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United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket No. 50-440
License Amendment Request:
Traversing In-Core Probe
System - Specification 3/4.3.7.7

Gentlemen:

Enclosed is an application for amendment of the Facility Operating License (NPF-58) Appendix A Technical Specifications for the Perry Nuclear Power Plant (PNPP) Unit 1. This License Amendment application proposes the addition of an alternative Limiting Condition for Operation (LCO) requirement for the use of data obtained from the on-line core monitoring system to replace data in inoperable channels.

A Summary, Description of Proposed Change, Safety Analysis, and an Environmental Consideration are provided in Attachment 1. Attachment 2 provides a copy of the marked up Technical Specification pages. Attachment 3 provides the Significant Hazards Consideration.

If you have questions or require additional information, please contact Mr. James D. Kloosterman, Manager - Regulatory Affairs at (216) 280-5833.

Very truly yours,

Robert A. Stratman

CSO:sc

Enclosure

Attachments

cc: NRC Project Manager
NRC Resident Inspector Office
NRC Region III
State of Ohio

270080

Operating Companies
Cleveland Electric Illuminating
Toledo Edison

A001

I, Robert A. Stratman, being duly sworn state that (1) I am Vice President, Nuclear - Perry of the Centerior Service Company, (2) I am duly authorized to execute and file this certification on behalf of The Cleveland Electric Illuminating Company and Toledo Edison Company, and as the duly authorized agent for Duquesne Light Company, Ohio Edison Company, and Pennsylvania Power Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

Robert A. Stratman

Sworn to and subscribed before me, this 21st day of DECEMBER, 1994.

Caroline M Balog

CAROLINE M. BALOG
Notary Public, State of Ohio
My Commission expires April 20, 1995
(Recorded in Lake County)

FORM/3788/SS

SUMMARY

A change to Technical Specification 3.3.7.7 Limiting Condition for Operation (LCO) for the Traversing In-Core Probe (TIP) system is proposed to permit the use of substitute data generated from the process computer, normalized with available operating measurements, for up to 10 Local Power Range Monitor (LPRM) strings. This change is due to an upgrade in the process computer which has the capability to accurately generate substitute data for as many as 25% of the LPRM strings. Since there are 41 strings of LPRMs in the Perry Nuclear Power Plant (PNPP) core, a limit of 10 strings are permitted to use the generated substitute data.

The plant is presently operating without the ability to calibrate one string of LPRMs in position 24-25, due to an interference which allows neither the "A" nor "B" TIP probe to enter the 24-25 channel. Therefore, calibration of this channel can not be accomplished. Since the 24-25 channel is located along the line of symmetry, the present methods in LCO 3.3.7.7 for substituting data cannot be accomplished. This proposed change would permit calibration of this or other LPRM strings using the substitute data generated by the process computer.

Since the improved Technical Specification submittal relocates this Specification to plant controlled procedures, this proposed change does not impact the improved Technical Specification submittal.

DESCRIPTION OF PROPOSED CHANGES

Modify Technical Specification 3.3.7.7 LCO, paragraph b, to add an allowance to use substitute replacement data generated from the process computer. The new LCO paragraph b will read as follows:

"b. With up to ten TIP measurement locations inoperable, data may be replaced by data as described in 1 or 2 below.

1. TIP data for inoperable measurement locations may be replaced by data obtained from that location's symmetric counterpart if the substitute TIP data was obtained from an OPERABLE measurement location, provided the reactor core is operating in a type A control rod pattern and the total core TIP uncertainty for the present cycle has been determined to be less than 8.7 percent (standard deviation).

2. TIP data for an inoperable measurement location may be replaced by data obtained from the on-line core monitoring system (process computer), normalized with available operating measurements."

In addition, to discuss this allowance, a change is being made to the Bases description of this Specification.

SAFETY ANALYSIS

BWR power operation relies upon readings from fixed in-core neutron detectors known as Local Power Range Monitors (LPRMs). LPRMs are small fission chambers with an approximately linear response to the local neutron flux and, thus, local thermal power. The current Surveillance Requirement to calibrate the LPRMs periodically employs a second set of movable detectors known as the Traversing In-Core Probe (TIP) system.

The required LPRM calibration relates a known power distribution, as measured by the TIP system, to the then existing LPRM readings. When the LPRMs are normalized to one another, to the TIP readings, and to a plant heat balance calculation, the LPRMs allow determination of the local power in six inch increments axially (nodes) along the 41 LPRM strings.

