PSEG

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Nuclear Business Unit

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United States Nuclear Regulatory Commission
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Washington, DC 20555

Gentlemen:

REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS
BEACON CHANGES
SALEM GENERATING STATION
FACILITY OPERATING LICENSES DPR-70 and DPR-75
DOCKET NOS. 50-272 AND 50-311

In accordance with 10CFR50.90, Public Service Electric & Gas (PSE&G) Company hereby requests approval of changes to the Salem Generating Station Technical Specifications (TS). In accordance with 10CFR50.91(b)(1), a copy of this submittal has been sent to the State of New Jersey.

Implementation of the request contained in this submittal will allow use of the Best Estimate Analyzer For Core Operations – Nuclear (BEACON) system at Salem to perform core power distribution measurements. BEACON is a core power distribution monitoring and support system based on a three dimensional nodal code. The system is used to provide data reduction for incore neutron flux maps, core parameter analysis and follow, and core prediction. BEACON is approved by the NRC to provide continuous core monitoring capabilities. The role for BEACON at Salem will be to augment the functionality of the flux mapping system when thermal power is greater than 25% of rated thermal power (RTP) for the purpose of performing power distribution surveillances. This limited application of the system is referred to as BEACON Technical Specification Monitoring (TSM). The NRC approved the BEACON topical report (WCAP-12472-P-A) and issued a safety evaluation report (SER) on February 16, 1994.

The WCAP contained revised TS pages to depict the full utilization of BEACON; however, since Salem will utilize only some of the approved features of BEACON, the TS pages included in the WCAP are only incorporated where applicable.

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The proposed changes have been evaluated in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and a determination has been made that this request involves no significant hazards considerations. The basis for the requested change is provided in Attachment 1 to this letter. A 10CFR50.92 evaluation, with a determination of no significant hazards consideration, is provided in Attachment 2. The marked up TS pages affected by the proposed changes are provided in Attachment 3.

The NRC has approved similar changes for the Virgil C. Summer Nuclear Station in License Amendment 142, dated April 9, 1999. NRC approval of these changes is requested by September 15, 2000 so that the changes may be utilized during startup of Salem Unit 2 following its eleventh refueling outage. Upon NRC approval of the proposed changes, PSE&G requests that the amendment be made effective on the date of issuance but that an implementation period of 30 days be allowed to provide sufficient time for associated administrative activities.

Should you have any questions regarding this request, please contact Mr. C. E. Manges, Jr. at 856-339-3234.

Sincerely,

M. J. Trum
Vice President - Maintenance

Affidavit
Attachments (3)

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REF: LRN-00-0212
LCR S00-08

STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

M. J. Trum, being duly sworn according to law deposes and says:

I am Vice President - Maintenance of Public Service Electric and Gas Company, and as such, I find the matters set forth in the above referenced letter, concerning Salem Generating Station, are true to the best of my knowledge, information and belief.

[signature]

Subscribed and Sworn to before me
this 14 day of June, 2000

[signature]
Notary Public of New Jersey

My Commission expires on 12/8/2003

ATTACHMENT 1
SALEM GENERATING STATION
FACILITY OPERATING LICENSES DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311
REVISIONS TO SALEM TS

BASIS FOR REQUESTED CHANGE:

Public Service Electric and Gas Company (PSE&G) requests that the Salem Technical Specifications (TS) be modified to allow use of the Best Estimate Analyzer For Core Operations – Nuclear (BEACON) system to perform core power distribution measurements. BEACON is a core power distribution monitoring and support system based on a three dimensional nodal code. The system is used to provide data reduction for incore neutron flux maps, core parameter analysis and follow, and core prediction. BEACON is approved by the NRC to provide continuous core monitoring capabilities. The role for BEACON at Salem will be to augment the functionality of the flux mapping system when thermal power is greater than 25% of rated thermal power (RTP) for the purpose of performing power distribution surveillances. This limited application of the system is referred to as BEACON TSM. The proposed changes will also relocate manufacturing and measurement uncertainty values associated with the power distribution measurements from the TS to the core operating limits report (COLR). The proposed changes to the TS are indicated on the marked-up TS pages contained in Attachment 3 of this submittal.

The use of BEACON as a Power Distribution Monitoring System (PDMS) has no impact upon plant operation or safety. No safety-related equipment, safety function, or plant operations will be altered as a result of this proposed change. Since the applicable Updated Final Safety Analysis report (UFSAR) limits will be maintained and the TS will continue to require operation within the core operational limits calculated by NRC-approved methodologies, the proposed changes are administrative in nature. Appropriate actions to be taken if limits are violated also remain unchanged in the TS. This proposed change will control the cycle-specific parameters within the acceptance criteria and assure conformance to 10CFR50.36 by using the approved methodology. The COLR will document the specific parameter limits resulting from Salem calculations, including mid-cycle or other revisions to parameter values. Therefore, the proposed change is in conformance with the requirements of 10CFR50.36.

REQUESTED CHANGE, PURPOSE AND BACKGROUND:

Salem Generating Station is proposing to implement BEACON TSM, which is a limited application that uses the system only to augment the functionality of the flux mapping system for purposes of power distribution surveillances. In the TSM application, if the PDMS meets specified operability requirements (i.e., current calibration by the incore detectors and operability of the core exit thermocouples and excore detectors), the system is used to measure core power distribution parameters. The power distribution surveillance continues to be performed with the same periodicity (once every 31 effective full power days under normal circumstances, although more frequent surveillances may be required under certain circumstances). Examples of the more frequent surveillances include conditions involving inoperable rod position indication and nuclear instrumentation.

In WCAP-12472-P-A, the use of BEACON to continuously monitor the power distribution and power peaking in the core allows the reactor to be operated with the relaxation of the axial flux difference target bands that are traditionally required for Westinghouse reactors. For the TSM BEACON application, the axial flux difference bands remain in place and are unaffected, and only the methodology by which the power distribution surveillance is performed is changed from the existing method. Thus, the BEACON TSM methodology is a more-conservative application of the BEACON technology than was approved in WCAP-12472-P-A.

Several plant TS changes are proposed to allow the use of BEACON to perform core power distribution surveillances. The proposed modifications are limited and allow for the power distribution surveillance to be performed by the PDMS, rather than specifying that the core distribution surveillances be performed using the movable incore detectors, as is the case in the existing TS.

An additional TS has been added to define the conditions under which BEACON is considered an OPERABLE PDMS. In the event that BEACON is inoperable, this TS requires the use of the incore movable detector system to perform the necessary power distribution surveillances.

The TS affected by this proposal are as follows:

3/4.1.3.1	Movable Control Assemblies - Group Height
3/4.1.3.2	Movable Control Assemblies – Position Indication Systems
3/4.2.2	Heat Flux Hot Channel Factor
3/4.2.3	Nuclear Enthalpy Hot Channel Factor
3/4.2.4	Quadrant Power Tilt Ratio
3/4.3.1	Reactor Trip System Instrumentation (Unit 2 only)
3/4.3.14	Power Distribution Monitoring System

In addition, a section will be added to the COLR to define the equations and constants to be used to determine the applicable measurement uncertainties to be applied to the core peaking factors when determined by the PDMS or the movable incore detectors. The constants found in this section of the COLR are used as coefficients in the uncertainty calculations and are determined using NRC-approved methodology. The constants may be revised periodically as appropriate to reflect cycle-specific variables.

The specific changes to the TS are as follows:

Page Number	**Affected Section**	**Description of Change**	**Reason for Change**
Index Page IV	Index	Added Power Distribution Monitoring System	Added new pages to Section 3.
3/4 1-18a (Unit 1) 3/4 1-14 (Unit 2)	TS 3.1.3.1 Action c.3.c	Replaced "A power distribution map is obtained from the movable incore detectors" with "A core power distribution measurement is obtained".	The generic phrase, "core power distribution measurements," is being used because above 25% RTP, the PDMS (an NRC approved core power distribution monitoring system) will be used to obtain power distribution information rather than using a power distribution map via movable incore detectors. The generic phrase is appropriate for whichever method is used.
3/4 1-19 (Unit 1) 3/4 1-16 (Unit 2)	3.1.3.2.1 Action a	Replaced "by the movable incore detectors" with "using the power distribution monitoring system (if power is above 25% RTP) or using the movable incore detectors (if power is less than 25% RTP or the power distribution monitoring system is inoperable)".	The revised wording allows use of either the PDMS or the incore detectors to perform the required action.

Page Number	Affected Section	Description of Change	Reason for Change
3/4 2-5	TS 3.2.2 Action b	Replaced "incore mapping" with "a core power distribution measurement"	The generic phrase, "core power distribution measurements,'" is being used because above 25% RTP, the PDMS will be used to obtain power distribution information rather than using a power distribution map via movable incore detectors. The generic phrase is appropriate for whichever method is used.
3/4 2-6	TS 3.2.2 SR 4.2.2.2.a	Replaced "greater than 5%" with "less than or equal to 25% but greater than 5%" and added "and when the PDMS is inoperable'" to the requirement to use the movable incore detectors to obtain a power distribution map to determine $F_Q(z)$. Also incorporated the requirement to add the applicable manufacturing and measurement uncertainties listed in the COLR.	This change is being made because above 25% RTP the PDMS will be used to obtain power distribution information rather than using the incore detectors. However, when PDMS is inoperable the incore detectors will be used. The requirement to add the uncertainties was incorporated because 4.2.2.2.b (the current requirement to add the uncertainties) is being deleted.

Page Number	**Affected Section**	**Description of Change**	**Reason for Change**
3/4 2-6	TS 3.2.2 SR 4.2.2.2.b	The current requirement to increase the measured $F_Q(z)$ component of the power distribution map to account for manufacturing tolerances and measurement uncertainties is being relocated to the COLR. A new requirement will be added that allows the PDMS to be used when THERMAL POWER is >25% and the measured $F_Q(z)$ component will be increased by the applicable manufacturing and measurement uncertainties listed in the COLR.	The requirement to increase the measured $F_Q(Z)$ by manufacturing tolerances and measurement uncertainties is being moved to 4.2.2.2.a. The specific manufacturing and measurement uncertainties are being moved to the COLR. This change is being made because above 25% RTP the PDMS will be used to obtain power distribution information rather than using the incore detectors.
3/4 2-6 & 7	TS 3.2.2 SR 4.2.2.2.d	Replaced "power distribution maps" with "core power distribution measurements"	The generic phrase, "core power distribution measurements,'" is being used because above 25% RTP, the PDMS will be used to obtain power distribution information rather than using a power distribution map via movable incore detectors. The generic phrase is appropriate for whichever method is used.

Page Number	Affected Section	Description of Change	Reason for Change
3/4 2-7a (Unit 1) 3/4 2-7 (Unit 2)	TS 3.2.2 SR 4.2.2.3	Replaced "power distribution map" with "core power distribution measurement" and changed the specified manufacturing tolerances and uncertainties with a reference to the COLR.	The generic phrase, "core power distribution measurements,'" is being used because above 25% RTP, the PDMS will be used to obtain power distribution information rather than using a power distribution map via movable incore detectors. The generic phrase is appropriate for whichever method is used. The specific manufacturing and measurement uncertainties are being moved to the COLR.
3/4 2-9	TS 3.2.3 Actions b & c	Replaced "in-core mapping" with "a core power distribution measurement".	The generic phrase, "core power distribution measurements," is being used because above 25% RTP, the PDMS will be used to obtain power distribution information rather than using a power distribution map via movable incore detectors.
3/4 2-10	TS 3.2.3 SR 4.2.3.1	Replaced "using the movable incore detectors to obtain a power distribution map" to "obtaining a core power distribution measurement".	The generic phrase, "core power distribution measurements,'" is being used because above 25% RTP, the PDMS will be used to obtain power distribution information rather than using a power distribution map via movable incore detectors. The generic phrase is appropriate for whichever method is used.

