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Waterford 3

W3F1-96-0205

A4.05

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November 21, 1996

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Cancellation of Licensee Event Report 96-013-00

Gentlemen:

Attached is a Notice of Cancellation of Licensing Event Report Number LER-96-013-00 for Waterford Steam Electric Station Unit 3. The LER is being canceled based on subsequent root cause analysis results which conclude that Waterford 3 did not operate in excess of 100% licensed reactor power in the reported event. Details of the investigation results are provided in the attached notice. A telephone notification was made to the NRC Communications Center retracting the earlier 10 CFR 50.72 call.

Very truly yours,

C.M. Dugger
General Manager
Plant Operations

CMD/OPP/ssf
Attachment

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cc: L.J. Callan (NRC Region IV), C.P. Patel (NRC-NRR), A.L. Garibaldi,
J.T. Wheelock - INPO Records Center, R.B. McGehee,
N.S. Reynolds, NRC Resident Inspectors Office, Administrator - LRPD

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Cancellation Notice For LER-96-013-00

Waterford 3 is hereby canceling LER-96-013-00 which had been conservatively submitted based on the possible operation of the plant in excess of 100% licensed reactor power. Subsequent to that submittal, based on results obtained from investigations and analyses, it has been concluded that the plant never actually exceeded 100% licensed reactor power. The basis for this assessment is documented in the discussion and conclusions section of this attachment.

BACKGROUND INFORMATION:

On 8/22/96, with the plant operating at an indication of 100% power, the Core Operating Limits Supervisory System (COLSS) Main Steam Secondary Calorimetric (MSBSCAL) power validity check alarm was intermittently received and, at times, locked in for several minutes. This alarm results from a difference between MSBSCAL and two out of three other power indications, Turbine First Stage Pressure (BTFSP), Feedwater Secondary Calorimetric (FWBSCAL) and Primary Calorimetric (BDELT). MSBSCAL was the primary indication used by the operators to maintain reactor power at 100%. The concern at that time was that MSBSCAL may have been indicating less than actual thermal power by approximately 0.4%, meaning that Waterford 3 may have operated in excess of the 100% licensed reactor power limit. Based on reviews of plant data, the gradual divergence between power indications began just after returning to power, following Refuel 7 (Nov., 1995). The plant has been operating at 100% power throughout the period, except for during two forced outages in 1996.

EVENT DESCRIPTION:

March 1994	Secondary plant parameters indicated possible feedwater venturi fouling of approximately 0.7%.
May 1994	Contractor independently measured feedwater flow with an Ultrasonic Flow Meter (UFM).
August 1994	Contractor Analysis of the UFM data indicated a 0.6 to 0.7 percent difference between the feedwater flows measured by the venturi and the UFM. This indicated that the venturis were fouled.
Feb 1995	Implemented the Secondary Calorimetric Power Measurement (MSBSCAL) using Steam Flow and gained approximately 8 MWe.

Oct 1995	Cycle 7 Refuel Outage. Plant Monitoring Computer (PMC) was replaced. Main Steam (MS) flow transmitters [EIS Identifier FIT] were rescaled.
Nov 1995	Start of Cycle 8. The deviation between MSBSCAL and FWBSCAL corresponded to approximately 8 MWe. Primary calorimetric BDELT was removed from service. The new PMC alarm screen was declared "unusable" by Plant Operations due to the large volume of information displayed.
Jan 1996	Calibrated the Turbine First Stage Pressure transmitter [EIS Identifier PIT], which is an input to BTFSP (Turbine First Stage Pressure Power). Following the calibration, BTFSP indicated 1.1% higher than MSBSCAL. With BDELT removed from service, a deviation of 0.85% power between BTFSP and MSBSCAL will give the "COLSS MSBSCAL VALIDITY CHECK" PMC alarm.
Feb 1996	Watt-hour meter (Component ID GENE2152 A INDREC) was replaced.
March 1996	Performance Engineer observes gross electrical generation slightly higher than expected (approximately 2-3 MWe). Deviation between MSBSCAL and FWBSCAL is approximately 1%. The Performance Engineer initiates a condition report (CR-96-0312). It was thought that the steam flow transmitter on the #1 steam generator side had drifted within its normal or allowable tolerance as calculated by ABB uncertainty analysis.
May 1996	When the plant was placed back on line following a plant trip, the Main Feed Pump Low Pressure Steam Supply throttle malfunctioned. Consequently, supply steam for the Main Feed Pump was switched to the High Pressure Steam throttle. Turbine First Stage Pressure dropped approximately 5 psi, and as a result, BTFSP also decreased approximately 0.5%. The deviation between BTFSP and MSBSCAL decreased to approximately 0.6%, which is below the alarm setpoint of 0.85% power.
June 1996	Commenced feedwater Ethanolamine chemical addition.
July 1996	Watt-hour transducer (Component ID GENEXMTR2151 E IXMITR) was verified to be in calibration. Watt-hour meter (Component ID GENE2152 A INDREC) was replaced in February, 1996. Comparisons of the two gross electrical generation measurement devices were consistent.

