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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Nine Mile Point Nuclear Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-63 and NPF-69
NRC Docket Nos. 50-220 and 50-410

Subject: License Amendment Request – Reactivity Anomalies Surveillance

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Exelon Generation Company, LLC (Exelon) requests an amendment to the Technical Specifications, Appendix A, of Renewed Facility Operating License Nos. DPR-63 and NPF-69 for Nine Mile Point Nuclear Station, Units 1 and 2 (NMP Units 1 and 2). The proposed amendment requests a change to modify the Technical Specifications (TS) concerning a change to the method of calculating core reactivity for the purpose of performing the Reactivity Anomalies surveillance at NMP Units 1 and 2.

Attachment 1 provides the Evaluation of Proposed Changes. Attachment 2 provides the Proposed Technical Specification and Bases Marked-Up Pages. The Bases pages are being provided for information only.

The proposed changes have been reviewed by the NMP Plant Operations Review Committee and approved by the Nuclear Safety Review Board in accordance with the requirements of the Exelon Quality Assurance Program.

Exelon requests approval of the proposed amendment by February 28, 2017. Once approved, the amendment shall be implemented within 60 days.

There are no regulatory commitments contained in this request.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), Exelon is notifying the State of New York of this application of license amendment by transmitting a copy of this letter and its attachments to the designated State Official.

Should you have any questions concerning this submittal, please contact Ron Reynolds at (610) 765-5247.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 18th day of March 2016.

Respectfully,

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachments: 1) Evaluation of Proposed Changes
2) Proposed Technical Specification and Bases Marked-Up Pages

cc:	USNRC Regional Administrator, Region I	w/attachments
	USNRC Project Manager, NMP	w/attachments
	USNRC Senior Resident Inspector, NMP	w/attachments
	A. L. Peterson, NYSERDA	w/attachments

ATTACHMENT 1

EVALUATION OF PROPOSED CHANGES

License Amendment Request

Nine Mile Point Nuclear Station, Units 1 and 2

Docket Nos. 50-220 and 50-410

SUBJECT: Reactivity Anomalies Surveillance

REACTIVITY ANOMALIES SURVEILLANCE

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Facility Operating License Nos. DPR-63 and NPF-69 for Nine Mile Point Nuclear Station, Units 1 and 2 (NMP Units 1 and 2).

The proposed change would revise the Technical Specifications (TS) to allow performance of the Reactivity Anomalies surveillance on a comparison of predicted to monitored core reactivity. This change provides for a more direct measurement of core reactivity conditions and eliminates the limitations that exist for performing the core reactivity comparisons with rod density. The reactivity anomaly verification is currently determined by a comparison of predicted vs. actual control rod density.

Exelon Generation Company, LLC (Exelon) requests approval of the proposed changes. Once approved, the amendment shall be implemented within 60 days.

2.0 DETAILED DESCRIPTION

The purpose of the Reactivity Anomalies surveillance is to compare the observed reactivity behavior of the core (at hot operating conditions) with the predicted reactivity behavior.

Currently, the NMP Units 1 and 2 TS require that the surveillance be done by comparing predicted control rod density (calculated prior to the start of operation for a particular cycle) to an actual control rod density. The comparison is done, as required by the surveillance requirements. The proposed revision will change the method by which the Reactivity Anomalies surveillance is performed and not the specified frequency for performing the surveillance.

The current NMP Unit 1 TS require that the reactivity difference between the monitored rod density and the predicted rod density shall not exceed 1% in reactivity.

The proposed NMP Unit 1 TS and Bases would be revised to state that the reactivity difference between the monitored $k_{effective}$ (k_{eff}) and the predicted k_{eff} shall be within ±1% $\Delta k/k$.

The current NMP Unit 2 TS require that the reactivity difference between the monitored rod density and the predicted rod density shall be within ± 1% $\Delta k/k$.

The proposed NMP Unit 2 TS and Bases would be revised to state that the reactivity difference between the monitored k_{eff} and the predicted k_{eff} shall be within ± 1% $\Delta k/k$.