Page Number	Affected Section	Description of Change	Reason for Change
3/4 2-10	TS 3.2.3 SR 4.2.3.2	Changed the specified uncertainties with a reference to the COLR.	The specific measurement uncertainties are being moved to the COLR.
3/4 2-12 (Unit 1) 3/4 2-15 (Unit 2)	TS 3.2.4 SR 4.2.4.c (Unit 1) TS 3.2.4 SR 4.2.4.2 (Unit 2)	Replaced the phrase "Using the movable incore detectors" with the phrase "Obtaining a core power distribution measurement". The Unit 2 requirement associated with the incore system (four pairs of symmetric thimble locations) is maintained by adding a footnote.	The phrase, "core power distribution measurement,'" is being added because above 25% RTP, the PDMS may be used to obtain power distribution information rather than obtaining a power distribution map via movable incore detectors.
3/4 3-5 (Unit 2 only)	TS 3/4.3.1 Table 3.3-1 Action 2.d	Added the phrase "or the power distribution monitoring system".	The phrase, "core power distribution measurement,'" is being added because above 25% RTP, the PDMS may be used to obtain power distribution information rather than obtaining a power distribution map via movable incore detectors.
New Pages 3/4 3-70 & 71 (Unit 1) 3/4 3-65 & 66 (Unit 2)	TS 3.3.3.14	Added PDMS Technical Specification.	This addition is necessary to provide the operability and surveillance requirements per the guidance in the SER approving WCAP 12474-P-A.
New Page 3/4 3-72 (Unit 1) 3/4 3-67 (Unit 2)	Table 3.3-14	Added Table of required plant input information with minimum number of valid inputs.	This addition is necessary to specify what inputs are required to ensure operability of the BEACON system.

Page Number	Affected Section	Description of Change	Reason for Change
B 3/4 2-4 & 5	B 3/4.2.2 B 3/4.2.3	Added sections to the Bases that discuss the uncertainties used for the measurements obtained using the PDMS.	Additions were made to the Bases to incorporate the use of PDMS in the TS.
B 3/4 3-2a (Unit 1) B 3/4 3-3 (Unit 2)	B 3/4.3.3.2	A clarification is added to the Bases regarding operability of the movable incore detector system for the purposes of calibration of PDMS Added "or the PDMS" to the Unit 2 discussion on measuring $F_Q(z)$ or $F^N_{\Delta H}$. The Unit 2 paragraph is added to Unit 1.	The change regarding operability of the movable incore detector system for the purposes of calibration of PDMS is a clarification to avoid confusion. The change is made because above 25% RTP, the PDMS may be used to obtain power distribution information rather than obtaining a power distribution map via movable incore detectors. The addition of the paragraph to Unit 1 achieves consistency between the units.
B 3/4 3-4	B 3/4.3.3.14	Added the bases for the new PDMS operability requirements.	Provided the bases for the new LCO, Surveillance Requirements, and Table as a result of implementing the PDMS.
6-24	6.9.1.9.a.4&5	Added $F_Q(Z)$ manufacturing/ measurement uncertainties and $F^N_{\Delta H}$ measurement uncertainties to the COLR.	This proposed change reflects added uncertainties being relocated from the Technical Specifications to the COLR. This reflects changes made to the Specifications as part of incorporating PDMS. The uncertainties associated with PDMS are different than the uncertainties associated with flux map generated power distribution measurements.

Page Number	Affected Section	Description of Change	Reason for Change
6-24a	6.9.1.9.b.5	Added WCAP-12472-P-A, which is an additional reference that documents the analytical methods used to determine the core operating limits.	The BEACON Core Monitoring and Operations Support System WCAP was added to the Administrative Controls Section of the Technical Specification to document the methodology of the NRC approved power distribution monitoring system. The PDMS in the proposed Technical Specifications is utilized when Thermal Power is > 25% RTP to measure the power distribution limits.

JUSTIFICATION OF REQUESTED CHANGES:

The NRC-approved WCAP-12472-P-A (Topical Report for BEACON) on February 16, 1994. The NRC concluded that BEACON provides a greatly improved continuous on-line power distribution measurement and display, limit surveillance, and operation prediction information system for Westinghouse reactors. The NRC also determined that no new instrumentation or calculation system (other than interface systems and integration analysis) is introduced and noted that the system review concluded that BEACON is acceptable for performing core monitoring and operations support.

The use of BEACON as a PDMS has no impact on plant operation or safety. No safety-related equipment, safety function, or plant operations will be altered as a result of the proposed change. Since the applicable UFSAR limits will be maintained and the TS will continue to require operation within the core operational limits calculated by these NRC-approved methodologies, the proposed change is administrative in nature. Appropriate actions to be taken if limits are violated will also remain in the TS.

This proposed change will control the cycle-specific parameters within the acceptance criteria and ensure conformance to 10CFR50.36 by using the approved methodology instead of specifying TS values. The COLR will document the specific parameter limits resulting from Salem calculations, including mid-cycle or other revisions to parameter values. Therefore, the proposed change is in conformance with the requirements of 10CFR50.36.

Any changes to the COLR will be made in accordance with the provisions of 10CFR50.59. From cycle to cycle, the COLR will be revised such that the appropriate core operating limits for the applicable cycle will apply. TS will not be changed.

The following is a summary/excerpt of Brookhaven National Laboratory's (BNL) Technical Evaluation Report (TER) for WCAP-12472-P-A. The section numbers and titles are those specified in the TER.

2.1 BEACON On-line Core Monitoring Methodology:

2.1.1 Determination of the Core Power Distribution:

The primary function of the BEACON core monitoring system is the determination of the three-dimensional core power distribution. In BEACON, this calculation is performed with the NRC approved Westinghouse SPNOVA nodal method. The SPNOVA data libraries and core models are consistent with the NRC approved Westinghouse PHOENIX/ANC design models and have been extensively benchmarked against operating reactor measurements.

2.1.2 Calibration of the Core Power Distribution:

BEACON uses the incore flux detector measurements, core-exit thermocouples and excore detectors to perform the local calibration of the SPNOVA three-dimensional power distribution. The SPNOVA predicted detector reaction rates are normalized to the incore measurements at the incore radial locations and over an axial mesh. The thermocouple adjustment is two-dimensional and is made by normalizing the SPNOVA radial power distribution to the assembly power inferred from the core-exit thermocouples. The thermocouple assembly power measurement is periodically calibrated to the incore-measured assembly power.

The incore detectors and core-exit thermocouples do not provide complete coverage of the core and BEACON employs a two-dimensional [surface] spline fit to interpolate/extrapolate these measurements to the unmonitored assemblies. The spline fit includes a tolerance factor which controls the degree to which the fit is forced to match the individual measurements. If, for example, the measurements are believed to be extremely accurate (inaccurate) a low (high) tolerance factor is used and the SPNOVA solution is (not) forced to be in exact agreement with the measurements.

The BEACON axial power shape is adjusted to insure agreement with the axial offset measured by the excore detectors. This adjustment is made by adding a sinusoidal component to the SPNOVA calculated axial power shape. The SPNOVA excore axial offset is determined by an appropriate weighting of the peripheral assembly powers. The excore detector axial offset is periodically calibrated to the incore detector measurement [in accordance with TS].

2.1.3 BEACON Core Monitoring Methodology:

The BEACON core monitoring process is carried out in three steps. In the first step the SPNOVA model, individual thermocouples, and the excore axial offset are calibrated to the full-core incore flux measurement. In the second step, the SPNOVA model is updated based on the most recent operating history, and adjusted using the thermocouple and excore measurements. The continuous monitoring is performed in Step-3 using the thermocouples and excores to update the BEACON model.

The continuous core monitoring of the current reactor statepoint (fuel burnup, xenon distribution, soluble boron concentration, etc.) provided by BEACON allows a more precise determination of the parameters used in the transient analyses, and therefore relaxes the requirement to limit the transient initial conditions via power distribution control. As part of the continuous monitoring, the fuel limits are calculated using the standard Westinghouse methods.

The Salem BEACON application (BEACON TSM) uses the system to augment the functionality of the flux mapping system when power is greater than 25% RTP for the purpose of performing power distribution surveillances and does not take credit for the continuous monitoring of the power distribution. The peaking factor limits at Salem are unchanged from the existing limits with implementation of TSM BEACON.

2.2 *Comparison of BEACON and INCORE Power Distributions:*

As an initial assessment of the power distribution calculation, Westinghouse has performed detailed comparisons of BEACON to the predictions of the INCORE System presently used at Westinghouse plants. These comparisons were made for three plants over four cycles, and included a range of fuel burnup, core loadings, power level and control rod insertion. For the high powered assemblies (P>1) [P is relative assembly power], BEACON reproduced a set of axially integrated measurements to within a few percent. The BEACON and INCORE axially integrated assembly powers also agreed to within a few percent for a sample of high powered assemblies.

The uncertainties to be applied to the BEACON power distribution measurements are different than those applied to the traditional flux map systems because BEACON uses a more comprehensive set of instrumentation. An uncertainty analysis of the BEACON power distribution measurement was performed and is reported in WCAP-12472-P-A. Since the power distribution measurement methodology is the same between BEACON and the Salem application (TSM BEACON), the uncertainty analysis and methodology is applicable to the Salem application of BEACON. Portions of the BNL TER relevant to the uncertainty analysis are excerpted as follows:

2.3 *Determination of the BEACON Uncertainty Components:*

2.3.1 *Model Calibration:*

Due to the change in reactor statepoint, SPNOVA modeling approximations and instrumentation error, a model calibration uncertainty is introduced into the BEACON predictions. Westinghouse has evaluated this uncertainty by comparing BEACON predicted and measured incore reaction rates over four cycles and a range of operating conditions, and has found that the model calibration uncertainty was very small and varied only slightly for these comparisons.

2.3.2 *Thermocouple Calibration:*

The thermocouple calibration uncertainty is due to the change in reactor statepoint and to instrument error. Westinghouse has evaluated this uncertainty by comparing the assembly powers inferred from the thermocouples to SPNOVA incore-corrected assembly powers. Comparisons for three plants and a range of operating conditions indicate a difference of less than a few percent at full power. The observed calibration uncertainty increased at lower powers due to the reduced enthalpy rise and changes in cross-flow.

2.3.3 *Axial Power Distribution Uncertainty:*

In order to determine the axial power distribution uncertainty, Westinghouse has compared SPNOVA incore-updated and SPNOVA excore-updated predictions of the axial power shape. These comparisons included a range of fuel burnups and rod insertions, and indicated a 95/95 upper tolerance limit of less than a few percent with a slight dependence on rod movement since calibration.

2.3.4 *Calibration Interval:*

Based on an extensive set of calibration data, the model calibration uncertainty is observed to increase as the calibration interval (in units of fuel burnup) increases. Using the observed fuel burnup dependence, an additional assembly power uncertainty is determined to account for the effects of increased calibration interval.

2.3.5 *Inoperable Detectors:*

The failure of detectors in the BEACON system results in a relaxation of the local calibration to measurement, and an increase in the power distribution uncertainty. The effect of random failures of the incore and thermocouple detectors on the assembly power was evaluated for failure rates of up to 75%. It is noteworthy that the assembly power uncertainty was found to increase linearly with incore [detector] failure and quadratically with the failure of thermocouples.

2.3.6 Local Power Distribution Uncertainty:

The BEACON calculation requires local power distribution factors for: (1) the ratio of assembly power-to-detector response, (2) assembly local peaking factor, and (3) the grid power-depression factor. The BEACON uncertainty analysis employs previously approved upper tolerance values for the assembly power-to-detector response ratio and the local peaking factor(5). The grid factor uncertainty was determined by comparison to measured flux traces and is found to be relatively small.

2.4 Determination of the BEACON Power Peaking Uncertainty:

The uncertainty in the BEACON power peaking resulting from errors in the SPNOVA model calibration and thermocouple calibration is determined using an analog Monte Carlo error propagation technique. In this analysis, the BEACON three-step calibration, model update and power distribution update procedure is simulated. The SPNOVA model and thermocouple calibration factors are subjected to random variations (based on their uncertainties) and the resulting variations in the BEACON power distribution are used to determine the 95% probability upper tolerance limit on the assembly power for the twenty highest powered assemblies.

