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Nuclear Regulatory Commission
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Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
TECHNICAL SPECIFICATION CHANGE REQUEST - INCORE ANALYSIS PROGRAM (TAC NO. 75059)

Enclosed is a request for change to the Palisades Technical Specifications. This change request revises the Technical Specifications to replace the current one-eighth core INCA incore analysis program with a new full core incore analysis program, PIDAL, developed by Consumers Power Company. Attachment 3 provides a description of the PIDAL software, Attachment 4 an uncertainty analysis and Attachment 5 proposed FSAR page changes to reflect the new PIDAL program.

The PIDAL incore analysis program is capable of determining power distribution, peaking factors and heat generation rate on a full core basis. This is in contrast to the current INCA model which assumes one-eighth core radial symmetry. This proposed change is driven by increasing needs to deviate from one-eighth core symmetrical loading patterns to meet reactor vessel fluence, while maintaining fuel cycle length goals.

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Director, Nuclear Licensing

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachments

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OC1089-0002-NL02

CONSUMERS POWER COMPANY
Docket 50-255
Request for Change to the Technical Specifications
License DPR-20

For the reasons hereinafter set forth, it is requested that the Technical Specifications contained in the Provisional Operating License DPR-20, Docket 50-255, issued to Consumers Power Company on October 16, 1972, for the Palisades Plant be changed as described in Section I below:

I. Changes

A. Change section 3.11.1a to read "With at least 160 of the 215 possible incore detectors and 2 incores per axial level per core quadrant."

B. Change section 3.23.1, action 3, to read "...Readings shall be taken on a minimum of 10 individual detectors per quadrant (to include a total number of 160 detectors in a 10-hour period) within 4 hours..."

C. Change the last paragraph of the basis for section 3.23.1 to read "...takes into account the local LHGR measurement uncertainty factors given in Table 3.23-3, an engineering uncertainty factor of 1.03, and a thermal power measurement uncertainty factor of 1.02." Also add new reference (5) to the list of references to read "(5) FSAR Section 3.3.2.5".

D. Add new Table 3.23-3 to read as follows:

"TABLE 3.23-3

POWER DISTRIBUTION MEASUREMENT UNCERTAINTY FACTORS

LHR/Peaking Factor Parameter	Measurement Uncertainty(a)	Measurement Uncertainty(b)
LHR	0.0623	0.0664
F_r^A	0.0401	0.0490
$F_r^{\Delta h}$	0.0455	0.0526

(a) Measurement uncertainty for reload cores using all fresh incore detectors.

(b) Measurement uncertainty for reload cores using a mixture of fresh and once-burned incore detectors."

E. Add the following paragraph and reference to the basis for section 3.23-2 to read:

"To ensure that the design margin of safety is maintained, the determination of the radial peaking factors takes into account the appropriate measurement uncertainty factors[1] given in Table 3.23-3.

References

(1) FSAR Section 3.3.2.5"

F. Change the last two sentences of the basis for section 3.23.3 to read "Quadrant power tilt calibration factors are determined using incore measurements and an incore analysis computer program[2]." and add new reference (2) to the list of references to read "(2) FSAR Section 7.6.2.4".

II. Discussion

PIDAL is an incore analysis routine developed by Consumers Power Company and is capable of determining the power distribution, peaking factors and LHGR, on a full core basis. This is in contrast to the current INCA model which must assume one-eighth core radial symmetry within the reactor core. There are two major driving forces for the conversion from INCA to PIDAL.

First, there is an increasing need to deviate from one-eighth core symmetric fuel loading patterns due to limitations on core design caused by reactor vessel fluence concerns. It has become clear that quarter core loading patterns will be required in order to meet goals established for vessel fluence while maintaining fuel cycle length. Secondly, it is expected PIDAL will allow full detection and measurement capabilities should non-symmetric power anomalies occur; ie, misaligned rods. INCA, being a one-eighth core model cannot accurately measure the core power distribution when localized asymmetric power distributions occur.

