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Constellation Energy Group

Nine Mile Point
Nuclear Station

June 23, 2003
NMP1L 1742

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: Nine Mile Point Unit 1
Docket No. 50-220
License No. DPR-63

Licensee Event Report 03-001, "Technical Specification Cooldown Rate Exceeded During Required Cooldown for a Failed Solenoid Actuated Pressure Relief Valve"

Gentlemen:

In accordance with 10 CFR 50.73(a)(2)(i)(A) and 10 CFR 50.73(a)(2)(i)(B), we are submitting Licensee Event Report (LER) 03-001, "Technical Specification Cooldown Rate Exceeded During Required Cooldown for a Failed Solenoid Actuated Pressure Relief Valve."

Very truly yours,

Lawrence A. Hopkins
Plant General Manager

LAH/KLE/jm
Attachment

cc: Mr. H. J. Miller, NRC Regional Administrator, Region I
Mr. G. K. Hunegs, NRC Senior Resident Inspector

IE22

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (1-2001)

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)

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TITLE (4)

Technical Specification Cooldown Rate Exceeded During Required Cooldown for a Failed Solenoid Actuated Pressure Relief Valve

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
04	22	2003	2003	001	00	06	23	2003	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1
POWER LEVEL (10)	000 / 023

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

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)		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	
20.2203(a)(2)(iv)	X	50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		NRC Form 366A	
20.2203(a)(2)(v)	X	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)			

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Kenneth L. Embry, Licensing Engineer	315-349-1518

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	SB	switch	G080	Y					

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

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

On April 21, 2003, Nine Mile Point Unit 1 (NMP1), having recently ended a refueling outage, was at low power preparing for technical specification (TS) required testing of six solenoid-actuated pressure relief valves (also referred to as Electromatic Relief Valves or ERVs). At 2117 with power approximately 23 percent, solenoid-actuated pressure relief valve, ERV-111, failed to open during testing. TS 3.1.5.a requires that all six ERVs be operable whenever the reactor coolant pressure is greater than 110 psig. At 2117 the action statement of TS 3.1.5.b was entered. After the remaining five ERVs were satisfactorily tested, NMP1 began a shutdown at 2230. The reactor was subcritical at 0055 on April 22, 2003. NMP1 exited the action statement at 0250. During the cooldown, the TS cooldown limit of 100 degrees Fahrenheit (F) in one hour was marginally exceeded (101 degrees F in one hour) for approximately three minutes in two of four loops. An engineering evaluation of the cooldown concluded that Appendix G requirements were not violated and that the structural integrity of the reactor pressure vessel was not compromised.

The ERV-111 failure was due to high resistance in its associated solenoid cut-out switch contacts. An inadequate preventive maintenance (PM) procedure did not specify measuring the contact resistance, hence the contact resistance increased unnoticed until the failure. Exceeding the cooldown limit occurred because the shutdown procedure did not adequately identify steam loads that should be secured to prevent exceeding the cooldown limit when decay heat values are low.

Corrective actions for the ERV failure include replacing the solenoid valve for ERV-111, modifying the PM procedure, and testing the resistance of the cut-out switch contacts on the remaining five ERVs. The corrective actions to address exceeding the cooldown rate are modifying the shutdown procedure and providing training on the event.

The test failure of ERV-111 is reportable in accordance with 10 CFR 50.73(a)(2)(i)(a), in that the failure resulted in a TS required shutdown. Exceeding the TS cooldown limit of 100 degrees F in one hour is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation prohibited by the technical specifications.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. Description of Event

