ATTACHMENT (2)

UNIT 2

TECHNICAL SPECIFICATION

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3/4.2.2 TOTAL PLANAR RADIAL PEAKING FACTOR - F^T_{xy}

LIMITING CONDITION FOR OPERATION

3.2.2.1 The calculated value of F^T_{xy} shall be limited to $\leq$ 1.70.**

APPLICABILITY: **MODE 1***.

ACTION: With F^T_{xy} > 1.70, within 6 hours either:

a. Withdraw and maintain full length CEAs at or beyond the Long Term Steady State Insertion Limits of Specification 3.1.3.6 and reduce **THERMAL POWER** as follows:

1. Reduce **THERMAL POWER** to bring the combination of **THERMAL POWER** and F^T_{xy} within the limits of Figure 3.2.2-1, or

2. Reduce **THERMAL POWER** to less than or equal to the limit established by the Better Axial Shape Selection System (BASSS) as a function of F^T_{xy}; or

b. Be in at least **HOT STANDBY**.

SURVEILLANCE REQUIREMENTS

4.2.2.1.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.1.2 F^T_{xy} shall be calculated by the expression $F^T_{xy} = F_{xy}(1+T_q)$ when F_{xy} is determined with a non-full Core Power Distribution Mapping System and shall be calculated as $F^T_{xy} = F_{xy}$ when determined with a full Core Power Distribution Mapping System. F^T_{xy} shall be determined to be within its limit at the following intervals:

a. Prior to operation above 70 percent of **RATED THERMAL POWER** after each fuel loading,

b. At least once per 31 days*** of accumulated operation in **MODE 1**, and

c. Within four hours if the **AZIMUTHAL POWER TILT** (T_q) is > 0.030.

** [INSERT C]

*** [INSERT B]

* See Special Test Exception 3.10.2.

SURVEILLANCE REQUIREMENTS (Continued)

c. Verifying at least once per 31 days that the **AXIAL SHAPE INDEX** is maintained within the limits of Figure 3.2.1-2, where 100 percent of the allowable power represents the maximum **THERMAL POWER** allowed by the following expression:

$$M \times N$$

where:

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

2. N is the maximum allowable fraction of **RATED THERMAL POWER** as determined by the F^T_{xy} curve of Figure 3.2.1-3.

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

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

b. Have their alarm setpoint adjusted to less than or equal to the limits shown on Figure 3.2.1-1 when the following factors are appropriately included in the setting of these alarms:

   1. A measurement-calculational uncertainty factor of 1.062.**

   2. An engineering uncertainty factor of 1.03.

   3. A linear heat rate uncertainty factor of 1.002 due to axial fuel densification and thermal expansion, and

   4. A **THERMAL POWER** measurement uncertainty factor of 1.02.

---

*[INSERT B]

**[INSERT A]

3/4.2.3 TOTAL INTEGRATED RADIAL PEAKING FACTOR - F_r^T

LIMITING CONDITION FOR OPERATION

3.2.3 The calculated value of F_r^T shall be limited to $\leq$ 1.70.**

APPLICABILITY: MODE 1*.

ACTION: With F_r^T > 1.70, within 6 hours either:

a. Be in at least **HOT STANDBY**, or

b. Withdraw and maintain the full length CEAs at or beyond the Long Term Steady State Insertion Limits of Specification 3.1.3.6 and reduce **THERMAL POWER** as follows:

1. Reduce **THERMAL POWER** to bring the combination of **THERMAL POWER** and F_r^T within the limits of Figure 3.2.3-1, or

2. Reduce **THERMAL POWER** to less than or equal to the limit established by the Better Axial Shape Selection System (BASSS) as a function of F_r^T.

When the **THERMAL POWER** is determined from Figure 3.2.3-1, it shall be used to establish a revised upper **THERMAL POWER LEVEL** limit on Figure 3.2.3-2 (i.e., Figure 3.2.3-2 shall be truncated at the allowable fraction of **RATED THERMAL POWER** determined by Figure 3.2.3-1). Subsequent operation shall be maintained within the reduced acceptable operation region of Figure 3.2.3-2.

SURVEILLANCE REQUIREMENTS

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 F_r^T shall be calculated by the expression $F_r^T = F_r\ (1+T_q)$ when F_r is determined with a non-full Core Power Distribution Mapping System and shall be calculated as $F_r^T = F_r$ when determined with a full Core Power

** [INSERT D]

* See Special Test Exception 3.10.2.