In addition, the uncertainty evaluation for the INCA model was over-conservative in some areas. Of immediate interest is the benefit of a 0.5% $F_r^{\Delta h}$ margin gain by switching to PIDAL. This translates to a roughly 1.5% reactor power gain at hot full power. During initial Cycle 8 operation, the $F_r^{\Delta h}$ margin was exhausted and this may recur later in the cycle.

The PIDAL program varies significantly from that of INCA. Most notably it monitors the full core on an assembly by assembly basis, rather than by averaging symmetric assemblies into an octant representation. PIDAL uses a modern method of coupling uninstrumented assemblies with instrumented neighbors in order to determine the nodal power distribution. PIDAL incorporates a mathematically rigorous method for determining incore quadrant power tilt which is believed to be more accurate than the INCA fitting method. PIDAL also has the capability of determining quadrant power tilt using an integral quadrant power method similar to INCA's.

The documentation effort for the PIDAL program and uncertainty analysis has been completed, resulting in a computer program which is better documented and easier to maintain than the INCA program. The PIDAL software was designed using standard state-of-the-art techniques which will allow maximum flexibility for future use as an on-line, real-time monitoring system. Attachment 3 provides a description of the new PIDAL program, Attachment 4 provides the uncertainty analysis associated with PIDAL, and Attachment 5 provides proposed FSAR changes to reflect the new PIDAL program.

Changes A and B revise affected Technical Specification sections to allow use of the PIDAL program. The PIDAL modeling will maintain acceptable uncertainties with up to 55 of 215 incore detectors inoperable.

Changes C, E and F revise affected basis sections to reflect use of the PIDAL program and to include FSAR references which describe the program.

Change D incorporates the PIDAL uncertainty factor into the Technical Specifications.

Analysis of No Significant Hazards Consideration

The incore analysis software, previously INCA and now PIDAL, is primarily a monitoring tool and is not considered as a possible initiator for an accident. As a core monitoring tool, it is used to confirm inputs for the accident analysis. It is used to verify that reactor operation is bounded by the assumptions made in performing the safety and accident analysis. The new PIDAL model has been benchmarked against and shown to agree well with the INCA model. It is not expected that the core power distribution parameters measured by PIDAL and used as inputs to the accident analysis will be significantly different from analogous INCA values. The program and inputs to the program will receive the same technical reviews and Administrative controls as did the INCA program. The PIDAL program change will result in an analytical representation of core parameters which is at least as accurate as the INCA program. Therefore, there will be no increase in the probability or consequences of a previously evaluated accident nor will it create a new or different kind of accident.

The linear heat generation rate and $F_r^{\Delta h}$ peaking factor measurement uncertainties associated with the PIDAL model are lower than those assumed for INCA. However, in conformance with accepted practices, the PIDAL uncertainty analysis determined 95/95 probability/confidence one-sided tolerance limits for the power distribution measurement uncertainties. Therefore, the margin of safety as related to measuring the reactor power distribution will not be reduced by switching to the PIDAL program.

III. Conclusion

The Palisades Plant Review Committee has reviewed this Technical Specification Change Request and has determined that this change does not involve an unreviewed safety question and, therefore, involves no significant hazards consideration. This change has been reviewed by the Nuclear Safety Services Department. A copy of this Technical Specification Change Request has been sent to the State of Michigan official designated to receive such Amendments to the Operating License.

CONSUMERS POWER COMPANY

To the best of my knowledge, information and belief, the contents of this Technical Specification Change Request are truthful and complete.

By _____
David P Hoffman, Vice President
Nuclear Operations

Sworn and subscribed to before me this 23rd day of October, 1989.

_____
Elaine E Buehrer, Notary Public
Jackson County, Michigan
My commission expires October 11, 1993

ATTACHMENT 1

Consumers Power Company
Palisades Plant
Docket 50-255

PROPOSED TECHNICAL SPECIFICATION PAGE CHANGES

October 23, 1989

7 Pages

TSP0889-0181-NL04