St. Lucie Unit 1
Docket No. 50-335
Proposed License Amendment
St. Lucie Unit 1 Incore Detection
System Operability Requirements

ATTACHMENT 1

St. Lucie Unit 1 Marked-up Technical Specifications Pages

3/4 2-2 ; 3/4 3-25

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SURVEILLANCE REQUIREMENTS (Continued)

c. Verifying that the AXIAL SHAPE INDEX is maintained within the allowable limits of Figure 3.2-2, where 100 percent of maximum allowable power represents the maximum THERMAL POWER allowed by the following expression:

M x N

where:

1. M is the maximum allowable THERMAL POWER level for the existing Reactor Coolant Pump combination,

2. N is the maximum allowable fraction of RATED THERMAL POWER as determined by the F_r^T curve of Figure 3.2-3.

4.2.1.4 Incore Detector Monitoring System# - The incore detector monitoring system may be used for monitoring the core power distribution by verifying that the incore detector Local Power Density alarms:

a. Are adjusted to satisfy the requirements of the core power distribution map which shall be updated at least once per 31 days of accumulated operation in MODE 1.

b. Have their alarm setpoint adjusted to less than or equal to the limits shown on Figure 3.2-1 when the following factors are appropriately included in the setting of these alarms:

1. A measurement-calculational uncertainty factor of 1.07,*

2. An engineering uncertainty factor of 1.03,

3. A THERMAL POWER measurement uncertainty factor of 1.02.

INSERT

INSERT

#If the core system becomes inoperable, reduce power to M x N within 4 hours and monitor linear heat rate in accordance with Specification 4.2.1.

* Until April 30, 1993 with less than 75% of all incore detector locations operable:
1. A measurement-calculational uncertainty factor of 1.08.

INSTRUMENTATION

INCORE DETECTORS

insert

LIMITING CONDITION FOR OPERATION

3.3.3.2 The incore detection system shall be OPERABLE* with:

a. At least 75% of all incore detector locations, and

b. A minimum of two quadrant symmetric incore detector locations per core quadrant.

An OPERABLE incore detector location shall consist of a fuel assembly containing a fixed detector string with a minimum of three OPERABLE rhodium detectors.

APPLICABILITY: When the incore detection system is used for:

a. Recalibration of the excore axial flux offset detection system,

b. Monitoring the AZIMUTHAL POWER TILT,

c. Calibration of the power level neutron flux channels, or

d. Monitoring the linear heat rate.

ACTION:

With the incore detection system inoperable, do not use the system for the above applicable monitoring or calibration functions. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.2 The incore detection system shall be demonstrated OPERABLE:

a. By performance of a CHANNEL CHECK within 24 hours prior to its use and at least once per 7 days thereafter when required for:

1. Recalibration of the excore axial flux offset detection system,

2. Monitoring the linear heat rate pursuant to Specification 4.2.1.3,

INSERT A

* Until April 30, 1993 the incore detection system shall be OPERABLE with:

a. At least 50% of all incore detector locations, and
b. A minimum of three quadrant symmetric incore detectors for at least three levels.

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ATTACHMENT 2

SAFETY ANALYSIS

Introduction

The proposed revision to St. Lucie Unit 1 Technical Specification (TS) 3.3.3.2 changes the incore detection system operability requirements to allow power distribution monitoring and calibration functions to be performed with: (a) 50% of incore detector locations operable, and (b) a minimum of three quadrant symmetric incore detectors for at least three levels operable. To compensate for any increased uncertainty when the number of operable detectors is reduced below the existing specification of 75%, TS 4.2.1.4.b.1 is revised to require an increase in the value of the measurement-calculational uncertainty factor used for the measurement of Linear Heat Rate (LHR). Similarly, plant procedures will require an increased uncertainty penalty to be used for the measured value of the Integrated Radial Peaking Factor (F_r).

Florida Power and Light Company (FPL) is requesting the TS revisions to facilitate full power operation of St. Lucie Unit 1 until the end of the current fuel cycle. Accordingly, the proposed TS would be effective from the date of issuance until April 30, 1993.

Discussion

The existing design for the St. Lucie Unit 1 fixed incore detection system consists of 45 detector locations within selected fuel assemblies of the reactor core. Each location contains a string of four self-powered, Rhodium neutron detectors positioned at elevations corresponding to 20%, 40%, 60%, and 80% of the active fuel height. At least three of the four detectors in a string must be operable for that location to be considered operable. If at least 75% of the locations are operable and a minimum of two quadrant symmetric locations per core quadrant are operable, then the incore detection system is considered operable. The incore detector data is processed using the Siemens Power Corporation

(SPC) INPAX-II/XTG Computer Codes to develop measured values of the core peaking factors, full core power distribution parameters, and incore detector alarm setpoint data based on linear heat rate.

The incore detector strings are normally replaced after having been in service for two complete fuel cycles. The existing detectors were installed during the 1990 refueling overhaul and have been in service for fuel cycle 10 and for the present cycle 11. Due to the current number of incore detector failures, it is anticipated that the incore detection system will fail to meet the existing operability requirements before the end of fuel cycle 11 is achieved in the Spring of 1993.