The analysis is performed for a range of operating conditions including off-normal power distributions and extended calibration intervals. A typical set of thermocouple uncertainties is used together with a relatively large tolerance factor which results in substantial smoothing of the thermocouple measurements. The upper tolerance limit on the assembly power peaking factor is calculated and found to increase as the square-root of the thermocouple uncertainty.

The enthalpy-rise ($F_{\Delta H}$) and power peaking factor (F_Q) uncertainties are determined by a statistical combination of the assembly peaking factor, axial peaking factor, calibration interval, inoperable detector and local power peaking component uncertainties. The $F_{\Delta H}$ and F_Q uncertainties are calculated for a typical case.

3.0 Summary of the Technical Evaluation:

The BEACON Core Monitoring and Operations Support System Topical Report WCAP-12472-P provides a detailed description of the BEACON methodology, the uncertainty analysis required to support the proposed Technical Specifications and the operation of the overall system. The review of BEACON focused on the approximations and assumptions implicit in the BEACON methodology, the completeness and accuracy of the BEACON uncertainty analysis and the adequacy of the BEACON core monitoring. Several important technical issues were raised during the initial review which required additional information and clarification from Westinghouse. This information was requested in Reference 6 and was provided in the Westinghouse response included in Reference 7. This evaluation is based on the material presented in the topical report and in Reference 7, and discussions with Westinghouse and the NRC staff at two meetings at the Westinghouse Corporate Offices in Rockville, Maryland on June 9 and September 11, 1992. The evaluation of the major issues raised during this review are summarized in the following.

3.1 <u>*BEACON Methodology:*</u>

The BEACON power distribution calculation is updated using the thermocouple and excore detector measurements. The thermocouple measurements are interpolated/extrapolated radially using the [surface] spline fit.

The BEACON system provides both a full three-dimensional nodal power distribution calculation as well as a simplified more approximate one-dimensional calculation. The BEACON on-line limits evaluation will be performed in three dimensions and the one-dimensional calculation will only be used as a scoping tool in predictive analysis.

The accuracy of the BEACON analysis decreases as the calibration intervals increase and the power distribution diverges from the reference power shape. In order to minimize BEACON uncertainty, the reference power distribution is updated every 15 minutes [or] when [significant changes occur in] the AFD or the [core] power.

The majority of the TS modifications are simply changes that allow the use of the PDMS to perform the required power distribution measurements. An additional TS has been added to define the conditions under which BEACON is OPERABLE. The conditions under which BEACON is determined to be operable were defined during the uncertainty analysis discussed previously. Thus, this TS ensures that the TSM BEACON uncertainties are applicable to the set of instrumentation, which BEACON is using. According to the SER:

The power distribution limits (Technical Specifications 3.2.1 through 3.2.4) remain for the most part unchanged from the current Technical Specifications except that they allow a core power distribution measurement to be obtained through BEACON without using the incore movable detectors.

The criteria for the incore neutron detectors, with BEACON operable, require at least 75% available at beginning-of-cycle, and a minimum of 50% at any time afterward, with a minimum of two per quadrant. Except for lowering the criterion to 50%, this is the same as in the current STS. The 50% level is reasonable for BEACON operable because of the increased surveillance available from, for example, the core exit thermocouples. For BEACON inoperable, the minimum requirement remains at 75% and 4 per quadrant, which is acceptable. (This requirement tends to keep the minimum for BEACON operable higher than 50%.)

The criteria for the core exit thermocouples, with BEACON operable, require at least 25% of the thermocouples, with at least 2 per quadrant, with the added requirement that the operable pattern normally covers all internal fuel assemblies within a chess "knight" move (an adjacent plus a diagonal square away), or there must be more frequent calibration. Calibration, with the incores, is required every 180 effective full-power days. However, calibration is required every 30 days when the knight move requirement is not satisfied. The accuracy of the power distribution information with decreased incore or thermocouple detector operability has been analyzed by Westinghouse, and penalties are applied to the calculated peaking factors (refer to TER section 2.3). The review has concluded that the minimum available incore and thermocouple detectors, when coupled with the increased uncertainty penalties, provide reasonable and acceptable power distribution information.

Section 4.0, "Technical Positions", of WCAP-12472-P-A and the "Conclusions" section of the NRC SER contained conditions for NRC approval. The following describes Salem's compliance with these conditions.

Although not specifically described in our submittal, cycle specific BEACON calibrations performed before startup and at BOC will ensure that power peaking uncertainties provide 95% probability upper tolerance limits at the 95% confidence level. These calibrations are performed using Westinghouse approved methodology. Until these calibrations are complete, more conservative default uncertainties are applied. The calibrations will be documented and retained as records.

Salem is a Westinghouse 4-loop NSSS with Westinghouse movable incore instrumentation. All fuel is presently of Westinghouse manufacture. Therefore, Salem does not differ significantly from the plants that form the WCAP database and no additional review of WCAP applicability to Salem is necessary.

Because the WCAP describes an application of BEACON where the core operating limits are changed and Salem proposes to use BEACON as a core Technical Specification monitor of our present limits, the comments of Section 4.0, Issue 3 do not apply to our submittal.

In summary, the BEACON system provides the capability for accurate and continuous core monitoring. The system uses current plant instrumentation in conjunction with a fully analytical methodology to generate on-line three-dimensional power distributions. The BEACON methodology and the impact of BEACON on TS have been accepted by the NRC as documented in WCAP-12472-P-A. The TS changes proposed in this submittal are more conservative than those approved in WCAP-12472-P-A and will not adversely impact the safe operation of Salem.

ENVIRONMENTAL IMPACT:

The proposed TS changes were reviewed against the criteria of 10CFR51.22 for environmental considerations. The proposed changes do not involve a significant hazards consideration, a significant increase in the amounts of effluents that may be released offsite, or a significant increase in the individual or cumulative occupational radiation exposures. Based on the foregoing, PSE&G concludes that the proposed TS changes meet the criteria given in 10CFR51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement.

ATTACHMENT 2
SALEM GENERATING STATION
FACILITY OPERATING LICENSES DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311
SIGNIFICANT HAZARDS EVALUATION

10CFR50.92 EVALUATION

Public Service Electric & Gas has concluded that the proposed changes to the Salem Generating Station Technical Specifications do not involve a significant hazards consideration. In support of this determination, an evaluation of each of the three standards set forth in 10CFR50.92 is provided below.

REQUESTED CHANGE

The proposed change allows the Power Distribution Monitoring System (PDMS) to be used for measuring power distribution limits when Thermal Power is greater than 25% of rated thermal power (RTP). This includes relocating manufacturing and measurement uncertainty values from the Technical Specification to the COLR. Also included in this change is the addition of a new specification and bases section for the Power Distribution Monitoring System (PDMS).

BASIS

1. *The proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.*

The proposed changes provide a different method for measuring the core power distribution parameters and relocates manufacturing and measurement uncertainty values from the TS to the core operating limits report (COLR). The Technical Specification (TS) power distribution limits themselves are not changed and will continue to be measured and verified to be within limits as required by the current TS surveillances. The cycle-specific core operating limits, although not in TS, will be followed in the operation of the Salem Generating Station. The proposed amendment continues to require the same actions to be taken when or if limits are exceeded as are required by current TS.

Each accident analysis addressed in the Salem Updated Final Safety Analysis Report (UFSAR) will be examined with respect to changes in cycle-dependent parameters, which are obtained from application of the NRC-approved reload design methodologies, to ensure that the transient evaluation of new reloads are bounded by previously accepted analyses. This examination, which will be performed per requirements of 10CFR50.59, ensures that future reloads will not involve an increase in the probability or consequences of an accident previously evaluated.

The method of measuring core power distribution parameters and the location of manufacturing and measurement uncertainty values are not initiators of any previously evaluated accidents and has no influence or impact on the consequences those accidents. Therefore, the changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

No safety-related equipment, safety function, or plant operation will be altered as a result of the proposed changes. The cycle specific variables are calculated using the NRC-approved methods and submitted to the NRC to allow the Staff to continue to trend the values of these limits. The TS will continue to require operation within the required core operating limits and appropriate actions will be taken when or if limits are exceeded. The change will not introduce any new accident initiators. Therefore, the change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. *The proposed change does not involve a significant reduction in a margin of safety.*

The proposed changes provide a different method for measuring the core power distribution parameters and relocates manufacturing and measurement uncertainty values from the TS to the COLR. The proposed method for measuring the core power distribution parameters has been verified by Westinghouse and reviewed and approved by the NRC. Appropriate measures exist to control the values of the manufacturing and measurement uncertainties. The proposed amendment continues to require operation within the core limits, as obtained from NRC-approved reload design methodologies. Appropriate actions that required to be taken when or if limits are violated remain unchanged. Future changes to measurement and manufacturing uncertainties located in the current TS will be evaluated in accordance with the requirements of 10CFR50.59. Since the 10CFR50.59 process does not allow any reduction in the margin of safety, prior NRC approval is required prior to a reduction in the margin of safety. Additionally, the Salem TS require revisions of the plant COLR be submitted to the NRC upon issuance. Therefore, the change does not involve a significant reduction in a margin of safety

CONCLUSION

Based on the above, PSE&G has determined that the proposed changes do not involve a significant hazards consideration.

SALEM GENERATING STATION
FACILITY OPERATING LICENSES DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311
REVISIONS TO THE TECHNICAL SPECIFICATIONS (TS)

TECHNICAL SPECIFICATIONS PAGES WITH PROPOSED CHANGES

The following Technical Specifications pages are affected by this change request:

Unit 1

TS SECTION	PAGE
Index	Index Page IV
TS 3.1.3.1 Action c.3.c	3/4 1-18a
TS 3.1.3.2.1 Action a	3/4 1-19
TS 3.2.2 Action b	3/4 2-5
TS 3.2.2 SR 4.2.2.2.a, b, and d	3/4 2-6 and 3/4 2-7
TS 3.2.2 SR 4.2.2.3	3/4 2-7a
TS 3.2.3 Actions b & c	3/4 2-9
TS 3.2.3 SR 4.2.3.1 and 2	3/4 2-10
TS 3.2.4 SR 4.2.4.c	3/4 2-12
TS 3.3.3.14 and Table 3.3-14	New Pages 3/4 3-70, 71, and 72
B 3/4.2.2 and B 3/4.2.3	B 3/4 2-4 & 5
B 3/4.3.3.2	B3/4 3-2a
B 3/4.3.3.14	B3/4 3-4
6.9.1.9.a.4 & 5	6-24
6.9.1.9.b.5	6-24a

Unit 2

TS SECTION	PAGE
Index	Index Page IV
TS 3.1.3.1 Action c.3.c	3/4 1-14
TS 3.1.3.2.1 Action a	3/4 1-16
TS 3.2.2 Action b	3/4 2-5
TS 3.2.2 SR 4.2.2.2.a, b, and d SR 4.2.2.3	3/4 2-6 and 3/4 2-7
TS 3.2.3 Actions b & c	3/4 2-9
TS 3.2.3 SR 4.2.3.1 and 2	3/4 2-10
TS 3.2.4 SR 4.2.4.2	3/4 2-15
Table 3.3-1 Action 2.d	3/4 3-5
TS 3.3.3.14 and Table 3.3-14	New Pages 3/4 3-65, 66, and 67
B 3/4.2.2 and B 3/4.2.3	B 3/4 2-4 & 5
B 3/4.3.3.2	B3/4 3-3
B 3/4.3.3.14	B3/4 3-4
6.9.1.9.a.4 & 5	6-24
6.9.1.9.b.5	6-24a

INSERT A

1. When THERMAL POWER is ≤ 25%, but > 5% of RATED THERMAL POWER, or

2. When the Power Distribution Monitoring System (PDMS) is inoperable;

and increasing the Measured $F_Q(Z)$ by the applicable manufacturing and measurement uncertainties as specified in the COLR.

