UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

November 18, 2021

Mr. Robert Franssen, Site Vice President
Entergy Operations, Inc.
Grand Gulf Nuclear Station
P.O. Box 756
Port Gibson, MS 39150

SUBJECT: GRAND GULF NUCLEAR STATION – NRC SUPPLEMENTAL INSPECTION REPORT 05000416/2021040 AND ASSESSMENT FOLLOW-UP LETTER

Dear Mr. Franssen:

On September 17, 2021, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection at your Grand Gulf Nuclear Station (GGNS) using Inspection Procedure (IP) 95002, "Supplemental Inspection Response to Action Matrix Column 3 (Degraded Performance) Inputs." The NRC performed IP 95002 to review your station's actions in response to a Yellow performance indicator (PI) for "Unplanned Scrams per 7,000 Critical Hours" (Initiating Events Cornerstone), which GGNS reported for the fourth quarter of 2020. On October 4, 2021, the NRC inspection team discussed the results of this inspection with you and other members of your staff in a public meeting. The results of this inspection are documented in the enclosed report. Based on the results of this inspection, the NRC concluded that the objectives of IP 95002 were met.

The NRC conducted the IP 95002 supplemental inspection to ensure that your staff understood the root and contributing causes of the events that resulted in the Yellow PI, to assess the extent of condition of these identified causes, to ensure that your planned and completed corrective actions would be effective in precluding repetition of the identified problem(s), and to determine if any adverse safety culture traits caused or significantly contributed to the performance issues.

In addition to specific causal factors identified following each of the five unplanned scram events, your staff's evaluation identified one common root cause for the scrams that led to the Yellow PI. Specifically, the GGNS staff determined the common root cause to be that "engineering leadership missed an opportunity to provide appropriate levels of technical rigor and management review during the development and implementation of the turbine control system modification." Corrective actions for this common root cause included enhancing accountability for individual and organizational performance, providing more effective supervisory oversight, and improving the engineering design change process.

Based on the inspection team's independent review of the above activities, the NRC determined that your completed and planned future corrective actions at GGNS were sufficient to address the performance decline that led to the Yellow PI.

Notwithstanding the above, the inspection team did identify some “general weaknesses” in the station’s root and common cause evaluations and associated corrective actions. These weaknesses involved the implementation of the operating experience program, the evaluation and resolution of certain issues in the corrective action program, the scope and veracity of some extent-of-cause and extent-of-condition reviews, and the applicability of corrective actions to preclude repetition (CAPRs) to some safety-related, high-risk systems and components. Your staff acknowledged and appropriately addressed these weaknesses following interactions with the NRC inspectors. A discussion of these issues is also included in the enclosed report.

Additionally, the NRC determined that the “Unplanned Scrams per 7,000 Critical Hours” PI had returned to Green in the third quarter of 2021. Based on the guidance in NRC Inspection Manual Chapter 0305, “Operating Reactor Assessment Program,” and the results of the IP 95002 inspection, the actions necessary to close the Yellow PI are complete and GGNS will transition from the Degraded Performance Column (i.e., Column 3) of the NRC’s Reactor Oversight Process Action Matrix to the Licensee Response Column (i.e., Column 1) as of the date of this letter. Please note that this letter supplements, but does not supersede, the NRC’s “mid-cycle” assessment letter, issued on September 1, 2021 (ADAMS Accession No. ML21232A225).

In accordance with Inspection Manual Chapter 2515, Appendix B, “Supplemental Inspection Program,” dated October 21, 2020, the NRC plans to conduct follow-up inspection activities for all of the planned CAPRs that were not yet complete at the time of this supplemental inspection and may include an evaluation of the associated “effectiveness review” actions. This inspection activity will be scheduled consistent with your NRC-accepted CAPR completion date as part of a future baseline inspection sample to verify that GGNS completed these actions in accordance with the established plan.

The NRC inspection team also documented three findings of very low safety significance (i.e., Green) in this report. Two of these findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violations or the significance or severity of the violations documented in this inspection report, you should provide a response within 30 days of the date of this letter, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement; and the NRC Resident Inspector at Grand Gulf Nuclear Station.

If you disagree with a cross-cutting aspect assignment, or the finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this letter, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; and the NRC Resident Inspector at GGNS.

In accordance with 10 CFR 2.390 of the NRC's Agency Rules of Practice and Procedure, a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Please contact Mr. Jason Kozal at 817-200-1144 with any questions you may have regarding this letter.

Sincerely,

Signed by Morris, Scott
on 11/18/21

Scott A. Morris
Regional Administrator
NRC Region IV

Docket No. 05000416
License No. NPF-29

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV®

GRAND GULF NUCLEAR STATION – NRC SUPPLEMENTAL INSPECTION REPORT
05000416/2021040 AND ASSESSMENT FOLLOW-UP LETTER – NOVEMBER 18, 2021

DISTRIBUTION:
JMonninger, DRA
AVegel, DRP
MHay, DRP
RLantz, DRS
JDixon, DRS
MMuessle
LHowell
DCylkowski, RC
RWilliams, RIV/OEDO
VDricks, ORA
LWilkins, OCA
SLingam, NRR
THipschman, NRR
AMoreno, RIV/OCA
BMaier, RSLO
JKozal, DRP
ANguyen, RIII/DRP
JEllegood, DRP
JVera, DRP
RKumana, DRP
BBergeon, DRS
PZurawski, RIII/DRP
MKeefe-Forsyth, NRR
RSigmon, NRR
JVazquez, NRR
LFlores, DRP
PVossmar, DRP
CYoung, DRP
TSteadham, DRP
MThomas, DRP
DNani, DRP
APrice, DRP
AElam, DRP
FRamirez, IPAT
DDodson, IPAT
R4Enforcement
ROP Assessments

ADAMS ACCESSION NUMBER: ML21306A311

X SUNSI Review PJV		X Non-Sensitive □ Sensitive		X Publicly Available □ Non-Publicly Available NRC-002		
OFFICE	RIII/DRP/SRI	RIV/DRP/SRI	RIV/DRP/SRI	RIV/DRP/RI	RIII/DRP/SRI	RIV/DRS
NAME	ANguyen	JEllegood	RKumana	JVera	PZurawski	BBergeon
DATE	/RA/ E	/RA/ E	/RA/ E	/RA/ E	/RA/ E	/RA/ E
OFFICE	HQ/NRR	HQ/NRR	HQ/NRR	RIV/DRS	RIV/DRP	RIV/DRP/BC
NAME	MKeefe-Forsyth	JVazquez	RSigmon	LFlores	PVossmar	JKozal
DATE	/RA/ E	/RA/ E	/RA/ E	/RA/ E	/RA/ E	/RA/ E
OFFICE	RIV/DRP/D	RIV/RA				
NAME	AVegel	SMorris				
DATE	/RA/ E					

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number:	05000416
License Number:	NPF-29
Report Number:	05000416/2021040
Enterprise Identifier:	I-2021-040-0000
Licensee:	Entergy Operations, Inc.
Facility:	Grand Gulf Nuclear Station
Location:	Port Gibson, MS
Inspection Dates:	August 23, 2021, to September 17, 2021
Inspectors:	A. Nguyen, Inspection Team Leader B. Bergeon, Operations Engineer J. Ellegood, Senior Resident Inspector L. Flores, Reactor Inspector (Observer) M. Keefe-Forsyth, Human Factors Specialist R. Kumana, Senior Resident Inspector R. Sigmon, Reactor Systems Engineer (Observer) J. Vazquez, Reactor Operations Engineer J. Vera, Resident Inspector P. Zurawski, Senior Resident Inspector
Approved By:	Jason W. Kozal, Chief Reactor Projects Branch C Division of Reactor Projects

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) evaluated the Entergy Operations' (Entergy's) actions to address a Yellow performance indicator by conducting a supplemental inspection at Grand Gulf Nuclear Station, in accordance with the Reactor Oversight Process Inspection Procedure (IP) 95002. Additionally, the NRC conducted baseline inspection activities in accordance with IP 71153 to review and assess the licensee event reports issued following each of the reactor scrams that led to the Yellow performance indicator. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov /reactors/operating/oversight.html for more information.

The NRC determined that the licensee's problem identification, causal analyses, and corrective actions sufficiently addressed the performance issues that led to the Yellow performance indicator. The inspectors concluded that all inspection objectives, as described in IP 95002, were **Met**. Assessments, findings, violations, and inspector-identified weaknesses in the licensee's evaluations are detailed below.

List of Findings and Violations

Failure to Verify Appropriate Design Inputs per the Engineering Change Process			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green FIN 05000416/2021040-01 Open/Closed	[H.3] - Change Management	71153
The inspectors identified a self-revealed Green finding when the licensee failed to verify appropriate design inputs per Procedure EN-DC-115, "Engineering Change Process," Revision 31, for the turbine control digital system upgrade project. Specifically, in three instances, the licensee failed to identify the following during the Design Review and Owner Acceptance Review of the engineering change: 1. An incorrect air gap setting for the new turbine speed monitoring probes which resulted in an automatic turbine trip and reactor scram on May 25, 2020. 2. The effect of vibration on the hydraulic actuator for a main turbine control valve, a critical aspect of the design, which resulted in operators having to initiate a manual reactor scram on August 8, 2020. 3. Incorrect design for primary water bushing flow transmitter sensing lines, which led to an automatic turbine trip and reactor scram on November 6, 2020.			

Failure to Follow the System Operating Instruction for the Primary Water System			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green NCV 05000416/2021040-02 Open/Closed	[H.11] - Challenge the Unknown	71153
The inspectors identified a self-revealed Green finding and associated non-cited violation of Technical Specification 5.4.1(a) when the licensee failed to implement Procedure 04-1-01-N43-1, "Primary Water System Operating Instruction," Revision 62. Specifically, while performing Section 5.2.2, "Filling and Venting to Raise System Water Tank Level to Normal," an operator inappropriately applied a caution statement associated with step 5.2.2.f after misdiagnosing that valve 1N43-FD01, the primary water system leakage			

water return valve, was stuck open. The operator incorrectly took manual action to close the valve, causing the primary water system head tank level to lower, resulting in an automatic turbine trip and reactor scram.

Failure to Prevent Recurrence of Multiple Scrams Related to the Turbine Control System			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green NCV 05000416/2021040-03 Open/Closed	[H.12] - Avoid Complacency	95002
The inspectors identified a self-revealed Green finding and associated non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, when the licensee failed to preclude repetition of recurrent plant scrams related to the turbine control system, a significant condition adverse to quality. Specifically, the licensee's actions to correct the causes of scrams that occurred prior to calendar year 2020 (and which resulted in the Unplanned Scrams per 7000 critical hours performance indicator crossing an elevated threshold in 2018), were ineffective. As a result, in 2020, four additional plant scrams related to turbine control system deficiencies caused the same performance indicator (Unplanned Scrams) to cross an elevated threshold.			

