Exelon Generation Company, LLC
Dresden Nuclear Power Station
6500 North Dresden Road
Morris, IL 60450-9765

www.exeloncorp.com

Exelon Nuclear

10 CFR 50.73

December 14, 2001

PSLTR: #01-0124

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Dresden Nuclear Power Station, Unit 3
Facility Operating License No. DPR-25
NRC Docket No. 50-249

Subject: Licensee Event Report 2000-003-01, "Manual Scram on Loss of Vacuum from Air Binding of Condenser Tubes due to Off Gas Recombiner Train Failure"

Enclosed is Licensee Event Report 2000-003-01, "Manual Scram on Loss of Vacuum from Air Binding of Condenser Tubes due to Off Gas Recombiner Train Failure," for the Dresden Nuclear Power Station (DNPS). This condition is being reported pursuant to 10 CFR 50.73 (a)(2)(iv), which requires the reporting of any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

The following actions were taken:

Maintenance replaced the Steam Seal Bypass Valve.

Contingency monitoring utilizing alternate indications was put into place to monitor condenser performance during the subsequent unit startup.

Operations submitted a Training Request (TR# 2000-884) requesting the Curriculum Review Committee (CRC) to provide (1) specific training on this event and the lessons learned, (2) further training on modified SJAE operation, and (3) utilization of alternate indications to determine Offgas (OG) system performance. The results of CRC response to this Training Request were provided to the Operations Manager for review and were accepted.

Installation of the correct size orifice into the 3A OG system.

Revised operating procedures to ensure the 3A OG Condenser is not overloaded under normal operating conditions.

Revised operating procedure to ensure Seal Steam bypass valve is operated < 250 psig Reactor pressure.

Counsel the system engineer on the importance of strictly following the post modification testing and special procedures, including creating proper acceptance criteria.

IE22

Any other actions described in the submittal represent intended or planned actions by DNPS. They are described for the NRC's information and are not regulatory commitments.

If you have any questions, please contact Dale Ambler, Regulatory Assurance Manager at (815) 416-2800.

Respectfully,

Preston Swafford
Site Vice President
Dresden Nuclear Power Station

Enclosure

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

# LICENSEE EVENT REPORT (LER)

| 1. FACILITY NAME | 2. DOCKET NUMBER | 3. PAGE |
|---|---|---|
| Dresden Nuclear Power Station Unit 3 | 05000249 | 1 OF 4 |

4. TITLE Manual Scram on Loss of Vacuum from Air Binding of Condenser Tubes due to Off Gas Recombiner Train Failure

| 5. EVENT DATE | | | 6. LER NUMBER | | | 7. REPORT DATE | | | 8. OTHER FACILITIES INVOLVED | |
|---|---|---|---|---|---|---|---|---|---|---|
| MO | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REV NO | MO | DAY | YEAR | FACILITY NAME | DOCKET NUMBER |
| | | | | | | | | | N/A | N/A |
| 05 | 04 | 2000 | 2000 | – 003 | – 01 | 12 | 14 | 2001 | FACILITY NAME N/A | DOCKET NUMBER N/A |

| 9. OPERATING MODE | 1 |
|---|---|
| 10. POWER LEVEL | 044 |

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

| | | | | | |
|---|---|---|---|---|---|
| 20.2201(b) | 20.2203(a)(3)(ii) | | 50.73(a)(2)(ii)(B) | | 50.73(a)(2)(ix)(A) |
| 20.2201(d) | 20.2203(a)(4) | | 50.73(a)(2)(iii) | | 50.73(a)(2)(x) |
| 20.2203(a)(1) | 50.36(c)(1)(i)(A) | X | 50.73(a)(2)(iv)(A) | | 73.71(a)(4) |
| 20.2203(a)(2)(i) | 50.36(c)(1)(ii)(A) | | 50.73(a)(2)(v)(A) | | 73.71(a)(5) |
| 20.2203(a)(2)(ii) | 50.36(c)(2) | | 50.73(a)(2)(v)(B) | | OTHER |
| 20.2203(a)(2)(iii) | 50.46(a)(3)(ii) | | 50.73(a)(2)(v)(C) | | Specify in Abstract below or in NRC Form 366A |
| 20.2203(a)(2)(iv) | 50.73(a)(2)(i)(A) | | 50.73(a)(2)(v)(D) | | |
| 20.2203(a)(2)(v) | 50.73(a)(2)(i)(B) | | 50.73(a)(2)(vii) | | |
| 20.2203(a)(2)(vi) | 50.73(a)(2)(i)(C) | | 50.73(a)(2)(viii)(A) | | |
| 20.2203(a)(3)(i) | 50.73(a)(2)(ii)(A) | | 50.73(a)(2)(viii)(B) | | |