INSERT B

Using the PDMS when THERMAL POWER is > 25% of RATED THERMAL POWER, and increasing the measured $F_Q(Z)$ by the applicable manufacturing and measurement uncertainties as specified in the COLR.

INSERT C

For measurements obtained using the Power Distribution Monitoring System (PDMS), the appropriate measurement uncertainty is determined using the measurement uncertainty methodology contained in WCAP 12472-P-A. The cycle and plant uncertainty calculation information needed to support the PDMS calculation is contained in the COLR. The PDMS will automatically calculate and apply the correct measurement uncertainty, and apply a 3% allowance for manufacturing tolerance.

INSERT D

The appropriate measurement uncertainty for $F^N_{\Delta H}$ obtained using PDMS is determined using the measurement uncertainty methodology contained in WCAP 12472-P-A. The cycle and plant specific uncertainty information needed to support the PDMS calculation is contained in the COLR. The PDMS will automatically calculate and apply the correct measurement uncertainty to the measured $F^N_{\Delta H}$.

INSERT E

The operability requirements of the movable incore detector system for the purposes of calibration of the PDMS is specified in Specification 3.3.3.14.

INSERT F

For the purpose of measuring $F_Q(Z)$ or $F^N_{\Delta H}$, a full incore flux map or the PDMS is used. Quarter-core flux maps, as defined in WCAP-8648, June 1976, may be used in recalibration of the excore neutron flux detection system, and full incore flux maps or symmetric incore thimbles may be used for monitoring the QUADRANT POWER TILT RATIO when one Power Range Channel is inoperable.

INSERT G

3/4.3.3.14 POWER DISTRIBUTION MONFTORING SYSTEM (PDMS)

The Power Distribution Monitoring System (PDMS) provides core monitoring of the limiting parameters. The PDMS continuous core power distribution measurement methodology begins with the periodic generation of a highly accurate 3-D nodal simulation of the current reactor power distribution. The simulated reactor power distribution is then continuously adjusted by nodal and thermocouple calibration factors derived from an incore power distribution measurement obtained using the incore movable detectors to produce a highly accurate power distribution measurement. The nodal calibration factors are updated at least once every 180 Effective Full Power Days (EFPD). Between calibrations, the fidelity of the measured power distribution is maintained via adjustment to the calibrated power distribution provided by continuously input plant and core condition information. The plant and core condition data utilized by the PDMS is cross checked using redundant information to provide a robust basis for continued operation. The loop inlet temperature is generated by averaging the respective temperatures from each of the loops, excluding any bad data. The core exit thermocouples provide many readings across the core and by the nature of their usage with the PDMS, smoothing of the measured data and elimination of bad data is performed with the Surface Spline fit. PDMS uses the NIS Power Range excore detectors to provide information on the axial power distribution. Hence, the PDMS averages the data from the four Power Range excore detectors and eliminates any bad excore detector data.

The bases for the operability requirements of the PDMS is to provide assurance of the accuracy and reliability of the core parameters measured and calculated by the PDMS core power distribution monitor function. These requirements fall under four categories:

1. Assure an adequate number of operable critical sensors.

2. Assure sufficiently accurate calibration of these sensors.

3. Assure an adequate calibration database regarding the number of data sets.

4. Assure the overall accuracy of the calibration.

The minimum number of required plant and core condition inputs include the following:

1. Control Bank Positions.

2. At least 50% of the cold leg temperatures.

3. At least 75% of the signals from the power range excore detector channels (comprised of top and bottom detector section).

4. Reactor Power Level.

5. A minimum number and distribution of operable core exit thermocouples.

6. A minimum number and distribution of measured fuel assembly power distribution information obtained using the incore movable detectors is incorporated in the nodal model calibration information.

The sensor calibration of Items 1, 2, 3, and 4 above are covered under other specifications. Calibration of the core exit thermocouples is accomplished in two parts. The first being a sensor specific correction to K-type thermocouple temperature indications based on data from a cross calibration of the thermocouple temperature indications to the average RCS temperature measured via the RTDs under isothermal RCS conditions. The second part of the thermocouple calibration is the generation of thermocouple flow mixing factors that cause the radial power distribution measured via the thermocouples to agree with the radial power distribution from a full core flux map measured using the incore movable detectors. This calibration is updated at least once every 180 EFPD.

INSERT H

5. WCAP-12472-P-A, BEACON – Core Monitoring and Operations Support System, Revision 0, (W Proprietary). Approved February 1994.

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

SECTION | PAGE

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

GROUP HEIGHT

LIMITING CONDITION FOR OPERATION

3.1.3.1 All full length (shutdown and control) rods, shall be OPERABLE and positioned within ± 18 steps(indicated position) when reactor power is ≤ 85 %, RATED THERMAL POWER, or ± 12 steps (indicated position) when reactor power is > 85% RATED THERMAL POWER, of their group step counter demand position within one hour after rod motion.

APPLICABILITY: MODES 1* and 2*

ACTION:

a. With one or more full length rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With more than one full length rod inoperable or mis-aligned from the group step counter demand position by more than ± 18 steps(indicated position) at ≤ 85 % RATED THERMAL POWER or ± 12 steps (indicated position) at > 85% RATED THERMAL POWER, be in HOT STANDBY within 6 hours.

c. With one full length rod inoperable due to causes other than addressed by ACTION a, above, or mis-aligned from its group step counter demand position by more than ± 18 steps(indicated position) at ≤ 85 % RATED THERMAL POWER or ± 12 steps (indicated position) at > 85% RATED THERMAL POWER, POWER OPERATION may continue provided that within one hour either:

   1. The rod is restored to OPERABLE status within the above alignment requirements, or

   2. The remainder of the rods in the bank with the inoperable rod are aligned to within ± 18 steps(indicated position) at ≤ 85 % RATED THERMAL POWER or ± 12 steps (indicated position) at > 85% RATED THERMAL POWER of the inoperable rod while maintaining the rod sequence and insertion limits in the COLR per specification 3.1.3.5. The THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.5 during subsequent operation, or

   3. The rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:

* See Special Test Exceptions 3.10.2 and 3.10.3.

a) A reevaluation of each accident analysis of table 3.1-1 is performed within 5 days; this reevaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.

b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at ~~least~~ once per 12 hours.

c) A (core) power distribution ~~map~~ (measurement) is obtained ~~from the movable incore detectors~~ and $F_Q(Z)$ $F^N_{\Delta H}$ are verified to be within their limits within 72 hours.

d) The THERMAL POWER level is reduced to less than or equal to 75% of RATED THERMAL POWER within one hour and within the next 4 hours the high neutron flux trip setpoint is reduced to less than or equal to 85% of RATED THERMAL POWER. THERMAL POWER shall be maintained less than or equal to 75% of RATED THERMAL POWER until compliance with ACTIONS 3.1.3.1.c.3.a and 3.1.3.1.c.3.c above are demonstrated.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full length rod shall be determined to be within the limits established in the limiting condition for operation at least once per 12 hours (allowing for one hour thermal soak after rod motion) except during time intervals when the Rod Position Deviation Monitor is inoperable, then verify the group positions at least once per 4 hours.*

4.1.3.1.2 Each full length rod not fully inserted in the core shall be determined to be OPERABLE by movement of at least 10 steps in any one direction at least once per 31 days.

* During Cycle 14, the position of Rod 1SB2 will be determined indirectly by the movable incore detectors within 8 hours following its movement until the repair of the indication system for this rod. During reactor startup, the fully withdrawn position of Rod 1SB2 will be determined by current traces and subsequently verified by the movable incore detectors prior to entry into Mode 1.

POSITION INDICATION SYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2.1 The shutdown and control rod position indication systems shall be OPERABLE and capable of determining the actual and demanded rod positions as follows:

a. Analog rod position indicators, within one hour after rod motion (allowance for thermal soak);

All Shutdnwn Banks: ±18 steps at ≤ 85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Rank A: ±18 steps at ≤ 85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank B: ±18 steps at ≤ 85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 160-228 steps.

Control Bank C and D: ±18 steps at ≤ 85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-228 steps.

b. Group demand counters; ± 2 steps of the pulsed output of the Slave Cycler Circuit over the withdrawal range of 0-228 steps.

APPLICABILITY: MODES 1 and 2.

ACTION:

a. With a maximum of one analog rod position indicator per bank inoperable either: (power distribution monitoring system (if power is above 25% RTP) or using the)

1. Determine the position of the non-indicating rod(s) indirectly by the movable incore detectors (using) at least once per 8 hours* and within one hour after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or

(If power is less than 25% RTP or the power distribution monitoring system is inoperable)

2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

* During Cycle 14, the position of Rod 1SB2 will be determined indirectly by the movable incore detectors within 8 hours following its movement until the repair of the indication system for this rod. During reactor startup, the fully withdrawn position will be determined by current traces and subsequently verified by the movable incore detectors prior to entry into Mode 1.

b. With two or more analog rod position indicators per bank inoperable, within one hour restore the inoperable rod position indicator(s) to OPERABLE status or be in HOT STANDBY within the next 6 hours. A maximum of one rod position indicator per bank may remain inoperable following the hour, with Action (a) above being applicable from the original entry time into the LCO.

c. With a maximum of one group demand position indicator per bank inoperable either:

1. Verify that all analog rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 18 steps when reactor power is ≤ 85% RATED THERMAL POWER or if reactor power is > 85% RATED THERMAL POWER, 12 steps of each other at least once per 8 hours, or

2. Reduce THERMAL POWER to less than 50% of RATED POWER within 8 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.2.1.1 Each analog rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system agree within 18 steps when reactor power is ≤ 85% RATED THERMAL POWER or if reactor power is > 85% RATED THERMAL POWER, 12 steps (allowing for one hour thermal soak after rod motion) at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system at least once per 4 hours.

4.1.3.2.1.2 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL calibration at least once per 18 months.

POWER DISTRIBUTION LIMITS

HEAT FLUX HOT CHANNEL FACTOR-$F_Q(Z)$

LIMITING CONDITION FOR OPERATION

3.2.2 $F_Q(z)$ shall be limited by the following relationships:

$$F_Q(z) \leq \frac{F^{RTP}_Q}{P} * K(z) \text{ for } P > 0.5, \text{ and}$$

$$F_Q(z) \leq \frac{F^{RTP}_Q}{0.5} * K(z) \text{ for } P \leq 0.5,$$

Where: F^{RTP}_Q = the F_Q limit at RATED THERMAL POWER (RTP) specified in the CORE OPERATING LIMITS REPORT (COLR),

$$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}, \text{ and}$$

$K(z)$ = the normalized $F_Q(z)$ as a function of core height as specified in the COLR.

APPLICABILITY: MODE 1

ACTION:

With $F_Q(z)$ exceeding its limit:

a. Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit. The Overpower ΔT Trip Setpoint reduction shall be performed with the reactor in at least HOT STANDBY.

b. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above the reduced limit required by a. above; THERMAL POWER may then be increased provided $F_Q(Z)$ is demonstrated through [a core power distribution measurement] ~~incore mapping~~ to be within its limit.

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 F_{xy} shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

a. Using the movable incore detectors to obtain a power distribution map ~~at any THERMAL POWER greater than 5% of RATED THERMAL POWER.~~

INSERT A

b. ~~Increasing the measured F_{xy} component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties.~~

INSERT B

c. Comparing the F_{xy} computed (F^C_{xy}) obtained in b, above to:

1. The F_{xy} limits for RATED THERMAL POWER (F^{RTP}_{xy}) for the appropriate measured core planes given in e and f below, and

2. The relationship:

$$F_{xy}{}^{L} = F_{xy}{}^{RTP}\,[1-PF_{xy}\ (1-P)]$$

where F^L_{xy} is the limit for fractional THERMAL POWER operation expressed as a function of F^{RTP}_{xy}, PF_{xy} is the power factor multiplier for F_{xy} in the COLR, and P is the fraction of RATED THERMAL POWER at which F_{xy} was measured.

d. Remeasuring F_{xy} according to the ~~following~~ schedule:

1. When F^C_{xy} is greater than the F^{RTP}_{xy} limit for the appropriate measured core plane but less than the F^L_{xy} relationship, additional power distribution ~~maps~~ measurements shall be taken and F^C_{xy} compared to F^{RTP}_{xy} and F^L_{xy}:

a) Either within 24 hours after exceeding by 20% of RATED THERMAL POWER or greater, the THERMAL POWER at which F^C_{xy} was last determined, or

b) At least once per 31 EFPD, whichever occurs first.