Additional Tracking Items

Type	Issue Number	Title	Report Section	Status
LER	05000416/2020-002-02	Reactor Scram Due to Main Turbine Trip	71153	Closed
LER	05000416/2020-002-01	Reactor Scram Due to Main Turbine Trip	71153	Closed
LER	05000416/2020-002-00	Reactor Scram Due to Main Turbine Trip	71153	Closed
LER	05000416/2020-003-00	Manual Reactor Scram Due to Turbine High Pressure Control Valve Malfunction and Automatic Reactor Water Level Scram	71153	Closed
LER	05000416/2020-003-01	Manual Reactor Scram Due to Turbine High Pressure Control Valve Malfunction and Automatic Reactor Water Level Scram	71153	Closed
LER	05000416/2020-004-00	Automatic Reactor Scram Due to Reactor Feed Pump Trip	71153	Closed
LER	05000416/2020-004-01	Automatic Reactor Scram Due to Reactor Feed Pump Trip	71153	Closed
LER	05000416/2020-005-00	Primary Water System Flow Lowered Causing Turbine Trip and Subsequent Reactor Scram	71153	Closed
LER	05000416/2020-005-01	Primary Water System Flow Lowered Causing Turbine	71153	Closed

Type	Issue Number	Title	Report Section	Status
		Trip and Subsequent Reactor Scram		
LER	05000416/2020-005-02	Primary Water System Flow Lowered Causing Turbine Trip and Subsequent Reactor Scram	71153	Closed
LER	05000416/2020-006-00	Primary Water Tank Low Level Causing Turbine Trip and Subsequent Reactor Scram	71153	Closed
LER	05000416/2020-006-01	Primary Water Tank Low Level Causing Turbine Trip and Subsequent Reactor Scram	71153	Closed
LER	05000416/2020-006-02	Primary Water Tank Low Level Causing Turbine Trip and Subsequent Reactor Scram	71153	Closed

INSPECTION SCOPE AND CONDUCT

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. The NRC staff determined that inspection samples were complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

On March 20, 2020, in response to the National Emergency declared by the President of the United States regarding the public health risks of the coronavirus (COVID-19), inspectors were directed to begin teleworking. In addition, regional baseline inspections were evaluated to determine if all or a portion of the objectives and requirements stated in the associated IPs could be performed remotely. If the inspections could be performed remotely, they were conducted per the applicable IP. In some cases, portions of an IP were completed both remotely and on site. All of the inspections documented below met the objectives and requirements for completion of the IPs.

OTHER ACTIVITIES – BASELINE

71153 - Follow Up of Events and Notices of Enforcement Discretion

Event Report (IP Section 03.02) (5 Samples)

The inspectors evaluated the following licensee event reports (LERs):

(1) LER 05000416/2020-002-02, Reactor Scram Due to Main Turbine Trip (ADAMS Accession No. ML21231A135). The inspection conclusions associated with this LER are documented in this report under Inspection Results Section 71153.

(2) LER 05000416/2020-003-01, Manual Reactor Scram Due to Turbine High Pressure Control Valve Malfunction and Automatic Reactor Water Level Scram (ADAMS Accession No. ML21231A136). The inspection conclusions associated with this LER are documented in this report under Inspection Results Section 71153.

(3) LER 05000416/2020-004-01, Automatic Reactor Scram Due to Reactor Feed Pump Trip (ADAMS Accession No. ML21231A137). The inspectors determined that it was not reasonable to foresee or correct the cause discussed in the LER; therefore, no performance deficiency was identified. The inspectors did not identify a violation of NRC requirements.

(4) LER 05000416/2020-005-02, Primary Water System Flow Lowered Causing Turbine Trip and Subsequent Reactor Scram (ADAMS Accession No. ML21231A138). The inspection conclusions associated with this LER are documented in this report under Inspection Results Section 71153.

(5) LER 05000416/2020-006-02, Primary Water Tank Low Level Causing Turbine Trip and Subsequent Reactor Scram (ADAMS Accession No. ML21231A139). The inspection conclusions associated with this LER are documented in this report under Inspection Results Section 71153.

OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

95002 - Supplemental Inspection Response to Action Matrix Column 3 (Degraded Performance) Inputs

This inspection fulfills the requirements to perform a supplemental inspection in response to degraded performance that led to the Grand Gulf facility being moved into Column 3 of the Action Matrix for the Unplanned Scrams per 7000 Critical Hours performance indicator crossing into the Yellow threshold. The inspection objectives are to:

- Ensure that the root and contributing causes of significant individual and collective performance issues are understood;
- Independently assess and ensure that the extent-of-condition and the extent-of-cause for significant individual and collective performance issues are identified;
- Ensure that completed corrective actions to address and preclude repetition of performance issues are timely and effective;
- Ensure that planned corrective actions to preclude repetition direct timely and effective actions to address and preclude repetition of significant individual and collective performance issues; and
- Independently determine if safety culture traits caused or significantly contributed to the individual and collective performance issues.

The inspectors reviewed and selectively challenged aspects of the licensee's problem identification, causal analyses, and corrective actions in response to crossing the Yellow threshold for the Unplanned Scrams per 7000 Critical Hours Performance Indicator in 2020. The inspectors independently assessed the extent of condition and extent of cause, and whether safety culture components caused or significantly contributed to any significant performance issues.

The inspectors used the criteria in Inspection Procedure (IP) 95002 when evaluating each objective above. The inspectors evaluated any identified gaps (or weaknesses) in the licensee's causal analyses and corrective actions to characterize their significance and to drive any additional necessary licensee actions. In accordance with Inspection Manual Chapter (IMC) 2515, Appendix B, a "Weakness" is defined as *"a deficiency associated with licensee actions to identify the causes of performance issue(s) and to preclude repetition*." There are three levels of weaknesses with increasing significance:

1) Minor Weakness: A weakness or omission that may warrant informal licensee engagement by inspectors but screens as a non-finding and non-violation.
2) General Weakness: A weakness or omission that is of enough importance to (a) warrant licensee engagement by inspectors; (b) be screened as an issue of concern using IMC 0612; (c) be documented using IMC 0611; and (d) inform NRC licensee Problem Identification and Resolution (PI&R) assessments.
3) Significant Weakness: A weakness or omission associated with licensee actions to identify the causes of performance issue(s) and to preclude repetition which does not provide the level of assurance required to meet supplemental inspection objectives and requirements. Until resolved or sufficiently mitigated, it precludes satisfactory completion of a supplemental inspection. Significant weaknesses warrant prompt licensee and NRC management engagement.

Supplemental Inspection Response to Action Matrix Column 3 (Degraded Performance) Inputs (1 Sample)

(1) Overall, the inspectors determined that the licensee's problem identification, causal analysis, and corrective actions sufficiently addressed the performance issues that led to the Yellow performance indicator. The team concluded that all inspection objectives were **Met**. Notwithstanding this outcome, the team identified four General Weaknesses which are described later in this report. Any planned corrective actions to preclude repetition (CAPRs) that were not complete at the time of the inspection will be reviewed during follow-up baseline inspection activities.

There were five individual scram events in 2020 that led to the Yellow performance indicator:

1. On May 25, 2020, the plant experienced a turbine trip and reactor scram due to erroneous overspeed signals from two out of three of the active speed probes on the main turbine shaft.
2. On August 8, 2020, operators inserted a manual reactor scram in response to main turbine high pressure control valve oscillations due to a loose threaded connection for the linear variable reluctance transmitter (LVRT) associated with that valve.
3. On August 24, 2020, while operators were starting up the unit from a forced outage, the reactor experienced an automatic scram caused by a low reactor vessel water level. The low water level was due to the reactor feedwater pump B minimum flow valve failing closed as a result of a failure of its valve positioner.
4. On November 6, 2020, an automatic turbine trip and subsequent reactor scram resulted from a low primary water system (PWS) flow to main generator bushing C trip signal due to gas voiding in the PWS that degraded water flow and increased instrumentation noise.
5. On December 11, 2020, an automatic turbine trip and subsequent reactor scram was caused by the PWS tank level lowering below its trip setpoint after an operator improperly controlled the valve used to fill the tank.

Objective 1: Ensure that the root and contributing causes of significant individual and collective performance issues are understood.

The team reviewed the licensee's root cause evaluation for each of the five unplanned scram events and the broader "common cause" evaluation. Evaluation criteria under this objective included: determining when and for how long the identified performance issues existed; assessing prior opportunities to identify these issues; understanding the plant significant consequences of the events; ensuring the causes were determined using a systematic process with a sufficient level of supporting detail; consideration of prior knowledge of operating experience; and identification of any potential programmatic weaknesses in performance.

NRC Assessment: The team concluded that this objective was **Met.** Overall, the licensee appropriately identified the issues that led to the scram events, how long they existed, what their associated risk and compliance consequences were, and if prior opportunities existed to identify them. In general, the licensee appropriately evaluated the causes of the events using a systematic process with a sufficient level of supporting detail to identify the root and contributing

causes and to identify any potential programmatic weaknesses in performance. There were also two General Weaknesses and several observations related to this objective.

General Weakness No. 1: The team identified a General Weakness associated with prior opportunities to implement effective corrective actions to preclude repetition of events. In 2018 and 2019, the licensee implemented corrective actions to prevent recurrence (CAPRs) for the previously identified decline in plant performance that included reviewing engineering changes/modifications to ensure established processes and procedures were followed with a high level of technical rigor. The licensee initially determined that the turbine control system (TCS) modification being implemented in the upcoming refueling outage (Spring 2020) would serve as an opportunity to implement these CAPRs. However, the licensee did not review the TCS modification as part of the 2018/2019 CAPRs at the time they were completed. When the licensee's effectiveness review later identified that the station had not applied the CAPRs to the TCS modification, an additional corrective action was generated and completed which applied the CAPR-driven design reviews to the modification. However, this corrective action was not completed with the appropriate level of rigor to identify the deficiencies associated with the TCS modification that later revealed themselves and resulted in scrams.

The repetition of scram events, effectively due to the same root cause(s), was a significant condition adverse to quality that resulted from a lack of engineering rigor and a failure to ensure the adequacy of a major system design change (i.e., the TCS modification). The previously established CAPRs, as described above, were in place specifically to prevent this outcome, but failed to do so. While the licensee's evaluations determined these previously established CAPRs were effective, the NRC inspection team concluded otherwise. Specifically, the TCS modification, a modification intended to correct the causes of prior GGNS scrams (a previous CAPR), was deficient. Further, as noted above, the station inappropriately excluded (screened out) the TCS modification from the CAPR-prompted reviews that would have initiated a reexamination of that engineering change for technical adequacy. Had this reexamination been performed, it may likely have prevented some of the 2020 scrams. The NRC team discussed this General Weakness with the licensee during the inspection activities and it is documented as a non-cited violation in the Results section of this report.

