



Robert J. Bayer
Plant Manager

September 14, 2022
WO 22-0022

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

Subject: Docket No. 50-482: Licensee Event Report 2022-001-00, "Low Steam Generator Level due to Main Feedwater Valve Failure Caused Reactor Trip"

Commissioners and Staff:

The enclosed Licensee Event Report (LER) 2022-001-00 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 Dustin T. Hamman 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/jkt

Enclosure: LER 2022-001-00 (NRC Form 366)

cc: S. S. Lee (NRC), w/e
S. A. Morris (NRC), w/e
G. E. Werner (NRC), w/e
Senior Resident Inspector (NRC), w/e



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, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: 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.

1. Facility Name Wolf Creek Generating Station	2. Docket Number 05000 482	3. Page 1 OF 4
--	---	---------------------------------

4. Title
Low Steam Generator Level due to Main Feedwater Valve Failure Caused 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
07	18	2022	2022	- 001 -	00	9	14	2022		05000
									Facility Name	Docket Number
										05000

9. Operating Mode 1	10. Power Level 100%
-------------------------------	--------------------------------

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

10 CFR Part 20	<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)	10 CFR Part 73
<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)	10 CFR Part 21	<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)	10 CFR Part 50	<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 Dustin Hamman, Director Nuclear and Regulatory Affairs	Phone Number (Include area code) (620) 364-4204
--	--

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					

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

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)
At 1803 Central Daylight Time (CDT) on July 18, 2022, Wolf Creek Generating Station (WCGS) experienced an automatic 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 #56005 was made at 2017 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 of the event was a failure of the valve stem for the 'B' steam generator (SG) main feedwater regulating valve (MFRV), causing the valve to fail closed and resulting in a loss of feedwater flow control to the 'B' SG. The hardware failure analysis performed on the valve stem determined that the failure of the valve stem was due to stress corrosion cracking (SCC) initiating from the external surface within the region contained within the packing area. The root cause investigation found that during the previous valve rebuild, an inappropriate chemical (anti-seize) was applied to the stem for lubrication to assist in the rebuild. It was the presence of this chemical which caused the SSC that led to the failure. All four MFRVs are scheduled to be rebuilt during the upcoming refueling outage in October 2022 with all four valve stems then being sent off to be examined to look for evidence of SCC.



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

(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, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: 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.

1. FACILITY NAME Wolf Creek Generating Station	2. DOCKET NUMBER 05000- 482	3. LER NUMBER		
		YEAR 2022	SEQUENTIAL NUMBER 001	REV NO. 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 (EII) 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 chrome plating.

EVENT DESCRIPTION

Wolf Creek Generating Station (WCGS) was operating in Mode 1 at 100% power on July 18, 2022, when at 18:02:55 Central Daylight Time (CDT), 'B' SG feed flow dropped from 3.85M lbm/hr to 690K lbm/hr. This caused an alarm in the Control Room for 'B' SG Flow Mismatch. The Ovation feedwater control system responded by taking the 'B' MFRV demand and positioning to 100% open as well as increasing main feedwater pump speed, though flow through the 'B' SG did not respond. The Control Room Operators identified the issue and were in progress of tripping the reactor based on these conditions; however, at 18:03:22 (27 seconds after first alarm), the reactor tripped automatically due to Low Level on the 'B' SG (23.5% on 2/4 level instruments). 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 56005 was made at 2017 CDT on July 18, 2022, 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)
CONTINUATION SHEET**

(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 Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: oira_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.

1. FACILITY NAME Wolf Creek Generating Station	2. DOCKET NUMBER 05000- 482	3. LER NUMBER		
		YEAR 2022	SEQUENTIAL NUMBER 001	REV NO. 00

NARRATIVE

CAUSE

The direct cause of the event was a failure of the valve stem for the 'B' SG MFRV, causing the valve to fail closed and resulting in a loss of feedwater flow control to the 'B' SG. The hardware failure analysis performed on the valve stem determined that the failure of the valve stem was due to stress corrosion cracking (SCC) initiating from the external surface within the region contained within the packing area.

The root cause was determined to be that the work instructions for assembling MFRVs were inappropriately updated to include a chemical (anti-seize) that was used in a way that is different than its intended purpose and was introduced into the packing area, causing SCC in the stem until it ultimately failed.

A contributing cause was that the use of a chrome plated stem, rather than a stem with a polished stainless steel surface, cultivated an environment for SCC to occur below the chrome layer. The unavoidable microcracks that are formed during chrome plating allowed contaminants to deposit and promoted crack growth.

CORRECTIVE ACTIONS

Actions taken:

- The 'B' MFRV was rebuilt and placed back into service with WCGS returning to Mode 1 at 0238 CDT on July 22, 2022.
- A training request was initiated for planners and implementers on the effects of chemicals on stainless steel components and the importance of internal cleanliness.
- A training request was initiated for Engineers to better understand SCC, including External SCC and Outside Diameter SCC.

Actions planned:

- Core Work Instructions (CWI) will be generated for MFRV disassembly and reassembly to ensure that the use of anti-seize is not used as a lubricant on the unthreaded portion of the valve stem.
- The Vendor Technical Manual will be revised to include a note during the assembly of the valve to not use a lubricant on the stem when lowering the bonnet onto the valve body.
- Preventive maintenance work orders for MFRV rebuilds will be revised to no longer include the use of anti-seize on the stem during valve reassembly.
- The stems for all four MFRVs, which will be rebuilt during Refueling Outage 25 in October 2022, will be sent out to be examined for evidence of SCC.
- Additionally, the design drawing for the MFRV will be revised to no longer allow the use of chrome plated valve stems.



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

(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 Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: 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.

1. FACILITY NAME Wolf Creek Generating Station	2. DOCKET NUMBER 05000- 482	3. LER NUMBER		
		YEAR 2022	SEQUENTIAL NUMBER 001	REV NO. 00

NARRATIVE

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

On August 18, 2021, WCGS experienced an automatic reactor trip due to Low Level in the 'B' SG (see LER 2021-004-00 dated October 18, 2021). The direct cause of this event was the propagation of a fatigue crack through the valve stem of the 'B' MFRV which caused the stem to fracture resulting in a loss of feed flow control to the 'B' SG. The root cause was determined to be 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. Though, both failures occurred on the same valve, this condition is not viewed as a repeat event due to differences in the failures. The valve stem that failed in 2021, had ultimately failed after 10 years of operation. The failure in 2022 occurred in the packing area and failed only after 11 months of operation. The hardware failure analysis identified the cause of the failure in 2022 as SCC. There were no signs of SCC in the failure area of the stem in 2021. Therefore, the failure of the stem in 2022 could not have been prevented on what was known during the evaluation of the 2021 failure. Thus, this is not a repeat event.