



Commonwealth Edison

Zion Generating Station  
101 Shiloh Blvd.  
Zion, Illinois 60099  
Telephone 708 / 746-2084

January 4, 1992

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

Dear Sir:

The enclosed Licensee Event Report number 92-022-00, Docket No. 50-295/DPR-39 from Zion Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(i)(B), which requires a 30 day written report when any operation or condition occurs that is prohibited by the plant's Technical Specifications.

Very truly yours,

T. P. Joyce  
Station Manager  
Zion Generating Station

TPJ/SLM/dmb

Enclosure: Licensee Event Report

cc: NRC Region III Administrator  
NRC Resident Inspector  
INPO Record Center  
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*Handwritten initials/signature*

LICENSEE EVENT REPORT (LER)															Form Rev 2.0									
Facility Name (1) Zion Unit 1										Docket Number (2) 0   5   0   0   0   2   9   5					Page (3) 1   of   0   6									
Title (4) Penetration Pressurization Air Compressor Aftercooler Drain Crosstie Valve Found in the Open Position																								
Event Date (5)			LER Number (6)				Report Date (7)				Other Facilities Involved (8)													
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names				Docket Number(s)											
1	2	0	4	9	2	9	2	---	0	2	2	---	0	0	0	1	0	4	9	3	Zion Unit 2    0   5   0   0   0   3   0   4			
OPERATING MODE (9) 1			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)																					
POWER LEVEL (10) 0   9   5			<input type="checkbox"/> 20.402(b)				<input type="checkbox"/> 20.405(c)				<input type="checkbox"/> 50.73(a)(2)(iv)				<input type="checkbox"/> 73.71(b)									
			<input type="checkbox"/> 20.405(a)(1)(i)				<input type="checkbox"/> 50.36(c)(1)				<input type="checkbox"/> 50.73(a)(2)(v)				<input type="checkbox"/> 73.71(c)									
			<input type="checkbox"/> 20.405(a)(1)(ii)				<input type="checkbox"/> 50.36(c)(2)				<input type="checkbox"/> 50.73(a)(2)(vii)				<input type="checkbox"/> Other (Specify									
			<input type="checkbox"/> 20.405(a)(1)(iii)				<input checked="" type="checkbox"/> 50.73(a)(2)(i)				<input type="checkbox"/> 50.73(a)(2)(viii)(A)				in Abstract									
			<input type="checkbox"/> 20.405(a)(1)(iv)				<input type="checkbox"/> 50.73(a)(2)(ii)				<input type="checkbox"/> 50.73(a)(2)(viii)(B)				below and in									
			<input type="checkbox"/> 20.405(a)(1)(v)				<input type="checkbox"/> 50.73(a)(2)(iii)				<input type="checkbox"/> 50.73(a)(2)(x)				Text)									
LICENSEE CONTACT FOR THIS LER (12)																								
Name Pat Wild, Technical Staff Engineer										TELEPHONE NUMBER														
ext. 2853										AREA CODE    7   0   8    7   4   6   -   2   0   8   4														
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																								
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS															
X				N																				
SUPPLEMENTAL REPORT EXPECTED (14)										Expected Submission Date (15)	Month	Day	Year											
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)										<input checked="" type="checkbox"/> NO														

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

On 12/04/92 at 1100 hours during the performance of Periodic Test (PT) 2R, "Penetration Pressurizer (PP) [BD] Compressors Operability Test", for the return to service of the #1 PP air compressor, multiple Service Water (SW) [BI] leaks developed in the PP system. It was determined that the SW aftercooler drain crosstie valve, 1AD0042, for the #1 PP air compressor was not in the fully closed position.

At 1300, the #0 compressor was declared inoperable due to unloading problems. With the #1 PP air compressor already inoperable, Unit 1 entered a 5 hour clock per Technical Specifications 3.0.3 since the backup Nitrogen System (NT) [LK] bottle pressure was below 1970 psig per Technical Specification 3.9.2.B.

On 12/07/92, the #2 PP air compressor aftercooler drain valve, 2AD0044, was found throttled open two turns causing leakage into the #2 PP air compressor discharge header.

The cause of 1AD0042 and 2AD0044 being open could not be determined. The cause of water being in the aftercoolers was design deficiency. A contributing cause of this event was drawing deficiency. Due to the availability of redundant pressure supplies, the inoperability of the PP air compressors did not jeopardize the capabilities of the containment isolation systems on either unit. Corrective actions include reviewing the design of the system, enhancing control room and plant drawings, and providing guidance to various departments on the manipulation of valves.

