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Kevin Bronson
Site Vice President - JAF

August 8, 2011
JAFP-11-0100

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: LER: 2011-003-00, Safety Relief Valve Setpoints Outside of Allowable
Tolerances
James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

Dear Sir or Madam:

This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the Plant's Technical Specifications."

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Joseph Pechacek, Licensing Manager, at (315) 349-6766.

Sincerely,

A handwritten signature in black ink that reads "Kevin Bronson".

Kevin Bronson
Site Vice President

KB/JP/mh

Enclosure(s): 1. JAF LER 2011-003-00, Safety Relief Valve Setpoints Outside of
Allowable Tolerances

cc: USNRC, Region 1
USNRC, Project Directorate
USNRC Resident Inspector
INPO Records Center

LICENSEE EVENT REPORT (LER)

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 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@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.

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James A. FitzPatrick Nuclear Power Plant

2. DOCKET NUMBER

05000333

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4. TITLE

Safety Relief Valve Setpoints Outside of Allowable Tolerances

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
06	08	2011	2011	003	00	08	08	2011	N/A	05000
									N/A	05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
1	<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 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)
10. POWER LEVEL	<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 checked="" 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

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Mr. Joseph Pechacek, Licensing Manager

TELEPHONE NUMBER (Include Area Code)

(315) 349-6766

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
B	SB	RV	T020	Y					

14. SUPPLEMENTAL REPORT EXPECTED

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

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

Review of the as-found test results for eleven Safety / Relief Valve (S/RV) pilot assemblies removed and replaced during the September 2010 Refueling Outage, determined that five S/RVs were outside the allowable as-found tolerance of 1145 psig +/- 3% (+/- 34.3 psig) required by Technical Specification (TS) Surveillance Requirement (SR) 3.4.3.1. Also, two of the eleven S/RVs tested were found to have excessive seat leakage to the point where as-found testing could not be performed.

The effect of these S/RVs being out of tolerance was analyzed and the results of this analysis show that nuclear plant safety was not adversely affected due to the availability of the Electric Lift System. Consequently, the safety significance of this event was minimal. The Root Cause for the failure of the S/RVs was determined to be corrosion bonding between the S/RV pilot disc and seat, a recognized industry generic problem with 2-stage Target Rock relief valves.

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NARRATIVE

BACKGROUND

The James A. FitzPatrick Nuclear Power Plant (JAF) used eleven (11) two-stage Target Rock Safety / Relief Valves (S/RV) [SB] for emergency pressure relief through operating cycle 19. These valves are located inside the primary containment, and relieve pressure from the main steam lines to the torus. The valves were manually actuated once for operating cycle 19 at start-up in order to demonstrate their ability to open. They were not subsequently tested during the plant operating cycle since actuation would result in an unnecessary transient.

During each refueling outage, approximately one-third of the S/RV main body assemblies and all eleven of the pilot assemblies are removed and replaced with vendor tested and certified components. The main bodies and pilots that are replaced are sent to a vendor facility for testing, refurbishment, and certification. The test results for pilot assemblies removed in September 2010, during Refueling Outage 19, identified five S/RV pilot assemblies that would not have opened within the Technical Specification (TS) setpoint tolerance of 1145 psig +/- 3% (1110.7 – 1179.4 psig), and two S/RV assemblies where excessive seat leakage prevented as-found testing.

Oxide bridging or corrosion bonding is a crevice corrosion phenomenon that occurs to highly polished metals in a wetted solution in close proximity to each other. This close proximity (usually a gap of between 0.1 and 100 μm) creates a crevice-like condition between the two wetted surfaces setting up the conditions for crevice corrosion to occur. An oxygen rich environment is created by the accumulation of oxygen in the area of the pilot disc due to the breakdown of water into hydrogen and oxygen. The correct material in the right geometry with exposure to oxygen and high temperature are the conditions which cause corrosion bonding in JAF S/RVs. There is extensive industry experience with corrosion bonding in the Target Rock 2-Stage S/RVs pilot assemblies.