The current method of performing the reactivity anomaly surveillance uses rod density for the comparison primarily because early core monitoring systems did not calculate core critical k_{eff} values for comparison to design values. Instead, rod density was used as a convenient representation of core reactivity.

Allowing the use of a direct comparison of $k_{eff,}$ as opposed to rod density, provides for a more direct measurement of core reactivity conditions and eliminates the limitations that exist for performing the core reactivity comparisons with rod density.

See the marked up TS and TS Bases pages for NMP Units 1 and 2 included in Attachment 2. The TS Bases pages are provided for information only.

3.0 TECHNICAL EVALUATION

If a significant deviation between the reactivity observed during operation and the expected reactivity occurs, the Reactivity Anomalies surveillance alerts the reactor operating staff to a potentially anomalous situation, indicating that something in the core design process, the manufacturing of the fuel, or in the plant operation may be different than assumed. This situation would trigger an investigation and further actions as needed.

The current method for the development of the Reactivity Anomalies curves used to perform the TS surveillance actually begins with the predicted k_{eff} at rated conditions and the companion rod patterns derived using those predicted values of k_{eff}. A calculation is made of the number of notches inserted in the rod patterns, and also the number of equivalent notches required to make a change of $\pm 1\%$ $\Delta k/k$ around the predicted k_{eff}. The rod density is converted to notches and plotted with an upper and lower bound representing the $\pm 1\%$ $\Delta k/k$ acceptance band as a function of cycle exposure. This curve is then used as the predicted rod density during the cycle. In effect, the comparison is indirect to critical k_{eff} with a "translation" of acceptance criteria to rod density.

While being a convenient measurement of core reactivity, control rod density has its limitations. Most obvious limitation is that all control rod insertions do not have the same impact on core reactivity. For example, edge rods and shallow rods (inserted 1/3 of the way into the core or less) have very little impact on reactivity while deeply inserted central control rods have a larger effect. Thus, it is not uncommon for reactivity anomaly concerns to arise during operations simply because of greater use of near-edge and shallow control rods than anticipated, when in fact no true anomaly exists. Use of monitored and predicted k_{eff} instead of rod density eliminates the limitations described above, provides for a technically superior comparison, and is a very simple and straightforward approach.

These proposed changes will not affect transient and accident analyses because only the method of performing the Reactivity Anomalies surveillance is changing, and the proposed method will provide a technically superior comparison as discussed above. Furthermore, the Reactivity Anomalies surveillance will continue to be performed at the current required frequency. Consequently, core reactivity assumptions made in safety analyses will continue to be adequately verified, and no margins of safety will be reduced.

NMP Units 1 and 2 utilize the Global Nuclear Fuel (GNF) 3D MONICORE (Reference 1) core monitoring software system. The latest version of this product incorporates the PANACEA Version 11 (PANAC11) (Reference 2) core simulator code to calculate parameters such as core nodal powers, fuel thermal limits, etc., using measured plant input data. PANAC11 is the same 3D core simulator code used in core design and licensing activities. When a 3D MONICORE core monitoring case is run, the core k_{eff} (as computed by PANAC11) is also calculated and printed directly on each 3D MONICORE case output. This value can then be directly compared to the predicted value of core k_{eff} as a measure of reactivity anomaly.

No plant hardware or operational changes are required with this proposed change.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

General Design Criteria 7, 8, 9, and 14 for NMP Unit 1 and General Design Criteria 26, 28, and 29 for NMP Unit 2 require that reactivity be controllable such that subcriticality is maintained under cold conditions and specified applicable fuel design limits are not exceeded during normal operations and anticipated operational occurrences. The Reactivity Anomalies surveillance required by NMP Units 1 and 2 TS serves to partly satisfy the above General Design Criteria by verifying that the core reactivity remains within expected/predicted values.

Ensuring that no reactivity anomalies exists provides confidence of adequate shutdown margin as well as providing verification that the assumptions of safety analyses associated with core reactivity remain valid.