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Zion Unit 1	0   5   0   0   0   2   9   5	9   2	-	0   2   2	-	0   0	0   2	OF	0   6				
TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]													

A. CONDITION PRIOR TO EVENT

MODE 1 - Power Operations RX Power 95% RCS [AB] Temperature/ Pressure 559 °F/ 2235 psig

B. DESCRIPTION OF EVENT

On 10/23/92 the Mechanical Maintenance (MM) Department took the #2 Penetration Pressurization (PP) [BD] air compressor out-of-service (OOS) to begin an inspection of the compressor aftercooler heat exchanger. The aftercooler uses service water from Lake Michigan as its cooling water. The inspection was being performed to satisfy Commitment #295-123-90-DET2.2.08-01, to "clean or test all safety related Service Water (SW) [BI] heat exchangers to ensure design heat transfer capability" and Commitment #295-123-90-DET2.2.08-03, for "initial implementation of Generic Letter (GL) 89-13 inspections/tests." This work was completed on 10/29/92 under work requests Z95607 and Z98707. At 1730 on 10/30/92, Periodic Test (PT)-2R, "Penetration Pressurizer Compressors Operability Test", was successfully completed on the #2 PP air compressor. PT-2R isolates the normal Instrument Air (IA) [LD] supply to the PP system, depressurizes the PP air receivers down to 90 psig, and runs the compressor to pressurize the PP air receivers to between 95 and 100 psig. The #2 PP air compressor was returned to service with no problems.

The #1 PP air compressor was taken OOS on 11/02/92 to perform the same inspections that were performed on the #2 PP air compressor aftercooler heat exchanger. This work was performed under work requests Z95157 and Z95158 and was completed on 12/03/92. During the inspection, one leaking tube was found in the aftercooler. On 11/10/92 the HMs requested an Engineering Evaluation to determine the number of tubes that could be plugged in the aftercooler because the current procedure did not allow for any tube plugging. On 11/11/92 the Engineering Evaluation determined that it was allowable to plug up to two tubes in either or both passes of the aftercooler. The repair was then performed and the cooler was reassembled. PT-2R was performed as the maintenance run for the closeout of the MM work package on the #1 PP air compressor. During the performance of PT-2R on 11/22/92, after the IA supply was isolated and the receivers were drained, water was observed leaking out of various areas of the PP system and the compressor area. SW supply to the #1 PP air compressor and aftercooler was then isolated and PT-2R aborted. The PP system was then immediately drained.

At this time, the cause of the leakage was believed to be SW leakage in the #1 PP air compressor aftercooler which had just been repaired. This leakage was not noticed prior to the performance of PT-2R because PP air pressure was greater than service water pressure. During the performance of PT-2R, the air pressure was decreased below SW pressure, allowing water to leak into the PP system.

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	Zion Unit 1	0	5	0	0	0	2	9	5	9	2	-	0	2	2	-	0	0	0	3	OF	0
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# B. DESCRIPTION OF EVENT (Continued)

The Technical Staff believed that the leakage could have been caused by tube plug leakage, gasket leakage, improper bonnet torque values, or tube sheet leakage. The MMs were then asked to reinspect the aftercooler and to perform leak tests on the tubes and tubesheet. Upon disassembly of the aftercooler, the tubesheet gasket on the SW inlet end was observed to be out of position and damaged. Neither the tubes nor the tubesheet were found to be leaking. It was decided that the aftercooler would be leak tight with new gaskets, so the aftercooler was reassembled.

PT-2R was performed for the second time as a maintenance run on 12/04/92 at 1100 hours. Multiple SW leaks again developed in the PP system when the PP Air Receivers were depressurized to 90 psig. PT-2R was again aborted and the valve lineup was returned to normal. The Technical Staff and the Operating Department then investigated the valve lineup to determine if the leakage could have been caused by something other than an aftercooler SW to PP air leakage. While isolating SW to the aftercooler and isolating PP air to the air compressor discharge to determine if there was a SW leak to the compressor cylinder, it was noticed that the sight glass for the PP compressor moisture separator was full of water. This led to the investigation of the piping associated with the moisture separator which led to the discovery of the #1 PP air compressor aftercooler drain crosstie valve, 1AD0042, in the not fully closed position. 1AD0042 is between the aftercooler water side drain line which connects with the drain piping of the #1 PP air compressor, the drain piping of the moisture separator, and the drain valve for the air side of the aftercooler, 1AD0045. With 1AD0042 open, SW was able to drain to the outlet of the moisture separator. When PP air pressure was decreased, SW was able to leak directly into the PP piping through the moisture separator.