2. When the F^{C}_{xy} is less than or equal to the F^{RTP}_{xy} limit for the appropriate measured core plane, additional core power distribution ~~maps~~ measurements shall be taken and F^{C}_{xy} compared to F^{RTP}_{xy} and F^{L}_{xy} at ~~least once per 31 EFPD~~.

e. The F_{xy} limit for Rated Thermal Power (F^{RTP}_{xy}) shall be provided for all core planes containing bank "D" control rods and all unrodded core planes in the COLR per specification 6.9.1.9.

f. The F_{xy} limits of e, above, are not applicable in the following core plane regions as measured in percent of core height from the bottom of the fuel:

1. Lower core region from 0 to 15% inclusive.
2. Upper core region from 85 to 100% inclusive.
3. Grid plane regions at 17.8 ± 2%, 32.1 ±2%, 46.4 ±2%, 60.6 ±2%, and 74.9 ±2% inclusive.
4. Core plane regions within ±2% of core height (±2.88 inches) about the bank demand position of the bank "D" control rods.

g. Evaluating the effects of F_{xy} on $F_Q(Z)$ to determine if $F_Q(Z)$ is within its limit whenever F^{C}_{xy} exceeds F^{L}_{xy}.

SURVEILLANCE REQUIREMENTS (Continued)

4.2.2.3 When $F_Q(Z)$ is measured pursuant to specification 4.10.2.2, an overall measured $F_Q(Z)$ shall be obtained from a power distribution map and increased by 3% to account for manufacturing tolerances and further increased by 5% to account for measurement uncertainty.

NUCLEAR ENTHALPY HOT CHANNEL FACTOR - $F^N_{\Delta H}$

LIMITING CONDITION FOR OPERATION

3.2.3 $F^N_{\Delta H}$ shall be limited by the following relationship:

$$F^N_{\Delta H} = F^{RTP}_{\Delta H} \; [1.0 + PF_{\Delta H} \; (1.0 - P)]$$

Where: $F^{RTP}_{\Delta H}$ is the limit at RATED THERMAL POWER (RTP) specified in the CORE OPERATING LIMITS REPORT (COLR).

$PF_{\Delta H}$ is the Power Factor Multiplier for $F^N_{\Delta H}$ specified in the COLR, and

P is $\frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

APPLICABILITY: MODE 1

ACTION:

With $F^N_{\Delta H}$ exceeding its limit:

a. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 2 hours and reduce the Power Range Neutron Flux-High Trip Setpoints to ≤ 55% of RATED THERMAL POWER within ~~the next 4 hours~~.

b. Demonstrate thru ~~in-core mapping~~ a core power distribution measurement that $F^N_{\Delta H}$ is within its limit within 24 hours after exceeding the limit or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 2 hours, and

c. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above the reduced limit required by a. or b. above; subsequent POWER OPERATION may proceed provided that $F^N_{\Delta H}$ is demonstrated through ~~in-core mapping~~ to be within its limit at a nominal 50% of RATED THERMAL POWER prior to exceeding this THERMAL POWER, at a nominal 75% of RATED THERMAL POWER prior to exceeding this THERMAL power and within 24 hours after attaining 95% or greater RATED THERMAL POWER.

SURVEILLANCE REQUIREMENTS

4.2.3.1 $F^N_{\Delta H}$ shall be determined to be within its limit by using the movable incore detectors to obtain a power distribution map: (core) (obtaining) (measurement)

a. Prior to operation above 75% of RATED THERMAL POWER after each fuel loading, and

b. At least once per 31 Effective Full Power Days.

c. The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 The measured $F^N_{\Delta H}$ of 4.2.3.1 above, shall be increased by 4% for measurement uncertainty.

the applicable $F^N_{\Delta H}$ uncertainties specified in the COLR

QUADRANT POWER TILT RATIO

LIMITING CONDITION FOR OPERATION

3.2.4 THE QUADRANT POWER TILT RATIO shall not exceed 1.02.

APPLICABILITY: MODE 1 ABOVE 50% OF RATED THERMAL POWER*

ACTION:

a. With the QUADRANT POWER TILT RATIO determined to exceed 1.02 but ≤ 1.09:

   1. Within 2 hours:

      a) Either reduce the QUADRANT POWER TILT RATIO to within its limit, or

      b) Reduce THERMAL POWER at least 3% from RATED THERMAL POWER for each 1% of indicated QUADRANT POWER TILT RATIO in excess of 1.0 and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours.

   2. Verify that the QUADRANT POWER TILT RATIO is within its limit within 24 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and reduce the Power Range Neutron Flux-High Trip setpoints to ≤ 55% of RATED THERMAL POWER within the next 4 hours.

   3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL power may proceed provided that the QUADRANT POWER TILT RATIO is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

b. With the QUADRANT POWER TILT RATIO determined to exceed 1.09 due to misalignment of either a shutdown or control rod:

   1. Reduce THERMAL POWER at least 3% from RATED THERMAL POWER for each 1% of indicated QUADRANT POWER TILT RATIO in excess of 1.0, within 30 minutes.

   2. Verify that the QUADRANT POWER TILT RATIO is within its limit within 2 hours after exceeding the limit or

*See Special Test Exception 3.10.2.

LIMITING CONDITION FOR OPERATION (Continued)

reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and reduce the Power Range Neutron Flux-High trip Setpoints to ≤ 55% of RATED THERMAL POWER within the next 4 hours.

3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the QUADRANT POWER TILT RATIO is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

c. With the QUADRANT POWER TILT RATIO determined to exceed 1.09 due to causes other than the misalignment of either a shutdown or control rod:

1. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 2 hours and reduce the Power Range Neutron Flux-High Trip Setpoints to ≤ 55% of RATED THERMAL POWER within the next 4 hours.

2. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the QUADRANT POWER TILT RATIO is verified within its limit at least once per hour for 12 hours or until verified at 95% or greater RATED THERMAL POWER.

SURVEILLANCE REQUIREMENTS

4.2.4 The QUADRANT POWER TILT RATIO shall be determined to be within the limit above 50% of RATED THERMAL POWER by:

a. Calculating the ratio at least once per 7 days when the alarm is OPERABLE.

b. Calculating the ratio at least once per 12 hours during steady state operation when the alarm is inoperable.

c. ~~Using the movable incore detectors~~ obtaining a core power distribution measurement to determine the QUADRANT POWER TILT RATIO at least once per 12 hours when one Power Range Channel is inoperable and THERMAL POWER is > 75 percent of RATED THERMAL POWER.

POWER DISTRIBUTION MONITORING SYSTEM

LIMITING CONDITION FOR OPERATION

3.3.3.14 The Power Distribution Monitoring System (PDMS) shall be OPERABLE with:

a. A minimum of the following inputs from the plant available for use by the PDMS as defined in Table 3.3-14.

1. Control Bank Position
2. T_{cold}
3. Reactor Power Level
4. NIS Power Range Detector Section Signals

b. Core Exit Thermocouples (T/C) meeting the criteria:

1. At least 25% operable T/C with at least 2 T/C per quadrant, and
2. The T/C pattern has coverage of all interior fuel assemblies (no face along the baffle), within a chess knight's move, radially, from a responding, calibrated T/C, or
3. At least 25%, operable T/C with at least 2 T/C per quadrant, and the installed PDMS calibration was determined within the last 31 Effective Full Power Days (EFPD).
4. The T/C temperatures used by the PDMS are calibrated via cross calibration with the loop temperature measurement RTDs, and using the T/C flow mixing factors determined during installed PDMS calibration.

c. An installed PDMS calibration satisfying the criteria:

1. The initial calibration in each operating cycle is determined using measurements from at least 75% of the incore movable detector thimbles obtained at a THERMAL POWER greater than 25% of RATED THERMAL POWER.
2. The calibration is determined using measurements from at least 50% of the incore movable detector thimbles at any time except as specified in 3.3.3.14.c.1, and
3. The calibration is determined using a minimum of 2 detector thimbles per core quadrant.

LIMITING CONDITION FOR OPERATION (Continued)

APPLICABILTY - MODE 1, above 25% RATED THERMAL POWER (RTP)

ACTION:

With any of the operability criteria listed in 3.3.3.14.a, 3.3.3.14.b, or 3.3.3.14.c not met, either correct the deficient operability condition, or declare the PDMS inoperable and use the incore movable detector system, satisfying the OPERABILITY requirements listed in Specification 3.3.3.2, to obtain any required core power distribution measurements. Increase the measured core peaking factors using the values listed in the COLR for the PDMS inoperable condition.

The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.14.1 The operability criteria listed in 3.3.3.14.a, 3.3.3.14.b, and 3.3.3.14.c shall be verified to be satisfied prior to acceptance of the PDMS core power distribution measurement results.

4.3.3.14.2 Calibration of the PDMS is required:

a. At least once every 180 Effective Full Power Days when the minimum number and core coverage criteria as defined in 3.3.3.14.b.1 and 3.3.3.14.b.2 are satisfied, or

b. At least once every 31 Effective Full Power Days when only the minimum number criterion as defined in 3.3.3.14.b.3 is satisfied.

TABLE 3.3-14

REQUIRED PDMS PLANT INPUT INFORMATION

PLANT INPUT INFORMATION	AVAILABLE INPUTS	MINIMUM NO. OF VALID INPUTS	APPLICABLE MODES
Control Bank Position	4	4[a]	1[c]
T_{cold}	4	2	1[c]
Reactor Power Level	3	1[b]	1[c]
NIS Power Range Excore Detector Section Signals	8	6[d]	1[c]

TABLE NOTATIONS

a. Determined from either valid Demand Position or the average of the valid individual RCCA position indications for all RCCAs in the Control Bank.

b. Determined from either the reactor THERMAL POWER derived using a valid secondary calorimetric measurement, the average NIS Power Range Detector Power, or the average RCS Loop ΔT.

c. Greater than 25% RTP.

d. Comprised of an upper and lower detector section signal per Power Range Channel; a minimum of 3 OPERABLE channels required.

POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 and 3/4.2.3 HEAT FLUX AND NUCLEAR ENTHALPY HOT CHANNEL AND RADIAL PEAKING FACTORS - $F_Q(Z)$, $F^N_{\Delta H}$ and $F_{xy}(Z)$

The limits on heat flux and nuclear enthalpy hot channel factors ensure that 1) the design limits on peak local power density and minimum DNBR are not exceeded and 2) in the event of a LOCA the peak fuel clad temperature will not exceed the 2200°F ECCS acceptance criteria limit.

Each of these hot channel factors are measurable but will normally only be determined periodically as specified in Specifications 4.2.2 and 4.2.3. This periodic surveillance is sufficient to insure that the hot channel factor limits are maintained provided:

a. Control rod in a single group move together with no individual rod insertion differing from the group demand position by more than the allowed rod mislagnment.

b. Control rod groups are sequenced with overlapping groups as described in Specification 3.1.3.5.

c. The control rod insertion limits of Specifications 3.1.3.4 and 3.1.3.5 are maintained.

d. The axial power distribution, expressed in terms of AXIAL FLUX DIFFERENCE, is maintained within the limits.

The relaxation in $F^N_{\Delta H}$ as a function of THERMAL POWER allows changes in the radial power shape for all permissible rod insertion limits. $F^N_{\Delta H}$ will be maintained within its limits provided conditions a thru d above, are maintained.