SURVEILLANCE REQUIREMENTS (Continued)

Distribution Mapping System. F_r^T shall be determined to be within its limit at the following intervals:

a. Prior to operation above 70 percent of **RATED THERMAL POWER** after each fuel loading,

b. At least once per 31* days of accumulated operation in **MODE 1**, and

c. Within four hours if the **AZIMUTHAL POWER TILT (T_q)** is > 0.030.

4.2.3.3 F_r^T shall be determined each time a calculation is required by using the incore detectors to obtain a power distribution map with all full length CEAs at or above the Long Term Steady State Insertion Limit for the existing Reactor Coolant Pump combination.

4.2.3.4 T_q shall be determined each time a calculation of F_r^T is made using a non-full Core Power Distribution Mapping System and the value of T_q used to determine F_r^T shall be the measured value of T_q.

* [INSERT B]

3/4.3.3 MONITORING INSTRUMENTATION

Incore Detectors

LIMITING CONDITION FOR OPERATION

3.3.3.2 The Incore Detection System shall be **OPERABLE** with at least one **OPERABLE** detector segment in each core quadrant on each of the four axial elevations containing incore detectors and as further specified below:

a. For monitoring the **AZIMUTHAL POWER TILT**:*

At least two quadrant symmetric incore detector segment groups at each of the four axial elevations containing incore detectors in the outer 184 fuel assemblies with sufficient **OPERABLE** detector segments in these detector groups to compute at least two **AZIMUTHAL POWER TILT** values at each of the four axial elevations containing incore detectors.

b. For recalibration of the Excore Neutron Flux Detection System:

1. At least 75%** of all incore detector segments,
2. A minimum of 9 **OPERABLE** incore detector segments at each detector segment level, and
3. A minimum of 2 **OPERABLE** detector segments in the inner 109 fuel assemblies and 2 **OPERABLE** segments in the outer 108 fuel assemblies at each segment level.

c. For monitoring the **UNRODDED PLANAR RADIAL PEAKING FACTOR**, the **UNRODDED INTEGRATED RADIAL PEAKING FACTOR**, or the linear heat rate:

1. At least 75%*** of all incore detector locations,
2. A minimum of 9 **OPERABLE** incore detector segments at each detector segment level, and
3. A minimum of 2 **OPERABLE** detector segments in the inner 109 fuel assemblies and 2 **OPERABLE** segments in the outer 108 fuel assemblies at each segment level.

An **OPERABLE** incore detector segment shall consist of an **OPERABLE** rhodium detector constituting one of the segments in a fixed detector string.

An **OPERABLE** incore detector location shall consist of a string in which at least three of the four incore detector segments are **OPERABLE**.

* [INSERT E]

** [INSERT F]

*** [INSERT G]

INSERT A:

For Unit 2 Cycle 10 only, when the percentage of **OPERABLE** incore detector locations (e.g., strings) falls below 75%, the measurement-calculational uncertainty factor on linear heat rate shall be increased by 1% (from 1.062 to 1.072) prior to comparison with the Technical Specification limit.

INSERT B:

For Unit 2 Cycle 10 only, when the percentage of **OPERABLE** incore detector locations (e.g., strings) falls below 75%, this surveillance shall be performed at least once per 15 days of accumulated operation in **MODE** 1.

INSERT C:

For Unit 2 Cycle 10 only, when the percentage of **OPERABLE** incore detector locations (e.g., strings) falls below 75%, the calculated value of F_{xy}^T shall be increased by 1% prior to comparison with the limit.

INSERT D:

For Unit 2 Cycle 10 only, when the percentage of **OPERABLE** incore detector locations (e.g., strings) falls below 75%, the calculated value of F_r^T shall be increased by 1% prior to comparison with the iimit.

INSERT E:

For Unit 2 Cycle 10 only, the following requirements shall be substituted for Limiting Condition for Operation 3.3.3.2.a:

> At least eight quadrant symmetric incore detector segment groups containing incore detectors in the outer 184 fuel assemblies with sufficient **OPERABLE** detector segments in these detector groups to compute at least one **AZIMUTHAL POWER TILT** value at each of the four axial elevations containing incore detectors and at least two **AZIMUTHAL POWER TILT** values at three axial elevations containing incore detectors.

