



# ENERGY NORTHWEST

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April 9, 2009  
GO2-09-065

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. 2009-001-00**

Dear Sir or Madam:

Transmitted herewith is Licensee Event Report No. 2009-001-00 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 that occurred on February 8, 2009.

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 2009-001-00

cc: EE Collins, Jr. – NRC RIV  
CF Lyon – NRC NRR  
INPO Records Center  
NRC Sr. Resident Inspector – 988C (2)  
RN Sherman – BPA/1399  
WA Horin – Winston & Strawn  
WC Walker – NRC RIV/fax

JE22  
NRR

<b>NRC FORM 366</b> <b>U.S. NUCLEAR REGULATORY COMMISSION</b> (9-2007)		<b>APPROVED BY OMB NO. 3150-0104</b> <b>EXPIRES 08/31/2010</b> 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 <a href="mailto:infocollects@nrc.gov">infocollects@nrc.gov</a> , 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.																																					
<b>LICENSEE EVENT REPORT (LER)</b> (See reverse for required number of digits/characters for each block)																																							
<b>1. FACILITY NAME</b> Columbia Generating Station		<b>2. DOCKET NUMBER</b> 05000397	<b>3. PAGE</b> 1 OF 4																																				
<b>4. TITLE</b> Reactor Scram due to Turbine Control System Trip Header Depressurization																																							
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<b>10. POWER LEVEL</b> 075		<table style="width: 100%;"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td>Specify in Abstract below or in NRC Form 366A</td> </tr> </table>		<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A
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<b>12. LICENSEE CONTACT FOR THIS LER</b>																																							
FACILITY NAME Kyle D. Christianson, Principal Licensing Engineer		TELEPHONE NUMBER (Include Area Code) 509-377-4315																																					
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>																																							
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<b>ABSTRACT</b> <p>On February 8, 2009 at 1125 hours, an automatic reactor scram occurred while Columbia was operating in Mode 1 at 75% power. The Digital Electro-Hydraulic (DEH) Control System emergency trip header momentarily depressurized during testing following on-line quadvoter valve assembly replacement. A Turbine Governor Valve Fast Closure trip signal was generated and a reactor scram occurred.</p> <p>The direct cause of the event was the introduction of air into the DEH system during quadvoter valve replacement and subsequent compression of the unvented, entrapped air during post maintenance testing. The compression resulted in backflow and excursion of the trip header pressure below the trip setpoint. The root cause is design deficiencies in the on-line serviceable quadvoter assembly which allowed system conditions that resulted in a reactor trip following performance of on-line maintenance activities.</p> <p>Both quadvoter valve assemblies in the affected channel were replaced. Prior to reactor startup, the DEH system was vented and tested to ensure removal of all air. Corrective actions to address quadvoter design deficiencies and to improve quadvoter performance are being pursued.</p> <p>This event did not adversely affect the health and safety of the public. Since the installation of a new DEH system at Columbia in 2007, one similar event was reported by Energy Northwest in LER 2008-001-00.</p>																																							

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**NARRATIVE**

Plant Condition

The plant was operating in Mode 1 at 75% power at the time of this event.

Event Description

On January 29, 2009, Quadvoter "B" (DEH-SV-TRIP/B) failed during performance of weekly surveillance testing of the solenoid valves in the DEH system [JJ] quadvoter hydraulic trip block [HCU]. The quadvoter valve assemblies are designed for on-line repair and Columbia Licensee Controlled Specifications Surveillance Requirements require a failed channel be returned to operable status within 14 days.

On February 8, 2009, Quadvoter "B" was isolated, replaced, vented, and unisolated in accordance with maintenance work instructions. Weekly surveillance testing was performed as the prescribed post maintenance testing prior to returning the quadvoter channel to operable status. During this testing, the DEH system experienced pressure transients and the trip header of the quadvoter valves momentarily depressurized below the Turbine Governor Valve Fast Closure trip setpoint. Both Reactor Protection System (RPS) [JC] trip systems received reactor trip signals and, at 1125 PST, a full scram of the reactor [RCT] occurred.

All rods fully inserted as expected in response to the RPS actuation and heat removal through the main condenser [SG] was maintained. A reactor water level 3 isolation occurred with the minimum level attained being zero inches. Post trip reactor vessel water level was maintained in the normal band using the feedwater [SJ] and condensate systems [SD] and pressure was controlled in the normal band using the bypass valves and main steam line drains. No other safety systems actuated or were required to actuate. There was no inoperable equipment at the start of the event that contributed to the event. Off-site power was available and three emergency diesel generators [EK] were operable and available. Crew recognition, response, and decision making enabled effective management of the transient.

