10CFR50.73

Virginia Electric and Power Company
Surry Power Station
5570 Hog Island Road
Surry, Virginia 23883

January 17, 2020

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

Serial No.: 20-023
SPS: SCN
Docket No.: 50-281
License No.: DPR-37

Dear Sir or Madam:

Pursuant to 10CFR50.73, Virginia Electric and Power Company hereby submits the following Licensee Event Report applicable to Surry Power Station Unit 2.

Report No. 50-281 / 2019-002-00

This report has been reviewed by the Station Facility Safety Review Committee and will be forwarded to the Management Safety Review Committee.

Very truly yours,

D 1/17/20 FOR FRED MLADEN

F. Mladen
Site Vice President
Surry Power Station

Enclosure

Commitment contained in this letter: None

cc: U.S. Nuclear Regulatory Commission, Region II
Marquis One Tower, Suite 1200
245 Peachtree Center Ave., NE
Atlanta, GA 30303-1257

NRC Senior Resident Inspector
Surry Power Station

IE22
NRR

NRC FORM 366
(04-2018)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See Page 2 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/)

1. Facility Name	2. Docket Number	3. Page
Surry Power Station Unit 2	05000 281	1 OF 4

4. Title

Auxiliary Feedwater System Loss of Safety Function due to Check Valve Failure to Close

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
11	20	2019	2019	- 002	- 00	01	17	2020	Facility Name	Docket Number 05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
N	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. Power Level	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☑ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☑ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Stephen C. Newman, Nuclear Engineer III	757-365-3397

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
E	BA	V	W030	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ Yes (If yes, complete 15. Expected Submission Date) ☑ No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

At 2144 [EST] on 11/20/2019, with Unit 2 at 100 percent power, all three (3) Unit 2 Auxiliary Feedwater (AFW) pumps were declared inoperable due to the Unit 2 Turbine Driven (TD) AFW pump discharge check valve failing to completely close, which caused flow from a running Unit 2 Motor Driven (MD) AFW to partially recirculate back to the Emergency Condensate Storage Tank. At 2203 the two (2) MDAFW pumps were declared operable after the discharge isolation valves for the TDAFW pump were closed.

The Unit 2 TDAFW discharge check valve condition existed from 10/28/19 to 11/20/19 and could have adversely impacted the ability of AFW to function properly. The cause of this event was determined to be excessive wear on the discharge check valve disc assembly parts causing the disc to stick partially open.

The safety consequences associated with this event are bounded by the safety analyses documented in UFSAR Chapter 14. The affected check valve's internal assembly parts were replaced. To prevent recurrence, a corrective action is planned to periodically inspect and/or replace the check valve internals, as needed, on both units. Unit 1 was not impacted by this event since it was in cold shutdown at the time.

NARRATIVE

A. Plant Operation Conditions Before the Event

Event Date: 11/20/2019
Unit 1: 0 Percent Power (Cold Shutdown)
Unit 2: 100 Percent Power

Background:

The Auxiliary Feedwater (AFW) system [EIIS: BA] is a safety-related system except for the initiating signals of the reactor coolant [EIIS: AC] buses undervoltage feature, the main feedwater pump [EIIS: SJ-P] breaker trip feature, the loss of reserve station power feature, and the AMSAC feature. The initiating circuitry incorporates both automatic and manual system start capability, including manual initiation of the system from the control room.

The AFW system consists principally of one (1) 100 percent capacity Turbine-Driven Auxiliary Feedwater (TDAFW) pump [EIIS: BA-P] rated for 700 gpm, two (2) 50 percent capacity Motor-Driven Auxiliary Feedwater (MDAFW) pumps [EIIS: BA-P] rated for 350 gpm, a 110,000-gallon storage tank, and associated piping, valves, and controls. The turbine-driven pump and the electrically-driven pumps represent two diverse pumping systems that operate automatically to supply auxiliary feedwater to the steam generators. These three (3) pumps are in parallel and provide flow to two common discharge headers. The discharge line of each pump contains a discharge check valve [EIIS: BA-V] horizontally mounted downstream of each AFW pump. These check valves are a Critical Class 1 component which are tested open every quarter and tested to close every refueling outage in accordance with the IST program.

Additionally, the Units 1 and 2 AFW systems can be cross-tied to ensure that in the event of a postulated high energy line break in the Main Steam Valve House or a fire that disables the auxiliary feedwater pumps, the unaffected system will have the ability of maintaining both units in a hot shutdown condition.

B. Description of Event:

On 11/20/2019, an AFW cross-tie capability test from Unit 2 to Unit 1 was performed. For the test, the Unit 2 "B" MDAFW pump was started to pressurize the AFW discharge header. Rather than closing the manual isolation valves, isolation of the other Unit 2 MDAFW and TDAFW pumps was accomplished by crediting each pump's discharge check valve. The purpose of this action was to prevent having to declare all the Unit 2 AFW pumps inoperable while running the test.