On April 21, 2003, Nine Mile Point Unit 1 (NMP1), having recently ended a refueling outage, was at low power preparing for technical specification (TS) required testing of six solenoid-actuated pressure relief valves (also referred to as Electromatic Relief Valves or ERVs). At 2056 with power approximately 23 percent, TS required testing of the six ERVs began. At 2117 solenoid-actuated pressure relief valve, ERV-111, failed to open when the manual switch was taken to the open position. TS 3.1.5.a requires that "During power operating condition whenever the reactor coolant pressure is greater than 110 psig and the reactor coolant temperature is greater than saturation temperature, all six solenoid-actuated pressure relief valves shall be operable." If TS 3.1.5.a is not met, TS 3.1.5.b requires that "the reactor coolant pressure and the reactor coolant temperature shall be reduced to 110 psig or less and saturation temperature or less, respectively, within ten hours." TS 3.1.5.b was entered when ERV-111 failed to open. The testing of the remaining ERVs continued and was satisfactorily completed at 2212. At 2230, NMP1 began the TS required shutdown. At 0055 the reactor was brought sub-critical and at 0250 on April 22, 2003 NMP1 exited TS 3.1.5.b. During the cooldown and depressurization to less than 110 psig, the cooldown rate, as determined by reactor coolant temperature, in two of four recirculation loops, marginally exceeded 100 degrees Fahrenheit (F) per hour.

NMP1 has 6 ERVs, 3 on each main steam line. The ERVs are part of the automatic depressurization system (ADS). Each ERV discharges to the suppression chamber. In the event of a small line break, the ERVs provide a means for depressurizing the reactor coolant system, allowing coolant injection by the core spray system.

The ERVs are pilot operated valves (Dresser Industries model 1525-VX). Energizing a solenoid opens the pilot valve. For ERV-111 the solenoid operated pilot valve is SOV-01-102A (model CR9503-213C manufactured by General Electric). A red indicating light, when illuminated, shows that the solenoid has stroked to open the pilot valve.

The ERV test (N1-ST-C2) consists of manually actuating the ERV with the reactor at pressure and then monitoring resultant system conditions. When the switch for ERV-111 was taken to the open position, the red indicating light did not illuminate, which indicated that the SOV did not stroke. Additionally, temperature and acoustic monitoring data collected downstream of ERV-111 did not indicate that ERV-111 had opened.

The solenoid contains two operating coils, a low resistance coil and a high resistance coil. A built-in cut-out switch bypasses the high resistance coil when the solenoid is not energized. Movement of the solenoid armature opens the cut-out switch and places the high resistance coil in series with the low resistance coil. Troubleshooting identified that high resistance in the cut-out switch contacts had prevented the solenoid from actuating.

During cooldown and depressurization, coolant temperature in two of four operating loops marginally exceeded the allowed maximum cooldown rate of 100 degrees F in one hour. The largest cooldown in either of these two loops was 101 degrees F in one hour and this cooldown rate lasted for approximately three minutes. In the other two operating loops the cooldown rates were 99 degrees F in one hour and 100 degrees F in one hour. The cooldown rate was reduced to less than 100 degrees F in one hour by securing auxiliary steam loads.

II. Cause of Event

The cause of the ERV failure to open was high resistance on the cut-out switch for solenoid valve SOV-01-102A which limited coil current and prevented the SOV from operating. The cause of the high resistance was an inadequate preventive maintenance procedure. Although the preventive maintenance procedure required cleaning the contacts, a measurement of contact resistance was not required.

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II. Cause of Event

The cause of exceeding the maximum allowed cooldown of 100 degrees in one hour, in two of four recirculation loops was due to procedural inadequacy. The shutdown procedure, N1-OP-43C, did not provide sufficient guidance to promptly secure steam loads to prevent exceeding a cooldown of 100 degrees F, when cooling down with low decay heat loads. A contributing cause was ineffective corrective action. A similar event occurred in May 1997, immediately following a refueling outage. A planned scram from 18 percent power resulted in a cooldown of 86 degrees F in a one hour period. Since the scram was from low power following a refueling outage, the decay heat load was low. An evaluation concluded that the plant response was to be expected for the operating conditions. The previous corrective action was not adequate to preclude recurrence.

