ENERGY NORTHWEST

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GO2-08-145

10 CFR 50.73

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397**
LICENSEE EVENT REPORT NO. 2008-001-00

Dear Sir or Madam:

Transmitted herewith is Licensee Event Report No. 2008-001-00 for Columbia Generating Station. This report is submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A). The enclosed report discusses items of reportability and corrective actions taken related to a Reactor Protection System Turbine Governor Valve fast closure scram due to failure of a compression fitting on the digital electro-hydraulic system that occurred on August 21, 2008.

There are no commitments being made to the NRC by this letter. If you have any questions or require additional information, please contact Mr. MC Humphreys at (509) 377-4025.

Respectfully,

SK Gambhir
Vice President, Technical Services

Enclosure: Licensee Event Report 2008-001-00

cc: EE Collins, Jr. – NRC RIV
CF Lyon – NRC NRR
INPO Records Center
NRC Sr. Resident Inspector – 988C (2)
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(9-2007)

APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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 an 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)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Columbia Generating Station	05000397	1 OF 4

4. TITLE

Reactor Scram due to Failed Compression Fitting

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
08	21	2008	2008	– 001	– 00	10	20	2008	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE
1

10. POWER LEVEL
65

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

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

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Richard M. Garcia, Senior Licensing Engineer	509-377-8463

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
D	JJ	TBG	SS23	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

ABSTRACT

On August 21, 2008, an automatic reactor scram occurred at 1606, while the plant was operating at 65% power due to electro-hydraulic fluid pressure loss caused by failure of a compression fitting on the digital electro-hydraulic (DEH) system. A turbine trip associated with low electro-hydraulic fluid pressure occurred shortly after the scram. All safety systems were available during the event and operated as designed. Plant operators effectively managed the transient. This event did not pose a threat to the health and safety of the public.

The direct cause was improper initial installation of a compression fitting in 2007. The root cause was less than adequate inspection and test requirements for installation of the compression fitting. Experimental data indicates that compression fittings on stainless steel tubing with wall thicknesses greater than or equal to 0.095 inches and outer diameters 3/4 inch or greater may be susceptible to these failures. Corrective actions have been completed to rework the failed hydraulic line and planned corrective actions will communicate lessons learned and revise the relevant procedures to prevent recurrence of this event. Additional actions will be taken to inspect similar fittings.

NARRATIVE

Plant Conditions

At the time of the event, the plant was operating in Mode 1 at 65% power for planned maintenance on Reactor Feedwater [SJ] Pump 1B (RFW-P-1B) coupling. Maintenance on RFW-P-1B was ongoing and the pump was out of service.

Event Description

On August 21, 2008, during performance of post maintenance testing of the DEH system following the planned replacement of the Channel B DEH Solenoid Trip Valve (DEH-SV-TRIP/B), a Swagelok compression fitting failed. Failure of the fitting and the subsequent loss of DEH fluid resulted in an immediate drop in DEH system trip header pressure to below the reactor protection system (RPS) [JC] trip setpoint of 1250 psig.

Per design, the low trip header pressure actuated the RPS system, scramming the reactor [RCT], via the Turbine Governor Valve Fast Closure, Trip Oil Pressure – Low signal. A recirculation [AD] pump trip was also associated with the scram. The scram occurred at 1606 hours and was followed by a main turbine [TA] trip about 23 seconds later.

The control room received a low DEH tank level alarm at about 1608 and dispatched an equipment operator to investigate. The equipment operator confirmed a DEH system leak that was not directly related to the maintenance previously performed on the DEH system. The control room operators secured the DEH pumps to limit the leak.

To prevent stratification, a reactor recirculation pump was restarted at about 1623, and the control room staff continued to monitor stable pressure decay and cooldown. By 1719, the DEH tank level had stabilized at 16.25 inches. As a result of the event, the DEH tank level dropped about 18 inches indicating a loss of approximately 90 gallons of Fyrquel hydraulic fluid. At 1930, the NRC Operations Center was notified in accordance with 10 CFR 50.72(b)(2)(iv)(B) via Event Notification #44432.

Immediate Corrective Actions

The turbine building [NM] sump pumps were stopped, and plant staff was dispatched to isolate, monitor and clean up the spill. The hydraulic line was reworked by reinstalling the existing tubing with a new, properly assembled compression fitting.

Assessment of Safety Consequences

This event did not pose a threat to the health and safety of the public. All safety systems operated as designed and there were no conditions that prevented the fulfillment of any safety function described in 10 CFR 50.73(a)(2)(v). While the failed fitting did result in a reactor trip, there was no resultant loss of mitigating equipment or functions, nor would such a loss be anticipated under any credible

alternate conditions.

