



Robert J. Bayer  
Plant Manager

October 18, 2021  
WO 21-0037

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

Subject: Docket No. 50-482: Licensee Event Report 2021-004-00, "Low Steam Generator Level due to Main Feedwater Valve Failure Caused Automatic Reactor Trip"

Commissioners and Staff:

The enclosed Licensee Event Report (LER) 2021-004-00 is being submitted pursuant to 10 CFR 50.73(a)(2)(iv)(A) regarding an Engineered Safety Features Actuation and automatic reactor trip at Wolf Creek Generating Station.

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4015, or Ron Benham at (620) 364-4204.

Sincerely,

A handwritten signature in black ink, appearing to read "R. J. Bayer", written in a cursive style.

Robert J. Bayer

RJB/rtt

Enclosure: LER 2021-004-00

cc: S. S. Lee (NRC), w/e  
S. A. Morris (NRC), w/e  
N. O'Keefe (NRC), w/e  
Senior Resident Inspector (NRC), w/e

(08-2020)



**LICENSEE EVENT REPORT (LER)**

(See Page 3 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 FOIA, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollections.Resource@nrc.gov](mailto:Infocollections.Resource@nrc.gov), and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: [oir\\_submission@omb.eop.gov](mailto:oir_submission@omb.eop.gov). The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

<b>1. Facility Name</b> Wolf Creek Generating Station	<b>2. Docket Number</b> 05000 482	<b>3. Page</b> 1 OF 3
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**4. Title**  
Low Steam Generator Level due to Main Feedwater Valve Failure Caused Automatic Reactor Trip

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
08	18	2021	2021	004	00	10	18	2021		05000
									Facility Name	Docket Number
										05000

<b>9. Operating Mode</b> 1	<b>10. Power Level</b> 100%
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**11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)**

<b>10 CFR Part 20</b>	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<b>10 CFR Part 73</b>
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	<b>10 CFR Part 21</b>	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<b>10 CFR Part 50</b>	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<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)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

**OTHER** (Specify here, in abstract, or NRC 366A).

**12. Licensee Contact for this LER**

Licensee Contact Ron Benham, Director Nuclear and Regulatory Affairs	Phone Number (Include area code) (620) 364-4204
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**13. Complete One Line for each Component Failure Described in this Report**

Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS
B	SJ	FCV	C635	Y					

<b>14. Supplemental Report Expected</b>	<b>15. Expected Submission Date</b>	Month	Day	Year
<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)				

**16. Abstract** (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)  
At 1036 Central Daylight Time (CDT) on 8/18/2021, Wolf Creek Generating Station (WCGS) experienced a reactor trip due to low level in the 'B' steam generator. WCGS was operating in MODE 1 at 100% power when the trip occurred. ENS notification #55416 was made at 1251 CDT in accordance with 10 CFR 50.72(b)(2)(iv)(B) due to reactor scram, and 10 CFR 50.72(b)(3)(iv) (A) for an auxiliary feedwater system actuation. All control rods dropped, all equipment functioned as designed, and offsite power remained available.

The direct cause was a fracture of the valve stem for the 'B' steam generator main feedwater regulating valve, causing the valve to fail closed and resulting in a loss of feed flow control to the 'B' steam generator. The hardware failure analysis performed on the valve stem determined that the fracture was due to a fatigue crack which had propagated through the stem of the valve. Tool marks within the thread root, as well as the thread root being cut deeper and narrower were identified as stress risers which allowed the crack to propagate into the material of the stem.

Dye penetrant testing of the replacement stem, and on the existing valve stems of the three other main feedwater regulating valves, showed no relevant indications.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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<b>1. FACILITY NAME</b> Wolf Creek Generating Station	<b>2. DOCKET NUMBER</b> 05000- 482	<b>3. LER NUMBER</b>		
		<b>YEAR</b> 2021	<b>SEQUENTIAL NUMBER</b> 004	<b>REV NO.</b> 00

**NARRATIVE**

**PLANT CONDITION PRIOR TO EVENTS**

The plant was operating in Mode 1 at 100% power when the reactor tripped. No systems, structures, or components (SSCs) were inoperable at the beginning of the event which contributed to the event.

**DESCRIPTION OF STRUCTURE(S), SYSTEM(S), AND COMPONENT(S)**

Energy Industry Identification System (EIIIS) codes and component codes are identified in the text as [XX].