Outputs from the calibrated LPRMs are used in the Reactor Protection System (Average Power Range Monitor) (APRM), the Control Rod Block (APRM), and the Process Computer. Accuracy requirements for the power distribution are defined by General Electric documents GESTAR-II (NEDE-24011-P-A-10, Section 4.3.1.1.1) and GE Fuel Bundle Designs (NEDE-31152), which are part of the present reactor fuel licensing basis. In particular, Table 3-3 of NEDE-31152 requires the TIP readings to have a root mean square (rms) uncertainty of no more than 8.7% for reload cores. The attending Table 3-3 comment states that this is a nodal power uncertainty which also applies to the power distribution as determined by the LPRM system. Thus, the accuracy in nodal power as determined by the LPRM system between TIP sets must also meet the 8.7% rms uncertainty.

PNPP has five gamma sensitive TIP machines that are used to periodically determine the power distribution in the core and to calibrate the LPRMs. The TIP system consists of five independent gamma photon detection units. Each unit contains a miniature ion chamber, positioned in the reactor core from outside the primary containment by a motor drive mechanism. The detector is attached to the drive mechanism by means of a flexible drive cable. Operation of the drive mechanism causes the ion chamber to be inserted into or retracted from the reactor core within individual TIP guide tubes.

The TIP system provides a signal proportional to the axial neutron flux at 41 radial core locations. This signal provides for the following:

a. Reliable calibration of the LPRM flux amplifier gains to compensate for changes in LPRM detector sensitivity which accompany prolonged neutron exposure,

b. Accurate information on core wide flux shapes to the computer so power and exposure distributions can be calculated, and

c. Accurate substitute inputs to the process computer for positions where LPRMs have failed.

The 41 LPRM strings are divided between the five TIP machines with one common LPRM assembly connected to all five TIPs for cross-channel calibration. Each TIP unit uses an indexing device to route the detector to the desired LPRM assembly.

The Technical Specifications (TSs) require normalization of the TIP detectors (process computer program OD1) within 72 hours prior to use. In addition, the Technical Specifications also require performing an LPRM calibration once every 1000 megawatt days per ton core exposure. This calibration also requires an OD1.

On Wednesday, September 28, 1994, with the Unit operating at 100% rated thermal power, PNPP personnel were performing the TIP normalization process per Surveillance Requirement 4.3.7.7, in preparation for completing LPRM calibrations. During this normalization process, neither the "A" nor "B" TIP machines were able to traverse into channel 24-25. Repeated attempts to produce acceptable results failed. The TIP probes appeared to be meeting some type of obstruction in string 24-25. The obstruction is located in the drywell, which is not accessible during the present power level. Therefore, removing the obstruction would require a severe reduction in power to enable a drywell entry. Although OPERABLE in all other aspects, the Technical Specifications required the LPRMs in this 24-25 location to be declared inoperable and bypassed. Bypassing the LPRMs resulted in a total of 10 LPRMs which were considered inoperable. Table 1 presents the LPRMs which were operable following the bypassing of the 24-25 LPRM string. Table 1 demonstrates that the TS Table 3.3.1-1 Footnote (c) requirements for LPRMs continued to be maintained. Since the LPRMs in string 24-25 are inoperable and bypassed, the TIP probe system is OPERABLE using the footnote "*" of TS 3.3.7.7. Operation may continue in this configuration. However, additional LPRM failures may result in declaring Average Power Range Monitors (APRMs) inoperable, and could result in a plant shutdown.

Concurrent with the investigation and attempted repair of the TIP probe system, a determination was made on the possibility of running an LPRM calibration without the capability of inserting the TIP probe into the 24-25 channel. Amendment 25 to the TS had approved the use of replacement data from symmetrical counterparts as long as the substitute data was obtained from OPERABLE measurement locations. However, string 24-25 is located on the line of symmetry and, therefore, does not have a corresponding symmetric location. Since approval of Amendment 25, the process computer has been upgraded to use the three dimensional (3D) Monicore program for determining LPRM calibration values. This 3D Monicore system was designed to handle the circumstances of missing TIP data, and generates a substitute value based on the calculated value corrected with core average adaptive correction factors. Thus, the inaccessible 24-25 string can continue to be calibrated using the generated normalization data.

