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

LaSalle County Station, Unit 1
Facility Operating License No. NPF-11
NRC Docket No. 50-373

Subject: LaSalle 1 Cycle 14 Startup Test Report Summary

Enclosed for your information is the LaSalle County Station (LSCS) Unit 1 Cycle 14 Startup Test Report. This report is submitted in accordance with Technical Requirements Manual Section 5.0.b.

LSCS Unit 1 Cycle 14 commenced operation on March 6, 2010, following a refueling and maintenance outage. The Unit 1 Cycle 14 core loading consisted of 320 fresh Framatome-ANP (FANP) Atrium-10 fuel bundles, 323 once-burned FANP Atrium-10 fuel bundles, and 121 twice-burned FANP Atrium-10 fuel bundles. Also installed in the Unit 1 Cycle 14 reactor were eight new GE/Reuter-Stokes NA-300 Local Power Range Monitors (LPRMs), sixteen new Westinghouse CR82M-1 Control Rod blades, four new General Electric Marathon C+ Control Rod blades, two used General Electric Duralife-215 Control Rod Blades and two 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

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. Terrence W. Simpkin, Regulatory Assurance Manager, at (815) 415-2800.

Respectfully,

David B. Wozniak

David B. Wozniak
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 1 Cycle 14 operation.

Criteria

The as-loaded core must conform to the cycle core design used by the Core Management Organization (FANP & 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 NF-AA-330-1001, Core Verification Guideline. The Unit 1 Cycle 14 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 21-22, 2010, the core was verified as being properly loaded and consistent with the LaSalle 1 Cycle 14 Core Loading Plan per Transmittal of Design Information (TODI) # NF1000036, Revision 0. This was documented in Work Order (WO) # 01113855-01.

Single Rod Subcritical Check

Purpose

The purpose of this test is to demonstrate that the Unit 1 Cycle 14 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, with the analytically determined strongest rod fully withdrawn.

Results and Discussion

The analytically determined strongest rod for the Beginning of Cycle 14 for Unit 1 was determined by Nuclear Fuels to be Control Rod 50-35 per TODI# NF1000050, Revision 0. On February 23, 2010, with a Unit 1 moderator temperature of 86.6 °F, Control Rod 50-35 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 01231385-01.

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, scram times from position 45 to position 05 and full stroke insertion time criteria (dependent on seal leakage and normal insertion time).

The testing population will consist of control rods:

- Prior to startup from refueling outages, perform friction testing on those control cells selected by Reactor Engineering, Operations, and System Engineering.

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; the settle times of all rods were less than 3.0 seconds. The testing was completed on February 28, 2010 and is documented in WO# 01142479.

Control Rod Drive Timing

Purpose

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

Criteria

The FSAR 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

LOS-RD-SR5, Control Rod Drive Timing, was performed for all 185 CRDMs on March 4, 2010 and is documented in WO# 01122436-01 and IR 1039400. None of the rods violated the FSAR allowed withdrawal speed. However, 39 control rods were outside of the desired LOS-RD-SR5 speed range of 40-60 seconds. All rod times were adjusted to be within the desired procedural range during the next performance of rod exercising per LOS-AA-W1, Technical Specifications Weekly Surveillance, on March 13, 2010.

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 14 is 0.12% Δk/k per ANP-2894(P) Rev. 0, "Startup and Operations Report LaSalle Unit 1 Cycle 14," transmitted by NF TODI# NF1000058, Revision 0, so a SDM of 0.50% Δk/k must be demonstrated.

Results and Discussion

The beginning-of-cycle SDM was successfully determined from the initial critical data. The initial Cycle 14 critical occurred on March 5, 2010, on Control Rod 38-27 at position 08, using an A-2 sequence. The moderator temperature was 180.2 °F and the reactor period was 202 seconds. Using rod worth information, moderator temperature reactivity corrections, and period reactivity corrections supplied by Nuclear Fuels in TODI# NF1000058, Revision 0, the SDM was determined to be 1.506% Δk/k. This was documented in LTS-1100-1, Attachment A and WO 01231421-01. The SDM exceeded the 0.50% 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 Powerflex 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 shall not exceed 1% Δk/k at full power steady state conditions. 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 1 Cycle 14 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 critical occurred on March 5, 2010, on Control Rod 38-27 at position 08, using an A-2 sequence. The moderator temperature was 180.2 °F and the reactor period was 202 seconds. Using rod worth information, moderator temperature, reactivity corrections, and period reactivity corrections supplied by Nuclear Fuels, the actual critical was determined to be within 0.2% Δk/k of the predicted critical. 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 01231411-01.

The reactivity anomaly calculation for full power steady state operation was performed on March 11, 2010. The data used was from 99.9% power at a cycle exposure of 95.6 MWD/MT at equilibrium conditions. The expected k_{eff} supplied by Nuclear Fuels was 1.0008. The actual k_{eff} was 1.0039. The resulting anomaly was 0.31% 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# 01231403.

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 LTS-1100-4, 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 successfully completed on March 1, 2010 per WO# 01113853-01. All 185 rods were scram timed during the reactor pressure vessel leakage testing (Hydro) prior to startup. No rods were classified SLOW or INOPERABLE, and the results of the testing are given below.

Notch Position	Core Average Scram Times of all CRDs (sec)
45	0.330
39	0.623
25	1.326
05	2.368

These results also meet the "Nominal" Scram Speeds referenced in the Unit 1 Cycle 14 Core Operating Limits Report (TRM Appendix I).

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 Powerflex 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 11, 2010, at approximately 100% power. The TIP set was performed with 4 of 5 TIP machines operable. All traces were obtained for the operable TIP machines. The χ^2 value was 2.09, which satisfies the test criteria of 36.19 for 19 pairs. The maximum deviation between symmetrical TIP pairs was 2.70%, which is within the 25% acceptance criteria. This was documented in WO# 01305836.

Recirculation System Performance

Purpose

The purpose of this procedure 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, Recirculation System Performance, and Technical Specifications, the performance curves used in conjunction with Reactor Recirculation (RR) 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 data was collected during the L1C14 startup. Data was obtained from computer points for all the points of interest to evaluate the RR System performance. No significant changes from L1C13 were noted in the L1C14 RR performance curves. This was completed on March 26, 2010 and is documented in WO# 01187862-01.