If the incore detection system becomes inoperable, the Excore Detector System must be used for monitoring the core power distribution and the maximum core output must be limited to 85% of full power. To determine if use of the incore system for power distribution monitoring and calibration functions could be extended, and thereby avoid the power constraint associated with using the excore system, FPL performed a power peaking uncertainty analysis of the INPAX-II/XTG computer codes. The analysis evaluated the measurement-calculational uncertainties in the presence of increased detector failures consistent with the proposed revision to TS 3.3.3.2.

Based on this recent analysis, FPL concluded that: (a) increasing the measurement-calculational uncertainty factor for Linear Heat Rate from the current value of 1.07 to 1.08, and (b) increasing the measurement-calculational uncertainty factor for the Integrated Radial Peaking Factor (F_r) from the currently used value of 1.06 to 1.075 will conservatively account for more than 25% but $\leq$ 50% of the total detector locations becoming inoperable.

Safety Assessment

The St. Lucie Unit 1 , Cycle 11 reactor core is currently operating with parameters and trends consistent with the behavior predicted by the cycle 11 core design analysis. Results from the core-follow program show that the maximum measured peaking factors for LHR (F_q) and F_r are within 6% and 3%, respectively, of predicted values. An increase in the required measurement uncertainty factors will account for the proposed reduction in allowable number of operable incore detectors used to conduct this program. This increase will provide assurance that calculations based on the incore detection system will continue to conservatively represent the F_q and F_r peaking factors. Thus, accurate representations of the spatial neutron flux distribution in the reactor core and conservative

setpoint data for the operable incore detector Local Power Density alarms will continue to be provided by the computer codes presently in use.

Enclosure 1 of this submittal (Attachment 3 of JPN-PSL1-SEFJ-92-008, Rev. 0) is an engineering analysis of the INPAX-II computer code power peaking uncertainties with the number of operable detector locations reduced to 50% of the total locations available. This analysis shows that measurement uncertainties of 8.0% for F_q and 7.5% for F_r are conservative for the reduced number of operable detector locations that were assumed. Additional conservatism is added by implementing the increased measurement uncertainty values when the number of operable incore detector locations becomes less than 75% of the total number of locations available. Thus, assurance is provided that actual core peaking factors will remain bounded by those assumed in the cycle 11 core safety analysis and further specified in the facility TS.

FPL has determined that reanalysis of transients previously analyzed in the St. Lucie Unit 1 Updated Final Safety Analysis Report (UFSAR) is not required as a result of this proposal. The increases proposed for the measurement-calculational uncertainties will provide assurance that actual core peaking factors are conservatively bounded by the measured peaking factors. Therefore, operating the reactor within the appropriate TS Limiting Conditions for Operation will continue to assure that actual core power distributions remain within the design parameters assumed for applicable event analyses contained in the UFSAR.

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DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

The standards used to arrive at a determination that a request for amendment involves no significant hazards consideration are included in the Commission's regulations, 10 CFR 50.92, which state that no significant hazards considerations are involved if 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; or (2) create the possibility of new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. Each standard is discussed as follows:

(1) Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed amendment allows operation with a reduced number of operable incore detector strings which provide an alternate means of monitoring nuclear core power distributions. A physical change to the facility is not involved and the incore detection system does not perform automatic interlock, control, or protective functions. The number of operable incore detectors has no impact on the probability that a particular accident will occur. Therefore, the proposed amendment does not involve a significant increase in the probability of an accident previously evaluated.

The proposed amendment requires an increase in the core peaking factor measurement uncertainties commensurate with the reduction in number of operable incore detectors to ensure that peaking factors are conservatively calculated. This increase represents more conservative alarm settings for the operable incore detectors which are set to activate whenever the peak linear heat rate approaches an allowable limit as determined by the plant accident analyses. Limiting peaking factors specified in the design basis for the nuclear core or assumed in the Updated Final Safety Analysis Report (UFSAR) remain unchanged and the amendment is only applicable to the present fuel cycle. Therefore, the proposed amendment will not significantly increase the consequences of an accident previously evaluated.

(2) Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed amendment does not change the physical design of the facility and a new failure mode is not introduced as a result of the reduction in the minimum required number of operable incore detector locations. Therefore, operation of the facility in accordance with the proposed amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Use of the modified specification would not involve a significant reduction in a margin of safety.

The physical facility is not changed by the proposed amendment and use of increased measurement uncertainty factors are required commensurate with the reduction in the minimum allowable number of incore detector locations. The increased measurement uncertainty factors assure that power distribution calculations based on the incore system will continue to be conservative and that the existing Limiting Conditions for Operation specified for linear heat rate and core peaking factors will not be exceeded. Therefore, use of the modified specification will not involve a significant reduction in a margin of safety.

Based upon the above, we have determined that the amendment request does 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 a margin of safety, and therefore does not involve any significant hazards consideration.

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ENCLOSURE 1

ANALYSIS OF INPAX-II POWER PEAKING UNCERTAINTIES

FOR ST. LUCIE UNIT 1 CYCLE 11

(Attachment 3 to JPN-PSL1-SEFJ-92-008, Rev. 0: 22 pages)