12. LICENSEE CONTACT FOR THIS LER

| NAME | TELEPHONE NUMBER (Include Area Code) |
|---|---|
| Timothy P. Heisterman | (815) 416-2815 |

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

| CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

| 14. SUPPLEMENTAL REPORT EXPECTED | | | 15. EXPECTED SUBMISSION DATE | MONTH | DAY | YEAR |
|---|---|---|---|---|---|---|
| YES (If yes, complete EXPECTED SUBMISSION DATE) | X | NO | | | | |

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)


On May 4, 2000, at 2018 hours, Operations inserted a manual reactor scram per station procedure when the condensate inlet temperature to the demineralizers reached 135 degrees.

A degrading condenser vacuum during a plant startup, coupled with an increasing condensate temperature characterized this event. A manual scram was initiated per procedure, on high condensate temperature, to protect the condensate demineralizer resins.

The root cause of this event determined four specific areas of failure that in the aggregate establish the conditions that resulted in Operations inserting a manual scram. The four specific areas include, 1) failure of the 3A Offgas (OG) system was determined to be installation of an incorrectly sized orifice, 2) failure to follow procedures by the system engineer involved with post modification testing of the system, 3) failure of system flow indication was caused by inappropriate application of the installed flow element, and 4) failure of the Seal Steam Bypass valve yoke was determined to be a procedural deficiency which allowed inappropriate use of the valve at Reactor pressures higher than designed.

Corrective actions include installation of correctly sized orifice into the 3A OG system, revised operating procedures to ensure the 3A OG Condenser is not overloaded under normal operating conditions, revised operating procedure to ensure Seal Steam bypass valve is operated < 250 psig Reactor pressure and counseled the system engineer on the importance of strictly following the post modification testing and special procedures, including creating proper acceptance criteria.

The safety significance of this event was minimal. Plant equipment response was per design. The Operations decision to manually scram was proper per procedure and pre-briefed in accordance with conservative decision making philosophy. With exception of the abnormalities causing and contributing to the need for a manual scram, plant equipment response was per design and required no operator action.

## A. Plant Conditions Prior to Event:

Unit: 03 Event Date: 05-04-2000 Event Time: 2018
Reactor Mode: 1 Mode Name: Run Power Level: 44 percent
Reactor Coolant System Pressure: 942 psig

## B. Description of Event:

At 0800 hours on May 4, 2000, Operations brought Unit 3 critical following a forced outage. At 1320 hours the control room received a 3A OG [SH] Condenser Low Level alarm. Being early in the unit startup, Operations discussed the low-level condition and concluded that as unit load increased, an increase in condensation would occur, restoring level in the condenser.

At 1330 hours, Operations received an OG Holdup Volume High Temperature alarm. At 1335 hours, the Steam Jet Air Ejector (SJAE) suction valves closed due to a high temperature condition in the holdup volume. The SJAE suction valves were re-opened. At 1602 hours, the unit was placed on-line.

At 1950 hours, station procedure for loss of condenser vacuum was entered. Operations initiated a load drop to minimum recirculation flow, attempting to compensate for the loss in condenser vacuum. At 2003, with the unit at minimum recirculation flow, the Unit Nuclear Shift Operator (NSO) initiated insertion of control rods to further drop power. It was concluded that the vacuum drop could not be recaptured and that inlet temperature to the demineralizers was 133 degrees. A crew briefing was held and at 2018 hours with demineralizer inlet temperature at 135 degrees, a manual scram was inserted.

No other systems, components or structures were identified which contributed to the isolation event.

## C. Cause of Event:

The root cause of the event determined four specific areas of failure that overall provided the concluding results to the cause of this event.

