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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

KEWAUNEE NUCLEAR POWER PLANT
DOCKET 50-305
LICENSE No. DPR-43

CYCLE 26 STRETCH POWER UPRATE STARTUP REPORT

In accordance with the requirements of Kewaunee Nuclear Power Plant (KNPP) Technical Specification (TS) 6.9.a.1, Nuclear Management Company (NMC) is required to submit a summary report of plant startup and power escalation testing within 90 days following completion of the startup test program. The KNPP TS requires this report whenever certain listed activities occur. The activity that occurred this cycle is a stretch power uprate of 6%. Enclosure 1 contains the KNPP Cycle 26 Stretch Power Uprate Startup Report.

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Enclosures (1)

cc: Administrator, Region III, USNRC
Project Manager, Kewaunee, USNRC
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ENCLOSURE 1
KEWAUNEE NUCLEAR POWER PLANT
CYCLE 26 STRETCH POWER UPRATE STARTUP REPORT

INTRODUCTION

Subsequent to the plant startup for Cycle 26, NMC received approval to increase the rated power of KNPP to 1772 MWt, an increase of 7.4% over the KNPP original licensed core power level of 1650 MWt. The 7.4% increase was approved and performed in two parts, a 1.4% MUR Uprate (License Amendment (LA)-168) and a 6% Stretch Uprate (LA-172). (ML031530734 and ML040430633 respectively)

The applicable portions of the testing program identified in the Updated Safety Analysis Report (USAR) applicable to the 7.4% uprate are described in USAR Section 13.3, Initial Testing of the Operating Reactor (Phase III). USAR Section 13.3 states the testing is to acquire data for the proper calibration of setpoints and to ensure that operation is within license requirements. USAR Section 13.3.4, Post- Startup Surveillance and Testing Requirements, states that the startup surveillance and testing requirements were designed to provide assurance that essential systems, which include equipment components and instrument channels, are capable of performing in accordance with their original design criteria. Specific Phase III tests relevant to the 7.4% Stretch Power Uprate are:

- Power Range Nuclear Instrumentation (NI) Calibration
- Reactor Coolant System (RCS) Loop Delta Temperature (ΔT) Instrumentation Calibration
- Automatic Control System Checkout
- Turbine Generator Startup Tests

7.4% Uprate Outage Activities

The following modifications were performed during the R26 Refueling Outage in April 2003 to support the full 7.4% power uprate:

- The 0% - 100% power T_{ave} operating band was changed from 547°F - 562°F to 547°F - 572°F to achieve an increase in full load main steam pressure. This reduced the main steam volumetric flow at uprate conditions to within the capability of HP Turbine steam path to maintain a minimum acceptable throttling margin in the turbine control valves. Instrumentation for T_{ref}, Pressurizer Level Control, Rod Control, Steam Dump Control, Overpower ΔT, and Over Temperature ΔT were rescaled/calibrated consistent with the new T_{ave} operating band using normal plant procedures for calibrating and testing the instrumentation. In addition, Plant Process Computer programs and alarm setpoints were updated to incorporate the change in the T_{ave} operating band.
- The main feedwater regulating valve internal trim was changed out to accommodate the increased feedwater flow associated with the planned 7.4% power uprate.

- Selected turbine casing and coupling bolting were changed out to accommodate the increased stresses and torque associated with the 7.4% uprate.
- The turbine generator electronic overspeed settings were reduced from 111% to 109.5% to prevent exceeding the design overspeed at the 7.4% uprated power.

The applicable portions of the USAR described tests applicable to the uprate activities performed during the R26 Refueling Outage were performed during the initial startup following the refueling consistent with the normal low power physics testing and power ascension testing and were previously reported in the KNPP Cycle 26 Startup Report dated March 10, 2004. (ML040780565)

1.4% MUR Power Uprate Activities

Prior to implementing the 6% Stretch Uprate during March 2004, KNPP performed a 1.4% Measurement Uncertainty Recapture (MUR) Power Uprate authorized by License Amendment 168, increasing licensed core power from 1650 MWt to 1673 MWt. In order to perform the 1.4% MUR uprate, KNPP installed an AMAG/CROSSFLOW ultrasonic flow measurement device (UFMD) capable of measuring feedwater flow and feedwater temperature to develop correction factors for the feedwater flow channels on each venturi and the feedwater temperature used in the Reactor Thermal Output (RTO) calculations. With the UFMD in service, the power measurement uncertainty is reduced from the 2% associated with the feedwater flow venturis to 0.6%.