4.2 Precedent

Similar TS amendments were approved as identified in the following letters:

Letter from Peter Bamford, Project Manager, U.S. Nuclear Regulatory Commission, to Michael J. Pacilio, Exelon, "Limerick Generating Station, Units 1 and 2-Issuance of Amendments RE: Reactivity Anomalies Surveillance (TAC Nos. ME6348 and ME6349)," dated March 14, 2012.

Letter from Richard B. Ennis, Senior Project Manager, U.S. Nuclear Regulatory Commission, to Michael J. Pacilio, Exelon, "Peach Bottom Atomic Power Station, Units 2 and 3-Issuance of Amendments RE: Reactivity Anomalies Surveillance (TAC Nos. ME6356 and ME6357)," dated May 25, 2012.

4.3 No Significant Hazards Consideration

Exelon has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed TS changes do not affect any plant systems, structures, or components designed for the prevention or mitigation of previously evaluated accidents. The amendment would only change how the Reactivity Anomalies surveillance is performed. Verifying that the core reactivity is consistent with predicted values ensures that accident and transient safety analyses remain valid. This amendment changes the TS requirements such that, rather than performing the surveillance by comparing predicted to actual control rod density, the surveillance is performed by a direct comparison of k_{eff}.

Therefore, since the Reactivity Anomalies surveillance will continue to be performed by a viable method, the proposed amendment does not involve a significant increase in the probability or consequence of a previously evaluated accident.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   This TS amendment request does not involve any changes to the operation, testing, or maintenance of any safety-related, or otherwise important to safety systems. All systems important to safety will continue to be operated and maintained within their design bases. The proposed changes to the Reactivity Anomalies surveillance will only provide a new, more efficient method of detecting an unexpected change in core reactivity.

   Since all systems continue to be operated within their design bases, no new failure modes are introduced and the possibility of a new or different kind of accident is not created.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

   Response: No.

   This proposed TS amendment proposes to change the method for performing the Reactivity Anomalies surveillance from a comparison of predicted to actual control rod density to a comparison of predicted to monitored k_{eff}. The direct comparison of k_{eff} provides a technically superior method of calculating any differences in the expected core reactivity. The Reactivity Anomalies surveillance will continue to be performed at the same frequency as is currently required by the TS, only the method of performing the surveillance will be changed. Consequently, core reactivity assumptions made in safety analyses will continue to be adequately verified.

   Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

Based on the above, Exelon concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of no significant hazards consideration is justified.

4.4 <u>Conclusions</u>

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. MFN-003-99, F. Akstulewicz (NRC) to G. Watford (GE), Acceptance for Referencing of Licensing Topical Reports NEDC-32601P, Methodology and Uncertainties for Safety Limit MCPR Evaluations; NEDC-32694P, Power Distribution Uncertainties for Safety Limit MCPR Evaluation; and Amendment 25 to NEDE-24011-P-A on Cycle-Specific Safety Limit MCPR (TAC Nos. M97490, M99069 and M97491), March 11, 1999, [provides NRC acceptance of 3D MONICORE core surveillance system power distribution uncertainties]
2. MFN-035-99, S. Richards (NRC) to G. Watford (GE), "Amendment 26 to GE Licensing Topical Report NEDE-24011-P-A, "GESTAR II" -Implementing Improved GE Steady-State Methods (TAC No. MA6481)," November 10, 1999 [provides NRC acceptance of PANACEA Version 11].

ATTACHMENT 2

PROPOSED TECHNICAL SPECIFICATION and BASES MARKED-UP PAGES

License Amendment Request

Nine Mile Point Nuclear Station, Units 1 and 2

Docket Nos. 50-220 and 50-410

TS Page for NMP Unit 1: 36

Bases Page for NMP Unit 1: 43

TS Pages for NMP Unit 2: 3.1.2-1 and -2

Bases Pages for NMP Unit 2: B 3.1.2-1 through -5

LIMITING CONDITION FOR OPERATION

f. If specification 3.1.1.b through e, above, are not met, the reactor shall be placed in the hot shutdown condition within ten hours.

a monitored

g. Reactivity Anomalies

The difference between ~~an observed~~ and predicted ~~control rod inventory shall not exceed the equivalent of one percent in reactivity.~~ If this limit is exceeded, the reactor shall be brought to the cold shutdown condition by normal orderly shutdown procedure. Operation shall not be permitted until the cause has been evaluated and the appropriate corrective action has been completed.