General Weakness No. 2: The team identified a General Weakness associated with the licensee's implementation of their Operating Experience (OE) Program. Specifically, the inspectors determined that the licensee did not identify available OE information prior to several of the scrams, and that these missed opportunities to leverage OE to prevent the scrams were potential common and/or individual contributing causes. The inspectors concluded that sufficient information was available for the licensee to have prior knowledge of the conditions that either caused or contributed to some of the events and, more importantly, that actions were not taken or planned to address those conditions.

One example was related to the May 25, 2020, event which resulted from the GGNS staff not identifying changes to the speed sensor air gap setting (a critical parameter) as part of the TCS design modification. As required by Entergy Procedure EN-DC-115, "Engineering Design Change Process," Revision 31, engineering change packages needed to include a relevant OE search and applicable actions to ensure similar errors would not occur. In the root cause evaluation for this event, the licensee found OE from Braidwood and San Onofre where turbine control system issues occurred due to similar errors in the speed sensor air gap setting. As such, the licensee determined that the May 25 event was "OE preventable" (i.e., if the licensee had appropriately evaluated and acted on the identified OE the cause of the scram would not

have occurred). However, the licensee did not identify the failure to assess and act upon pertinent OE information as a root or contributing cause in their causal evaluation for this event.

A second example relating to the General Weakness identified for implementation of the OE program involved the August 24, 2020 event. Entergy Procedure EN-MA-106, "Work Planning," Revision 1, required that relevant OE be identified and included in work packages to ensure quality-related maintenance activities incorporated applicable lessons learned. The licensee identified in their root cause evaluation for this event that the work order to replace the reactor feedwater pump B minimum flow valve did not contain relevant OE that was found during the post-event OE search. As a corrective action to preclude repetition, the work order was updated with the OE to include more intrusive inspections, testing, and validation of proper worker practices prior to installation and prior to system re-start. This OE came from similar failures that occurred at Byron and Turkey Point in the early 2000s. However, the failure to incorporate available OE was not considered to be a potential root or contributing cause for this event.

In conversations with the licensee staff, the team noted that identifying relevant OE *after* an event can provide valuable information about appropriate corrective actions but misses a key component of a successful OE program (i.e., to leverage available information *prior* to events to help preclude them from occurring). An OE program is fully successful when it proactively seeks out and identifies information that is then used to recognize and avoid potential problems before they impact the plant.

The inspectors determined that sufficient information was available for the licensee to have prior knowledge of the conditions that either caused or contributed to the events in the examples above. The inspectors further concluded that the licensee did not fully evaluate the inadequate implementation of their OE program as potential root or contributing causes for either of these events, or more holistically during their common cause review. The inspectors also conducted interviews with the corporate and site OE specialists and identified further areas for enhancement within this program, including targeted training and independent auditing for quality. Therefore, the team concluded that the issues with the OE program were programmatic in nature and that this deficiency was determined to be a General Weakness.

The team's detailed assessment of this inspection objective included the following:

a. Identification. All five of the events were judged to be self-revealing as documented in the individual licensee root cause evaluations. The inspectors determined that this characterization was appropriate based on reviewing the causal evaluations and operations logs. In all five events, the self-revealing equipment deficiencies led to plant scrams.

   The inspectors determined that the licensee appropriately assessed the exposure time for the issues associated with the five events. The main turbine control and protection system was upgraded during a scheduled refueling outage in spring 2020. The licensee determined that four of the five events were directly related to this modification and all the events occurred post-installation. The one event not associated with the TCS modification (i.e., the August 24, 2020 feedwater valve failure) was determined to be caused by a faulty positioner installed during a scheduled preventive maintenance activity.

The inspectors determined that the licensee did evaluate for missed opportunities to identify the conditions. However, the team identified an example where the licensee missed opportunities for prior identification, evaluation, and resolution of some issues that caused the scrams. This was determined to be a General Weakness and was related to effectively using the corrective action program (CAP) to preclude repetition of scram events as described above under the NRC Assessment section.

b. Risk and Compliance. The licensee's individual event root cause evaluations and the overall common cause analysis included discussions of general safety of the public, nuclear safety, radiological safety, and environmental safety and stated that no actual consequences resulted from the events. The licensee further concluded that the potential risk significance of the individual events was low because the scrams were uncomplicated and sufficient redundancy in mitigating systems was available to ensure safe shutdown and long-term cooling of the reactor. The inspectors determined that the licensee appropriately understood the risk and consequences associated with the individual scram events.

   The licensee conducted, as part of their common cause analysis, an aggregate review of the risk associated with the five scram events in 2020. All of these scrams were classified as "transients with the main condenser (heat sink) available." As a result, the licensee increased the frequency of those transient initiators in the probabilistic risk assessment (PRA) model from 0.831/reactor year to 5/reactor year. All of the other initiating event frequencies were kept at the frequencies calculated in the PRA model. Using these inputs, the licensee calculated that the aggregate risk of the five scrams had a change in Core Damage Frequency (CDF) of 7.16E-07 / reactor year. The licensee concluded that this modeling result indicated that, while the overall aggregate risk remained relatively low, the aggregate impact of the events resulted in a change in CDF to approximately double that of the baseline risk.

   An NRC senior reactor analyst (SRA) conducted an independent review of the five unplanned scrams that occurred at GGNS and determined that the licensee's aggregate risk assessment was appropriate. All plant transients at an operating reactor facility create opportunities for failure of the installed mitigation systems and therefore increase risk. The SRA noted that all GGNS mitigation systems responded as designed following the May 25, 2020, August 24, 2020, November 6, 2020, and December 11, 2020, scrams. Therefore, the increase in risk was represented by the conditional core damage probability of 3.00E-07 as quantified by the GGNS-specific Standardized Plant Analysis Risk (SPAR) model, Version 8.59. On August 8, 2020, licensed operators manually scrammed the plant when a failed high-pressure control valve was causing power oscillations in the reactor. Thirty minutes after the manual scram, the failure of a startup feedwater level control valve resulted in an automatic scram signal when reactor vessel water level went below the low-level scram setpoint. To bound the risk of this event, the analyst quantified the conditional core damage probability of a loss of main feedwater initiating event (1.88E-06).

   The analyst noted that the industry average scram rate for boiling water reactors was about 0.8/year with the 95th percentile of about 1.1/year. In contrast, GGNS experienced approximately 7.5 scrams per year during the 8 months following the refueling outage. To better understand the aggregate risk of the five unplanned scrams, the SRA used the GGNS experience over the 8 months in question and increased the transient initiating event frequency to 6.0/year and the loss of main feedwater initiating event frequency to

1.5/year. The result from the SPAR model was a change in CDF of 4.35E-06/year. Like the licensee, the NRC analyst concluded that this indicated an increase of approximately double the SPAR baseline of 2.43E-06.

During their review for any challenges to regulatory compliance under this objective, the inspectors identified some regulatory compliance concerns associated with the causes of the events which are described in more detail in the Results section of this report.

c. Methodology. The inspectors concluded that the licensee's individual root cause evaluations were conducted at a level of detail commensurate with the significance and complexity of the events. For each of the five individual scram events, the licensee used several methodologies and analytical techniques to identify the root and contributing causes of the events. These techniques included: failure modes analyses, equipment failure evaluations, barrier analyses, "why" staircases, event and causal factor charting, comparative timelines, human performance evaluations, and organizational and programmatic evaluations. In general, the team determined that the licensee employed a systematic and evidence-based analysis, using the multitude of techniques mentioned above, to consistently determine the root and contributing causes of the performance issues that led to the scrams.

The inspectors noted that in a few of the evaluations the licensee did not describe in sufficient detail why potential causes were eliminated or not fully considered. One example involved the licensee's evaluation of August 24, 2020, reactor feedwater pump trip. The licensee's final root cause was that the reactor feedwater pump B minimum flow valve positioner experienced an early failure because it was only in service for approximately 29 hours after a preventive maintenance change-out activity. However, the licensee did create a corrective action to preclude repetition (CAPR) for the event which included revising the work instructions for installation of this and similar valve positioners to conduct a number of inspections and verifications prior to putting the valve back in service. Based on this, the inspectors questioned whether the valve positioner failure was in fact an early failure or if it could have been caused by maintenance work practices. From these questions, the inspectors discovered that the root cause was changed throughout the review and challenge process. The initial root cause was an inadequate replacement of the valve positioner installed during the preventive maintenance activities. Based on the CAPR and other corrective actions, which included enhancing the receipt inspection process, and the post-failure data provided in the failure analysis report, the inspectors determined that this root cause appeared to be more appropriate and better aligned with the actions the licensee was taking to address the event. This issue was determined to be of minor significance because the CAPR and corrective actions taken in response to the event were considered appropriate to address the root cause and prevent recurrence of the issue.

Another example was related to the December 11, 2020, event in which the inspectors determined that the licensee did not sufficiently emphasize the human performance aspects associated with the event. Several human performance barriers broke down which caused and/or contributed to the scram. The inappropriate manipulation of plant equipment, outside of procedural guidance, and without utilizing the proper questioning attitude for system operation, greatly exacerbated the event and are described in more detail as a non-cited violation in the Results section of this report. The inspectors determined that the significance of these human performance breakdowns was not sufficiently described or addressed in the root cause evaluation. The actions to address

the human performance aspects of this event were narrow in scope, only focusing on the crew that was involved in the event, and only focused on use of the procedure for the primary water system evolution. The lack of detail associated with this aspect of this event was shared as an observation with the licensee, where it was discovered by the inspectors that additional actions were being taken to address a decline in human performance in the operations department. This information, however, was not provided in the root cause evaluation or as part of the supplemental information to the team. It was also discovered that these actions were being taken due to several other human performance issues within the department that had occurred after the December 11, 2020, scram. The fact that additional errors occurred, and subsequent licensee actions were deemed necessary, bolstered the inspectors' observation that the licensee had not fully evaluated operator performance deficiencies in their root cause evaluation for the December 11 event.

d. Prior Opportunities and Operating Experience. For the five individual scram events and the common cause analysis, the licensee included an evaluation of internal and external OE. For some of the events, this search yielded multiple examples where the licensee potentially missed opportunities to apply actions from OE throughout the nuclear industry to, at a minimum mitigate, if not prevent, some of the events from occurring. The team determined this was a General Weakness associated with the licensee's implementation of their OE program as described under the NRC Assessment section above.

