THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket No. 50-440
Exigent Technical Specification
Change Request - Traversing
In-Core Probe System

Gentlemen:

The Cleveland Electric Illuminating Company (CEI) hereby requests Amendment of Facility Operating License NPF-58 for the Perry Nuclear Power Plant (PNPP), Unit 1. In accordance with the requirements of 10 CFR 50.91(b)(1), a copy of this request for amendment has been sent to the State of Ohio.

The proposed amendment will permit the use of functioning channels of the Traversing In-core Probe (TIP) System to provide necessary data when one or more of the TIP measurement locations are inaccessible or inoperable. This will allow continued operation utilizing operable TIP measurement data substituted from symmetric core locations for use in Local Power Range Monitor (LPRM) calibrations and thermal power monitoring.

Attachment 1 provides a description of the system, general discussion, description of exigent circumstances, significant hazards analysis and environmental impact considerations. Attachment 2 provides copies of the changes to be made to the Technical Specifications and Bases. Attachments 3, 4 and 5 depict the TIP indexing mechanism, a core map which shows the assigned TIP machine at each LPRM location and the TIP system layout respectively.

In accordance with standard operating practice, it is CEI's intention to return the inoperable TIP unit to service at the next planned or forced outage or prior to changing to an asymmetric control rod pattern.

If there are any questions, please feel free to call.

Very truly yours,

Al Kaplan
Vice President
Nuclear Group

AK/njc
Attachments
cc: P. Hiland (NRC Resident Insp.)
T. Colburn (NRR Project Mgr.)
J. Harris (State of Ohio)
NRC Region III

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I. System Description and Operation

The Traversing In-Core Probe (TIP) system provides a method for measuring core gamma flux distribution which is used by the process computer to:

a. calculate core power and exposure distributions from which the fuel thermal limits are determined,

b. determine appropriate readings against which to calibrate the fixed in-core neutron detectors, Local Power Range Monitors (LPRMs),

c. determine substitute values to be used by the process computer for LPRMs which have failed,

d. determine appropriate constants with which to relate the readings of LPRMs to those of the TIPs.

The TIP system consists of five independent subsystems which together can measure the axial gamma flux distribution in the 41 radial core locations containing LPRM detector assemblies. Each subsystem consists of a gamma detector on a flexible drive cable, a drive motor unit, an indexing mechanism, TIP guide tubes (which are an integral part of the LPRM detector assemblies), and associated controls and signal conditioning electronics. Each of the 41 radial core locations are assigned to a particular channel of a TIP subsystem. One channel on each subsystem is connected to a common core location. In four other core locations, the LPRM detector assembly is shared by channels on two separate TIP subsystems which provides redundant direct monitoring capabilities. The indexing mechanism selects the channel of a TIP subsystem in which the gamma flux is to be measured.

In-core gamma flux measurements are made when the drive motor inserts and then retracts the TIP detector and drive cable through the indexing mechanism and up and down one of the TIP guide tubes (at one of the 41 core locations). These measurements can be supplied to the process computer or optionally to an X-Y plotter or meter.

The LPRMs provide input to the Average Power Range Monitors (APRMs) the output of which is calibrated against core power determined from a reactor heat balance. The LPRMs are also used by the process computer to determine core power and exposure distributions (and thereby thermal limits) between the measurement of gamma flux distribution via the TIP system. The radial arrangement of the LPRMs within the core does not result in every fuel bundle being monitored by an LPRM detector assembly/TIP channel; approximately one fourth of the fuel bundles are directly monitored.

The calculation of the core power and exposure distributions and thermal limits for the other three fourths of the interior fuel bundles employs the symmetry inherent in the core as a result of its design and operation. The core is designed to be both mirror symmetric (symmetric across the horizontal and vertical axes through the center control rod) and rotationally symmetric (quadrant symmetric about the center control rod). All operating control rod sequences (A1, A2, B1, and B2) are mirror symmetric with the "A" sequences also being rotationally symmetric. Since "A" sequences have both mirror symmetry and rotational symmetry, the rod pattern is referred to as octant symmetric. With the core designed and operating in octant symmetry, the LPRM locations are symmetric across a NE-SW line through the center control rod. This provides symmetric LPRM detector assemblies (TIP channels) for all core locations except those which do not require symmetry since they share at least two TIP subsystems. Therefore, under these conditions all TIP channels in one TIP subsystem have at least one symmetric TIP channel or can be accessed by a different TIP subsystem.