core k_{eff} shall be within ± 1% $\Delta k/k$

SURVEILLANCE REQUIREMENT

the predicted core k_{eff}

monitored core k_{eff}

g. Reactivity Anomalies

The ~~observed control rod inventory~~ shall be compared with ~~a normalized computed prediction of the control rod inventory~~ during startup, following refueling or major core alteration.

monitored core k_{eff}

These comparisons will be used as base data for reactivity monitoring during subsequent power operation throughout the fuel cycle. At specific power operating conditions, the ~~actual control rod configuration~~ will be compared with the ~~expected configuration based upon appropriately corrected past data.~~ This comparison will be made every equivalent full power month.

predicted core k_{eff}

f. Reactivity Anomalies monitored core k_{eff} the measured value core k_{eff} within ± 1% Δk/k core k_{eff}

During each fuel cycle excess operating reactivity varies as fuel depletes and as any burnable poison in supplementary controls is burned. The magnitude of this excess reactivity is indicated by the integrated worth of control rods inserted into the core, referred to as the control rod inventory in the core. As fuel burnup progresses, anomalous behavior in the excess reactivity may be detected by comparison of ~~actual rod inventory~~ at any base equilibrium core state to predicted ~~rod inventory~~ at that state. Equilibrium xenon, samarium and power distribution are considered in establishing the steady-state base condition to minimize any source of error. During an initial period, (on the order of 1000 MWD/T core average exposure following core reloading or modification) ~~rod inventory~~ predictions can be normalized to ~~actual rod patterns~~ to eliminate calculational uncertainties. Experience with other operating BWR's indicates that ~~the control rod inventory~~ should be predictable to ~~the equivalent of one percent in reactivity~~. Deviations beyond this magnitude would not be expected and would require thorough evaluation. One percent ~~reactivity~~ limit is considered safe since an insertion of this reactivity into the core would not lead to transients exceeding design conditions of the reactor system.

Δk/k

(1) Paone, C. J., Stirn, R. C., and Wooley, J. A., "Rod Drop Accident Analysis for Large Boiling Water Reactors," NEDO-10527, March 1972.

core k_{eff}

(2) Stirn, R. C., Paone, C. J., and Young, R. M., "Rod Drop Accident Analysis for Large BWRs," Supplement 1 - NEDO-10527, July 1972.

(3) Stirn, R. C., Paone, C. J., and Haun, J. M., "Rod Drop Accident Analysis for Large Boiling Water Reactors Addendum No. 2 Exposed Cores," Supplement 2 - NEDO-10527, January 1973.

(4) Report entitled "Technical Basis for Changes to Allowable Rod Worth Specified in Technical Specification 3.3.B.3," transmitted by letter from L. O. Mayer (NSP) to J. F. O'Leary (USAEC), dated October 4, 1973.

(5) Letter, R. R. Schneider, Niagara Mohawk Power Corporation to A. Giambusso, USAEC, dated November 15, 1973.

(6) To include the power spike effect caused by gaps between fuel pellets.

(7) NRC Safety Evaluation, "Acceptance for Referencing of Licensing Topical Report NEDE-24011-P-A, General Electric Standard Application for Reactor Fuel, Revision 8, Amendment 17," dated December 27, 1987.

(8) Licensing Topical Report, "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A, latest approved revision.

3.1 REACTIVITY CONTROL SYSTEMS

3.1.2 Reactivity Anomalies

core k_{eff}

LCO 3.1.2 The reactivity difference between the monitored ~~rod density~~ and the predicted ~~rod density~~ shall be within ± 1% Δk/k.

core k_{eff}

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Core reactivity difference not within limit.	A.1	Restore core reactivity difference to within limit.	72 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.2.1	Verify core reactivity difference between the monitored ~~rod density~~ and the predicted ~~rod density~~ is within ± 1% Δk/k. core k_{eff}	Once within 24 hours after reaching equilibrium conditions following startup after fuel movement within the reactor pressure vessel or control rod replacement AND 1000 MWD/T thereafter during operations in MODE 1