1AD0042 was then closed and the PP system was drained. PT-2R was reperformed on all three PP air compressors, and no leakage was observed from any portion of the PP system. However, at the end of the PT the #1 and #0 compressors would not unload and stop running when the local switches were placed in 'Auto'. The #0 PP air compressor was declared inoperable at 1300 hours on 12/04/92. With the #1 PP air compressor already inoperable, Unit 1 was placed on a 5 hour clock per Technical Specification 3.0.3 since the backup Unit 1 Nitrogen System (NT) [LK] bottle pressure was below 1970 psig per Technical Specification 3.9.2.B. The Unit 1 Nitrogen bottles were pressurized to above 1970 psig by 1337 hours and Unit 1 was taken off of the 5 hour clock.

The inability of the #1 and #0 compressors to unload was believed to be caused by the presence of service water in the pressure sensing lines to the unloader switches and the presence of service water in the unloader valves' air supply lines. Work requests were written to calibrate the unloader pressure switches and drain the pressure sensing lines. The work request for the #0 compressor was completed late on 12/04/92 and PT-2R was run on early 12/05/92. The PT was aborted, however, due to the #0 compressor unloading at about 93 psig which is below the acceptable range required of 95 to 100 psig. Based on the setpoint of the unloader switch, the compressor should unload at 95 psig  $\pm$  0.75 psig. Taking the inaccuracies of the pressure gauge into account, the compressor should have operated correctly and should not have failed the PT. PT-2R was again performed on the #0 compressor and the unloading occurred at 95 psig. The #0 compressor was declared operable at 1330 on 12/05/92, and Unit 1 was taken out of the Limiting Condition for Operation.

The #1 compressor unloader switch was calibrated and the pressure sensing lines were drained. PT-2R was successfully performed on the #1 compressor and it was declared operable at about 2200 hours on 12/05/92.



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#### B. DESCRIPTION OF EVENT (Continued)

On 12/07/92 when Operating was returning the #1 PP air dryer to service, water was observed leaking out of the PP air dryer. On 12/08/92 after a walkdown of the #2 PP air piping valve lineup, the Technical Staff Engineer discovered that the #2 air compressor aftercooler drain valve, 2AD0044, was not fully closed. This was the cause of the leakage. 2AD0044 was subsequently closed.

On 12/14/92 when PT-2R was performed on the #2 compressor, the compressor would not pressurize the receivers. A work request was written to calibrate the unloader pressure switch. After calibration, Technical Staff Surveillance (TSS) 15.6.46, "PP Compressor Capability Test" was performed on the #2 compressor. During the test, the compressor would only achieve an output pressure of about 50 psig and it seemed as though the compressor was only using one side of the compressor cylinder to pressurize. TSS 15.6.46 caused residual water still left in the PP system from 1AD0042 and 2AD0044 being left open to collect at the #2 PP air compressor. The #2 unloader pressure switch sensing line and the #2 unloader air supply lines were drained and the test was continued. After completing TSS 15.6.46, PT-2R was performed on the #2 air compressor. The #2 PP air compressor did not unload within the acceptable pressure range of 95 to 100 psig. The compressor was still running loaded at 106 psig. The unloader pressure switch sensing line was again drained, and PT-2R was successfully performed.

#### C. APPARENT CAUSE OF EVENT

The cause of 1AD0042 being in the not fully closed position could not be determined. As part of the heat exchanger maintenance work, the section of piping including the mispositioned valves was removed and then reinstalled. The operator who performed the independent verification on the return to service of the equipment checked the eight valves that were inside the OOS boundary and verified that their positions were correct. The MMs who worked on the air compressors were interviewed and stated that no manipulation of valves took place during the maintenance. It can not be determined how this valve became mispositioned.

The cause of 2AD0044 being not fully closed could not be determined.

The cause of the water being found in the #1 and #2 PP air compressor aftercoolers was design deficiency. The #1 PP air compressor aftercooler heat exchanger is designed to have a common drain line for the air side and the water side. The air side drain valve, 1(2)AD0045, is normally closed, and the water side drain valves are normally closed. If 1(2)AD0042, 1(2)AD0044, OAD-0054, #0 compressor aftercooler drain crosstie valve, or OAD-0056, #0 compressor aftercooler drain valve, is open or leaking, then backflow from the water side of the aftercooler heat exchanger can flow into the moisture separator and subsequently into the PP air system.