II. Discussion

The wording of the present PNPP Technical Specification (3.3.7.7) forces a determination that the TIP system is inoperable whenever any single LPRM detector assembly cannot be traversed by a least one of its associated TIP channel(s). If a TIP subsystem cannot traverse the LPRM detector assembly assigned to it in order to obtain data, the lack of gamma flux distribution information will cause the process computer to be unable to:

a. calculate core power and exposure distributions or fuel thermal limits,
b. determine appropriate readings against which to calibrate the LPRMs,
c. determine substitute values to be used by the process computer for LPRMs which have failed,
d. determine appropriate constants with which to relate the readings of LPRMs to those of the TIPs.

However, if the core is octant symmetric, all of these functions could be satisfactorily accomplished based upon the gamma flux distribution from a symmetric TIP channel.

The repeatability of the gamma flux measurement by a TIP channel and the degree of agreement between symmetric channels can be statistically expressed as the total TIP uncertainty. This parameter can be determined and compared against the value assumed in the reload licensing submittal.

The proposed amendment will allow, provided the core has been operating in an "A" control rod sequence, the performance of the above functions based upon the manual substitution of TIP data in the process computer data base from a symmetric channel to a channel which cannot be traversed. This substitution will also be restricted to when the cycle's total TIP uncertainty has been previously demonstrated to be within the value assumed in the General Electric reload licensing topical report - GESTAR II (8.7 percent). Based upon the last full core TIP set for this cycle (run on August 9, 1989 at approximately 95 percent reactor power), the total TIP uncertainty for this cycle is 6.0 percent. The wording of the proposed LCO will prohibit use of the symmetric data option unless the total TIP uncertainty can be shown to be within the assumed value of 8.7 percent.

The proposed revision to the Limiting Condition for Operation (LCO) is intended to prevent shutdown required by certain inoperable TIP equipment which can only be repaired with the reactor shutdown. The proposed revision to the Applicability section adds a "*" to item a. (involving recalibration of the LPRM detectors), to allow the LPRMs to be recalibrated using the symmetric data substitution method. The proposed method of substituting data using symmetric counterparts is a proven technique. Previous problems at several other BWRs have necessitated substitution of data for inaccessible TIP channels.

This specification requires changing of the LCO and the Applicability sections to reflect the capability to substitute symmetric channel data for inaccessible locations (see Attachment 2). Also, the bases have been revised to reflect this technique (see Attachment 2).

III. Description of Exigent Circumstances

The first indication of a problem was found on Friday, August 11, 1989 while taking TIP traces with the B TIP unit. A trace for TIP channel B2 (corresponding to an LPRM location of 24-33) could not be taken due to mechanical interference within the indexing mechanism for the B unit. The indexing mechanism for each TIP unit (see Attachment 3) selects the channel (or LPRM location) to be accessed by the TIP detector probe. This mechanical interference in the indexing mechanism prevented the B TIP detector probe from physically passing from the indexing machine into the guide tube resulting in that channel on the B TIP unit being inaccessible. Subsequently, three other LPRM locations (channels) on the B unit could not be accessed due to this interference. However, two of these channels (locations) can be accessed by other TIP units which allows flux measurements to be made at these locations. Therefore, at this time two channels cannot be accessed by a TIP unit (see Attachment 4).

The TIP indexing mechanisms are located within the drywell (see Attachment 5) and are therefore inaccessible during power operation (Mode 1). Even at reduced power levels, purgings of the drywell cannot be performed (only permitted in Modes 4 and 5) and therefore direct access to the TIP machines by drywell entry is severely limited due to temperature and health physics concerns. Attempts are continuing to be made, by various means, to remotely advance the sprocket wheel to correctly position the indexing mechanism and therefore allow passage of the TIP detector. The exact problem within the B machines indexing mechanism cannot be determined until a drywell entry can be made, since troubleshooting attempts from outside the drywell to date have proven unsuccessful.

