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RA22-029

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

LaSalle County Station, Unit 1
Renewed Facility Operating License No. NPF11
NRC Docket No. 50-373

Subject: LaSalle 1 Cycle 20 Startup Test Report Summary

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

LaSalle County Station Unit 1 Cycle 20 began operation on March 17, 2022, following a refueling and maintenance outage. The Unit 1 Cycle 20 core loading consisted of 272 fresh Global Nuclear Fuel GNF-3 fuel bundles, 280 once-burned Global Nuclear Fuel GNF-2 fuel bundles, and 212 twice-burned Global Nuclear Fuel GNF-2 fuel bundles. Also installed in the Unit 1 Cycle 20 reactor were 8 new GE/Reuter-Stokes NA-300 Local Power Range Monitors (LPRMs), and 8 new General Electric Ultra HD Control Rod blades and 1 new General Electric Ultra MD.

Attached are the evaluation results from the following tests:

Reactor Core Verification
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. Daniel Mearhoff, Regulatory Assurance Manager, at (815) 415-2800.

Respectfully,

P. Hansett
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 20 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. The Unit 1 Cycle 20 core verification consisted of a core height, assembly orientation, assembly location, and assembly seating check. Bundle serial numbers and orientations were recorded during the video recorded scans for comparison to the appropriate core loading map and Cycle Management documentation. The core was verified as being properly loaded and consistent with the LaSalle 1 Cycle 20 Core Loading Plan, Revision 8. This was documented in WO# 5021511-01.

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 and include limits on rod settle time. The control rod settle test acceptance criterion is less than or equal to 7 seconds.

Results and Discussion

CRD Friction Testing commenced after the completion of the core load verification and single rod subcritical check. All 185 control rods settled in less than 3.0 seconds, which is documented in WO# 5021459-05.

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

LOS-RD-SR5, Control Rod Drive Timing, preferred beginning of cycle acceptance criteria for the withdraw times (full-in to full-out) is between 45 and 60 seconds and insert times (full-out to full-in) is between 40 and 55 seconds.

Results and Discussion

Control rod timing per LOS-RD-SR5 was performed satisfactorily for all 185 CRDMs and is documented in WO# 5021459-04. None of the rod withdrawal speeds were faster than the LOS-RD-SR5 preferred criteria.

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 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 20 is 0.06% Δk/k per the LaSalle Unit 1 Cycle 20 Cycle Management Report, Revision 6, so a SDM of 0.44% Δk/k must be demonstrated.

Results and Discussion

The beginning of cycle SDM was successfully determined from the initial critical data. The initial Cycle 20 critical occurred on March 17, 2022, on Control Rod 46-11 at position 18, using an A2 sequence. The moderator temperature was 160 °F and the reactor period was 389 seconds. Using LTS-1100-1 and the LaSalle Unit 1 Cycle 20 Cycle Management Report, Revision 6, the SDM was determined to be 1.52% Δk/k. This was documented in LTS-1100-1, Attachment A and WO# 5021448-01. The SDM was greater than the minimum 0.38% Δk/k that is 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-LA-715, NF-AB-760, 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 1 Cycle 20 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 20 critical occurred on March 17, 2022, on Control Rod 46-11 at position 18, using an A2 sequence. The moderator temperature was 160 °F and the reactor period was 389 seconds. The expected k_{eff} supplied by Nuclear Fuels was 1.0040. The actual k_{eff} was 1.0059. The resulting anomaly was 0.19% Δk/k. The anomaly determined is within the 1% Δk/k required for BOC conditions as stated in NF-LA-715. This was documented in NF-LA-715, Attachment 3 and WO# 5021449-01.

The reactivity anomaly calculation for full power steady state operation was performed. The data used was from 99.9% power at a cycle exposure of 114.5 MWD/sT at equilibrium conditions. The expected k_{eff} supplied by Nuclear Fuels was 1.0085. The actual k_{eff} was 1.0072. The resulting anomaly was 0.13% 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# 5021265-01.

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 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 performed per WO# 5021549-01. Results of testing are given below.

Notch Position	Core Average Scram Times of all CRDs (sec)
45	0.302
39	0.583
25	1.259
05	2.282

These results also meet the "Option B" Scram Speeds referenced in the Unit 1 Cycle 20 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-707, the TIP uncertainty value must be less than 6%.

Results and Discussion

Core power symmetry calculations were obtained based upon data obtained from a full core TIP set (OD1) at approximately 100% power. The TIP uncertainty value was 3.77%. This was documented in WO# 5224570-01.