Required USAR and Technical Specification (TS) testing for the MUR uprate were performed under a KNPP 1.4% MUR Implementation Plan which controlled the activities leading up to and including implementation of the MUR uprate and was also reported in the KNPP CYCLE 26 Startup Report dated March 10, 2004.

6% Stretch Uprate

Subsequent to the 1.4% MUR Power Uprate, KNPP completed the 7.4% Power Uprate by performing a 6% Stretch Power Uprate authorized by LA-172, which increased licensed core power from 1673 MWt to 1772 MWt. This uprate resulted in an additional nominal 30 MWe increase in electrical output.

The applicable portions of the testing program identified in the USAR applicable to the 6% Stretch Power Uprate are described in USAR Section 13.3, Initial Testing of the Operating Reactor (Phase III). USAR Section 13.3 states the testing is to acquire data for the proper calibration of setpoints and to ensure that operation is within license requirements. USAR Section 13.3.4, Post-Startup Surveillance and Testing Requirements, states that the startup surveillance and testing requirements were designed to provide assurance that essential systems, which include equipment components and instrument channels, are capable of performing in accordance with their original design criteria. Specific Phase III tests relevant to the 6% Stretch Power Uprate are:

- Power Range Nuclear Instrumentation (NI) Calibration
- Reactor Coolant System (RCS) Loop Delta Temperature (ΔT) Instrumentation Calibration

- Automatic Control System Checkout

Required USAR and TS testing for the 6% Stretch Uprate was performed under a KNPP 6% Stretch Uprate Implementation Plan to control the activities leading up to and including implementation of LA-172 and the escalation of reactor power to the new licensed power level.

USAR and TS testing associated with the power range nuclear instruments is a calibration based on a secondary heat balance. Prior to increasing reactor power, the power range nuclear instruments were calibrated using a secondary heat balance based on the new 100% licensed power level. Once reactor power was increased to the new licensed level, the power range nuclear instrument indication was compared to a secondary heat balance performed at the uprated power. The power range nuclear instrument indications were consistent with the uprated power heat balance, thereby satisfying the testing requirements for the power range nuclear instruments.

Testing of the RCS Loop control and protection ΔT Instrumentation was performed by calibrating and testing the individual loop Over Temperature ΔT (OTΔT) and Over Power ΔT (OPΔT) control and protection instrumentation channels using predicted ΔT values for the uprated power. Following the increase to the uprated power level, the individual loop ΔT indications were found to be indicating less than the predicted values, however, within the allowable setpoint range. Although the RCS Loop control and protection ΔT instrumentation indications were within the allowable range, the control and protection ΔT instrumentation indications deviated from the predicted values by more than normal calibration tolerances and were, therefore, recalibrated with the actual measured uprated full power ΔT values. Once the over temperature and over power control and protection instruments were recalibrated with the actual uprated power ΔT, the RCS Loop ΔT control and protection instrumentation testing requirements were satisfied.

Testing the Automatic Control System for the 6% Stretch Uprate was performed by rescaling/calibrating instrumentation for P-13 permissive, T_{ref} Control, Rod Control, and Steam Dump Control with the predicted uprated power turbine first stage pressure using normal plant procedures for calibrating and testing the instrumentation. In addition, the Plant Process Computer programs and alarm setpoints were updated to incorporate the change in the turbine first stage pressure operating band and the 6% increase in power. The main feedwater UFMD was also updated with appropriate uprated power feedwater flow and MWt values.