Following the scram, reactor pressure was controlled initially via bypass valves while DEH pressure was adequate, and subsequently with main steam line drains. Reactor level was controlled to within the normal band with the feedwater and condensate systems [SD]. By keeping reactor water level within the normal band, and avoiding controlling pressure through safety relief valves, the challenge to the reactor pressure vessel posed by the scram was reduced.

The consequences of a similar event at full power instead of the lower power level of this event would not have been considerably more serious. The sequencing of the turbine trip lagging the scram by approximately 23 seconds did result in a water level swell that almost reached the level 8 (L8) trip setpoint. The timing of the turbine trip relative to the scram is not assumed to be constant and as such, exact response is difficult to ascertain. Under certain scenarios the L8 trip would be reached and might result in the need to restart a feedwater pump during the scram recovery, presenting a potential complication to the operators. Actual plant response during an event causing a L8 trip would still be bounded by the Final Safety Analysis Report (FSAR) Chapter 15 – Feedwater Controller Failure – Maximum Demand analysis. Improvements to the feedwater level control logic will be evaluated to determine if system design changes are necessary to further minimize the potential for a L8 trip during similar conditions in the future.

Cause of Event

The direct cause was a less than adequate swaging of the fitting due to improper assembly of the compression fitting. The rear ferrule of the fitting was reversed, reflecting a human performance error at original installation during the most recent refueling outage (R-18). This represents a cognitive failure to recognize that the fitting was improperly assembled at original installation. Swagelok supplies fittings in a ready to install assembly and checks to ensure proper orientation of ferrules. The design of the quadvoter block is such that bolt head interference prevents effective use of a wrench for installation. The assembly was likely disassembled and subsequently reassembled in order to use a socket for installation, introducing the potential for the ferrule reversal error. The reversed rear ferrule's inadequate grip on the tubing allowed the tubing to slide out of the fitting due to the pressure and other stresses the fitting was subjected to.

The root cause of this event is less than adequate installation and inspection/test requirements for the DEH compression fitting installation. Contributing causes identified by the root cause evaluation team include procedural deficiencies that result in inconsistent installation quality for compression fittings and less than adequate work order planning/appreciation of the risk for correct compression fitting installation for the DEH system.

Further Evaluation

As part of the determination of the extent of condition, the adequacy of the swaging process was experimentally evaluated for various types of stainless steel tubing. The range of tubing examined

included nominal 1/2 inch, 3/4 inch and 1 inch tubing with wall thicknesses ranging from 0.065 inches to 0.120 inches. The failed fitting was installed on 1 inch tubing that was 0.120 inches thick. Testing revealed that smaller diameter, thinner walled tubing could be adequately swaged even with a reversed rear ferrule. On the other hand, adequate swaging of thicker walled tubing was not consistently achievable using existing station procedures, even with the rear ferrule properly oriented. Results of testing demonstrated front ferrule slip for fittings installed on 1 inch outer diameter, 0.120 inch thick stainless steel tubing. When testing was performed with an improved swaging technique, no ferrule slip occurred. The potentially impacted fittings have been limited to 4 fittings on the quadvoter oil skid and three fittings on DEH Solenoid Valve 20 (DEH-SV-20). As noted below, the quadvoter fittings were tightened following the initial event.

Similar Events

The root cause team review of the corrective action program database from 1998 until present revealed the following similar event.

Problem evaluation request 203-2272 documents a concern discovered in 2003 related to Parker Ferulok fittings on the Reactor Coolant Cleanup system that were improperly set. Parker Ferulok fittings are similar to Swagelok in that both are stainless steel compression fittings. The 2003 event did not result in a plant trip, nor was the manufacturer of the compression fitting the same. As such, no extent of condition evaluation was required for addressing the event to look at other types of fittings such as Swagelok. The corrective actions resulting from the 2003 event resulted in enhancements only to the installation procedures for Parker Ferulok compression fittings. Therefore, since the significance of the 2003 event did not warrant an extent of condition review, the associated corrective actions from the 2003 event are not significant to the cause of the 2008 event.

Further Corrective Actions

A number of corrective actions have already been implemented related to this event and several more are planned to prevent recurrence. Full inspections for proper fit-up of thick-walled, 1-inch tubing installed on the quadvoter oil skid and on DEH-SV-20 will be performed during R-19.

An interim corrective action to convey lessons learned to personnel likely to work with compression fittings is planned. Longer term corrective actions to address extent of cause, extent of condition and to prevent recurrence include procedure revisions, training as warranted on the revised procedures, and enhancements to the risk management process.

Energy Industry Identification System (EIIS) Information codes from IEEE Standards 805-1984 and 803-1983

EIIS codes are represented in brackets as [XX] and [XXX] throughout the body of the narrative.