III. Analysis of Event

The TS required shutdown of NMP1 resulting from the failure of ERV-111 is reportable in accordance with 10 CFR 50.73(a)(2)(i)(A) as a shutdown required by technical specifications. Additionally, the cooldown rate in excess of the TS allowed maximum of 100 degrees F per hour in two of the four operating recirculation loops, is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as operation prohibited by Technical Specifications. TS 3.2.2, Minimum Reactor Vessel Temperature For Pressurization, specifies that during reactor vessel heatup and cooldown when the reactor is critical, the reactor vessel temperature and pressure shall satisfy the requirements of Figures 3.2.2.c and 3.2.2.d. Figure 3.2.2.d, Cooldown – Core Critical, is a plot of maximum reactor pressure versus reactor vessel beltline downcomer water temperature and is based upon cooling rates of less than or equal to 100 degrees F in one hour. Figure 3.2.2.d specifies that temperature is measured at the recirculation loop suction. Since the cooling rate measured at the recirculation suction for two of the recirculation loops marginally exceeded 100 degrees in one hour, the basis of Figure 3.2.2.d was not met.

Operation of three ERVs is sufficient to depressurize the primary system to 110 psig, which will permit full flow of the core spray system within required time limits. Five of the six ERVs satisfactorily passed their surveillance test. Therefore five ERVs were operable, providing sufficient depressurization capability.

A qualitative risk evaluation concluded that, based on the risk achievement worth, ERV-111 failing to open was of low risk significance.

Engineering evaluated the impact of the cooldown with the following considerations:

1. Reactor coolant temperature is used to define vessel inner diameter (ID) temperature.
2. The thermal analysis assumes adiabatic conditions on the vessel outer diameter (OD) and very high heat transfer coefficient on the vessel ID.
3. Realistic vessel heat transfer coefficients will create a lag time between vessel coolant and vessel ID surface conditions.

A review of the heat transfer coefficients assumed in the analysis compared to realistic values indicated that sufficient lag time exists such that the vessel inner surface would not exceed the cooldown limit of 100 degrees F in one hour, given that the coolant cooldown rate reached 101 degrees F in a one hour period for a maximum of 3 minutes. Additionally, vessel OD surface thermal couple data confirmed that the vessel OD surface temperature change was approximately 50 degrees F coincident with the recirculation suction temperature change of 100 degrees F in one hour. The OD temperature data confirmed that significant margin relative to the assumed 100-degree through-wall thermal gradient remained. The Engineering evaluation concluded that the cooldown of the vessel inner surface did not exceed 100 degrees F in one hour, 10 CFR 50 Appendix G requirements were not violated, and the overall structural integrity of the reactor vessel was not compromised.

Based on the above, the failure of ERV-111 and subsequent cooldown did not pose a threat to the health and safety of plant personnel or the public.

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IV. Corrective Actions

1. Replaced the SOV for ERV-111.
2. Measured cut-out switch contact resistance and inspected contact coating for the remaining five ERVs and cleaned contacts as necessary.
3. The ERV preventive maintenance procedure was revised to include contact resistance measurement.
4. Revised procedure N1-OP-43C, Plant Shutdown, to provide additional guidance for securing steam loads to control cooldown rate.
5. Operator training will be provided on this event, including actions to address excessive cooldown
6. Initiatives are underway to improve the effectiveness of the corrective action program, as a result of previously identified weaknesses in the corrective action program

V. Additional Information

1. Failed Components:
   SOV-01-102A Model CR9503-213C Manufacturer General Electric
2. Previous similar events:
   Licensee Event Report (LER) 00-005 discusses a loss of secondary containment due to an inadequate procedure for checking track bay doors closed. The corrective actions are specific to the event. LER 00-002 discusses an instance in which a service water check valve failed a surveillance test due to inadequate preventive maintenance. The corrective actions were specific to check valves. The corrective actions for the events discussed above would not have prevented the ERV-111 failure or exceeding the TS allowed maximum cooldown of 100 degrees F in one hour.
3. Identification of components referred to in this Licensee Event Report:

Components	IEEE 805 System ID	IEEE 803A Function
Core Spray	BM	N/A
Automatic Depressurization System	SB	N/A
Reactor Coolant System	AD	N/A
Main Steam System	SB	N/A
Vessel	AD	RPV
Valve	SB	V, RV
Solenoid	SB	SOL
Coil	SB	CL
Switch	SB	N/A
Contacts	SB	N/A