When an F_Q measurement is taken, both experimental error and manufacturing tolerance must be allowed for 5% is the appropriate allowance for a full core map taken with the incore detector flux mapping system and 3% is the appropriate allowance for manufacturing tolerance. INSERT C

When $F^N_{\Delta H}$ is measured, experimental error must be allowed for and ~~4% is the appropriate allowance for a full core map taken with the~~ is obtained from the COLR when using the PDMS or the incore detection system. The specified limit for $F^N_{\Delta H}$ also contains an 8% allowance for uncertainties which mean that normal operation will result in $F^N_{\Delta H} \leq F^{RTP}_{\Delta H} / 1.08$ where $F^{RTP}_{\Delta H}$ is the limit of RATED THERMAL POWER (RTP) specified in the CORE OPERATING LIMITS REPORT (COLR). The 8% allowance is based on the following considerations:

a. abnormal perturbations in the radial power shape, such as from rod misalignment, effect $F^N_{\Delta H}$ more directly F_Q,

b. although rod movement has a direct influence upon limiting F_Q to within its limit, such control is not readily available to limit $F^N_{\Delta H}$, and

c. errors in prediction for control power shape detected during startup physics tests can be compensated for in F_Q by restricting axial flux distributions. This compensation for $F^N_{\Delta H}$ is less readily available.

INSERT D

The radial peaking factor $F_{xy}(z)$ is measured periodically to provide assurance that the hot channel factor, $F_Q(z)$, remains within its limit. The F_{xy} limit for Rated Thermal Power (F^{RTP}_{xy}), as provided in the COLR per specification 6.9.1.9, was determined from expected power control maneuvers over the full range of burnup conditions in the core.

3/4.2.4 QUADRANT POWER TILT RATIO

The quadrant power tilt ratio limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during startup testing and periodically during power operation.

The limit of 1.02 at which corrective action is required provides DNB and linear heat generation rate protection with x-y plane power tilts. A limiting tilt of 1.025 can be tolerated before the margin for uncertainty in F_Q is depleted. The limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The two hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the power by 3 percent from RATED THERMAL POWER for each percent of tilt in excess of 1.0.

(3) 1R41D is the setpoint channel; 1R41B is the measurement channel.

(4) 1R41D is the setpoint channel; 1R41C is the measurement channel.

(5) The new release rate channel 1R41D setpoint value of 2E4 uCi/sec is within the bounds of the concentration setpoint values listed in Table 3.3-6 (originally for 1R45) for normal and accident plant vent flow rates.

3/4.3.3.2 MOVABLE INCORE DETECTORS

The OPERABILITY of the movable incore detectors with the specified minimum complement of equipment ensures that the measurements obtained from use of this system accurately represent the spatial neutron flux distribution of the reactor core. The OPERABILITY of this system is demonstrated by irradiating each detector used and normalizing its respective output. INSERT E

INSERT F

3/4.3.3.3

THIS SECTION DELETED

3/4.3.3.4

THIS SECTION DELETED

3/4.3.4 DELETED

INSERT G

d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and

f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Radioactive Effluent Release Reports shall include a list of descriptions of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

6.9.1.9 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. Moderator Temperature Coefficient Beginning of Life (BOL) and End of Life (EOL) limits and 300 ppm surveillance limit for Specification 3/4.1.1.4,

2. Control Bank Insertion Limits for Specification 3/4.1.3.5,

3. Axial Flux Difference Limits and target band for Specification 3/4.2.1,

4. Heat Flux Hot Channel Factor, F_Q, its variation with core height, K(z), and Power Factor Multiplier PF_{xy}, and $F_Q(z)$ manufacturing/measurement uncertainties for Specification 3/4.2.2, and

5. Nuclear Enthalpy Hot ~~Channel Factor, and Pow~~er Factor Multiplier, $PF_{\Delta H}$ ~~for Specification 3/4.2.3.~~ and $F^N_{\Delta H}$ measurement uncertainty

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-9272-P-A, Westinghouse Reload Safety Evaluation Methodology, July 1985 (W Proprietary), Methodology for Specifications listed in 6.9.1.9.a. Approved by Safety Evaluation dated May 28, 1985.

2. WCAP-8385, Power Distribution Control and Load Following Procedures - Topical Report, September 1974 (W Proprietary) Methodology for Specification 3/4.2.1 Axial Flux Difference. Approved by Safety Evaluation dated January 31, 1978.

3. WCAP-10054-P-A, Rev. 1, Westinghouse Small Break ECCS Evaluation Model Using NOTRUMP Code, August 1985 (W Proprietary), Methodology for Specification 3/4.2.2 Heat Flux Hot Channel Factor. Approved for Salem by NRC letter dated August 25, 1993.

4. WCAP-10266-P-A, Rev. 2, The 1981 Version of Westinghouse Evaluation Model Using BASH Code, Rev. 2. March 1987 (W Proprietary) Methodology for Specification 3/4.2.2 Heat Flux Hot Channel Factor. Approved by Safety Evaluation dated November 13, 1986.

(INSERT H)

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any mid-cycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

SPECIAL REPORTS

6.9.2 Special reports shall be submitted to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555, with a copy to the Administrator, USNRC Region I within the time period specified for each report.

6.9.3 Violations of the requirements of the fire protection program described in the Updated Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be submitted to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington, DC 20555, with a copy to the Regional Administrator of the Regional Office of the NRC via the Licensee Event Report System within 30 days.

6.9.4 When a report is required by ACTION 8 or 9 of Table 3.3-11 "Accident Monitoring Instrumentation", a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring for inadequate core cooling, the cause of the inoperability, and the plans and schedule for restoring the instrument channels to OPERABLE status.

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

GROUP HEIGHT

LIMITING CONDITION FOR OPERATION

3.1.3.1 All full length (shutdown and control) rods, shall be OPERABLE and positioned within ± 18 steps (indicated position) when reactor power is ≤ 85% RATED THERMAL POWER, or ± 12 steps (indicated position) when reactor power is > 85% RATED THERMAL POWER, of their group step counter demand position within one hour after rod motion.

APPLICABILITY: MODES 1* and 2*

ACTION:

a. With one or more full length rods inoperable due to being immovable as a result of excessive friction or mechanical interference or known to be untrippable, determine that the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied within 1 hour and be in HOT STANDBY within 6 hours.

b. With more than one full length rod inoperable or mis-aligned from the group step counter demand position by more than ± 18 steps (indicated position) at ≤ 85% RATED THERMAL POWER or ± 12 steps (indicated position) at > 85% RATED THERMAL POWER, be in HOT STANDBY within 6 hours.

c. With one full length rod inoperable due to causes other than addressed by ACTION a, above, or mis-aligned from its group step counter demand position by more than ± 18 steps (indicated position) at ≤ 85% RATED THERMAL POWER or ± 12 steps (indicated position) at > 85% RATED THERMAL POWER, POWER OPERATION may continue provided that within one hour either:

   1. The rod is restored to OPERABLE status within the above alignment requirements, or

   2. The remainder of the rods in the bank with the inoperable rod are aligned to within ± 18 steps (indicated position) at ≤ 85% RATED THERMAL POWER or ± 12 steps (indicated position) at >85% RATED THERMAL POWER, of the inoperable rod while maintaining the rod sequence and insertion limits in the COLR per Specification 3.1.3.5. The THERMAL POWER level shall be restricted pursuant to Specification 3.1.3.5 during subsequent operation, or

   3. The rod is declared inoperable and the SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is satisfied. POWER OPERATION may then continue provided that:

*See Special Test Exceptions 3.10.2 and 3.10.3.

a) A reevaluation of each accident analysis of Table 3.1- is performed within 5 days; this reevaluation shall confirm that the previously analyzed results of these accidents remain valid for the duration of operation under these conditions.

b) The SHUTDOWN MARGIN requirement of Specification 3.1.1.1 is determined at least once per 12 hours.

c) A core power distribution measurement is obtained from the movable incore detectors and $F_Q(Z)$ and $F^N_{\Delta H}$ are verified to be within their limits within 72 hours.

d) The THERMAL POWER level is reduced to less than or equal to 75% of RATED THERMAL POWER within one hour and within the next 4 hours the high neutron flux trip setpoint is reduced to less than or equal to 85% of RATED THERMAL POWER. THERMAL POWER shall be maintained less than or equal to 75% of RATED THERMAL POWER until compliance with ACTIONS 3.1.3.1.c.3.a and 3.1.3.1.c.3.c above are demonstrated.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The position of each full length rod shall be determined to be within the limits established in the limiting condition for operation at least once per 12 hours (allowing for one hour thermal soak after rod motion) except during time intervals when the Rod Position Deviation Monitor is inoperable, then verify the group positions at least once per 4 hours.

4.1.3.1.2 Each full length rod not fully inserted in the core shall be determined to be OPERABLE by movement of at least 10 steps in any one direction at least once per 31 days.

REACTIVITY CONTROL SYSTEMS

POSITION INDICATION SYSTEMS - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.3.2.1 The shutdown and control rod position indication systems shall be OPERABLE and capable of determining the actual and demanded rod positions as follows:

a. Analog rod position indicators, within one hour after rod motion (allowance for thermal soak);

All Shutdown Banks: ± 18 steps at ≤85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank A: ± 18 steps at ≤85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 200-228 steps.

Control Bank B: ± 18 steps at ≤85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal ranges of 0-30 steps and 160-228 steps.

Control Banks C and D: ± 18 steps at ≤85% reactor power or if reactor power is > 85% RATED THERMAL POWER ± 12 steps of the group demand counters for withdrawal range of 0-228 steps.

b. Group demand counters; ± 2 steps of the pulsed output of the Slave Cycler Circuit over the withdrawal range of 0-228 steps.

APPLICABILITY: MODES 1 and 2.

ACTION:

a. With a maximum of one analog rod position indicator per bank inoperable either:

(power distribution monitoring system (if power is above 25% RTP) or using the)

1. Determine ~~the position of the non-indicating rod~~(s) indirectly ~~by~~ (using) the movable incore detectors at least once per 8 hours and within one hour after any motion of the non-indicating rod which exceeds 24 steps in one direction since the last determination of the rod's position, or (if power is less than 25% RTP or the power distribution monitoring system is inoperable)

2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

b. With two or more analog rod position indicators per bank inoperable, within one hour restore the inoperable rod position indicator(s) to OPERABLE status or be in HOT STANDBY within the next 6 hours. A maximum of one rod position indicator per bank may remain inoperable following the hour, with Action (a) above being applicable from the original entry time into the LCO.

c. With a maximum of one group demand position indicator per bank inoperable either:

1. Verify that all analog rod position indicators for the affected bank are OPERABLE and that the most withdrawn rod and the least withdrawn rod of the bank are within a maximum of 18 steps when reactor power is ≤ 85% RATED THERMAL POWER or if reactor power is > 85% RATED THERMAL POWER, 12 steps of each other at least once per 8 hours, or

2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 8 hours.

SURVEILLANCE REQUIREMENTS

==

4.1.3.2.1.1 Each analog rod position indicator shall be determined to be OPERABLE by verifying that the demand position indication system and the rod position indication system agree within 18 steps when reactor power is ≤ 85% RATED THERMAL POWER or if reactor power is > 85% RATED THERMAL POWER, 12 steps (allowing for one hour thermal soak after rod motion) at least once per 12 hours except during time intervals when the Rod Position Deviation Monitor is inoperable, then compare the demand position indication system and the rod position indication system at least once per 4 hours.

4.1.3.2.1.2 Each of the above required rod position indicator(s) shall be determined to be OPERABLE by performance of a CHANNEL calibration at least once per 18 months.

POWER DISTRIBUTION LIMITS

3/4.2.2 HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$

LIMITING CONDITION FOR OPERATION

3.2.2 $F_Q(z) \leq \frac{F_Q^{RTP}}{P} * K(z)$ for $P > 0.5$, and

$F_Q(z) \leq \frac{F_Q^{RTP}}{0.5} * K(z)$ for $P > 0.5$, and

Where F_Q^{RTP} = the F_Q limit at RATED THERMAL POWER (RTP) specified in the CORE OPERATING LIMITS REPORT (COLR),

$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$, and

$K(z)$ = the normalized $F_Q(z)$ as a function of core height as specified in the COLR.