   The team also shared an observation with the licensee for prior occurrences of human performance behavior gaps in the operations department that significantly contributed to the December 11 event. This specific human performance issue is documented in the Results section as a non-cited violation. This event, however, was not the only example of a decline in the usage of human performance tools to prevent errors by operators. Approximately 6 weeks prior to the December 11 event, the operations department experienced a clearance and tagging error, where the wrong valve was tagged for a work activity. The licensee took narrowly scoped actions that primarily involved conducting observations of the clearance and tagging program and did not evaluate or correct the human performance behaviors associated with the event. Also, in July 2020, operations personnel identified that the primary water system (PWS) leakage water return valve, the valve that "locked out" during the December 11 event, had become "stuck closed." Minimal questioning attitude (a human performance behavior attribute) was applied during the CAP response to this issue to determine why it occurred and what the risk impact would be if it malfunctioned again. The condition report was closed as a "broke/fix" item.

e. Common Cause. The licensee conducted a common cause analysis for the five individual scram events in 2020. This analysis reviewed the events in aggregate, the causes of those events, and any potential programmatic weaknesses. The licensee performed a variety of streaming analyses (a common root cause evaluation tool used to align and evaluate data) and evaluation methodologies to determine a common root cause and contributing causes for the 2020 events.

   The licensee-established common root cause was identified as "Entergy Engineering Leadership (Corporate Projects and Site Engineering) did not fully align the organization around roles and responsibilities for the Turbine Control System modification missing an opportunity to provide greater rigor to the design change." A contributing cause for the common cause was identified as "Engineering Leadership has not fully enforced

standards for design changes which require validation of technical adequacy, protect design and operating margins, ensure plant interfaces are fully evaluated, and quality of equipment or parts installed perform as expected." Both causes address programmatic issues within the engineering organization associated with the engineering design change process. These causes emphasize the need to properly implement, with a sufficient level of rigor and technical adequacy, the modification process and ensure thorough reviews of the design change products are conducted by licensee supervisory staff.

Another contributing cause was determined to be "Station personnel have at times exhibited complacent behaviors related to aspects of generation risk during implementation of the CAP to fully mitigate some precursor incidents." This cause identified programmatic weaknesses in the CAP where significant issues associated with "generation risk" had not been fully evaluated and resolved – as self-revealed in the five individual scram events in 2020.

While the licensee did document several programmatic weaknesses as part of their analyses, the inspectors identified additional programmatic issues that the licensee did not recognize. These included the effective use and implementation of the OE program and the CAP, specifically as it pertains to comprehensiveness of evaluations and the timely and effective resolution of identified issues. The inspection team also determined that additional licensee emphasis could be placed on improving human performance behaviors, including some of the specific areas mentioned in the Safety Culture section later in this report. The inspectors shared these observations with the licensee to evaluate for any additional actions to implement moving forward.

Objective 2: Independently assess and ensure that the extent-of-condition and extent-of-cause of significant individual and collective performance issues are identified.

The inspectors independently sampled the licensee's assessments to ensure they sufficiently and comprehensively addressed extent-of-condition and extent-of-cause. The goal of the extent-of-condition review was to ensure the licensee's evaluation was of sufficient breadth and depth to identify issues similar to those for which the supplemental inspection was performed. The goal of the extent-of-cause review was to ensure that the licensee's evaluation was of sufficient breadth and depth to identify other plant equipment, processes, or human performance issue that may have been impacted by the root causes of the performance issues.

NRC Assessment: The team concluded that this objective was **Met**. Overall, the licensee appropriately identified the extent-of-condition and extent-of-cause for the performance issues. There was one General Weakness related to this objective.

General Weakness No. 3: The team identified a General Weakness with the scope of the licensee's extent-of-condition and cause reviews. The inspectors found that the licensee's reviews excluded potentially risk-significant systems and components that could be impacted by the engineering design change process deficiencies and overall organizational gaps revealed through the five individual scram events. In the analyses performed for the individual events and the common cause, many of the extent-of-condition reviews focused on the TCS modification and plant equipment or process issues that would screen as high risk to electrical power generation. The inspectors conducted their independent assessment by applying the licensee-identified condition or cause to other nuclear safety and risk-significant equipment or processes. The inspectors deemed this to be appropriate because the overriding concern of

ensuring nuclear safety extends beyond electrical power generation risk significant items. The inspectors also determined that the underlying causes of the decline in licensee performance revealed by the 2020 scram events could also be present in safety-related equipment and processes necessary for transient mitigation.

One example of this weakness was revealed during the inspectors' review of recent design changes to the site's emergency diesel generators (EDGs). In the first half of 2021, the licensee replaced sub-covers (EDG cylinder boundary and support components) for both EDG divisions. These modifications were not screened as being risk significant per the licensee's Technical Task Risk and Rigor (Procedure EN-HU-104) process and hence were not included in the licensee's extent-of-cause reviews as they related to reviewing in-process or completed engineering changes. The inspectors identified several gaps during their review of the modification packages, including one case in which an EDG modification package was classified as being non-safety related. This was an incorrect classification based on the component classification of the EDGs and the subcover assemblies (all safety-related). Also, there were missing critical parameters from the Division II EDG table that later led to system operation challenges post-installation (discussed in more detail in the corrective actions section). Additionally, the risk calculation, per the Procedure EN-HU-104 process, was incorrect. Finally, none of these issues were identified by the licensee's process including their review board.

This General Weakness included several other examples where the inspectors determined that the licensee's scope of the extent-of-condition or extent-of-cause reviews was limited. For the August 8, 2020, event, the inspectors identified that the licensee did not evaluate the potential impacts of vibration on equipment already installed in the plant that was unrelated to the TCS. Instead, the licensee focused on components that could have been affected by the TCS modification. For the November 6, 2020, event, the inspectors determined that the licensee's scope of reviewing the alarm response instructions (ARIs) should have been expanded to include systems outside of the PWS. By conducting a small sampling of licensee procedures, the team identified several ARIs that contained instructions of a similar level of detail that was considered deficient in the ARIs for responding to the PWS alarm. These ARIs were associated with other nuclear safety significant systems. The same potential cause existed in these procedures that potentially could lead the operators to respond in a similar manner to a different alarm indication and could cause adverse system impacts. Finally, the inspectors identified that the common root cause (i.e., engineering leadership didn't ensure proper roles and responsibilities) extent-of-cause and extent-of-condition only reviewed major modifications in progress across the Entergy fleet at that time. This was a small sample of only three projects and none of those projects were in-progress at GGNS. The inspectors shared this observation with the licensee for their consideration to expand their sample size.

The team's detailed assessment of this inspection objective included the following:

a. Extent-of-Condition and -Cause. The team reviewed the licensee's extent-of-condition evaluations which were performed individually for each of the five scram events and collectively for the common cause analysis. These evaluations involved extending out many of the conditions to other high-risk components within the TCS. For the May 25, 2020, event, the condition of the speed sensor gap setting being inaccurate was reviewed for other components installed as part of the modification to validate their design settings were correct. For the August 8 event, the condition of the main turbine control valve actuator having a loose threaded rod was reviewed for all other hydraulic actuator assemblies installed as part of the upgrade. For the August 24 event, the

condition reviewed was foreign material intrusion into similar valve positioners for conditional single point vulnerabilities such as the other reactor feedwater pump minimum flow valves and startup level control valves. For the November 6 event, the condition reviewed was potential design deficiencies with other PWS flow transmitters that could have been impacted by the system modification. Finally, for the December 11 event, the condition reviewed included proper operation and response of other equipment used during a tank fill evolution for the PWS. Corrective actions included performing a TCS modification vulnerability study to identify any additional latent design change issues, reviewing operator single point vulnerabilities within the PWS, and reviewing critical balance of plant systems for generation risks.

The team reviewed the licensee's extent-of-cause evaluations which were performed individually for each of the five scram events and collectively for the common cause analysis. These evaluations involved extending many of the causes to examine other major projects underway to ensure the critical parameters were identified, the proper level of oversight and reviews were assigned, and that any latent design issues were found for the TCS upgrade modification. For the two issues related, at least in part, to operations performance, the causes were extended to look at other ARIs for the PWS and other operational challenges that may have previously been captured in the CAP for the PWS. For the August 24 event, the reactor feedwater minimum flow valve failure, there was not an extent-of-cause evaluation performed because the licensee deemed it to be an early failure. Corrective actions included steps to establish, enforce, and monitor the effectiveness of changes to the fleet process for engineering design changes, specifically as they related to major modifications and/or projects involving contractors.

Objective 3: Ensure that completed corrective actions to address and preclude repetition of performance issues are timely and effective.

The inspectors determined if the completed licensee-identified corrective actions to preclude repetition (CAPRs) were appropriate and included a plan for timely implementation. The inspectors then reviewed implementation of those actions to ensure they were completed according to the plan, commensurate with their significance. For those CAPRs that included effectiveness reviews (either interim or final) already completed at the time of the inspection, the inspectors verified that the licensee had established actions which included proper quantitative and/or qualitative measures of success. The inspectors also reviewed a sample of corrective actions taken for contributing causes and extent-of-condition/extent-of-cause actions. These actions were evaluated for appropriate prioritization for implementation and to ensure they adequately addressed the issues identified. The following table details the completed CAPRs:

Cause	CAPR
May 25, Root Cause 1: Entergy Engineering Leadership (Corporate Projects and Site Engineering) did not ensure critical assumptions in the TCS modification were documented or validated for turbine shaft movement during operation where a reduction in margin was present in accordance with Procedure EN-DC-115, roles and responsibilities were not well communicated across organizations, and	**CAPR 1 [Revised in response to NRC concerns]**: Revise Procedure EN-HU-104, Technical Task Risk & Rigor, to require creation of a detailed table listing risk parameters (setpoints, settings, dimensions) being revised for engineering changes (ECs) with high consequence generation or multiple train (common mode) or single train safety-related system risk. Table is to list the old parameter, new, and