In order to prevent S/RV leakage, several corrective actions have been implemented: enhanced insulation was installed on pilot assemblies, ventilation was redirected to limit cooling effect, and pilot assemblies were replaced with recently refurbished, tested and certified assemblies. Additionally, a Technical Specification Amendment was approved that allows JAF to implement a new test method. S/RV testing is now performed in accordance with the Inservice Testing Program. The S/RV surveillance test is now verified through a series of overlapping tests prior to startup. By using this overlapping test approach, it is not necessary to lift the S/RVs during startup. This test method was used in 2010 for startup from Refueling Outage 19 and is expected to alleviate some of the issues with S/RV leakage.

In order to address the concerns with corrosion bonding and S/RV leakage, JAF has begun a phased conversion to 3-Stage Target Rock S/RVs. Industry experience has shown that the 3-Stage S/RVs are less susceptible to the corrosion bonding and they reduce the risk that S/RV leakage will occur. Because 3-Stage S/RVs have a greater mechanical force compared to 2-Stage Target Rock S/RVs, there will be more force on the pilot seat to prevent them from leaking and more force to break corrosion bonding when the valve needs to open.

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EVENT DESCRIPTION

As-found testing was performed on all eleven Main Safety / Relief Valves (S/RV) pilot assemblies removed in September 2010, during Refueling Outage 19. The testing was conducted between May 1, 2011 and June 3, 2011 by Wyle Laboratories. The TS setpoint for each S/RV is 1145 psig +/- 3%. During the initial lift test, five of the eleven pilot assemblies failed to open within the allowed setpoint tolerance of +/-3% (1110.7 to 1179.3 psig). The following table summarizes the test results for the 5 pilot assemblies that failed the initial lift test: 1235, 1218, 1045, 1217 and 1195. The following two pilots could not be tested for set point drift: 1236 and 1191, due to excessive pilot valve seat leakage.

In-service Location	Pilot Serial Number	First Test (psig)	Acceptance Range 1111-1179	Over Pressure Analysis Limit 1195 psig
02RV-71H	1235	1189	Unsat	Under
02RV-71B	1218	1208	Unsat	Over
02RV-71C	1045	1206	Unsat	Over
02RV-71G	1217	1192	Unsat	Under
02RV-71K	1195	1246	Unsat	Over
02RV-71F	1236	----	Not Tested	
02RV-71E	1191	----	Not Tested	

Additional tests performed on five of the seven pilot assemblies passed the acceptance criteria of +/-3%. The root cause for the high lift setpoint on the five pilot assemblies was determined to be corrosion bonding between the pilot valve disc and seat. Due to the limited capacity of the vendor test equipment, two other pilots assemblies (1236 and 1191) were precluded from as-found testing due to excessive pilot seat leakage.

TS LCO 3.4.3 requires nine operable S/RVs when in Modes 1, 2 or 3. Specifically, the LCO states: "The safety function of nine S/RVs shall be OPERABLE." Since less than nine of eleven pilot valves were within allowable setpoint tolerance, this report is being made under 10 CFR 50.73(a)(2)(i)(B), "Any operation or condition which was prohibited by the plant's Technical Specifications..."

Three S/RV main bodies and pilots were replaced with certified 3-Stage Target Rock S/RV assemblies and the remaining eight pilot assemblies were replaced with certified 2-Stage pilots during the refueling outage. The replacement main bodies and pilot assemblies were tested in accordance with the IST program as required by the plant Technical Specifications; therefore, all installed S/RVs are OPERABLE.

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EVENT ANALYSIS

The S/RVs provide overpressure protection for the Reactor Coolant Pressure Boundary (RCPB) as required by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. S/RV pilots actuating at pressures higher than the required setpoint may be significant if adequate overpressure protection is not available. The RCPB Overpressure Analysis is performed each fuel cycle, based on the worst case anticipated transient with nine S/RVs opening at an analyzed upper pressure limit of 1195 psig, and two S/RVs out of service. Although the Electric Lift System installed in 2000 is not credited in the RCPB Overpressure Analysis, it was OPERABLE throughout the operating cycle. This system energizes solenoid valves which supply pneumatic pressure to assist in overcoming corrosion bonding. Based on industry experience, this Electric Lift System compensates for corrosion bonding, and was available to mitigate the effects of corrosion bonding on the five S/RV pilot assemblies that exhibited this failure mode.