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.2 Reactivity Anomalies

BASES

BACKGROUND

In accordance with GDC 26, GDC 28, and GDC 29 (Ref. 1), reactivity shall be controllable such that subcriticality is maintained under cold conditions and acceptable fuel design limits are not exceeded during normal operation and anticipated operational occurrences. Reactivity Anomalies is used as a measure of the predicted versus measured (i.e., monitored) core reactivity during power operation. The continual confirmation of core reactivity is necessary to ensure that the Design Basis Accident (DBA) and transient safety analyses remain valid. A large reactivity anomaly could be the result of unanticipated changes in fuel reactivity, control rod worth, or operation at conditions not consistent with those assumed in the predictions of core reactivity, and could potentially result in a loss of SDM or violation of acceptable fuel design limits. Comparing predicted versus measured core reactivity validates the nuclear methods used in the safety analysis and supports the SDM demonstrations (LCO 3.1.1, "SHUTDOWN MARGIN (SDM)") in ensuring the reactor can be brought safely to cold, subcritical conditions.

When the reactor core is critical or in normal power operation, a reactivity balance exists and the net reactivity is zero. A comparison of predicted and measured reactivity is convenient under such a balance, since parameters are being maintained relatively stable under steady state power conditions. The positive reactivity inherent in the core design is balanced by the negative reactivity of the control components, thermal feedback, neutron leakage, and materials in the core that absorb neutrons, such as burnable absorbers, producing zero net reactivity.

In order to achieve the required fuel cycle energy output, the uranium enrichment in the new fuel loading and the fuel loaded in the previous cycles provide excess positive reactivity beyond that required to sustain steady state operation at the beginning of cycle (BOC). When the reactor is critical at RTP and operating moderator temperature, the excess positive reactivity is compensated by burnable

(continued)

BASES

BACKGROUND (continued)

absorbers (e.g., gadolinia), control rods, and whatever neutron poisons (mainly xenon and samarium) are present in the fuel.

core k-effective (k_{eff})

The predicted core reactivity, as represented by ~~control rod density~~, is calculated by a 3D core simulator code as a function of cycle exposure. ~~Rod density shall be the number of control rod notches inserted as a fraction of the total number of control rod notches. All rods fully inserted is equivalent to 100% rod density.~~ This calculation is performed for projected operating states and conditions throughout the cycle. ~~The core reactivity is determined for control rod densities for actual plant conditions and is then compared to the predicted value for the cycle exposure.~~

The monitored core k_{eff} is calculated by the core monitoring system for actual plant conditions and is then compared to the predicted value for the cycle exposure.

APPLICABLE SAFETY ANALYSES

Accurate prediction of core reactivity is either an explicit or implicit assumption in the accident analysis evaluations (Ref. 2). In particular, SDM and reactivity transients, such as control rod withdrawal accidents or rod drop accidents, are very sensitive to accurate prediction of core reactivity. These accident analysis evaluations rely on computer codes that have been qualified against available test data, operating plant data, and analytical benchmarks. Monitoring reactivity anomaly provides additional assurance that the nuclear methods provide an accurate representation of the core reactivity.

core k_{eff}

core k_{eff}

core k_{eff}

core k_{eff}

The comparison between measured and predicted initial core reactivity provides a normalization for the calculational models used to predict core reactivity. If the measured and predicted ~~rod density~~ for identical core conditions at BOC do not reasonably agree, then the assumptions used in the reload cycle design analysis or the calculation models used to predict ~~rod density~~ may not be accurate. If reasonable agreement between measured and predicted core reactivity exists at BOC, then the prediction may be normalized to the measured value. Thereafter, any significant deviations in the measured ~~rod density~~ from the predicted ~~rod density~~ that develop during fuel depletion may be an indication that the assumptions of the DBA and transient analyses are no longer valid, or that an unexpected change in core conditions has occurred.

Reactivity Anomalies satisfies Criterion 2 of Reference 3.