Shortly after the Unit 2 "B" MDAFW pump was started, an operator in the field reported the Unit 2 TDAFW pump was turning backwards. This allowed flow from the running Unit 2 MDAFW pump to partially recirculate back to the Emergency Condensate Storage Tank. As a result, all three (3) Unit 2 AFW pumps were declared inoperable. After isolating the discharge check valve, both Unit 2 MDAFW pumps were declared operable. Unit 2 remained in a 72-hour Technical Specification action statement to restore the Unit 2 TDAFW pump. Troubleshooting determined that the backward rotation had been caused by the Unit 2 TDAFW pump discharge check valve that had not fully closed.

It was concluded that the discharge check valve failing to completely close occurred during the performance of the last quarterly Unit 2 TDAFW pump flow surveillance test on 10/28/2019 and that between 10/28/2019 and 11/20/2019 this condition could have prevented the Unit 2 AFW System from functioning properly; consequently, this report is being submitted pursuant to 10 CFR 50.73 (a)(2)(v)(B), as an event or condition that could have prevented the fulfillment of a safety function of SSCs needed to remove residual heat.

NARRATIVE

Additionally, because the pumps were determined to be inoperable longer than allowed by Technical Specification 3.6.F, this report is also being submitted pursuant to 10 CFR 50.73 (a)(2)(i)(B), as any operation or condition which was prohibited by the plant's Technical Specifications.

C. Cause of Event:

The direct cause of the check valve failure was due to excessive wear on the check valve disc assembly parts. The internal valve assembly for this valve was last replaced in 1993.

The root cause was that no scheduled preventative maintenance was being performed on the Unit 2 TDAFW pump discharge check valve due to decisions made in 1996 and 2005 to rely on back leakage checks vs. performing check valve open and inspect. As a result, the station was not monitoring the extent of the wear occurring on the valve internals.

D. Safety Consequences

The safety consequences of postulated accident scenarios rely on the availability of the AFW system to provide water to the steam generators for the purpose of removing core decay heat during and after the postulated accident scenarios. Limiting analysis assumptions for evaluation of such scenarios include a loss of offsite power rendering the Main Feedwater (MFW) pumps unavailable. For the duration of the Unit 2 AFW system unavailability period in question, Surry Power Station retained offsite power. This ensured that the Unit 2 MFW system was available as an alternate method of providing water to the steam generators and, therefore, ensuring a source of secondary coolant.

A review of station logs identified that, if the Unit 2 MFW system were unavailable for any reason, additional defense-in-depth was provided by the station cross-tie piping. Using this piping, at least one (1) Unit 1 motor driven AFW pump was available to provide water to the Unit 2 steam generators for all but five (5) hours of the period in question, when the cross-tie was unavailable for testing on 11/15/2019. During this five (5) hours of unavailability, it is estimated that the capability to resupply water to Unit 2 would have taken less than 1 hour if needed.

Further, isolation of the unanalyzed flow path through the Unit 2 TDAFW pump discharge line, which restored the operability of the Unit 2 AFW system, was completed within 20 minutes of identifying the Unit 2 TDAFW pump was rotating backward on 11/20/2019. This demonstrates that operability of the Unit 2 AFW system could have been promptly restored in response to an actual event. Consequently, the safety consequences associated with this event were bounded by the safety analyses documented in UFSAR Chapter 14.

Risk Significance:

The initiating events most challenging for this event are Emergency Switchgear Room (ESGR) floods and plant transients. ESGR floods have the potential to disable all emergency power, leaving only the Unit 1 or 2 TDAFW pumps to provide secondary cooling. Plant transients typically rely on AFW as the primary source of decay heat removal, so a challenge to AFW would require operators to either align the Auxiliary Feedwater cross-tie, Main Feedwater, Condensate, or use feed and bleed for decay heat removal.

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/)

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Surry Power Station Unit 2	05000- 281	2019	- 002	- 00

NARRATIVE

E. Corrective Actions

Corrective Actions (Completed)

1. The Unit 2 TDAFW pump discharge check valve's internal assembly was replaced.

2. The Unit 1 Turbine Driven AFW pump discharge check valve's internal assembly was inspected and determined to be satisfactory.

Corrective Actions (Planned pending causal evaluation approval)

1. Until the Unit 1 and Unit 2 MDAFW pump discharge check valve internal assemblies are inspected and/or replaced, as necessary, alternate methods will be used to ensure the check valve is closed after the performance of surveillance flow testing.

2. Revise the AFW pump discharge check valve maintenance program to periodically inspect and/or replace the check valve internals, as needed, on both units.

3. Determine if there are other vulnerable safety-related system check valves and implement similar maintenance program changes as required.

F. Previous Occurrences

No previous Licensee Event Reports which could be comparable to this event were found.

G. Component Failure

Yes. ASME Class 600, 6" cast steel swing check valve with raised face ends. Manufactured by Walworth Project Engineering.