Cause	CAPR
leadership behaviors were lacking to promote sufficient challenge to achieve an acceptable result to prevent an unplanned scram.	basis for acceptability. This table would then be presented for mitigating actions such as Independent Third-Party Reviews (ITPRs), Engineering Quality Review Team (EQRT), and challenge board. **[Revision 12, Completed 9/13/2021]** *Note: inspectors were unable to inspect implementation of the CAPR since it was revised in response to the NRC's questions at the end of the inspection* – this action is also in the **Planned CAPR** section for follow-up
August 8, Root Cause 2: Engineering leadership (Corporate Projects and Site Engineering) did not ensure full implementation of Entergy processes as intended to verify vendor quality of the valve actuator assembly fabrication, installation coordination of work activities, vendor work planning, control of work activities performed by supplemental vendor support on-site through execution phase by supplemental support.	**CAPR 3:** Revise Procedure EN-MP-100, Critical Procurements, to incorporate requirements to document and track specific methods utilized to verify critical characteristics are met. **[Complete]**
August 24, Root Cause 1: Reactor feed pump B minimum flow valve positioner installed during preventive maintenance activities failed due to infant mortality within approximately 29 hours of service.	**CAPR 4:** Implement work instructions (such as a new maintenance procedure or model work order) for those air operated valves (AOVs) using ABB/Bailey AV1 or AV2 series positioners to inspect the positioners prior to installation. **[Complete]**
November 6, Root Cause 1: Entergy engineering leadership (Corporate Projects and Site Engineering) made changes to the design of the primary water bushing flow instrumentation loop without fully evaluating the impacts of the changes to the instrumentation feedback quality and existing operating margins to a generator trip.	**CAPR 5:** The sensing lines for all primary water flow transmitters were walked down and those that were determined to require modification to obtain the proper slope per JS02 were changed appropriately. Replaced tubing to the three bushing flow transmitters. Added test valves to allow backfilling the bushing, rotor, and stator flow instruments. **[Complete]**
	CAPR 6: Increase primary water flow transmitter damping and trip time delay. **[Complete]**
	CAPR 7: Raised the low bushing flow alarm setpoint from 29.8 to 31.5 gpm to provide advanced notification of a degrading flow. **[Complete]**
December 11, Root Cause 1: Entergy engineering leadership (Corporate Projects and Site Engineering) established a design	***Reference CAPR 1**

Cause	CAPR
for the leakage water return valve control logic which was not fully understood and had impacts that changed the operation which were not desired in the TCS modification resulting in an automatic plant trip.	
December 11, Root Cause 2: The operating crew lacked adequate knowledge of the primary water system to control and stabilize the leakage water standpipe level.	**CAPR 9:** Perform training for licensed and non-licensed operators on the operation of valve N43FD01 and how the primary water system should respond during head tank addition, and on overall operation of the primary water system. **[Complete]**
Common Cause, Root Cause 1: Entergy engineering leadership (Corporate Projects and Site Engineering) did not fully align the organization around roles and responsibilities for the turbine control system modification missing an opportunity to provide greater rigor to the design change.	**CAPR 10:** Develop and implement a Roles and Responsibility Matrix to be used to establish, communicate, and track specific requirements for each participating individual through each portion of the modification process. **[Complete]**

NRC Assessment: The inspection team concluded that this objective was **Met**. However, the team did identify several gaps in the area of corrective actions associated with programmatic deficiencies identified in the CAPRs, corrective actions, and effectiveness reviews. There was one General Weakness and several observations related to this objective.

General Weakness No. 4: The team identified a General Weakness associated with the licensee's CAPRs. Specifically, the inspectors determined that one of the licensee's primary CAPRs (Original CAPR 1, not displayed in the table above) would not address process deficiencies in the engineering design change process in systems/components other than those that would be categorized as high risk to electrical power generation. This CAPR made significant revisions to the licensee's processes but did not adequately address the root causes of the issues. It excluded nuclear safety and risk-significant equipment from the scope of the CAPR. The licensee could experience a repeat event due to engineering design change gaps that could lead to improper modifications. Additionally, the licensee used this CAPR as a process entry point for other CAPRs and its deficiencies could have led to those CAPRs being ineffective as well.

Based on the initial assessment of CAPR 1 and the potential impact that gaps in that CAPR would have on other CAPRs, the team initially considered this issue to be a Significant Weakness. Specifically, CAPR 1, as originally written, was listed as "Revise EN-HU-104, Technical Task Risk & Rigor, to require creation of a detailed table listing generation risk parameters (setpoints, settings, dimensions) being revised for Engineering Changes (ECs) with high generation risk." The inspectors questioned why this CAPR wasn't also applied to nuclear safety and risk-significant engineering changes that didn't contribute to electrical power generation risk (i.e., mitigating systems).

As stated, the changes made to improve Entergy Procedure EN-HU-104 did not apply to most ECs having nuclear safety risk. Although Attachment 9.1 of that procedure acknowledged a nuclear safety risk impact on multiple trains of safety-related systems, the highest consequence risk screening which could be assigned was 'Medium.' As a result, CAPR 10, the Roles and Responsibilities Matrix (aka "RACI" process), to improve accountability and ownership of design

changes would not be implemented. This led the inspectors to question the effectiveness of the CAPRs to prevent repeat events that could result in challenges to the reliability of safety-significant equipment and unplanned transients on the plant.

A supporting example for this process observation was identified during the extent-of-condition/cause reviews. The inspectors reviewed EC 83472 and CAPR 1 as it related to the Division II emergency diesel generator (EDG) sub-cover replacement. The inspectors noted during this review that the function of the rocker arm shaft plugs was not identified by engineering personnel as a critical design parameter for the modification. As a result, EDG rocker arm shaft plugs were not procured and installed during the sub-cover modification installation in January 2021. During post-installation and subsequent surveillance testing of the Division II EDG, in March of 2021, a low lube oil pressure alarm was received, and a downward trend in lube oil pressure was noted that extended back to January 2021. The licensee-identified failure mechanism was the absence of rocker arm shaft plugs. While this issue was determined by the inspectors to be of minor safety significance since the EDG maintained its safety function, it highlighted the importance of applying CAPR actions to improve engineering technical rigor to safety-related equipment. This condition, or something similarly missed during the modification, had the potential to cause a higher consequence, especially for this high safety and risk significant equipment. This engineering change was copied and prepared to be installed on the other division EDG not long after the March 2021 event. If this issue hadn't self-revealed, a common mode failure could potentially have resulted.

After discussing this concern with licensee staff, CAPR 1 was revised to the language that is listed in the above table (Revised CAPR 1), which included adding "multiple train (common mode) or single train safety-related system risk." This revision was incorporated into Entergy Procedure EN-HU-104 in Revision 12, dated September 13, 2021. After reviewing the revised CAPR and associated corrective actions, the inspectors determined that the new actions would sufficiently address the vulnerability originally identified with implementation of the process. Specifically, the change to include high risk significant, safety-related systems as "high" risk items in Procedure EN-HU-104 ensured that the responsible engineer would create the critical parameters table for the associated design change and that the table would be reviewed by the Engineering Quality Review Team. The inspectors concluded that this change would also drive the licensee to utilize the new RACI process (responsibility and accountability tool – CAPR 10) for the same level of high-risk significant modifications. The inspectors determined that this action adequately addressed their concerns that the original CAPRs may not have been fully effective at ensuring individuals understand their roles and responsibilities and capture critical information with the appropriate level of technical rigor for modifications that have the potential to cause significant impacts on the plant (whether they are high electrical power generation or scram risk, or high safety system reliability risk). However, at the conclusion of the inspection activities, the CAPR was not yet implemented (i.e., had not been used for any engineering changes) and the associated effectiveness review plan was still being developed based. As such, the NRC plans to review these items during future follow-up inspection activities. Based on the licensee's changes to the CAPR, the team reclassified the gaps identified in the corrective actions area as a General Weakness.

The team's detailed assessment of this inspection objective included the following:

a. Completed Corrective Actions to Preclude Repetition (CAPRs). The licensee, through their causal evaluation process for the five individual scram events and the common cause analysis, identified multiple root causes and CAPRs. The inspectors reviewed the CAPRs to determine if they appropriately addressed the identified root causes and

contained a thorough plan for implementation. The inspectors then reviewed implementation of those actions to ensure they were completed according to the plan and done so in a timely manner, commensurate with their significance. For those CAPRs that had effectiveness reviews (either interim or final) already completed, those completed effectiveness reviews were evaluated to ensure the actions had proper quantitative and/or qualitative measures of success, and that they had been completed satisfactorily. The table above lists the identified root causes, the associated CAPR(s), and completion information for those CAPRs already completed at the time of the inspection. The table in the next section lists the open CAPRs that had not yet been completed at the time of the inspection. CAPR 1 is listed in both sections because of the initial completion of the action at the beginning of the NRC inspection; however, based on NRC concerns, it was revised and recategorized as an open item to inspect those revisions and implementation.

As mentioned in the NRC Assessment section above, the team identified one General Weakness for gaps identified in the implementation of some of the CAPRs. The team also shared several observations with the licensee related to this area. For example, the team observed that CAPRs 1, 3, and 10 relied heavily on the knowledge of individuals constructing the procurement table, critical parameters table, and/or the responsibilities matrix. The inspectors noted that there were very few corrective actions to address self-revealed gaps in staff knowledge identified following many of the scram events. Without ensuring the proper information is included and used in these process tools, they may not be effective. The team acknowledged that licensee staff had instituted additional actions for station management review that could help identify errors in the process tools. However, the team observed that more actions could be taken to improve the training and knowledge of the personnel that use these tools to further enhance their effectiveness.

b. Other Key Completed Corrective Actions. In addition to the CAPRs, the licensee created plans for corrective actions to address the contributing causes and extent-of-condition/extent-of-cause for each individual scram event and the common cause analysis. As with the CAPRs, many of these actions spanned multiple causes. One key area the inspectors reviewed was associated with actions related to improvements for the corrective action program (CAP). Corrective action program deficiencies were referenced in the common cause evaluation and the May 25, November 6, and December 11 event evaluations as contributing causes. Corrective actions included: analyzing the staff's ability to identify high risks and taking action to mitigate those risks; reinforcing risk assessment requirements to the Performance Review Group (PRG) and engineering / operations management; performing independent observations of PRG and pre-PRG meetings using a revised what-it-looks-like (WILL) sheet; reviewing mitigation plans for conditional single point vulnerabilities (SPVs) and eliminate conditional SPVs during maintenance; reviewing condition reports since the 2020 refueling outage for trip risks; and verifying system monitoring plans to identify degrading trends. Another key set of actions was associated with licensee oversight of "supplemental" workers. The licensee implemented actions to provide a greater level of oversight for supplemental workers prior to their arrival on-site as well as during their work activities. These actions also included more thorough and detailed reviews of third-party work products as part of the Owner Acceptance Review process.

Other important corrective actions the inspectors reviewed included actions for extent-of-condition and extent-of-cause. As previously mentioned, many extent-of-condition

actions focused on verifying and/or correcting similar/same conditions within the TCS. These actions included activities such as valve positioner inspections and enhancements, correcting flow transmitter design issues for the primary water system, performing a vulnerability study and enacting mitigating actions for deficiencies identified within the TCS, and addressing vibration-induced equipment impacts. The extent-of-cause actions related to improving the engineering design change process, implementing the prescribed CAPRs (listed above), and providing additional oversight for engineering change activities. An example of these actions included reviewing in-process and/or completed major modifications throughout the fleet against the new Procedure EN-HU-104 process and identifying any gaps in those design changes prior to implementation. These reviews also included utilizing the new Critical Procurement table and Critical Parameter table as part of those project plans. These same actions to create more detailed and thorough project plans were expanded to include other third-party projects and additional oversight for those projects.