In accordance with the KNPP 6% Stretch Power Uprate Implementation Plan, the 6% Stretch Uprate was accomplished in two 3% increments. The uprate implementation plan contained predicted values for major plant parameters for each of the 3% increments to verify satisfactory plant response. The Automatic Control System checkout was performed by monitoring the response and indications of the control and protection instrumentation recalibrated to the new turbine first stage pressure operating band. The response and indications of these systems compared quite favorably with the predicted values and were determined to be satisfactory. The response of the control and protection instrumentation and the main feedwater regulating valves indicate

the plant will continue to satisfactorily respond to original design plant transients. In addition, the response of the feedwater UFMD was monitored following each of the 3% power increases by the UFMD vendor and the output verified to be operating as expected during the increase in power to the new licensed power level.

The measured changes in the key plant parameters following each of the 3% power increases compared favorably with the predicted changes and were determined to be satisfactory. Pre and post system walkdowns of accessible areas of systems impacted by the uprate were performed to identify any unexpected or abnormal changes in piping vibrations or thermal expansion resulting from the 6% power uprate. No unexpected or abnormal changes were identified with the exception of a high level alarm in the 14A feedwater heater.

Shortly after reactor power was increased to 1772 MWt, Control Room Annunciator 47063-T, FW HTR 14A/B LEVEL HIGH, alarmed. Investigation determined that the level in the 14A feedwater heater local gauge glass level was stable approximately ½ – 1 inch above the high level mark. The 14B feedwater heater local level was being maintained stable, approximately 2 – 3 inches below the high level mark. Information from the heater manufacturer indicates that with the exception of a minor loss of heater efficiency, the current level in the 14A heater will pose no intermediate or long term problems for the heater. Engineering is currently evaluating the cause for the 14A heater high level, the imbalance in level between the 14A and 14B heaters, and the permanent fix.

LA-172 contained commitments associated with implementation of the 6% Stretch Uprate. Each of the following commitments were verified complete by the KNPP 6% Stretch Uprate Implementation Plan or shall be completed following the uprate as required.

1. Revise all documents, as appropriate, for the stretch power uprate to address Framatome ANP fuel departure-from-nucleate boiling ratio design basis prior to implementation of the license amendment.
2. Complete changes to the condensate storage tank level setpoints, and first-stage turbine pressure, as appropriate, prior to implementation of the license amendment.
3. Complete piping and pipe support evaluations for service water and component cooling water prior to implementation of the license amendment.
4. Update the Kewaunee Nuclear Power Plant Environmental Qualification Plan, as appropriate, to reflect power uprate evaluations prior to implementation of the license amendment.
5. Revise plant procedures, as appropriate, to accommodate the stretch power uprate prior to implementation of the license amendment. Emergency, abnormal, and operating procedures that are entered due to a loss-of-normal feedwater event or have auxiliary feedwater TS requirements shall be changed, as appropriate, prior to implementation of the license amendment.
6. Review new TS requirements, revised procedures, and any control room changes due to the stretch power uprate to determine necessary changes to the operator

training program and complete the required portion of the operator training prior to implementation of the license amendment.

7. Update setpoint changes for reactor protection and control inputs, alarms, computer constants, and embedded values, consistent with operation at 1772 MWt prior to implementation of the license amendment. Power range nuclear instruments shall be recalibrated and checked based on a secondary heat balance prior to implementation of the license amendment.
8. Revise degraded voltage and thrust calculations for motor-operated valve operators outside containment which were reviewed for impact of uprated post accident temperatures, as required, prior to implementation of the license amendment.
9. Provide NRC with a status update and schedule for resolution of Generic Letter (GL) 96-06 water hammer issues by April 2, 2004.
10. Incorporate the increase in flow rate and velocities, as well as the changes in operating pressures and temperatures, into the Kewaunee Nuclear Power Plant Flow Accelerated Corrosion (FAC) Program as part of the power uprate implementation. The Kewaunee Nuclear Power Plant FAC program models shall be updated prior to the next program inspections scheduled for the next refueling outage.
11. Establish an inspection and monitoring program to monitor potential feedwater heater degradation at the stretch power uprate conditions. An inspection program shall be developed based on the baseline inspection results and using programs and processes in place at the Kewaunee Nuclear Power Plant. This shall be completed prior to the next refueling outage.