As originally issued, the Technical Specifications state that the TIP system shall be operable with five detectors and support equipment to enable mapping the core, and all 5 detectors are required to be capable of calibration at a common location. At the present time, four channels (including the common channel) cannot be accessed by the B TIP machine. Therefore, without approval of this revision to Technical Specification 3.3.7.7 the TIP system will be considered inoperable when it is next necessary to recalibrate the LPRM detectors. The next calibration of the LPRMs is required to be performed within 1000 MWd/t of the last calibration date. This next calibration is estimated to be due on September 18, 1989 (assuming full power operation). The late date taking into account the 25 percent permissible extension of the surveillance interval is September 29, 1989.

Without approval of this Technical Specification change PNPP will be forced to shutdown when the next surveillance for calibrating the LPRMs comes due in late September. PNPP could not have foreseen this problem with the TIP system as TIP calibrations can only be performed at an appreciable flux level (after entry into Mode 1) and no problems with the indexing mechanism were identified during prior testing of the system. Prior to and during plant startup following the recent refuel outage, the TIP probes were driven through each of the indexing mechanisms under both cold and hot conditions. Three successful full core TIP traverses were performed during the current operating cycle prior to this failure. CEI therefore could not have reasonably submitted our request in a more timely manner.

An exigent change is being requested since a full 30 day Federal Register Notice period may not be possible before shutdown of the plant is required. If a full 30 day period can be provided, this change could also be handled in a normal fashion. As is common CEI practice, a problem of this nature would be fixed prior to plant startup should an unscheduled plant shutdown occur between now and the overdue date of the LPRM calibration surveillance.

An unscheduled plant shutdown and subsequent repair of the indexing mechanism would eliminate the need for processing of this change request on an exigent basis; CEI respectfully requests that this change continue to be processed (in a normal fashion) should such circumstances arise since the change is technically justified and can eliminate future problems during power operation resulting from inaccessibility of LPRM channels.

IV. Significant Hazards Analysis

The standards used to arrive at a determination that a request for amendment requires no significant hazards consideration are included in the Commission's Regulations, 10 CFR 50.92, which states that the operation of the facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability of 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 a margin of safety. CEI has reviewed the proposed change with respect to these three factors.

1. The core monitoring methodology is based on symmetry of rod patterns and fuel loading. This is not changed, but extended to use a higher order of symmetry (octant symmetry) which exists with "type A" sequence rod patterns.

   This change does not change the fundamental process involved in calibrating neutron instrumentation (LPRMs), but requires that only the equipment associated with the TIP channels necessary for recalibrating LPRMs and for core monitoring functions be operable. The use of symmetric detectors to provide substitute data for inaccessible TIP channels does not compromise the ability of the process computer to accurately represent the spatial gamma flux distribution of the reactor core.

   This proposed change does not alter the basic method used to calculate power and exposure distributions and fuel thermal limits. The existing method for calculating core power and exposure distributions and fuel thermal limits includes provisions for monitoring the gamma flux distribution with mirror or rotational symmetry. This proposed change includes provisions for using octant symmetry, which is both mirror and rotationally symmetrical.

   This proposed change does not alter the basic method used to determine the appropriate constants with which to relate the readings of LPRMs to those of the TIPs or the basic method used to determine substitute values to be used by the process computer for LPRMs which have failed. The proposed change specifies the use of TIP data which is equivalent to that which would normally be used.

The calibration of LPRMs using symmetric string base distributions provide LPRM data within the normal uncertainty expected for calibrations with all five machines operable. Consequently, this condition will not adversely affect core thermal limit calculations.

This proposed change does not alter the function, performance or operation of any safety system or safety related equipment. The restriction to "A" control rod sequences and the limitation on total TIP uncertainty ensures the readings from symmetric channels are equivalent.

Therefore, this proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. The substitution of data into inaccessible TIP channels has no effect on any accident initiator, therefore this proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. This proposed change does not involve a significant reduction in a margin of safety because the implementation is restricted by the LCO to type A symmetric control rod patterns, and then only when the total TIP uncertainty has been demonstrated previously in the cycle to be within the value assumed in the General Electric reload licensing topical report - GESTAR II (8.7 percent).

V. Environmental Impact

Cleveland Electric Illuminating has reviewed the proposed Technical Specification change against the criteria of 10 CFR 51.22 for environmental considerations. As shown above, the proposed change does not involve a significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, CEI concludes 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.

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