The team evaluated these other key corrective actions to ensure they adequately addressed the issues identified and were appropriately prioritized for implementation. In general, the actions that were already completed appeared to be effective at resolving the associated issues. The inspectors shared some observations with the licensee in this area which focused on ensuring proper supporting documentation for closure of these actions, proper traceability of actions, and timely resolution. One example related to the December 11 event, in which a work order to correct the flawed control system logic was not properly coded as being related to a root cause evaluation and was cancelled and transferred to another work order. This new work order was not coded to track the resolution of this corrective action as it related to the root cause evaluation. Without proper coding, these work orders could be inappropriately changed or cancelled, and actions that were credited in the corrective action plan for the scram event could potentially not be completed.

Objective 4: Ensure that planned corrective actions to preclude repetition direct timely and effective actions to address and preclude repetition of significant individual and collective performance issues.

The inspectors reviewed the licensee's plans for the not-yet-completed CAPRs. These plans were reviewed to ensure appropriate level of detail, timeliness, and their potential for effectiveness. Additionally, the effectiveness review plans associated with each CAPR were reviewed to ensure the planned actions were appropriate and had proper quantitative and/or qualitative measures of success. A follow-up inspection plan will be developed to ensure timely and appropriate implementation of the actions during a future NRC baseline inspection. The table below lists the planned CAPRs:

Cause	CAPR
May 25, Root Cause 1: Entergy engineering leadership (Corporate Projects and Site Engineering) did not ensure critical assumptions in the TCS modification were documented or validated for turbine shaft movement during operation where a reduction in margin was present in accordance with Procedure EN-DC-115, roles and responsibilities were not well communicated	**CAPR 1**: Revise Procedure EN-HU-104, Technical Task Risk & Rigor, to require creation of a detailed table listing risk parameters (setpoints, settings, dimensions) being revised for ECs with high consequence generation or multiple train (common mode) or single train safety-related system risk. Table is to list the old parameter, new, and basis for acceptability. This table would then be

Cause	CAPR
across organizations, and leadership behaviors were lacking to promote sufficient challenge to achieve an acceptable result to prevent an unplanned scram.	presented for mitigating actions such as ITPR, EQRT, and challenge board. **[Revision 12, Completed 9/13/2021]** *Note: inspectors were unable to inspect CAPR implementation since it was revised in response to the NRC's questions at the end of the inspection*
August 8, Root Cause 1: Entergy engineering leadership (Corporate Projects and Site Engineering) did not ensure the actuator assembly design was fully evaluated and the effects of vibration on the equipment in the TCS modification were fully evaluated.	**CAPR 2:** Implement an EC based on engineering analysis which incorporates design features to reduce and control the effects of vibration on the actuator assembly. Incorporate findings into an engineering change package and process in accordance with Procedure EN-DC-115. [**Due 4/29/2022]**
November 6, Root Cause 1: Entergy engineering leadership (Corporate Projects and Site Engineering) made changes to the design of the primary water bushing flow instrumentation loop without fully evaluating the impacts of the changes to the instrumentation feedback quality and existing operating margins to a generator trip.	**CAPR 8:** Complete a permanent design change for the generator bushing primary water flow low trip setpoint to ensure that the proper margin to the trip setpoint is maintained. [**Due 6/1/2022]**

NRC Assessment: The team concluded that this objective was **Met**. Overall, the team concluded that the planned CAPRs appeared to direct the timely implementation of licensee actions to preclude repetition of the events. When complete, the NRC plans to inspect and assess the planned corrective actions to prevent recurrence identified in the table above.

The team's detailed assessment of this inspection objective included the following:

a. Planned Corrective Actions to Preclude Repetition: In general, the team determined these CAPR plans appeared to direct timely implementation and would likely be effective in addressing and precluding repetition of the significant individual and collective performance issues. The inspectors noted that the licensee was planning to implement many of the planned CAPRs during the next refueling outage. For other modifications, the licensee assigned longer due dates because the planned CAPRs would take longer to complete. The inspectors determined this was reasonable based on the conditions and/or processes that caused the five scram events.

   The inspectors did not identify any significant deficiencies during their evaluation of the "effectiveness review" plans. However, the inspectors noted that the effectiveness of the CAPRs are best evaluated after implementation and an appropriate run time. The inspectors also observed that in some cases the licensee had not been sufficiently thorough and critical when assessing CAPR effectiveness. As an example, the inspectors noted that the "old" interim effectiveness review for the "old" CAPR 1 (changes to Procedure EN-HU-104), was considered satisfactorily met even though deficiencies were identified with the engineering changes reviewed. In this case, every EC reviewed, where the EC responsible engineer elected to create a critical parameters table (even though not required by procedure), had one or more examples of failure to

follow the new process. Since these items were captured in CAP during the review for effectiveness, the licensee considered the CAPR effective. The inspectors disagreed with this assessment of the data based on the process not being effectively used to identify critical parameters and information, as designed.

Objective 5: Independently determine if safety culture traits caused or significantly contributed to the performance issues.

The inspectors independently determined whether the licensee's root cause, extent-of-condition, and extent-of-cause evaluations appropriately considered if safety culture components caused or significantly contributed to the performance issues leading to the Yellow PI. The inspectors also reviewed the third-party safety culture assessment that was performed prior to the inspection activities on-site.

NRC Assessment: The team concluded that this objective was **Met**. Overall, the team concluded that safety culture was appropriately evaluated throughout the licensee's causal evaluations and that appropriate actions were taken to address identified gaps. The inspectors also made some observations related to this objective.

The team's detailed assessment of this inspection objective included the following:

a. Safety Culture: The inspectors reviewed the five individual scram root cause evaluations to determine if the licensee appropriately identified the cross-cutting aspects applicable to the causes of each event, as well as the common cause analysis for general licensee performance issues. The inspectors independently assessed the relationship between the safety culture aspects and performance issues identified at GGNS by conducting focus group sessions and individual interviews, observing a Nuclear Safety Culture Monitoring Panel (NSCMP) meeting, evaluating an independent safety culture assessment of the station, and reviewing other causal evaluations, self-assessments, and corrective action documents developed by the licensee.

   The inspectors interviewed 104 plant employees including staff-level personnel, supervisors, superintendents, and key managers. Focus group and interview participants were selected from various departments throughout the licensee organization. Focus groups did not combine supervisors with staff-level personnel. The inspectors designed the focus groups and interviews to gather information on the safety culture at the station with questions directed toward specific safety culture aspects. These questions included aspects such as: leadership safety values and actions, problem identification and resolution, personal accountability, work processes, continuous learning environment, safety communication, respectful work environment, and safety conscious work environment (SCWE).

   The NRC defines "Safety Culture" as "*the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals*." There are many traits included in Safety Culture that help to better define "core values and behaviors." One such value is Safety Conscious Work Environment or SCWE. This is a work environment in which employees feel free to raise nuclear safety concerns through multiple avenues without the fear of retaliation. The team determined that overall, the station exhibited signs of a positive SCWE.

The team also found that the licensee identified several safety culture attributes associated with the causes of each individual scram event, as well as the common cause(s) that contributed to the overall GGNS performance decline. The inspectors determined that most of these licensee-identified attributes were appropriate; however, they also identified a few additional attributes that the licensee should have considered. One such attribute, as was previously described as a General Weakness, was in the area of operating experience. Operating experience is a safety culture trait within the area of Continuous Learning. As mentioned earlier in this report, the inspectors determined that the licensee was not effectively implementing the OE program to ensure that valuable information was reviewed and leveraged to preclude avoidable events from occurring.

Another safety culture attribute identified by the inspection team was in the area of Benchmarking (also part of the Continuous Learning area). The inspectors determined that overall, the licensee had an appropriate Benchmarking program; however, it was not applied consistently throughout the organization. The team identified that Benchmarking was predominantly performed solely within the Entergy fleet and the inspectors considered this a missed opportunity to leverage the experience of other organizations within the nuclear industry to identify potential process gaps. The inspectors also determined that rather than using Benchmarking as a tool to improve overall plant and organizational performance to identify and address issues before they became problems at the station, the licensee tended to use it in response to events after the condition had manifested itself.

A third safety culture attribute that the inspectors identified, which was missed in the licensee's evaluation, was in the area of Training (also part of Continuous Learning). Specifically, the inspectors identified a performance gap in the licensee's implementation of new processes for knowledge retention and transfer across departments. In particular, the inspectors noted a lack of consistency among departments regarding the application of the licensee's Knowledge Transfer and Retention Process (KTRP). The team discussed these safety culture observations with senior management at the station. In most cases, the station had some corrective actions in place that addressed portions of the identified gaps. The station took additional actions to address the team's concerns.

The team shared their overall assessment of safety culture with the licensee during briefings while on-site. Overall, the station demonstrated a successful practice of many of the traits that contribute to a healthy Safety Culture – including SCWE, Questioning Attitude, and a Respectful Work Environment. However, the inspectors noted a general lack of understanding among several licensee personnel, both at the staff and management level, regarding the definition of "safety culture." When asked to define "safety culture" most individuals interviewed provided the definition of a safety conscious work environment (SCWE). The inspectors noted that, while a healthy environment for raising concerns is indeed important, it is only one element of a healthy Safety Culture. The team emphasized that Safety Culture is a complex, integrated structure of traits that permeates throughout the organization. The team shared that consistent and persistent messaging of safety culture components for every activity, every day, will be essential for ensuring that the cultural improvements underway at the site will progress in a sustainable manner.

Conclusion

Overall, the inspectors determined that the licensee's problem identification, causal analyses, and corrective actions sufficiently addressed the performance issues that led to the Yellow performance indicator. All inspection objectives, as described in IP 95002, were **Met** and this inspection is therefore closed. Open items such as CAPR follow-up will be inspected as part of the ongoing NRC baseline inspection program.

INSPECTION RESULTS

Failure to Verify Appropriate Design Inputs per the Engineering Change Process			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green FIN 05000416/2021040-01 Open/Closed	[H.3] - Change Management	71153

The inspectors identified a self-revealed Green finding when the licensee failed to verify appropriate design inputs per Procedure EN-DC-115, "Engineering Change Process," Revision 31, for the turbine control digital system upgrade project. Specifically, in three instances, the licensee failed to identify the following during the Design Review and Owner Acceptance Review of the engineering change:

1. An incorrect air gap setting for the new turbine speed monitoring probes which resulted in an automatic turbine trip and reactor scram on May 25, 2020.
2. The effect of vibration on the hydraulic actuator for a main turbine control valve, a critical aspect of the design, which resulted in operators initiating a manual reactor scram on August 8, 2020.
3. Incorrect design for primary water bushing flow transmitter sensing lines, which led to an automatic turbine trip and reactor scram on November 6, 2020.

