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10CFR50.73

GNRO-2018/00023

April 27, 2018

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

SUBJECT: Licensee Event Report 2018-003-00, Inoperable Reactor Protection Functions During Main Steam Isolation Valve and Turbine Stop Valve Channel Functional Tests due to Use of a Test Box
Grand Gulf Nuclear Station, Unit 1
Docket No. 50-416
License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report 2018-003-00, Inoperable Reactor Protection Functions During Main Steam Isolation Valve and Turbine Stop Valve Channel Functional Tests due to Use of a Test Box. This report is being submitted in accordance with 10CFR50.73(a)(2)(v)(A) as an event or condition that could have prevented the fulfillment of the safety function.

This letter contains no new commitments. If you have any questions or require additional information, please contact Douglas Neve at 601-437-2103.

Sincerely,

E. A. L

Eric A. Larson
Site Vice President
Grand Gulf Nuclear Station
EAL/tdf

Attachment: Licensee Event Report 2018-003-00

cc: (see next page)

cc: with Attachment

U.S. Nuclear Regulatory Commission
ATTN: Mr. Siva Lingam
Mail Stop OWFN 8 B1
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Grand Gulf Nuclear Station
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission
ATTN: Mr. Kriss Kennedy, NRR/DORL (w/2)
Mail Stop OWFN 8 B1
Washington, DC 20555-0001

Attachment

Licensee Event Report (LER) 2018-003-00

NRC FORM 366 (04-2017) 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
Grand Gulf Nuclear Station, Unit 1	05000 416	1 OF 5

4. TITLE

Inoperable Reactor Protection Functions During Main Steam Isolation Valve and Turbine Stop Valve Channel Functional Tests due to Use of a Test Box

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 N/A	DOCKET NUMBER 05000 N/A
3	6	2018	2018-003-00			4	27	2018	FACILITY NAME N/A	DOCKET NUMBER 05000 N/A

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

9. OPERATING MODE: 1				
	☐ 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)
	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
10. POWER LEVEL: 78%	☐ 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)*
Douglas Neve / Manager, Regulatory Assurance	(601) 437-2103

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
A	JC	NA	NA	NA	NA	NA	NA	NA	NA

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 15 single-spaced typewritten lines)*

On March 6, 2018, during a review of industry operating experience, it was determined that use of the Reactor Protection System (RPS) test box described in station procedures would potentially result in the loss of two RPS reactor scram safety functions. Technical Specification (TS) 3.3.1.1 requires that RPS instrumentation for Table 3.3.1.1-1 Function 6 for Main Steam Isolation Valve – Closure (MSIV) and Function 9 for Turbine Stop Valves Closure (TSV) remain OPERABLE. It was concluded that an isolation of three of four Main Steam Lines or Turbine Stop Valves would not necessarily have resulted in a full Scram during testing, as required the TS bases, depending on the combination of closed valves occurring while the test box was in use. Modifications were approved in 2014 to accommodate the test box and surveillance procedures were revised to incorporate the use of the test box in May and June of 2016. Between May 2016 and February 2018, the MSIV Closure and TSV Closure procedures were each performed 6 times using the test box. While it did not meet the TS bases, the RPS remained functional at all times. The failure to recognize the impact of the modification and procedure revisions is considered a human performance error by engineering personnel.

1. FACILITY NAME	2. DOCKET	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV. NO.
Grand Gulf Nuclear Station, Unit 1	05000 416	2018-003-00		

NARRATIVE

A. PLANT CONDITIONS PRIOR TO THE EVENT

On March 6, 2018, Grand Gulf was operating in Mode 1 at 78% Power. There were no structures, systems, or components that were inoperable at the start of this event that contributed to this event.

B. DESCRIPTION

On March 6, 2018, engineering personnel identified that the use of the Reactor Protection System (RPS) [EIIS: JC] test fixture as implemented in some surveillance test procedures could result in the loss of two RPS reactor scram safety functions. Use of the test fixture in surveillance test procedures unintentionally resulted in the loss of Technical Specification (TS) Table 3.3.1.1 Function 6, Main Steam Isolation Valve-Closure, and Function 9, Turbine Stop Valve Closure (Trip Oil Pressure –Low), as defined in the TS bases. The TS bases state a scram will occur on isolation of at least one main steam isolation valve (MSIV) [EIIS: SB][ISV] in three of four main steam lines (MSLs), and on closure of three of four turbine stop valves (TSV) [EIIS: TA][ISV]. A review determined that isolation of three of four MSLs, or closure of three of four TSVs, would not necessarily have resulted in a full Scram while the test fixture was in use.

The test box was designed to reduce unnecessary RPS actuations. The test box consists of a 5-ohm resistor in parallel with a 5 VAC lamp terminated with banana jacks. The RPS test box establishes a low resistance path in parallel with the trip logic relay contacts.

The RPS has two independent trip systems (A and B) with two trip logics (i.e., trip divisions) in each trip system: A and C trip logics for Trip System A, and B and D trip logics for Trip System B. For Function 6 (MSIV Closure), which uses pressure transmitters and trip units to detect changes in hydraulic pressure, there are sixteen total instrument channels (two per MSIV) with each logic division having four instrument channels and each trip system having eight. The logic used ensures a full reactor scram occurs for the condition where at least one MSIV in three or more MSLs are less than 90% open. This occurs as the logic uses valves in A and C MSLs for Division A trip logic, A and B MSLs for the Division B trip logic, B and D MSLs for the Division C trip logic, and C and D MSLs for the Division D trip logic. By varying the order in which the auxiliary relay contacts are paralleled within each RPS trip logic it can be assured that a half Scram will occur in each trip system even if all the MSL switches on any one MSL fail. Similarly, the TSV logic has eight instrument channels with the same alternating logic for the four TSVs.