INSERT F:

For Unit 2 Cycle 10 only, the following requirement shall be substituted for Limiting Condition for Operation 3.3.3.2.b.1:

> At least 60% of all incore detector segments,

INSERT G:

For Unit 2 Cycle 10 only, the following requirement shall be substituted for Limiting Condition for Operation 3.3.3.2.c.1:

> At least 60% of all incore detector locations,

ATTACHMENT (3)

DESCRIPTION OF PREVIOUS ANALYSES

About a third of the way through Cycle 6 of Fort Calhoun Unit 1, 18% of the detector strings had failed. Most of the failures were in detectors that had been in the core for four or five cycles, with the rest of the failed detectors in their second cycle (Reference 1). Synthesis uncertainties were evaluated for the observed failures and for extrapolated failures which considered all the oldest detectors failed as well as those in the core for their second cycle. This represented failure of 75% of the detector strings. The synthesis uncertainties were 1-2% below those in the topical report for both the observed and extrapolated failure patterns. The maximum increase in the synthesis uncertainties for 75% failures was less than 1%. This translated into an increase of 0.4% in the overall CECOR uncertainty for the extrapolated failure pattern. The overall CECOR uncertainties were only slightly higher than the topical values, because the observed higher than normal basic detector measurement uncertainty caused by the detectors in the core for their fourth and fifth cycles had already been incorporated. Even so, the resulting overall uncertainties were below the interim values allowed at that time. However, as a conservative measure, the CECOR uncertainties were increased by 1% over the interim values to allow continued operation with up to 80% failures. Administrative changes regarding surveillance and the calculation of alarm limits were implemented.

Near the end of Cycle 4 of St. Lucie Unit 1, 13% of the detector strings had failed. The detectors ranged from those new in the cycle to those in their third cycle. Various extrapolated failure patterns within these instruments, assuming that up to 60% of the strings failed, were considered (Reference 2). It was found that the synthesis uncertainties for the observed and extrapolated failure patterns were less than those in the topical report. Again the maximum increase in the synthesis uncertainties with increased failures was less than 1%, which led to an increase of less than 0.3% in the overall combined uncertainty. The overall combined uncertainties were well below the topical values (and interim values in place at that time) for both the observed and extrapolated patterns. In fact, even if the observed basic detector measurement uncertainty increased by about a percent and was higher than in the topical, the overall uncertainties would still be less than those in the topical report. Based on this, continued operation without penalty was allowed with up to 50% failures. Again, administrative changes regarding surveillance and the calculation of alarm limits were implemented.

At the startup of Cycle 8 of Calvert Cliffs Unit 1, 20% of the strings were failed (References 3, 4 and 5). Most of the failures were either new detectors or the oldest, which were in their third cycle. Synthesis uncertainties were evaluated for the known and extrapolated failure patterns assuming that up to 75% of the strings failed. The synthesis uncertainties for both the known and extrapolated failure patterns were below those in the topical, with a maximum increase of about 0.5% for the case of extreme failures. The overall combined uncertainties increased by 0.2% even for the extreme failure assumptions. The combined overall uncertainties were less than those in the topical report even with 75% failures. In fact, the CECOR topical values would not be exceeded even if the observed basic detector measurement uncertainties were higher than those in the topical by 0.2 to 0.5%. Based on this, continued operation without penalty was allowed with up to 50% failures. An additional commitment regarding the required surveillance interval was implemented.

In summary, the increase in the CECOR uncertainties even for extreme instrument failure rates of 60-75% was in the range of 0.5 to 1%, and never exceeded 1%. The CECOR synthesis uncertainty values even for the extreme failures were below those in the CECOR topical, Reference (6). The effect of the increased synthesis uncertainty on the total CECOR uncertainty never exceeded 0.4%. The resulting total CECOR uncertainty even with the increased synthesis uncertainties was always below the approved topical report or interim uncertainties in place at the time.

ATTACHMENT (3)

DESCRIPTION OF PREVIOUS ANALYSES

REFERENCES:

(1) CEN-150(O)-P, Analysis of CECOR Power Peaking Uncertainties for Fort Calhoun Unit 1 Cycle 6, dated February 1981

(2) CEN-172(F)-P, Analysis of CECOR Power Peaking Uncertainties for St. Lucie Unit 1 Cycle 4, dated July 1981

(3) CEN-318(B)-P, Analysis of CECOR Power Peaking Uncertainties for Calvert Cliffs Unit 1 Cycle 8, dated November 1985

(4) Letter from Mr. A. E. Lundvall, Jr. (BG&E) to Mr. E. J. Butcher, Jr. (NRC), dated December 17, 1985, Request for Amendment, Operability Requirements for Incore Detector Strings

(5) Letter from Mr. D. H. Jaffe (NRC) to Mr. J. A. Tiernan (BG&E), dated March 31, 1986, Issuance of Amendment 116

(6) CENPD-153-P, Rev. 1-P-A, Evaluation of Uncertainty in the Nuclear Power Peaking Measured by the Self-Powered, Fixed In-Core Detector System, dated May 1980