(continued)

core k_{eff}

BASES (continued)

LCO

The reactivity anomaly limit is established to ensure plant operation is maintained within the assumptions of the safety analyses. Large differences between monitored and predicted core reactivity may indicate that the assumptions of the DBA and transient analyses are no longer valid, or that the uncertainties in the Nuclear Design Methodology are larger than expected. A limit on the difference between the monitored ~~rod density~~ and the predicted ~~rod density~~ of

± 1% Δk/k has been established based on engineering judgment. A > 1% deviation in reactivity from that predicted is larger than expected for normal operation and should therefore be evaluated.

APPLICABILITY

In MODE 1, most of the control rods are withdrawn and steady state operation is typically achieved. Under these conditions, the comparison between predicted and monitored core reactivity provides an effective measure of the reactivity anomaly. In MODE 2, control rods are typically being withdrawn during a startup. In MODES 3 and 4, all control rods are fully inserted, and, therefore, the reactor is in the least reactive state, where monitoring core reactivity is not necessary. In MODE 5, fuel loading results in a continually changing core reactivity. SDM requirements (LCO 3.1.1) ensure that fuel movements are performed within the bounds of the safety analysis, and an SDM demonstration is required during the first startup following operations that could have altered core reactivity (e.g., fuel movement, control rod replacement, control rod shuffling). The SDM test, required by LCO 3.1.1, provides a direct comparison of the predicted and monitored core reactivity at cold conditions; therefore, Reactivity Anomalies is not required during these conditions.

ACTIONS

A.1

Should an anomaly develop between measured and predicted core reactivity, the core reactivity difference must be restored to within the limit to ensure continued operation is within the core design assumptions. Restoration to within the limit could be performed by an evaluation of the core design and safety analysis to determine the reason for the anomaly. This evaluation normally reviews the core conditions to determine their consistency with input to design calculations. Measured core and process parameters

(continued)

BASES

ACTIONS

A.1 (continued)

are also normally evaluated to determine that they are within the bounds of the safety analysis, and safety analysis calculational models may be reviewed to verify that they are adequate for representation of the core conditions. The required Completion Time of 72 hours is based on the low probability of a DBA during this period, and allows sufficient time to assess the physical condition of the reactor and complete the evaluation of the core design and safety analysis.

B.1

If the core reactivity cannot be restored to within the 1% Δk/k limit, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours. The allowed Completion Time of 12 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

core k_{eff}

SR 3.1.2.1

Verifying the reactivity difference between the monitored and predicted ~~rod density~~ is within the limits of the LCO provides further assurance that plant operation is maintained within the assumptions of the DBA and transient analyses. The core monitoring system calculates the ~~rod density~~ for the reactor conditions obtained from plant instrumentation. A comparison of the monitored ~~rod density~~ to the predicted ~~rod density~~ at the same cycle exposure is used to calculate the reactivity difference. The comparison is required when the core reactivity has potentially changed by a significant amount. This may occur following a refueling in which new fuel assemblies are loaded, fuel assemblies are shuffled within the core, or control rods are replaced or shuffled. Control rod replacement refers to the decoupling and removal of a control rod from a core location, and subsequent replacement with a new control rod or a control rod from another core location. Also, core reactivity changes during the cycle. The 24 hour interval after reaching equilibrium conditions following a startup is

core k_{eff}

core k_{eff}

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.1.2.1 (continued) core k_{eff}

based on the need for equilibrium xenon concentrations in the core, such that an accurate comparison between the monitored and predicted ~~rod density~~ values can be made. For the purposes of this SR, the reactor is assumed to be at equilibrium conditions when steady state operations (at equilibrium xenon with no control rod movement or core flow changes) at ≥ 75% RTP have been obtained. The 1000 MWD/T Frequency was developed, considering the relatively slow change in core reactivity with exposure and operating experience related to variations in core reactivity. This comparison requires the core to be operating at power levels which minimize the uncertainties and measurement errors, in order to obtain meaningful results. Therefore, the comparison is only done when in MODE 1.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26, GDC 28, and GDC 29.
2. USAR, Chapter 15.
3. 10 CFR 50.36(c)(2)(ii).