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May 17, 2013

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

LaSalle County Station, Unit 2
Facility Operating License No. NPF-11
NRC Docket No. 50-374

Subject: LaSalle 2 Cycle 15 Startup Test Report Summary

Enclosed for your information is the LaSalle County Station (LSCS) Unit 2 Cycle 15 Startup Test Report. This report is submitted in accordance with Technical Requirements Manual Section 5.0.b.

LaSalle County Station Unit 2 Cycle 15 began commercial operation on March 3, 2013, following a refueling and maintenance outage. The Unit 2 Cycle 15 core loading consisted of 304 fresh Global Nuclear Fuel GNF-2 fuel bundles, 310 once-burned AREVA Atrium-10 fuel bundles, two once-burned AREVA Atrium-10XM fuel bundles, 142 twice-burned AREVA Atrium-10 fuel bundles and six twice-burned AREVA Atrium-10XM fuel bundles. Also installed in the Unit 2 Cycle 15 reactor were 12 new GE/Reuter-Stokes NA-300 Local Power Range Monitors (LPRMs), 10 new General Electric Marathon C+ Control Rod blades, 33 new General Electric Ultra MD Control Rod blades and 10 used General Electric Marathon C+ Control Rod blades.

Attached are the evaluation results from the following tests:

- Reactor Core Verification
- Single Rod Subcritical Check
- Control Rod Friction and Settle Testing
- Control Rod Drive Timing
- Shutdown Margin Test (In-sequence critical)
- Reactivity Anomaly Calculation (Critical and Full Power)
- Scram Insertion Times
- Core Power Distribution Symmetry Analysis
- Reactor Recirculation System Performance

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All test data was reviewed in accordance with the applicable test procedures, and exceptions to any results were evaluated to verify compliance with Technical Specification limits and to ensure the acceptability of subsequent test results.

Should you have any questions concerning this letter, please contact Mr. Guy V. Ford, Jr., Regulatory Assurance Manager at (815) 415-2800.

Respectfully,

Peter J. Karaba
Site Vice President
LaSalle County Station

Attachment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – LaSalle County Station

Reactor Core Verification

Purpose

The purpose of this test is to visually verify that the core is loaded as intended for Unit 2 Cycle 15 operation.

Criteria

The as-loaded core must conform to the cycle core design used by the Core Management Organization (GNF & Nuclear Fuels) in the reload licensing analysis. Any discrepancies discovered in the loading will be promptly corrected and the affected areas re-verified to ensure proper core loading prior to unit startup.

Conformance to the cycle core design will be documented by a permanent core serial number map signed by the audit participants.

Results and Discussion

Core verification was performed concurrently with core load and shuffle per core verification guideline NF-AA-330-1001 “Core Verification Guideline.” The Unit 2 Cycle 15 core verification consisted of a core height, assembly orientation, assembly location, and assembly seating check performed by reactor services and reactor engineering. Bundle serial numbers and orientations were recorded during the videotaped scans for comparison to the appropriate core loading map and Cycle Management documentation. On February 26 – 27, 2013, the core was verified as being properly loaded and consistent with the LaSalle 2 Cycle 15 Core Loading Plan, Revision 1. This was documented in WO# 01426452-01.

Following the emergent core redesign, a second core verification was performed to supplement the initial core verification. On February 27, 2013, the final core configuration was verified as being properly loaded and consistent with the LaSalle 2 Cycle 15 Core Loading Plan, Revision 2. This was documented in WO# 01426452-02.

Single Rod Subcritical Check

Purpose

The purpose of this test is to demonstrate that the Unit 2 Cycle 15 core will remain subcritical upon the withdrawal of the analytically determined strongest Control Rod.

Criteria

In accordance with LTP-1600-30 “Single Rod Subcritical Check,” the core must remain subcritical with no significant increase in SRM readings, and with the analytically determined strongest rod fully withdrawn.

Results and Discussion

The analytically determined strongest rod for the Beginning of Cycle 15 for Unit 2 was determined by Nuclear Fuels to be Control Rod 46-35 per TODI# NF1300053, Revision 1. On February 27, 2013, with a Unit 2 moderator temperature of 87.5 °F, Control Rod 46-35 was withdrawn to the full out position (48) and the core remained subcritical with no significant increase in SRM readings. This information is documented in WO# 01426446-01.