Theoretical advances in process computer monitoring include the development of new mathematical techniques and algorithms combining three dimensional reactor physics theory with on-line core data, e.g., LPRM readings. One such methodology, currently in use for PNPP, employs an adaptive learning algorithm using on-line, as well as historical core data inputs to improve power calculations within the reactor physics model. This is accomplished by effectively modifying the neutron leakage terms to force the calculated power distribution to match the measured power distribution as determined by the TIP system. Subsequent calculations use the adaptive coefficients and LPRM readings during monitoring between TIP sets. The methodology is capable of calculating substitute TIP data and utilizing it when measured TIP data is missing. This reactor physics methodology was used to study the effect of operating with a failure to scan strings assigned to a TIP machine due to TIP machine failure. Detailed statistical comparisons of calculational results to identical calculations results with TIP machine failure showed a TIP machine Out-of-Service Uncertainty of 1.8%. Since this small additional uncertainty, when combined with the other uncertainties associated with the core monitoring, yields an overall uncertainty well below 8.7%, it was concluded that plants can be operated, including performance of LPRM calibration, with a total of ten TIP measurement locations out of service indefinitely (25% of the LPRMs).

TS 3.3.7.7 for PNPP currently requires that the five TIP machines and their associated hardware (TIP detector drive, read-out equipment, and indexing mechanism) be operable. It also requires that the five detectors be calibrated in a common location. If one or more of the TIP machines are inoperable, the TS presently permits the use of replacement data for up to ten (10) TIP measurement locations as long as the reactor is operating in a type A control rod pattern, the TIP uncertainty has been determined to be less than 8.7%, and the substitute data has been obtained from a symmetrical, operable location. If these requirements are not met for each TIP unit, then the TIP system, in accordance with TS 3.3.7.7 is inoperable and cannot be used for re-calibration of any LPRM detector or for monitoring core thermal limits (Average Planar Linear Heat Generation Rate, Linear Heat Generation Rate, or Minimum Critical Power Ratio).

The proposed amendment will allow the utilization of substitute TIP data from normalized TIP data as calculated by the on-line core monitoring system. The Limiting Condition for Operation (LCO) of Technical Specification 3.3.7.7 is proposed to be modified to allow substitute TIP data to be utilized when actual data is not available. Certain TIP locations which lie on the axis of symmetry do not have symmetric counterparts. Should these locations be inaccessible, TIP data will be generated by computer modeling of the core conditions using the on-line core monitoring system described earlier in this discussion, with the calculated data normalized to the available real data. Use of the computer modeling method is not limited to the locations which lie on the axis of symmetry. The computer modeling method may be used to generate substitute TIP data for any TIP channel. Analysis supports the use of this method for the generation of substitute TIP data for a total of ten (10) TIP measurement locations.

The LCO addition is intended to prevent load reductions or shutdowns which may be required by certain inoperable TIP equipment. The proposed method (using a computer modeling method using a 3-dimensional core simulator) of using substitute TIP data is not a new innovation and has been used at other BWRs.

ENVIRONMENTAL CONSIDERATION

The proposed Technical Specification change request has been reviewed against the criteria of 10 CFR 51.22 for environmental considerations. As shown above and in Attachment 3, the proposed change does not involve a significant hazards consideration, does not increase the types and amounts of effluents that may be released offsite, and does not significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, it has been concluded that the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.

Table 1

LPRMs OPERABLE Following Placing 24-25 LPRM String in Bypass

APRM	LEVEL				TOTAL
	A	B	C	D	
A	5	4	6	4	19
B	6	6	4	4	20
C	5	5	4	6	20
D	4	6	6	4	20
E	5	5	5	4	19
F	4	4	6	6	20
G	4	6	5	5	20
H	6	4	4	6	20

INSTRUMENTATION

TRAVERSING IN-CORE PROBE SYSTEM

LIMITING CONDITION FOR OPERATION

3.3.7.7 The traversing in-core probe system shall be OPERABLE with either:

a. Five movable detectors, drives and readout equipment to map the core, and indexing equipment to allow all five detectors to be calibrated in a common location.

OR

b. With one or more TIP measurement locations inoperable, data may be replaced by data obtained from that location's symmetric counterpart if the substitute TIP data was obtained from an OPERABLE measurement location, provided the reactor core is operating in a type A control rod pattern and the total core TIP uncertainty for the present cycle has been determined to be less than 8.7 percent (standard deviation). Symmetric counterpart data may be substituted for a maximum of ten TIP measurement locations.

Insert

APPLICABILITY: When the traversing in-core probe is used for:

a.* Recalibration of the LPRM detectors, and

b.* Monitoring the APLHGR, LHGR, or MCPR.

ACTION:

With the traversing in-core probe system inoperable, do not use the system for the above applicable monitoring or calibration functions. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.7.7 The traversing in-core probe system shall be demonstrated OPERABLE by normalizing each of the above required detector outputs within 72 hours prior to use when required for the above applicable LPRM calibration and monitoring functions.

*Only the detector(s) in the location(s) of interest are required to be OPERABLE.