- July 16, 1996 Plant shutdown until August 5 due to Reactor Coolant Pump seal problems.
- Aug 12, 1996 Gross electrical generation was higher than expected and could not be explained. The Performance Engineer initiated a Condition Report (CR-96-1239). Repairs made during the forced outage to the "A" Main Feed Pump Turbine restored First Stage Pressure.
- Aug 21, 1996 A revision to the PMC alarm screen was implemented which removed most of the clutter that had rendered the screen unusable. A change was made to the COLSS calculation of smoothed plant power to remove BDELT from the power selection. This prevents the normal variations in BDELT from causing smoothed plant power to fluctuate. BDELT and the PMC alarm for "COLSS MSBSCAL VALIDITY" were returned to service. The alarm was cycling at a high rate. BDELT was calibrated in an attempt to resolve the alarm issue.
- Aug 22, 1996 At approximately 0100, Plant Operations switched to FWBSCAL from MSBSCAL due to PMC alarm "COLSS MSBSCAL VALIDITY CHECK." Mismatch between MSBSCAL and FWBSCAL was approximately 1.5%. A Condition Report was initiated (CR-96-1299). A cross disciplinary team (Design Engineering, Modification Control, Systems Engineering, Reactor Engineering and Performance and Operations) including the ABB CE site representative, was initiated to investigate the condition.
- Aug 28, 1996 The power mismatch was conservatively reported to the NRC due to the potential for having exceeded Licensed Power.

DISCUSSION AND CONCLUSION:

Waterford 3 has performed a thorough investigation of the cause of the diverging indications of reactor power. Possible causes were identified and evaluated to isolate the root cause. Relevant plant instrumentation calibration data was reviewed to determine the contribution that instrument drift made to the power indication mismatch. The data was reviewed by the multi-discipline team and by two independent consultants (ABB CE and MPR Associates).

Plant operating parameters over the most recent fuel cycle were evaluated. Among the parameters evaluated were turbine first stage pressure, steam flow, steam header pressure, feedwater flow, ratio of feedwater to steam flow, condensate flow rate, and steam generator blowdown flow. Consideration was given to several events that occurred during the fuel cycle, such as the calibration of turbine first stage instruments in January 1996. COLSS instrument input calibration data packages (and supporting calculations) were reviewed.

Containment entries were made to check the calibration of the two steam flow transmitters and to make adjustments as necessary. The #1 Steam Generator Steam Flow transmitter (MS IFT 1011) was found to be in calibration. The #2 Steam Generator Steam Flow transmitter (MS IFT 1021) was found 30 mV low, out of calibration by -0.010 volts (0.030 - 0.020). The sensing leg and reference leg of the #2 Steam Generator Steam Flow transmitter were back filled. Indicated flow increased slightly. The difference between MSBSCAL and FWBSCAL was 1.7%.

The power validity check alarm 2 out of 3 logic had been satisfied (actuating the alarm) when BTFSP and FWBSCAL exceeded deviation alarm limits. Calibration of the Turbine First Stage Pressure transmitter (January 1996) caused BTFSP to exceed its deviation alarm limit. The gradual upward drift of both feedwater flow transmitters and additional feedwater venturi fouling caused FWBSCAL to exceed its deviation alarm limit.

The root cause analysis concluded that although the #2 Steam Generator flow transmitter was found out of calibration, the overall impact on the thermal power calculation was still within allowable uncertainties. This was attributed to other process parameters used in the calculation being well within their calibration limits (e.g. MS IFT 1011). Steam flow measurement was therefore determined to be functioning properly. It was concluded that MSBSCAL functioned properly during the period of gradual divergence of reactor power indications.

Since the plant was being operated on MSBSCAL, it follows that licensed thermal power was not exceeded. Waterford 3 did not operate in an unanalyzed condition. The condition was not reportable under the requirements of 10 CFR 50.72 or 10 CFR 50.73. There was no violation of Technical Specifications involved. Therefore, LER-96-013-00, which had conservatively reported the condition is hereby being canceled. The plant will return to using MSBSCAL as the primary indication for maintaining reactor power at 100%.

Measures that have been taken include:

- Review of COLSS instrument input calibration data packages (and supporting calculations),
- calibration of the main steam and feedwater flow transmitters,
- replacement of the #2 Steam Generator flow transmitter,
- backfilling the high and low pressure sensing lines to the #2 Steam Generator flow transmitter, and
- a second revision to the PMC alarm screen, making the screen useable.

Waterford 3 will take additional measures as deemed necessary under the corrective actions program.