APPLICABILITY: MODE 1

ACTION:

With $F_Q(Z)$ exceeding its limit:

a. Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower delta T Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit. The Overpower delta T Trip Setpoint reduction shall be performed with the reactor in at least HOT STANDBY.

b. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above the reduced limit required by a. above; THERMAL POWER may then be increased provided $F_Q(Z)$ ~~is~~ is demonstrated through ~~incore mapping~~ a core power distribution measurement to be within its limit.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 F_{xy} shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

a. Using the movable incore detectors to obtain a power distribution map ~~at any THERMAL POWER greater than 5% of RATED THERMAL POWER.~~

[INSERT A]

b. ~~Increasing the measured F_{xy} component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5% to account for measurement uncertainties.~~

[INSERT B]

c. Comparing the F_{xy} computed (F^{C}_{xy}) obtained in b, above to:

1. The F_{xy} limits for RATED THERMAL POWER (F^{RTP}_{xy}) for the appropriate measured core planes given in e. and f., below, and

2. The relationship:

$$F^{L}_{xy} = F^{RTP}_{xy} \quad [1 + PF_{xy}(1-P)]$$

where F^{L}_{xy} is the limit for fractional THERMAL POWER operation expressed as a function of F^{RTP}_{xy}, PF_{xy} is the power factor multiplier for F_{xy} in the CORL, and P is the fraction of RATED THERMAL POWER at which F_{xy} was measured.

d. Remeasuring F_{xy} according to the following schedule:

1. When F^{C}_{xy} is greater than the F^{RTP}_{xy} limit for the appropriate measured [core] plane but less than the F^{L}_{xy} relationship, additional power distribution ~~maps~~ [measurements] shall be taken and F^{C}_{xy} compared to F^{RTP}_{xy} and F^{L}_{xy}:

a) Either within 24 hours after exceeding by 20% of RATED THERMAL POWER or greater, the THERMAL POWER at which F^{C}_{xy} was last determined, or

b) At least once per 31 EFPD, whichever occurs first.

core

2. When the F^{c}_{xy} is less than or equal to the F^{RTP}_{xy} limit for the appropriate measured core plane, additional power distribution ~~maps~~ shall be taken and F^{c}_{xy} compared to F^{RTP}_{xy} and F^{L}_{xy} at least once per 31 EFPD.

measurements

e. The F_{xy} limit for Rated Thermal Power (F^{RTP}_{xy}) shall be provided for all core planes containing bank "D" control rods and all unrodded core planes in the COLR per specification 6.9.1.9.

f. The F_{xy} limits of e., above, are not applicable in the following core plane regions as measured in percent of core height from the bottom of the fuel:

1. Lower core region from 0% to 15%, inclusive.
2. Upper core region from 85% to 100%, inclusive.
3. Grid plane regions at 17.8% ± 2%, 32.1% ± 2%, 46.4% ± 2%, 60.6% ± 2% and 74.9% ± 2%, inclusive.
4. Core plane regions within ± 2% of core height (± 2.88 inches) about the bank demand position of the bank "D" control rods.

g. Evaluating the effects of F_{xy} on $F_Q(Z)$ to determine if $F_Q(Z)$ is within its limit whenever F^{c}_{xy} exceeds F^{L}_{xy}.

core measurement

4.2.2.3 When $F_Q(Z)$ is measured pursuant to specification 4.10.2.2, an overall measured $F_Q(Z)$ shall be obtained ~~from~~ a power distribution ~~map~~ and increased by ~~3% to account for~~ manufacturing ~~tolerances~~ and ~~further increased by 5% to account for~~ measurement ~~uncertainty~~.

the applicable

uncertainties as specified in the COLR

POWER DISTRIBUTION LIMITS

3/4.2.3 NUCLEAR ENTHALPY HOT CHANNEL FACTOR $F^N_{\Delta H}$

LIMITING CONDITION FOR OPERATION

3.2.3 $F^N_{\Delta H}$ shall be limited by the following relationship:

$$F^N_{\Delta H} = F^{RTP}_{\Delta H} \, [1.0 + PF_{\Delta H} \, (1.0 - P)]$$

Where $F^{RTP}_{\Delta H}$ is the limit at RATED THERMAL POWER in the Core Operating Limits Report (COLR).

$PF_{\Delta H}$ is the Power Factor Multiplier for $F^N_{\Delta H}$ specified in the COLR, and P is $\dfrac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

APPLICABILITY: MODE 1

ACTION:

With $F^N_{\Delta H}$ exceeding its limit:

a. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 2 hours and reduce the Power Range Neutron Flux-High Trip Setpoints to ≤ 55% of RATED THERMAL POWER within the next 4 hours.

b. Demonstrate thru ~~in-core mapping~~ [a core power distribution measurement] that $F^N_{\Delta H}$ is within its limit within 24 hours after exceeding the limit or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 2 hours, and

c. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above the reduced limit required by a. or b. above; subsequent POWER OPERATION may proceed provided that $F^N_{\Delta H}$ is demonstrated through ~~in-core mapping~~ [a core power distribution measurement] to be within its limit at a nominal 50% of RATED THERMAL POWER prior to exceeding this THERMAL POWER, at a nominal 75% of RATED THERMAL POWER prior to exceeding this THERMAL POWER and within 24 hours after attaining 95% or greater RATED THERMAL POWER.

SURVEILLANCE REQUIREMENTS

4.2.3.1 $F^N_{\Delta H}$ shall be determined to be within its limit by [obtaining] ~~using the movable incore detectors to obtain~~ a [core] power distribution ~~map~~ [measurement]:

a. Prior to operation above 75% of RATED THERMAL POWER after each fuel loading, and

b. At least once per 31 Effective Full Power Days.

c. The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 The measured $F^N_{\Delta H}$ of 4.2.3.1 above, shall be increased by ~~4% for measurement uncertainty~~ [the applicable uncertainties specified in the COLR].

3/4.2.4 QUADRANT POWER TILT RATIO

LIMITING CONDITION FOR OPERATION

3.2.4 The QUADRANT POWER TILT RATIO shall not exceed 1.02.

APPLICABILITY: MODE 1 above 50% of RATED THERMAL POWER*.

ACTION:

a. With the QUADRANT POWER TILT RATIO determined to exceed 1.02 but less than or equal to 1.09:

1. Calculate the QUADRANT POWER TILT RATIO at least once per hour until:

a) Either the QUADRANT POWER TILT RATIO is reduced to within its limit, or

b) THERMAL POWER is reduced to less than 50% of RATED THERMAL POWER.

2. Within 2 hours:

a) Either reduce the QUADRANT POWER TILT RATIO to within its limit, or

b) Reduce THERMAL POWER at least 3% from RATED THERMAL POWER for each 1% of indicated QUADRANT POWER TILT RATIO in excess of 1.0 and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours.

3. a) Verify that the QUADRANT POWER TILT RATIO is within its limit within 24 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and reduce the Power Range Neutron Flux-High Trip setpoints to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.

*See Special Test Exception 3.10.2.

LIMITING CONDITION FOR OPERATION (Continued)

b) Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL power may proceed provided that the QUADRANT POWER TILT RATIO is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

b. With the QUADRANT POWER TILT RATIO determined to exceed 1.09 due to misalignment of either a shutdown or control rod:

1. Calculate the QUADRANT POWER TILT RATIO at least once per hour until:

(a) Either the QUADRANT POWER TILT RATIO is reduced to within its limit, or

(b) THERMAL POWER is reduced to less than 50% of RATED THERMAL POWER.

2. Reduce THERMAL POWER at least 3% from RATED THERMAL POWER for each 1% of indicated QUADRANT POWER TILT RATIO in excess of 1.0, within 30 minutes.

3. Verify that the QUADRANT POWER TILT RATIO is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and reduce the Power Range Neutron Flux-High Trip Setpoints to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.

4. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the QUADRANT POWER TILT RATIO is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

c. With the QUADRANT POWER TILT RATIO determined to exceed 1.09 due to causes other than the misalignment of either a shutdown or control rod:

LIMITING CONDITION FOR OPERATION (Continued)

1. Calculate the QUADRANT POWER TILT RATIO at least once per hour until:

   (a) Either the QUADRANT POWER TILT RATIO is reduced to within its limit, or

   (b) THERMAL POWER is reduced to less than 50% of RATED THERMAL POWER.

2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within 2 hours and reduce the Power Range Neutron Flux-High Trip Setpoints to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.

3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the QUADRANT POWER TILT RATIO is verified within its limit at least once per hour for 12 hours or until verified at 95% or greater RATED THERMAL POWER.

d. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The QUADRANT POWER TILT RATIO shall be determined to be within the limit above 50% of RATED THERMAL POWER by:

a. Calculating the ratio at least once per 7 days when the alarm is OPERABLE.

b. Calculating the ratio at least once per 12 hours during steady-state operation when the alarm is inoperable.

4.2.4.2 The QUADRANT POWER TILT RATIO shall be determined to be within the limit when above 75% of RATED THERMAL POWER with one Power Range Channel inoperable by ~~using the movable incore detectors~~ [obtaining a core power distribution measurement*] to confirm that the normalized symmetric power distribution~~, obtained from the four pairs of symmetric thimble locations,~~ is consistent with the indicated QUADRANT POWER TILT RATIO at least once per 12 hours.

* Using either the movable incore detectors in the four pairs of symmetric thimble locations or the power distribution monitoring system.

TABLE NOTATION

* With the reactor trip system breakers in the closed position and the control rod drive system capable of rod withdrawal.

\# The provisions of Specification 3.0.4 are not applicable.

\## High voltage to detector may be de-energized above P-6.

\### If ACTION Statement 1 is entered as a result of Reactor Trip Breaker (RTB) or Reactor Trip Bypass Breaker (RTBB) maintenance testing results exceeding the following acceptance criteria, NRC reporting shall be made within 30 days in accordance with Specification 6.9.2:

1. A RTB or RTBB trip failure during any surveillance test with less than or equal to 300 grams of weight added to the breaker trip bar.

2. A RTB or RTBB time response failure that results in the overall reactor trip system time response exceeding the Technical Specification limit.

ACTION STATEMENTS

ACTION 1 - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, be in HOT STANDBY within 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.1.1.1 provided the other channel is OPERABLE.

ACTION 2 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours.

b. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.1.1.1.

c. Either, THERMAL POWER is restricted to ≤ 75% of RATED THERMAL POWER and the Power Range, Neutron Flux trip setpoint is reduced to ≤ 85% of RATED THERMAL POWER within 4 hours; or, the QUADRANT POWER TILT RATIO is monitored at least once per 12 hours.

d. The QUADRANT POWER TILT RATIO, as indicated by the remaining three detectors, is verified consistent with the normalized symmetric power distribution obtained by using the movable in-core detectors in the four pairs of symmetric thimble locations at least once per 12 hours when THERMAL POWER is greater than 75% of RATED THERMAL POWER.

either

or the power distribution monitoring system

POWER DISTRIBUTION MONITORING SYSTEM

LIMITING CONDITION FOR OPERATION

3.3.3.14 The Power Distribution Monitoring System (PDMS) shall be OPERABLE with:

a. A minimum of the following inputs from the plant available for use by the PDMS as defined in Table 3.3-14.

1. Control Bank Position
2. T_{cold}
3. Reactor Power Level
4. NIS Power Range Detector Section Signals

b. Core Exit Thermocouples (T/C) meeting the criteria:

1. At least 25% operable T/C with at least 2 T/C per quadrant, and

2. The T/C pattern has coverage of all interior fuel assemblies (no face along the baffle), within a chess knight's move, radially, from a responding, calibrated T/C, or

3. At least 25%, operable T/C with at least 2 T/C per quadrant, and the installed PDMS calibration was determined within the last 31 Effective Full Power Days (EFPD).