INSERT:

b. With up to ten TIP measurement locations inoperable, data may be replaced by data as described in 1 or 2 below.

1. TIP data for inoperable measurement locations may be replaced by data obtained from that location's symmetric counterpart if the substitute TIP data was obtained from an OPERABLE measurement location, provided the reactor core is operating in a type A control rod pattern and the total core TIP uncertainty for the present cycle has been determined to be less than 8.7 percent (standard deviation).

2. TIP data for an inoperable measurement location may be replaced by data obtained from the on-line core monitoring system (process computer), normalized with available operating measurements.

MONITORING INSTRUMENTATION (Continued)

3/4.3.7.4 REMOTE SHUTDOWN INSTRUMENTATION AND CONTROLS

The OPERABILITY of the remote shutdown monitoring instrumentation and controls ensures that sufficient capability is available to permit shutdown and maintenance of HOT SHUTDOWN of the unit from locations outside of the control room. This capability is required in the event control room habitability is lost and is consistent with General Design Criteria 19 of 10 CFR 50.

3/4.3.7.5 ACCIDENT MONITORING INSTRUMENTATION

The OPERABILITY of the accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess important variables following an accident. This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light Water Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," December 1975 and NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980. The CHANNEL CHECK for the Primary Containment Isolation Valve Position consists of the verification that indication of valve position (open or closed) can be determined by the valve position lights in the control room. The CHANNEL CALIBRATION for the Primary Containment Isolation Valve Position consists of the Position Indication Test (PIT), which is conducted in accordance with Specification 4.0.5.

3/4.3.7.6 SOURCE RANGE MONITORS

The source range monitors provide the operator with information of the status of the neutron level in the core at very low power levels during startup and shutdown. At these power levels, reactivity additions shall not be made without this flux level information available to the operator. When the intermediate range monitors are on scale, adequate information is available without the SRMs and they can be retracted.

The SRMs are required OPERABLE in OPERATIONAL CONDITION 2 to provide for rod block capability, and are required OPERABLE in OPERATIONAL CONDITIONS 3 and 4 to provide monitoring capability which provides diversity of protection to the mode switch interlocks.

3/4.3.7.7 TRAVERSING IN-CORE PROBE SYSTEM

The OPERABILITY of the traversing in-core probe system with the specified minimum complement of equipment ensures that the measurements obtained from use of this equipment accurately represent the spatial gamma flux distribution of the reactor core. With less than the specified complement of equipment, the spatial gamma flux distribution of the reactor core can still be accurately represented by using either replacement data from ~~symmetrical strings (LPRM locations),~~ provided the conditions specified in the LCO are met. BASES INSERT

The TIP system OPERABILITY is demonstrated by normalizing all probes (i.e., detectors) prior to performing an LPRM calibration function. Monitoring core thermal limits may involve utilizing individual detectors to monitor selected areas of the reactor core, thus all detectors may not be required to be OPERABLE. The OPERABILITY of individual detectors to be used for monitoring is demonstrated by comparing the detector(s) output with data obtained during the previous LPRM calibrations.

BASES INSERT:

symmetrical strings (LPRM locations) or by process computer generated replacement data,

SIGNIFICANT HAZARDS CONSIDERATION

The standards used to arrive at a determination that a request for amendment involves no significant hazards considerations are included in the Commission's Regulations, 10 CFR 50.92, which state that the operation of the facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in the margin of safety.

The proposed change has been reviewed with respect to these three factors and it has been determined that the proposed change does not involve a significant hazard because:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The TIP system is not used to prevent or mitigate the consequences of any previously analyzed accident or transient. No assumptions are made in any accident analysis relative to the operation of the TIP system. No other safety related system is affected by this change.

   The use of substitute values from calculations performed by the on-line computer core monitoring system does not affect the consequences of plant transients previously evaluated in the USAR because the total core TIP reading (nodal power) uncertainty remains less than 8.7%. Thus, the MCPR safety limit is not affected.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The proposed change does not involve the installation of any new equipment or the modification of any equipment designed to prevent or mitigate the consequences of accidents or transients. Therefore, the change has no effect on any accident initiator, and no new or different type of accidents are postulated to occur.

3. The proposed change does not result in a significant reduction in the margin of safety.

   The total core TIP reading uncertainties will remain within the assumptions of the licensing basis; thus, the margin of safety to the MCPR safety limits is not reduced. The ability of the computer to accurately represent nodal powers in the reactor core is not compromised. The ability of the computer to accurately predict the LHGR, APLHGR, MCPR, and its ability to provide for LPRM calibration, are not compromised. Therefore, the margin of safety is not significantly reduced.