The as-found tests for S/RV pilot 1236 and 1191 could not be completed. These S/RV pilots were not tested due to excessive seat leakage that would have required additional steam flow during as-found testing. The additional steam flow could not be provided by the lab test equipment.

The safety significance of this event is considered low and does not decrease the effectiveness of plant barriers providing safety to the public.

CAUSE OF EVENT

The root cause for the five high out-of-tolerance pilot setpoints was determined to be corrosion bonding between the S/RV pilot disc to seat [Cause Code B]. Conditions conducive to corrosion bonding exist in the S/RV pilot disc and seat at JAF; the correct material in the right geometry with exposure to oxygen and high temperature. With a bond forming between the pilot disc and seat, more pressure is required to raise the pilot disc off its seat. Since the normal balance of pilot assembly spring force and steam pressure force necessary to lift the pilot disc corresponds to the nominal setpoint of the S/RV, the pilot disc to seat bond results in a higher pilot lift setpoint.

EXTENT OF CONDITION

All of the S/RVs are susceptible to setpoint drift due to pilot disc to seat corrosion bonding. This is a recurring industry issue that has been the subject of both Nuclear Regulatory Commission (NRC) and Boiling Water Reactor Owner's Group (BWROG) generic assessments. Based on the known industry wide issues with the two-stage Target Rock S/RVs JAF has implemented the following industry recommendations:

1. Installed Stellite 21 discs in all eleven S/RVs pilot assemblies during refurbishment at the vendor facility;
2. Installed the electric lift system recommended by the BWROG;
3. Installed enhanced insulation on the S/RVs;
4. Redirected ventilation air flow away from the S/RVs; and
5. Began phased replacement of 2-Stage S/RVs with 3-Stage (3 replacements installed during R-19).

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FAILED COMPONENT IDENTIFICATION

Manufacturer: Target Rock Corporation
 Model Number: 7567F-10
 NPRDS Manufacturer Code: T020
 FitzPatrick Component ID: 02RV-71B, C, E, F, G, H & K

CORRECTIVE ACTIONS

Corrective Actions Completed Prior to this Report:

1. Installed enhanced insulation on pilot assemblies.
2. Redirected ventilation to limit cooling effect.
3. Replaced pilot assemblies with recently refurbished, tested and certified assemblies.
4. Replaced 3 S/RV's with the new 3-Stage S/RVs.

Planned Corrective Actions:

1. Replace the remaining 2-stage Target Rock S/RV's with new 3 stage Target Rock S/RV's.

ASSESSMENT OF SAFETY CONSEQUENCES

The effect of the lift setpoints for these S/RVs being out of tolerance was analyzed and nuclear plant safety was not adversely affected based on Electric Lift System Operability. Consequently, the safety significance of this event was minimal.

This event did not result in a safety system functional failure as defined by NUREG 1022, Revision 2 and NEI 99-02, Revision 5.

SIMILAR EVENTS

1. JAF LER-09-005 "Safety Relief Valve Setpoint Drift," June 22, 2009.
2. JAF LER-07-001 "Safety Relief Valve Setpoint Drift," August 6, 2007.
3. JAF LER-05-002 "Safety Relief Valve Setpoint Drift," June 6, 2005.
4. JAF LER-03-002 "Safety Relief Valve Setpoint Drift," October 16, 2003.
5. JAF LER-01-005 "Safety Relief Valve Setpoint Drift," August 17, 2001.
6. JAF LER-99-003 "Safety Relief Valve Setpoint Drift," March 16, 1999.
7. JAF LER-98-002 "Safety Relief Valve Setpoint Drift," April 9, 1998.

REFERENCES

1. JAF Condition Report CR-JAF-2011-03011, Seven of the eleven pilots failed as-found testing
2. JAF Condition Report CR-JAF-2009-01439, Five of the eleven pilots failed as-found testing.
3. JAF Condition Report CR-JAF-2007-02108 and CR-JAF-2007-02937, Root Cause Analysis Report, Seven of ten S/RV pilots failed as-found testing (testing high out of tolerance).