Control Rod Friction and Settle Testing

Purpose

The purpose of this test is to demonstrate that excessive friction does not exist between the Control Rod Blade and the fuel assemblies during operation of the Control Rod Drive (CRD) following core alterations.

Criteria

Appropriate acceptance criteria are provided in LOS-RD-SR7 "Channel Interference Monitoring" and include limits on rod settle time (less than 7 seconds), and if necessary, full stroke insertion time criteria (dependent on seal leakage and normal insertion time).

All control rods are tested.

Results and Discussion

CRD friction testing commenced after the completion of the core load verification and single rod subcritical check. All 185 control rods met the appropriate acceptance criteria of less than 7 seconds; the settle times of all rods were less than or equal to 4.0 seconds. Two control rods settled in > 3.0 seconds and have been administratively added to the testing population per the evaluation of Reactor Engineering and Nuclear Fuels. The testing was completed on March 7, 2013 and is documented in WO# 01600361-01.

Control Rod Drive Timing

Purpose

The purpose of this test is to check and set the withdrawal speeds of the Control Rod Drives (CRDs).

Criteria

The UFSAR maximum allowed withdrawal speed for a control rod is 6.0 in/sec, which corresponds to a full stroke withdrawal time of 24 seconds.

Results and Discussion

Procedure LOS-RD-SR5 "Control Rod Drive Timing" was performed for all 185 CRDMs on March 1 – 2, 2013 and is documented in WO# 01426477-04. All of the rods met the UFSAR allowed withdrawal speed.

Shutdown Margin Test

Purpose

The purpose of this test is to demonstrate, from a normal in-sequence critical, that the core loading has been limited such that the reactor will remain subcritical throughout the operating cycle with the strongest worth Control Rod in the full-out position and all other rods fully inserted.

Criteria

In accordance with LTS-1100-1 "Shutdown Margin Determination" and Technical Specifications, if a shutdown margin (SDM) of 0.38% Δk/k + R cannot be demonstrated with the strongest worth Control Rod fully withdrawn, the core loading must be altered to meet this margin. R is the reactivity difference between the core's beginning-of-cycle SDM and the minimum SDM for the cycle. The R value for Cycle 15 is 0.457% Δk/k per the LaSalle Unit 2 Cycle 15 Cycle Management Report, Revision 0, so a SDM of 0.837% Δk/k must be demonstrated.

Results and Discussion

The beginning-of-cycle SDM was successfully determined from the initial critical data. The initial Cycle 15 critical occurred on March 3, 2013, on Control Rod 22-27 at position 06, using an A sequence. The moderator temperature was 178 °F and the reactor period was 394 seconds. Using rod worth information, moderator temperature reactivity corrections, and period reactivity corrections supplied by Nuclear Fuels in the L2C15 Cycle Management Report, Revision 0, the SDM was determined to be 2.0024% Δk/k. This was documented in LTS-1100-1, Attachment A and WO# 01426440-01. The SDM exceeded the 0.837% Δk/k that was required to satisfy the Technical Specifications.

Reactivity Anomaly Determination

Purpose

The purpose of this test is to compare the actual and predicted critical rod configurations to detect any unexpected reactivity trends.

Criteria

In accordance with NF-AB-715 "Critical Predictions with Powerplex III," NF-AB-760 "Reactivity Anomaly Determination," and Technical Specifications, the reactivity equivalence of the difference between the actual critical Control Rod configuration and the predicted critical Control Rod configuration and the difference between the actual and predicted reactivity of the Control Rod configuration at full power steady state conditions shall not exceed 1% Δk/k. If the difference exceeds 1% Δk/k, the cause of the anomaly must be determined, explained, and corrected for continued operation of the unit.

Results and Discussion

Two reactivity anomaly calculations were successfully performed during the Unit 2 Cycle 15 Startup Test Program. One reactivity anomaly calculation is from the in-sequence critical and the other is from steady state, equilibrium conditions at approximately 100% full power.