The use of the RPS test box, as implemented in the procedures, would bypass MSL valve position signal inputs for two MSLs (i.e., bypass four instrument channels) and prevent the associated trip logic from being in a tripped condition (i.e., half-scram). This prevents the associated trip system from generating a half-scram when two of three isolated MSLs are in the bypassed division and, while a valid Group 1 isolation (closure of all four MSLs) would still result in a full scram, a scram would not occur in two of four possible MSL isolation scenarios involving just three MSLs, as required by the TS bases.

For Function 9 (TSV Closure), the logic used ensures a full reactor scram occurs for the condition where three or more TSVs are less than fully open. Each trip system monitors trip fluid pressure

for all four TSVs, and the use of the RPS test box would bypass the pressure transmitter inputs for two of the TSVs. This prevents the associated trip system from generating a half-scram when two of the three closed TSVs are in the bypassed division, and while a turbine trip (closure of all four TSVs) would still result in a full scram, a scram would not occur in two of four possible TSV closure scenarios involving just three TSVs as required by the TS bases.

Use of the test box was added to the Function 6 (MSIV) test procedures on May 5, 2016, and added to the Function 9 (TSV) procedures on June 6, 2016. The MSIV Closure procedure was performed six times with the test box and each TSV Closure procedure was performed six times. The longest time the test box was installed during the surveillances was 3 hours and 32 minutes for the Function 6 and 5 hours and 48 minutes for Function 9.

With one trip trip logic bypassed and Function 6 inoperable, Technical Specification 3.3.1.1 Required Action G requires restoring RPS trip capability or being in Mode 3 within 6 hours. TS 3.3.1.1 Condition G was not intentionally entered during the performance of the surveillance but was met each time.

With one trip logic bypassed and Function 9 inoperable, Technical Specification 3.3.1.1 Conditions C and E requires restoring RPS trip capability within 1 hour or reducing power to less than 35.4% reactor thermal power within the following 4 hours. TS 3.3.1.1 Condition E was not intentionally entered during the performance of the surveillance but was met each time with one exception. On January 4, 2017, Function 9 was in a bypassed condition for 5 hours and 48 minutes, however GGNS was in Mode 4 at the time and operability was not required.

C. REPORTABILITY

This event is being reported under 10CFR50.73(a)(2)(v)(A) and 50.73(a)(2)(v)(D) as an event that that could have prevented the fulfillment of the safety function of structures or systems that are needed to (A) shut down the reactor and maintain it in a safe shutdown condition and (D) mitigate the consequences of an accident.

D. CAUSE

The direct cause of this event was inadequate procedure revision. The cause of the inadequate procedure revision was an inadequate 10CFR50.59 screening of the associated design change due to inadequate risk recognition and inadequate technical rigor.

The activity description in the process applicability determination was not clear, and the risk was not recognized. The TS bases were reviewed as part of the applicability determination but the impact of the change on the bases was not recognized.

E. CORRECTIVE ACTIONS

The following actions are completed or planned.

Completed:

- Revised MSIV Closure surveillance procedures to remove the use of RPS Test Box
- Revised TSV Closure surveillance procedures to remove the use of RPS Test Box.
- Conduct training for 50.59 evaluators using industry experts as instructors to increase evaluator knowledge of changes with respect to NEI 96-07 and current industry experience on 50.59 evaluations.
- Review a sample of 50.59 Evaluations performed within the past three years to verify technically correct justifications
- Review a sample of process applicability determinations performed within the past three years to confirm those changes screened out
- Review a sample of process applicability determinations performed within the past three years to verify engineering changes were screened to the correct program
- Utilize industry 50.59 experts for independent third party reviews of 59.59 evaluations.

Planned actions included in the corrective action program which may be changed in accordance with the program

- Review this event with engineering personnel and coach on the need for technical rigor and risk recognition

F. SAFETY SIGNIFICANCE

Function 6 had one division bypassed for a total of 17 hours and 46 minutes over the 20 month period. While Function 6 did not meet the bases requirement for operability while bypassed, RPS remained functional and would have initiated a scram on a Group 1 MSIV isolation (isolation of all four MSLs). In addition, GGNS credits Function 2.b, Fixed Neutron Flux - High, with generating a scram in the overpressurization analysis rather than a direct scram from MSIV closure, and reload analyses show that MSIV closure is not an otherwise limiting event.

Function 9 had one division bypassed for a total of 69 hours and 54 minutes over the 20 month period. Regarding Function 9, the TSV scram is credited in the Turbine Trip with no bypass analysis, which is a limiting event. While the TSV scram did not meet the bases requirement for operability while bypassed, RPS remained functional and would have initiated a scram upon a turbine trip and TSV closure. In addition, the turbine control valves (TCVs) [EIIS: TA][FCV] are operated by follow-up pistons which receive fluid from the TSV trip system. In the event that RPS failed to respond to the TSV closure, Function 10, TCV Fast Closure, Trip Oil Pressure-Low, would initiate a reactor scram based on pressure loss in the system. Plant data indicates the TCV scram would occur within 0.1 seconds of TSV scram failure.

MSIV closure, TSV closure, and TCV valve fast closure are all anticipatory trips for reactor vessel overpressure transients, and scram earlier than either the neutron monitoring system or nuclear

system high pressure. The nuclear system high-pressure scram provides diversity of trip initiation and, in conjunction with the pressure-relief system, is adequate to preclude overpressurizing the nuclear system. RPS safety function was maintained at all times and there was no significant impact to health and safety of the public. Based on this, this condition will not be counted as a safety system functional failure against Performance Indicator MS05, Safety System Functional Failures.

G. PREVIOUS SIMILAR OCCURRENCES

No previous similar events could be found.