Description: The main turbine control and protection system was upgraded in the spring 2020 during Refueling Outage RF22 to replace the main turbine electro-hydraulic control (EHC) and mechanical-hydraulic control (MHC) system to a high-pressure hydraulic system and digital control system. All non-safety work was performed under one vendor-prepared Engineering Change EC72780.

On May 25, 2020, a reactor scram occurred due to a main turbine trip from approximately 65 percent power during valve testing in the initial power ascension following implementation of the turbine control digital system (TCS) upgrade. The trip was determined to be caused by inadvertent overspeed signals from two active speed probes which contacted the speed wheel installed on the turbine shaft, causing erratic high and low signals that initiated an overspeed trip signal. The contact resulted from movement of the shaft during operation of the turbine and occurred during high-pressure turbine valve stroke testing of valves associated with the high-pressure turbine. The speed sensing probes and speed sensing wheel had been modified as part of the installation of the TCS upgrade per Engineering Change EC72780 with a smaller air gap than required, which reduced operating margin. The air gap is the distance between the speed probe and speed wheel axially and radially. It has an established minimum setting to ensure that the speed wheel on the turbine shaft does not contact the active speed probes. Speed measurement is required for turbine speed control and the overspeed protection functions. The vendor design specification for minimum air gap specified was 0.035 inches, a value that was too small for the configuration of the TCS at GGNS. This specification was based on industry knowledge and not verified to be correct for GGNS equipment. The original speed probe gap at GGN was 0.047 inches, but there was no documentation nor basis for the reduction of the air gap with the new design. Contrary to the

Engineering Change process, during the design review, the licensee did not do a complete review of the specific element related to the speed wheel or basis for the original air gap setting nor was the documentation obtained from the vendor. These parameters and supporting documentation were all critical aspects of the design change.

On August 8, 2020, operators manually scrammed the reactor in response to high pressure control valve oscillations greater than 5 percent. The cause of the pressure control valve oscillations was a loose threaded connection for the linear variable reluctance transmitter (LVRT) driver plate on hydraulic actuator for the "D" main turbine control valve. The hydraulic valve actuator assemblies were installed with a new design of LVRT assembly. The LVRT assembly consists of two LVRTs mounted to a common bracket that is attached to the valve actuator assembly. The LVRT driver plate connects the actuator rod to the LVRT assembly to provide position indication for the valve. This connection became loose and resulted in a scram.

Vibration on equipment had previously been determined to cause equipment issues with alignment, assembly fasteners to loosen, and assembly parts critical to the function of the actuator assembly to back out. The vibration conditions were measured and evaluated as part of Engineering Change EC72780 but were not fully evaluated for the effects of vibration on the entire assembly to identify weaknesses, ultimately leading to an inadequate design. Contrary to the Engineering Change process, critical aspects of the design were not identified during design reviews and owner acceptance reviews. The vendor design documentation contained vibration data that was obtained in Refueling Outage 21, but the evaluation and review of this data was accepted without analysis of all parts of the assembly, and therefore, not fully understood.

On November 6, 2020, an automatic turbine trip and subsequent scram occurred due to a low-level signal for primary water system (PWS) flow to generator bushing C. The cause of the scram was gas voids developed in the PWS, which degraded generator bushing primary water flow and increased instrumentation noise in the bushing flow transmitters. Cooling flow to the 'A', 'B', and 'C' phase generator bushings is supplied from a common PWS supply header that splits into three parallel lines to supply each of the three phase bushings. Flow transmitters for each phase share a common sensing line from a flow element; flows are expected to be the same for all three bushings. A low flow alarm and turbine trip occur for low flow conditions. The primary water flow transmitters were upgraded to digital transmitters and the instrumentation rack design was changed as part of the TCS upgrade per Engineering Change EC72780. This resulted in changing the sensing line configuration to the transmitters that connect them to the system. As a result, the sensing lines were not installed with the proper sloping as required per the site's Standard JS-02, "Instrument and Control Standard Installation Notes and Details for Safety and Non-Safety Related Services," Revision 2, as well as the Vendor Manual for the transmitters. The effect of not sloping the instrument lines is that it allows air and/or hydrogen to accumulate in the sensing lines and ultimately can lead to false low flow indication and false trips. Additionally, the new instrument rack design did not include valves necessary to perform proper backfilling of the sensing lines to remove air and/or hydrogen. During the primary water system upgrade design review and owner acceptance review, the licensee failed to verify appropriate design inputs were used and failed to evaluate the impact of the changes on system operation. Specifically, the design drawing for the instrument rack provided by the vendor showed sensing lines that did not have a slope when installed. Additionally, the primary water transmitter manifolds did not include backfill valves in the new design that had existed on the previous transmitter manifolds to aid in removal of air and/or hydrogen from the sensing lines.

Inspectors identified that licensee Procedure EN-DC-115, “Engineering Change Process,” Revision 31, step 6.7, discussed the review and approval requirements for engineering changes processed using the standard design process performed per Procedure EN-DC-115-01, “Industry Standard Design Process (IP-ENG-001),” Revision 1. Step 3.5.9 of Procedure EN-DC-115-01 required that design team members review the change package to ensure appropriate design inputs/design requirements had been identified and properly evaluated. Further, step 3.5.12 of Procedure EN-DC-115-01 required an owner acceptance review for vendor generated designs or engineering products and stated, in part, that an Owner Acceptance Review should confirm the change package includes the appropriate design inputs. Contrary to these requirements, in the examples noted, the licensee failed to verify appropriate design inputs were used during these reviews.

Corrective Actions: The licensee implemented several actions in their engineering design process to ensure that roles and responsibilities will be clearly established for Corporate and Site functions when approving engineering modifications prepared by outside design organizations or by Entergy engineering organizations to improve procedural compliance and modification quality. Root cause evaluations were also performed for each of these events.

Corrective Action References: CR-GGN-2020-08779, CR-GGN-2020-10715, CR-GGN-2020-11199, CR-GGN-2021-03320

Performance Assessment:

Performance Deficiency: The failure to verify appropriate design inputs per Procedure EN-DC-115, “Engineering Change Process,” Revision 31, for the turbine control system digital upgrade project was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Design Control attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the performance deficiency resulted in three reactor scrams on May 25, 2020, August 8, 2020, and November 6, 2020.

Significance: The inspectors assessed the significance of the finding using Appendix A, “The Significance Determination Process (SDP) for Findings At-Power.” The finding was determined to be of very low safety significance (Green) because it caused a reactor trip but did not cause a loss of mitigating equipment relied on to transition the plant from the onset of a trip to a stable shutdown condition.

Cross-Cutting Aspect: H.3 - Change Management: Leaders use a systematic process for evaluating and implementing change so that nuclear safety remains the overriding priority. Specifically, station leadership did not ensure that design reviews and owner acceptance reviews associated with the turbine control system digital upgrade project were sufficiently scoped and detailed to avoid significant, unintended consequences. As a result, the licensee did not identify that the design inputs associated with the 3 different events were incorrect and three reactor scrams occurred.

Enforcement: Inspectors did not identify a violation of regulatory requirements associated with this finding.

Failure to Follow the System Operating Instruction for the Primary Water System			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green NCV 05000416/2021040-02 Open/Closed	[H.11] - Challenge the Unknown	71153

The inspectors identified a self-revealed Green finding and associated non-cited violation of Technical Specification 5.4.1(a) when the licensee failed to implement Procedure 04-1-01-N43-1, "Primary Water System Operating Instruction," Revision 62. Specifically, while performing Section 5.2.2, "Filling and Venting to Raise System Water Tank Level to Normal," an operator inappropriately applied a caution statement associated with step 5.2.2.f after misdiagnosing that valve 1N43-FD01, the primary water system leakage water return valve, was stuck open. The operator incorrectly took manual action to close the valve, causing the primary water system head tank level to lower, resulting in an automatic turbine trip and reactor scram.

Description: On December 11, 2020, during operator rounds, primary water system (PWS) head tank level was found to be low. Operations personnel began filling the tank using Procedure SOI 04-1-N43-1, "Primary Water System Operating Instruction," Revision 62, to raise level in the tank to the normal band.

To fill the tank, operators opened a local manual fill valve, which takes water from a demineralized water storage tank and directs it to a standpipe. The PWS leakage water return motor operated valve (MOV) 1N42-FD01 operates automatically to maintain standpipe level, directing excess water in the standpipe back to the primary water tank. Operators aligned the system for filling using Section 5.2.2 of Procedure SOI 04-1-01-N43-1. This procedure had a caution statement prior to performing step 5.2.2.f that stated, in part, "filling the PW tank too fast may cause leakage water return valve 1N43-FD01 to stroke full open and stick open. If, while filling the PW tank, the MOV sticks full open, stop filling, and manually move 1N43-FD01 off its full open backseat."

After opening the local manual fill valve, the operator noted that there did not appear to be any movement of valve 1N43-FD01. This was not the expected result, so the operator took local, manual control of the valve to move it in the closed position (per the caution statement). Prior to taking this action, the operator did not validate that the valve stroked to its full open backseat. The operator then inappropriately acted to close, or move the valve off its full open backseat, which resulted in fully closing valve 1N43-FD01 and isolating makeup water to the tank. PWS level continued to lower, eventually reaching the low level setpoint that resulted in the automatic turbine trip and reactor scram.

Corrective Actions: The licensee issued a revision to the system operating instruction to provide instructions for local manual standpipe control and monitoring standpipe level of the PWS.

Corrective Action Reference: CR-GGN-2020-12131

Performance Assessment:

Performance Deficiency: The licensee's failure to follow Procedure SOI 04-1-01-N43-1, "Primary Water System Operating Instruction," was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Human Performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the performance deficiency resulted in an automatic turbine trip and reactor scram.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." The finding was determined to be of very low safety significance (Green) because it caused a reactor trip but did not cause a loss of mitigating equipment relied on to transition the plant from the onset of a trip to a stable shutdown condition.

Cross-Cutting Aspect: H.11 - Challenge the Unknown: Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding. Specifically, the operator had an unexpected plant response and operated a valve contrary to procedure, which prevented transfer of makeup water from the standpipe to the primary water tank, eventually resulting in an automatic turbine trip and reactor scram.

Enforcement:

Violation: Technical Specification 5.4.1(a), "Procedures," requires, in part, that written procedures be implemented as recommended by Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Section 4.m of Regulatory Guide 1.33, Revision 2, Appendix A, recommends procedures governing operation of the turbine-generator system. System Operating Instruction 04-1-01-N43-1, "Primary Water System," Revision 62, Section 5.2.2, "Filling and Venting to Raise System Water Tank Level to Normal," states, in part, "filling the PWS tank too fast may cause leakage water return valve 1N43-FD01, to stroke full open and stick open. If, while filling the PW tank, the MOV sticks full open, stop filling, and manually move N43-FD01 off its full open backseat."