4. The T/C temperatures used by the PDMS are calibrated via cross calibration with the loop temperature measurement RTDs, and using the T/C flow mixing factors determined during installed PDMS calibration.

c. An installed PDMS calibration satisfying the criteria:

1. The initial calibration in each operating cycle is determined using measurements from at least 75% of the incore movable detector thimbles obtained at a THERMAL POWER greater than 25% of RATED THERMAL POWER.

2. The calibration is determined using measurements from at least 50% of the incore movable detector thimbles at any time except as specified in 3.3.3.14.c.1, and

3. The calibration is determined using a minimum of 2 detector thimbles per core quadrant.

LIMITING CONDITION FOR OPERATION (Continued)

APPLICABILTY.- MODE 1, above 25% RATED THERMAL POWER (RTP)

ACTION:

With any of the operability criteria listed in 3.3.3.14.a, 3.3.3.14.b, or 3.3.3.14.c not met, either correct the deficient operability condition, or declare the PDMS inoperable and use the incore movable detector system, satisfying the OPERABILITY requirements listed in Specification 3.3.3.2, to obtain any required core power distribution measurements. Increase the measured core peaking factors using the values listed in the COLR for the PDMS inoperable condition.

The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.14.1 The operability criteria listed in 3.3.3.14.a, 3.3.3.14.b, and 3.3.3.14.c shall be verified to be satisfied prior to acceptance of the PDMS core power distribution measurement results.

4.3.3.14.2 Calibration of the PDMS is required:

a. At least once every 180 Effective Full Power Days when the minimum number and core coverage criteria as defined in 3.3.3.14.b.1 and 3.3.3.14.b.2 are satisfied, or

b. At least once every 31 Effective Full Power Days when only the minimum number criterion as defined in 3.3.3.14.b.3 is satisfied.

TABLE 3.3-14

REQUIRED PDMS PLANT INPUT INFORMATION

PLANT INPUT INFORMATION	AVAILABLE INPUTS	MINIMUM NO. OF VALID INPUTS	APPLICABLE MODES
Control Bank Position	4	4[a]	1[c]
T_{cold}	4	2	1[c]
Reactor Power Level	3	1[b]	1[c]
NIS Power Range Excore Detector Section Signals	8	6[d]	1[c]

TABLE NOTATIONS

a. Determined from either valid Demand Position or the average of the valid individual RCCA position indications for all RCCAs in the Control Bank.

b. Determined from either the reactor THERMAL POWER derived using a valid secondary calorimetric measurement, the average NIS Power Range Detector Power, or the average RCS Loop ΔT.

c. Greater than 25% RTP.

d. Comprised of an upper and lower detector section signal per Power Range Channel; a minimum of 3 OPERABLE channels required.

3/4.2.2 and 3/4.2.3 HEAT FLUX AND NUCLEAR ENTHALPY HOT CHANNEL AND RADIAL PEAKING FACTORS - $F_Q(Z)$ AND $F^N_{\Delta H}$

The limits on heat flux and nuclear enthalpy hot channel factors and RCS flow rate ensure that 1) the design limits on peak local power density and minimum DNBR are not exceeded and 2) in the event of a LOCA the peak fuel clad temperature will not exceed the 2200°F ECCS acceptance criteria limit.

Each of these hot channel factors are measurable but will normally only be determined periodically as specified in Specifications 4.2.2 and 4.2.3. This periodic surveillance is sufficient to insure that the limits are maintained provided:

a. Control rod in a single group move together with no individual rod insertion differing from the group demand position by more than the allowed rod misalignment.

b. Control rod groups are sequenced with overlapping groups as described in Specification 3.1.3.5.

c. The control rod insertion limits of Specifications 3.1.3.4 and 3.1.3.5 are maintained.

d. The axial power distribution, expressed in terms of AXIAL FLUX DIFFERENCE, is maintained within the limits.

The relaxation in $F^N_{\Delta H}$ as a function of THERMAL POWER allows changes in the radial power shape for all permissible rod insertion limits. $F^N_{\Delta H}$ will be maintained within its limits provided conditions a through d above, are maintained.

When an F_Q measurement is taken, both experimental error and manufacturing tolerance must be allowed for. Five percent is the appropriate allowance for a full core map taken with the incore detector flux mapping system and 3% is the appropriate allowance for manufacturing tolerance. INSERT C

When $F^N_{\Delta H}$ is measured, experimental error must be allowed for and ~~4% is the appropriate allowance for a full core map taken with the~~ incore detection system. The specified limit for $F^N_{\Delta H}$ also contains an 8% allowance for uncertainties which mean that normal operation will result in $F^N_{\Delta H} \leq F^{RTP}_{\Delta H}/1.08$. Where $F^{RTP}_{\Delta H}$ is the limit at RATED THERMAL POWER (RTP) specified in the CORE OPERATING LIMITS REPORT (COLR). The 8% allowance is based on the following considerations:

is obtained from the COLR when using the PDMS or the

3/4.2.2 and 3/4.2.3 HEAT FLUX AND NUCLEAR ENTHALPY HOT CHANNEL AND RADIAL PEAKING FACTORS - $F_Q(Z)$ AND $F^N_{\Delta H}$ (Continued)

a. abnormal perturbations in the radial power shape, such as from rod misalignment, effect $F^N_{\Delta H}$ more directly than F_Q.

b. although rod movement has a direct influence upon limiting F_Q to within its limit, such control is not readily available to limit $F^N_{\Delta H}$, and

c. errors in prediction for control power shape detected during startup physics test can be compensated for in F_Q by restricting axial flux distributions. This compensation for $F^N_{\Delta H}$ is less rapidly available.

INSERT D

The radial peaking factor $F_{xy}(Z)$ is measured periodically to provide assurance that the hot channel factor $F_Q(Z)$, remains within its limit. The F_{xy} limit for RATED THERMAL POWER F^{RTP}_{xy}, as provided in COLR per specification 6.9.1.9, was determined from expected power control maneuvers over the full range of burnup conditions in the core.

3/4.2.4 QUADRANT POWER TILT RATIO

The quadrant power tilt ratio limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during startup testing and periodically during power operation.

Immediate action(s), in accordance with the LCO Action Statements, means that the required action should be pursued without delay and in a controlled manner.

3/4.3.3.2 MOVABLE INCORE DETECTORS

The OPERABILITY of the movable incore detectors with the specified minimum complement of equipment ensures that the measurements obtained from use of this system accurately represent the spatial neutron flux distribution of the reactor core. The OPERABILITY of this system is demonstrated by irradiating each detector used and normalizing its respective output. INSERT E

For the purpose of measuring $F_Q(Z)$ or $F^N_{\Delta H}$, a full incore flux map or the PDMS is used. Quarter-core flux maps, as defined in WCAP-8648, June 1976, may be used in recalibration of the excore neutron flux detection system, and full incore flux maps or symmetric incore thimbles may be used for monitoring the QUADRANT POWER TILT RATIO when one Power Range Channel is inoperable.

3/4.3.3.3

THIS SECTION DELETED

3/4.3.3.4

THIS SECTION DELETED

3/4.3.3.5 REMOTE SHUTDOWN INSTRUMENTATION

The OPERABILITY of the remote shutdown instrumentation ensures that sufficient capability is available to permit shutdown and maintenance of HOT STANDBY of the facility 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 Criterion 19 of 10 CFR 50.

3/4.3.3.6

THIS SECTION DELETED

3/4.3.3.7 ACCIDENT MONITORING INSTRUMENTATION

The OPERABILITY of the accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these 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-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations."

The limit of 1.02 at which corrective action is required provides DNB and linear heat generation rate protection with x-y plane power tilts. A limiting tilt of 1.025 can be tolerated before the margin for uncertainty in F_Q is depleted. The limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The 2 hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the power by 3% from RATED THERMAL POWER for each percent of tilt in excess of 1.0.

3/4.2.5 DNB PARAMETERS

The limits on the DNB related parameters assure that each of the parameters are maintained with the normal steady state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the initial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum DNBR of the design DNBR value throughout each analyzed transient.

The 12 hour periodic surveillance of these parameters through instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation. The 18 month periodic measurement of the RCS total flow rate is adequate to detect flow degradation and ensure correlation of the flow indication channels with measured flow such that the indicated percent flow will provide sufficient verification of flow rate on a 12 hour basis.

CROSS REFERENCE - TABLES 3.3-13 and 4.3-13

T/S Table Item No.	Instrument Description	Acceptable RMS Channels
1a	Waste Gas Holdup System Noble Gas Activity	2R41A, B and D(1)(2)
2a	Containment Purge and Pressure - Vacuum Relief Noble Gas Activity	2R12A or 2R41A, B and D(1)(2)
3a	Plant Vent Header System Noble Gas Activity	2R16 or 2R41A, B and D(1)(2)

(1) The channels listed are required to be operable to meet a single operable channel for the Tecnnical Specification's "Minimum Channels Operable" requirement.

(2) 2R41D is the setpoint channel. 2R41A and 2R41B are the measurement channels.

3/4.3.4 DELETED

INSERT G

d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and

f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Radioactive Effluent Release Reports shall include a list of descriptions of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification 3.12.2.

6.9.1.9 <u>CORE OPERATING LIMITS REPORT (COLR)</u>

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. Moderator Temperature Coefficient Beginning of Life (BOL) and End of Life (EOL) limits and 300 ppm surveillance limit for Specification 3/4.1.1.3,

2. Control Bank Insertion Limits for Specification 3/4.1.3.5,

3. Axial Flux Difference Limits and target band for Specification 3/4.2.1,

4. Heat Flux Hot Channel Factor, F_Q, its variation with core height, K(z), and Power Factor Multiplier PF_{xy}, and $F_Q(Z)$ manufacturing/measurement uncertainties for Specification 3/4.2.2, and

5. Nuclear Enthalpy Hot Channel Factor, and Power Factor Multiplier, $PF_{\Delta H}$, and $F_{\Delta H}$ measurement uncertainty for Specification 3/4.2.3

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-9272-P-A, <u>Westinghouse Reload Safety Evaluation Methodology</u>, July 1985 (<u>W</u> Proprietary), Methodology for Specifications listed in 6.9.1.9.a. Approved by Safety Evaluation dated May 28, 1985.

2. WCAP-8385, Power Distribution Control and Load Following Procedures - Topical Report, September 1974 (W Proprietary) Methodology for Specification 3/4.2.1 Axial Flux Difference Approved by Safety Evaluation dated January 31, 1978.

3. WCAP-10054-P-A, Rev. 1, Westinghouse Small Break ECCS Evaluation Model Using NOTRUMP Code, August 1985 (W Proprietary), Methodology for Specification 3/4.2.2 Heat Flux Hot Channel Factor. Approved for Salem by NRC letter dated August 25, 1993.

4. WCAP-10266-P-A, Rev. 2, The 1981 Version of Westinghouse Evaluation Model Using BASH Code, Rev. 2. March 1987 (W Proprietary) Methodology for Specification 3/4.2.2 Heat Flux Hot Channel Factor. Approved by Safety Evaluation dated November 13, 1986.

INSERT H

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any mid-cycle revisions or supplements shall be provided upon issuance for each reload cycle to the NRC.

SPECIAL REPORTS

6.9.2 Special reports shall be submitted to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555, with a copy to the Administrator, USNRC Region I within the time period specified for each report.

6.9.3 Violations of the requirements of the fire protection program described in the Updated Final Safety Analysis Report which would have adversely affected the ability to achieve and maintain safe shutdown in the event of a fire shall be submitted to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington, DC 20555, with a copy to the Regional Administrator of the Regional Office of the NRC via the Licensee Event Report System within 30 days.

6.9.4 When a report is required by ACTION 8 OR 9 of Table 3.3-11 "Accident Monitoring Instrumentation", a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring for inadequate core cooling, the cause of the inoperability, and the plans and schedule for restoring the instrument channels to OPERABLE status.