The main feedwater regulating valves (MFRVs) [SJ-FCV] are air operated angle valves which automatically control feedwater flow to the steam generators (SGs) [SB-SG] between 30 percent and full power. The MFRVs are located in the turbine building. The MFRVs also can provide backup isolation of main feedwater flow in the event that a main feedwater isolation valve (MFIV) [SJ-ISV] fails to close.

Closure of the MFIVs or MFRVs terminates flow to the SGs, in the event of a feedwater line break occurring upstream of the MFIVs or MFRVs. Since the MFIVs are located upstream of the point where the auxiliary feedwater lines connect to the main feedwater lines, which is in turn upstream of the main feedwater check valves (located in Area 5 inside the auxiliary building), closure of the MFIVs or the MFRVs ensures delivery of auxiliary feedwater to the SGs for support of the auxiliary feedwater function in the event of a main feedwater line break in the turbine building.

AEFCV0520 is the MFRV on the main feedwater line which feeds the 'B' SG and has a Copes-Vulcan actuator. The actuator valve stem is made from ASTM A276 Type 316 Condition B stainless steel with a 1" in diameter and 8 UNC-2A threads.

**EVENT DESCRIPTION**

Wolf Creek Generating Station (WCGS) was operating in Mode 1 at 100% power on August 18, 2021, when at 1035 Central Daylight Time (CDT), feed water flow began dropping. As a result of the lower flow, valve demand increased which caused the valve position indication to increase. The balance-of-plant (BOP) operator reported that going to manual would not change the course of the transient as the signal was responding properly to actual level decrease. The BOP operator was then directed to trip the plant based on loss of flow indication. But prior to taking action, SG 'B' level fell below the low SG level reactor trip and main feedwater isolation set point of 23.5 percent and at 1036 CDT, the reactor automatically tripped. This resulted in a Main Feedwater Isolation and an Auxiliary Feedwater Actuation. All control rods dropped, all required safety systems functioned as designed, and offsite power remained available.

**BASIS FOR REPORTABILITY**

The reactor trip and actuation of Engineered Safety Feature Actuation System (ESFAS) instrumentation actuation described in this event is reportable per 10 CFR 50.73(a)(2)(iv)(A), which requires reporting of "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a) (2) (iv) (B) of this section..." Paragraph (B)(1) of 10 CFR 50.73(a)(2)(iv) includes "Reactor Protection System (RPS) including: reactor scram or reactor trip." Paragraph (B)(6) of 10 CFR 50.73(a)(2)(iv) includes "PWR auxiliary or emergency feedwater."

ENS notification 55416 was made at 1251 CDT on August 18, 2021, in accordance with 10 CFR 50.72(b)(2)(iv)(B), which requires notification within 4 hours, and 10 CFR 50.72(b)(3)(iv)(A) which requires notification within 8 hours.



**LICENSEE EVENT REPORT (LER)  
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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Wolf Creek Generating Station	05000- 482	2021	004	00

**NARRATIVE**

**CAUSE**

The direct cause was a fatigue crack propagated through the stem of AEFCV0520, causing the stem to fracture, resulting in a loss of feed flow control to the 'B' Steam Generator.

The root cause was tool marks within the thread root caused local stress risers, which allowed multiple cracks to initiate. In addition, the thread root was also cut deeper and narrower than allowed by specification. This created an additional stress riser which allowed the cracks to propagate into the body of the valve stem.

**CORRECTIVE ACTIONS**

Actions taken:

AEFCV0520 was disassembled and then reassembled with a replacement valve stem. The replacement valve stem was satisfactorily inspected (no visible indications) using dye penetrant testing prior to installation. Dye penetrant testing of the stems on the other three main feedwater control valves was also performed to look for surface indications of cracking. No relevant indications were identified on any of the other three stems.

Actions planned:

A new Preventive Maintenance (PM) activity will be created to replace the stems on the four MFRVs on a 7.5-year interval. The frequency of 7.5 years for this time-directed stem replacement PM was set based on the life span of the valve stem that failed, and therefore considers a valve stem with sharper than allowed threads and tooling marks. In addition, a methodology and scope for verifying root depth of threads on replacement stems for critical valves will be implemented.

**SAFETY SIGNIFICANCE**

There were no safety consequences impacting plant or public safety from this event. All control rods dropped, offsite power remained available, and all safety equipment operated appropriately and as designed. There was no loss of any function that would have prevented fulfillment of actions necessary to: shutdown the reactor and maintain it in a safe shutdown condition, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident.

**OPERATING EXPERIENCE/PREVIOUS EVENTS**

None