NRC Model.versus	-22°F	- 9°F	_11°F

ATTACHMENT II to CONSUMERS POWER COMPANY AFFIRMATION OF JANUARY 16, 1980 EFFECT OF PROPOSED NRC CLAD SWELLING AND RUPTURE MODEL ON BIG ROCK POINT ECCS ANALYSES

NRC letter dated November 9, $1979^{(1)}$ requested that utilities evaluate the present ECCS clad swelling and rupture models in light of the proposed NRC clad swelling and rupture model⁽²⁾. It was specifically requested that either the present clad swelling and rupture model be confirmed as in agreement or conservative with respect to the NRC model over the range of interest or that results of calculations be presented which show the impact of the proposed NRC clad swelling and rupture model.

The ENC BWR clad swelling and rupture model has been compared to the proposed NRC temperature ramp rate dependent clad swelling and rupture model and found to be in agreement or conservative over the range of interest. The ENC BWR rupture temperature model already has a temperature ramp rate dependence which is in agreement with the proposed NRC rupture temperature model over the range of interest ($T_{rupture} > 950^{\circ}$). Over this same range of interest and at slow ramp rates typical of BWR ruptures, the rupture strain used in ENC BWR model for both heat transfer and oxidation (30%) is greater than or in agreement with the rupture strain of the proposed NRC slow ramp rate model.

Because the ENC BWR clad swelling and rupture model is in agreement or is conservative relative to the proposed NRC clad swelling and rupture model over the range of interest, it is concluded that the present ENC licensing analyses and current plant ECCS limits are in conformance with 10 CFR 50.46.

References

- 1. NRC letter from D G Eisenhut to operating LWR's dated November 9, 1979.
- 2. D A Powers and R O Meyer, "Cladding Swelling and Rupture Models for LOCA Analyses", Draft NUREG-0630, dated November 8, 1979.