At 1808 EST (1508 PST), the NRC was notified of the RPS actuation per 10 CFR 50.72(b)(2)(iv)(B) (reference event notification number 44839). This LER is submitted pursuant to 50.73(a)(2)(iv)(A) as an event or condition that resulted in automatic actuation of the reactor protection system.

Immediate Corrective Action

Following the event, testing was performed to determine the cause of the scram. With the reactor shutdown in Mode 4, Quadvoter "B" was again replaced, vented per instructions provided for on-line replacement, and the weekly surveillance testing re-performed. During the testing, pressure measurements of the trip header were conducted. The weekly surveillance testing independently de-energizes and re-energizes the solenoid valves to demonstrate proper operation. A pressure transient occurred when Quadvoter "B" was re-energized causing the trip header pressure to momentarily drop below trip point limits. The testing illustrated that the DEH system was not completely vented of air.

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Cause

The direct cause of the scram was the compression of unvented, entrapped air in the DEH system following maintenance which momentarily depressurized the trip header. Air introduced into the inter-valve cavity line between Quadvoter "A" (DEH-SV-TRIP/A) and Quadvoter "B" serial pair during the replacement was incapable of being vented due to system design. When Quadvoter "B" was re-energized, the air was aligned with the trip header which resulted in backflow and momentary depressurization.

The root cause of the event was design deficiencies in the on-line serviceable quadvoter valve assembly which allowed system conditions that resulted in a reactor trip following performance of on-line maintenance activities. Several contributing causes were identified: 1) The quadvoter solenoid valves which require on-line replacement are experiencing high failure rates. The failures are attributable to the degradation of the DEH Fyrquel fire-retardant hydraulic fluid due to excessive heat from the pilot valve coils of the quadvoter solenoid valve assemblies. 2) Inadequate Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) did not determine a design deficiency existed prior to plant installation. 3) The trip header does not have a pressure monitoring system for evaluating trip header response during routine and post maintenance testing.

Further Corrective Action

Quadvoter "A" was replaced to ensure both valves in at least one DEH trip channel were new. With the reactor shutdown in Mode 4, the system was operated and vented until testing verified no air remained entrapped and no significant pressure transients resulted from solenoid valve operation. Temporary cooling fans have been installed at the Quadvoter assembly to reduce hydraulic fluid heating. Additional valve cycling during the weekly surveillance is being performed to facilitate hydraulic fluid exchange in the solenoids and reduce the potential for valve sticking. These actions provide greater system reliability for operation until the next scheduled outage (R-19, May – June 2009) when design modifications to prevent recurrence will be implemented.

To permit future on-line replacement of quadvoter valve assemblies, design modifications to the DEH system are being assessed and prepared for implementation during the R-19 outage. The modifications will allow venting of the DEH system following maintenance, prevent depressurization of the trip header during pressure transients, provide quadvoter solenoids that operate within the normal temperature range of the DEH hydraulic fluid, and provide a pressure monitoring system for the trip header. Until completion of the modifications, on-line replacement of quadvoter valve assemblies will not be performed.

To ensure design deficiencies are identified prior to plant installation, station procedures are being prepared to address inadequacies and strengthen FAT and SAT testing.

Assessment of Safety Consequences

For this event, High-Pressure Core Spray (HPCS) [BG], Reactor Core Isolation Cooling (RCIC) [BN], and both trains of emergency AC power [EA, EB & EK] and Residual Heat Removal (RHR) [BO] systems were capable of performing their intended safety function. This event did not involve an event or condition that could have prevented the fulfillment of any safety function described in 10 CFR 50.73(a)(2)(v). This event posed no threat to the health and safety of the public or plant personnel and was therefore, not safety significant.

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Similar Events

Since installation of the new DEH system at Columbia in 2007, one similar event was reported by Energy Northwest in LER 2008-001-00. On August 21, 2008, during performance of post maintenance testing of the DEH system following the planned replacement of Quadvoter "B," a Swagelok compression fitting failed. The failure resulted in an immediate drop in DEH system trip header pressure to below the RPS trip setpoint and a full scram of the reactor occurred. The root cause of the event was determined to be less than adequate installation and inspection/test requirements for the DEH compression fitting installation.

Energy Industry Identification System (EIIS) Information codes from IEEE Standards 805-1984 and 803-1983: EIIS information denoted as [XX] or [XXX] throughout the narrative.