The initial Cycle 15 critical occurred on March 3, 2013, on Control Rod 22-27 at position 06, using an A sequence. The moderator temperature was 178 °F and the reactor period was 394 seconds. The expected k_{eff} supplied by Nuclear Fuels was 0.997. The actual k_{eff} was 0.997384. The resulting anomaly was 0.0384% Δk/k. The anomaly determined is within the 1% Δk/k required for BOC conditions as stated in NF-AB-715. This was documented in NF-AB-715, Attachment 3 and WO# 01426440-01.

The reactivity anomaly calculation for full power steady state operation was performed on March 8, 2013. The data used was from 99.5% power at a cycle exposure of 83.5 MWD/MT at equilibrium conditions. The expected k_{eff} supplied by Nuclear Fuels was 1.00742. The actual k_{eff} was 1.0088. The resulting anomaly was 0.14% Δk/k. This value is within the 1% Δk/k criteria of Technical Specifications. This was documented in NF-AB-760, Attachment 1, and WO# 01426453-01.

Scram Insertion Times

Purpose

The purpose of this test is to demonstrate that the Control Rod scram insertion times are within the operating limits set forth by the Technical Specifications.

Criteria

In accordance with LOS-RD-SR12 "Scram Insertion Times" and Technical Specifications, the maximum scram insertion time of each Control Rod from the fully withdrawn position (48) to notch position 05, based on de-energization of the scram pilot valve solenoids as time zero, shall not exceed 7.0 seconds. Also, no more than 12 OPERABLE Control Rods shall be "slow" in accordance with the below table. In addition, no more than 2 OPERABLE Control Rods that are "slow" shall occupy adjacent locations.

When the scram insertion time of an operable Control Rod from the fully withdrawn position (48), based on de-energization of the scram pilot valve solenoids as time zero, exceeds any of the following, that Control Rod is considered "slow":

Notch Position	Scram Time to Notch Indicated (seconds)
45	0.52
39	0.80
25	1.77
05	3.20

Results and Discussion

Scram testing was completed on March 5, 2013 per WO# 01426412. 97 rods were scram timed during the reactor pressure vessel leakage testing (Hydro) prior to startup, and the remaining 88 rods prior to 40% power. Results of testing are given below.

Notch Position	Core Average Scram Times of all CRDs (sec)
45	0.302
39	0.590
25	1.279
05	2.319

These results also meet the "Option B" Scram Speeds referenced in the Unit 2 Cycle 15 Core Operating Limits Report (TRM Appendix J).

Core Power Distribution Symmetry Analysis

Purpose

The purpose of this test is to verify the core power symmetry.

Criteria

In accordance with NF-AB-716 "TIP Measurement Uncertainty for Powerplex III," the χ^2 value of the total measured TIP uncertainty must be less than the critical value at the 1% confidence level (i.e., 36.19 for 19 TIP pairs).

The gross check of the TIP signal symmetry should yield a maximum deviation between symmetrically located pairs of less than 25%.

Results and Discussion

Core power symmetry calculations were performed based upon data obtained from a full core TIP set (OD-1) performed on March 13, 2013, at approximately 100% power. The TIP set was performed with four of five TIP machines operable. All traces were obtained for the operable TIP machines. The χ^2 value was 11.59, which satisfies the test criteria of 36.19 for 19 pairs. The maximum deviation between symmetrical TIP pairs was 9.04%, which is within the 25% acceptance criteria. This was documented in WO# 01608623-01.

Recirculation System Performance

Purpose

The purpose of this test is to collect sufficient baseline data at the beginning of cycle to establish the following relationships:

- core thermal power vs. total core flow
- recirculation total drive flow vs. total core flow
- core plate flow vs. total core flow
- recirculation flow control valve position vs. loop drive flow
- jet pump readings vs. loop drive flow

Criteria

In accordance with LTP-1600-13 "Reactor Recirculation System Performance" and Technical Specifications, the performance curves used in conjunction with reactor recirculation system flow and differential pressure data will establish baseline data to determine if possible jet pump or recirculation pump degradation exists.

The established baseline performance curves will also be used to verify jet pump operability to determine if jet pump anomalies exist.

Results and Discussion

Reactor Recirculation (RR) data was collected during the L2C15 startup. Data was obtained from computer points for all the points of interest to evaluate the RR System performance. The RR performance curves were updated for L2C15; no significant changes from L2C14 were noted in the curves. This was completed on March 28, 2013 and is documented in WO# 01426287-01.