3A OG system operation:

Failure of the 3A OG system was determined to be failure to follow procedures by the system engineer involved with post modification testing of the system. Contributing to this event was installation of an incorrectly sized orifice. The root cause of the improper post modification testing (PMT) was a failure to follow procedures by the system engineer to follow both the Special Procedure (SP) process and the PMT process, which resulted in a SP without acceptance criteria for dilution steam pressure. This led to the failure of the system engineer to properly address the abnormal dilution steam pressure that was observed during PMT. The System Engineer failed to initiate a CR and failed to properly document the abnormal condition observed. The PMT process is sound and if it had been followed, the event would have been prevented. (NRC Cause Code A)

Flow indication for 3A OG system:

Failure of system flow indication was caused by inappropriate application of the installed flow element. Failure of system flow indication was determined to be an inability of the flow element to measure the process flow at the location in which it was installed. The flow element has been used successfully in the OG system to measure process flow to the main chimney, and it was believed that it could also measure flow downstream of the OG Condenser. The flow element used was a 'thermal dispersion' element that used three sensors to detect flow. One sensor was a small heater, which was used to heat the variable sensor. Flow passing by the variable sensor would cool the sensor, and when compared to the reference (third) sensor, a correlation to flow can be made. It was determined that the moisture content of the OG stream at the location in which it was being measured (downstream of the OG Condenser), adversely affected the element. This in turn provided inaccurate indication of system flow in the Control Room. Moisture collected on the element sensors and interfered with the heater sensor such that the variable sensor was cooler than it should have been. This was interpreted by the element as high flow, and was indicated as such in the Control Room (off-scale, high). (NRC Cause Code X)

Seal Steam bypass valve:

Failure of the Seal Steam Bypass (S2) valve yoke was determined to be a procedural deficiency which allowed inappropriate use of the valve at Reactor pressures higher than designed. The bypass valve was being used to assist the normal Seal Steam Feed Valve (SSFV) in providing seal steam pressure during the Unit start-up. The system operating procedure allowed use of the S2 valve up to a Reactor pressure of 350 psig. It was discovered that this was above the valve design pressure of 250 psig as specified in the turbine vendor manual. Use of the Seal Steam bypass flowpath at the higher Reactor pressure created excessive piping vibration, which subsequently caused the S2 valve yoke to fail due to fatigue failure. When the bypass valve yoke failed, the valve traveled full open and subsequently caused the 12-inch header relief valve to open. The relief valve discharges below the Main Condenser hotwell waterline and significantly raised the temperature of the Condensate [SD] leaving the hotwell. A manual scram was required in accordance with plant procedures when temperatures reached 135 degrees Fahrenheit to the inlet of the Condensate Demineralizers [SF]. (NRC Cause Code D)

Inadequate Training:

Contributing factors appear to be knowledge deficiency regarding OG operation with the installation of the Dilution Steam modification. The training supplied was limited to presenting the dilution steam modification as a "like for like" change out, with the 3A Dilution Steam orifice plate modification performing the same function as a pressure control valve. The cause for this failure was inadequate review scope by the Curriculum Review Committee (CRC) who failed to take into consideration the need for a greater understanding of system performance to support troubleshooting of the OG system under abnormal system operation.

## D. Safety Analysis:

The safety significance of this event was limited to the fact that it was a challenge to Operations, as is every situation involving a need for prompt diagnosis and decision to manually trip the reactor. The Operations decision to manually scram was proper per procedure and pre-briefed in accordance with conservative decision making philosophy. With exception of the abnormalities causing and contributing to the need for a manual scram, plant equipment response was per design and required no operator action.

## E. Corrective Actions:

Maintenance replaced the Steam Seal Bypass Valve.

Contingency monitoring utilizing alternate indications was put into place to monitor condenser performance during the subsequent unit startup.

Operations submitted a Training Request (TR# 2000-884) requesting the CRC to provide (1) specific training on this event and the lessons learned, (2) further training on modified SJAE operation, and (3) utilization of alternate indications to determine Offgas system performance. The results of CRC response to this Training Request were provided to the Operations Manager for review and accepted.

Installed correct sized orifice into the 3A OG system.

Revised operating procedures to ensure the 3A OG Condenser is not overloaded under normal operating conditions.

Revised operating procedure to ensure Seal Steam bypass valve is operated < 250 psig Reactor pressure.

Counseled the system engineer on the importance of strictly following the PMT and SP procedures, including creating proper acceptance criteria.

## F. Previous Occurrences:

A review was conducted via a search of previous condition reports generated. No previous occurrences were identified associated with this type of failure.

## G. Component Failure Data:

N/A