A contributing cause of this event was a drawing deficiency. The piping and instrument drawing used to develop the OOS for the work on the #1 PP air compressor shows two lines coming out of the aftercooler but it is not apparent that one of the lines is for air and the other is for water. If this information was clear when the OOS was being developed, closer control could have been established to ensure that the two water side drain valves were closed when the equipment was returned to service.

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#### D. SAFETY ANALYSIS OF EVENT

The PP system supplies air to the containment mechanical penetrations and liner weld channels. The PP system is required to be pressurized at a pressure greater than calculated post-accident pressure, which is 47 psig. The PP system is divided into four zones on each unit and each zone is supplied by an air receiver normally maintained at a pressure of 100 psig. Each air receiver supplies PP air to its respective zone and maintains the required 49 psig to the downstream penetrations and weld channels. The IA system acts as the normal supply of air to each of the four air receivers on each unit. The IA system is backed up by three PP air compressors (one for each unit and one common) and each tap into the common header upstream of the PP air dryers. The PP air dryers dry the normal supply of IA (or PP air compressor air) before discharging into the PP air receivers. The common header contains pressure switches which control the #1, #2, and #0 PP air compressors. Should these switches sense low header pressure in the event of a loss of IA, they automatically start the PP air compressors. The #1 and #2 PP air compressor's switch autostart setpoint is 80 psig and the #0 PP air compressor switch autostart setpoint is 75 psig.

Should the unlikely event occur that there is a concurrent loss of both instrument air and all PP air compressors, the air receivers are designed to provide air to the PP system for up to four hours. The four hours is sufficient time to allow Operating to manually valve in the Nitrogen system which acts as a final backup to the PP system, and is capable of maintaining the required pressure of 49 psig to the mechanical penetrations and weld channels.

The PP system is required to be operable in Modes 1, 2, 3, and 4 per Technical Specification 3.9.2. At the time of this event Unit 1 was in Mode 1 and Unit 2 was in Mode 6.

Based on the previous information, there is no reason to believe that the containment isolation capability of the mechanical penetrations and weld channels was affected or degraded by the introduction of service water into the PP system. At the time of the event, the normal instrument air supply was available and the air receivers were pressurized to the required 100 psig. In addition, the backup Nitrogen system bottles were pressurized to the required 1970 psig and were available if required. After draining the PP system, all three PP air compressors have satisfactorily completed PT-2R. Furthermore, the containment isolation system at Zion Station is not evaluated as being a precursor to any accident in the FSAR or the UFSAR.

Due to the availability of redundant pressure supplies, the inoperability of the PP air compressors did not jeopardize the capabilities of the containment isolation systems on either unit.

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#### E. CORRECTIVE ACTIONS

1. The Technical Staff will review the design of the PP air compressor system and determine if the system should be modified. (295-180-92-10901)
2. The Control Room drawings have been enhanced to more clearly indicate the air and water sides of the PP air compressors to ensure that operators are aware of the design concern.
3. The Technical Staff will review all Safety Related plant system drawings with heat exchangers to ensure that the shell and tube side drains are clearly indicated. (295-180-92-10902)
4. The MM Department is currently reviewing and implementing a policy on manipulating valves during maintenance. (295-201-92-09001)
5. Since this event, the Operating Department has been made more aware that per Zion Administrative Procedure (ZAP) 300-06, "Station Equipment Out of Service and Personnel Protection Procedure", equipment can be included in OOSs without hanging a card on the equipment. Due to recent events, the Operating Department is currently reviewing their OOS and training policies to ensure that they are adequate. (295-201-92-09002)
6. Guidance will be issued to the Operating, Maintenance, Technical Staff, and Engineering/Construction Departments regarding manipulation of valves under various circumstances. (295-180-92-10903)

#### F. PREVIOUS EVENTS

LER 1-92-020 documented an event where the 1B Auxiliary Feedwater (AFW) Pump Discharge Isolation Valve, 1FW0038, was found to be not in the fully open position. The corrective actions for LER 1-92-020 would not have prevented LER 1-92-022.

LER 2-92-002 documented an inadvertent containment spray that was due to the plant not being in the correct condition as required by the prerequisites of the PT. The corrective actions from LER 2-92-002 would not have prevented LER 1-92-002.

#### G. COMPONENT FAILURE DATA

None