Contrary to the above, on December 11, 2020, while filling the PWS tank, an operator inappropriately determined MOV 1N43-FD01 stuck full open, and therefore stopped filling, and manually moved the MOV in the closed direction to reposition it off its full open backseat. However, prior to taking this action, the operator did not validate that the valve had stroked to its full open backseat. This resulted in the valve going full closed and the primary water system head tank level lowering to its low level setpoint, resulting in an automatic turbine trip and reactor scram.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

Failure to Prevent Recurrence of Multiple Scrams Related to the Turbine Control System			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Initiating Events	Green NCV 05000416/2021040-03 Open/Closed	[H.12] - Avoid Complacency	95002
The inspectors identified a self-revealed Green finding and associated non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, when the licensee failed to preclude repetition of recurrent plant scrams related to the turbine control system, a significant condition adverse to			

quality. Specifically, the licensee's actions to correct the causes of scrams that occurred prior to calendar year 2020 (and which resulted in the Unplanned Scrams per 7000 critical hours performance indicator crossing an elevated threshold in 2018), were ineffective. As a result, in 2020, four additional plant scrams related to turbine control system deficiencies caused the same performance indicator (Unplanned Scrams) to cross an elevated threshold.

Description: In 2018, the licensee crossed the threshold for White Performance Indicators (PIs) for both Unplanned Scrams per 7000 Critical Hours, as well as a White Performance Indicator for Unplanned Power Changes per 7000 Critical Hours. The turbine control system that led to the scrams had quality-related instrumentation that supplied trip inputs to the reactor protection system. The PIs crossing the elevated threshold and the root causes identified for the scram events were considered significant conditions adverse to quality (SCAQs). Corrective actions to preclude repetition (CAPRs) were created to address the common root causes identified for the events.

The licensee evaluated the 2018/2019 individual scrams and commonalities under multiple root cause evaluations (RCEs) (2018-9645 – common cause analysis (CCA) for Unplanned power changes and 2018-13042 – CCA for scrams and 2019-1504 – RCE for Auto Scram due to Generator Lockout). CAPRs credited in both common cause documents and the 2019 evaluation included the following:

> *CR-GGN-2019-01504 CAPR-19*
> *CAPR - Develop and implement a standard for performing Engineering Design Review for Engineering changes. Establish in the standard critical attributes for review, requirements for organizational engagement at key milestones, and requirements for risk ranking for prioritization for review of engineering changes. Standards shall be developed using attributes for each phase of a modification in accordance with EN-DC-115 Attachment 9.19, Standard Design Process.*
>
> *CR-GGN-2019-01504 CAPR-20*
> *CAPR - Develop a detailed quality review checklist with attributes required for preparation of an Engineering Change in accordance with EN-DC-115 Attachment 9.19 Stand Design process and incorporate the checklist into EN-DC-213, Engineering Quality Review process used at GGNS.*
>
> *CR-GGN-2019-01504 CAPR-22*
> *CAPR - Develop a detailed critical attributes list for third party review for engineering changes using criteria for each phase of a modification in accordance with EN-DC-115 Attachment 9.19, Standard Design process. Use the attributes list in conjunction with EN-HU-104, Technical Task Risk & Rigor, to implement these attributes at GGNS.*

The licensee implemented these actions in 2019. The licensee's effectiveness review for those CAPRs (LO-GLO-2019-00088 CA-01/02) concluded that the actions were effective based on the sampling performed. However, the effectiveness review noted that EC 72780 (TCS upgrade modification) was outside the population of items reviewed based on its approval prior to implementation of the CAPR actions. At the time, the licensee justified the decision not to include EC72780 in the scope of items reviewed, noting it was aligned with standard station practices.

After the licensee identified that the TCS upgrade modification was missed in the initial reviews for the implemented CAPRs, CA-35 of 2019-1504 was created with the intent to

identify deficiencies in EC 72780 as specified in the extent-of-cause evaluation under that RCE. This action was completed; however, not to the appropriate level of rigor to identify deficiencies with the modification that later self-revealed after installation, eventually causing/contributing to four out of the five SCRAMs in 2020. Specifically, licensee personnel performed a very limited retroactive sampling of some aspects of the modification and failed to perform an in-depth review that would have met the quality standard that was set by the original CAPR.

During this inspection, the inspectors noted that the licensee performed an internal operating experience review as part of their common cause analysis. While this review identified missed opportunities to address issues with the TCS modification, the licensee concluded that the condition was not a repeat event. However, the inspectors concluded that the causes shared multiple commonalities and, if the CAPRs had been properly applied to the TCS modification, the associated scrams could have been prevented.

Corrective Actions: The licensee took actions to improve the engineering design change process to provide greater levels of accountability, appropriate levels of oversight, and a more rigorous review process. Actions were also taken to improve the quality of engineering design change products to ensure greater technical rigor and proper risk assessment/mitigation.

Corrective Action Reference: CR-GGN-2020-10715

Performance Assessment:

Performance Deficiency: The licensee failed to effectively take corrective actions to preclude repetition of recurrent TCS-related plant scrams, a significant condition adverse to quality, which led to crossing an elevated threshold again in 2020 for the Unplanned Scrams per 7000 Critical Hours Performance Indicator.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Design Control attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, multiple scrams occurred due to the licensee's failure to appropriately implement the turbine control system upgrade modification.

Significance: The inspectors assessed the significance of the finding using Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." The finding did not include an impact on mitigating systems which resulted in a Green (very low) safety significance. However, since the finding involved multiple scrams, the inspectors consulted with the regional senior risk analyst (SRA). The SRA determined that the finding was of Green significance.

Cross-Cutting Aspect: H.12 - Avoid Complacency: Individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Individuals implement appropriate error reduction tools.

Enforcement:

Violation: 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that, for significant conditions adverse to quality, the cause of the condition is determined, and corrective action taken to preclude repetition.

Contrary to the above, between December 12, 2018, and December 11, 2020, the licensee failed to take corrective actions to preclude repetition for significant conditions adverse to quality. Specifically, in response to the elevated PI threshold being crossed in 2018, the licensee took actions to address deficiencies within the engineering design change process that were determined to be the common root causes of the TCS-related 2018 scram events (CR-GGN-2019-01504 CAPR-19, CAPR-20, and CAPR-22). The TCS had quality-related instrumentation that supplied trip inputs to the reactor protection system. On December 11, 2020, the plant scrammed for the fifth time in calendar year 2020, causing the same PI to cross the elevated threshold once again. The NRC determined that the station missed opportunities to correct deficiencies within the TCS upgrade modification when they failed to properly apply CAPR-19, -20, and -22, which led to four out of the five scrams in 2020 due to effectively the same root causes, a repetitive significant condition adverse to quality.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified that no proprietary information was retained or documented in this report.

- On October 4, 2021, the inspectors presented the IP 95002 supplemental inspection results to Mr. R. Franssen, Site Vice President, and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71153	Corrective Action Documents	CR-GGN-2020-08779	RCE Manual Plant Scram in Response to Pressure Control Valve Oscillations	2
71153	Corrective Action Documents	CR-GGN-2020-10715	Yellow Performance Indicator for Unplanned Scrams 4Q 2020	1
71153	Corrective Action Documents	CR-GGN-2020-11199	RCE Turbine Trip on Low Primary Water Flow to Generator Bushing 'C' Phase	2
71153	Corrective Action Documents	CR-GGN-2021-03320	RCE Plant Scram on Turbine Overspeed Trip	2
71153	Drawings	F6059EGP001	Electronic Generator Protection	3
71153	Drawings	F6059SPD101	Speed Sensing Installation	4
71153	Drawings	F6059TPBKTI	Thrust Probe Installation	3
71153	Engineering Changes	EC 72780	Turbine Control Protection System – non-safety	0
71153	Engineering Changes	EC 87601	Modification to the Speed Probe Bracket	0
71153	Engineering Changes	EC 88018	Replace Air Regulator of 1N21F513 With High Volume Air Regulator and Modify Piping to Regulate the Associated Volume Boosters with a Common Supply Line	0
71153	Miscellaneous		GGNS Operations Log	08/08/2020
71153	Miscellaneous	460000043	Alpha line Pressure Transmitters Absolute and Gage Models 1151AP and 1151GP Vendor Manual	10/07/1994
71153	Miscellaneous	LER 2020-002	Reactor Scram due to Main Turbine Trip	2
71153	Miscellaneous	LER 2020-003	Manual Reactor Scram Due to Turbine High Pressure Control Valve Malfunction and Automatic Reactor Water Level Scram	1
71153	Miscellaneous	LER 2020-004	Automatic Reactor Scram Due to Reactor Feed Pump Trip	1
71153	Miscellaneous	LER 2020-005	Primary Water System Flow Lowered Causing Turbine Trip and Subsequent Reactor Scram	2
71153	Miscellaneous	LER 2020-006	Primary Water Tank Low Level Causing Turbine Trip and Subsequent Reactor Scram	2

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
71153	Procedures	04-1-01-N43-1	System Operating Instruction Primary Water System	62
71153	Procedures	EN-DC-115	Engineering Change Process	31
71153	Procedures	EN-DC-115-01	Industry Standard Design Process (IP-ENG-001)	1
71153	Procedures	EN-DC-149	Acceptance of Vendor Documents	15
71153	Procedures	EN-HU-102	Human Performance Traps and Tools	18
71153	Procedures	EN-HU-104	Technical Task and Rigor	8
71153	Procedures	EN-HU-106	Procedure and Work Instruction Use and Adherence	9
71153	Procedures	EN-LI-118	Corrective Action Program	44
71153	Procedures	EN-OP-115	Conduct of Operations	30
71153	Procedures	JS-02	Instrument and Control Standard Installation Notes and Details for Safety and Non-Safety Related Services	2
71153	Work Orders	511784, 511780, 511754, 552294		0
95002	Corrective Action Documents	CR-GGN-2018-13042	White Performance Indicator Exceeded: SCRAMs per 7000 Critical Hours- Root Cause Evaluation	2
95002	Corrective Action Documents	CR-GGN-2019-00895	Liquid Penetrant Examination, Cracked Portion of Left Bank #1 Seat	02/05/2019
95002	Corrective Action Documents	CR-GGN-2019-00904	Liqui Penetrant Examination, Hairline Crack Right Bank #1 Subcover	02/05/2019
95002	Corrective Action Documents	CR-GGN-2019-00932	Liquid Penetrant Examination, Linear Indications on Rocker Arm Subcovers	02/06/2019
95002	Corrective Action Documents	CR-GGN-2019-00961	Three of six Division II Subcovers Show Signs of Damage	02/06/2019
95002	Corrective Action Documents	CR-GGN-2019-01504	An automatic reactor scram was initiated by the Reactor Protection System.	06/15/2020
95002	Corrective Action Documents	CR-GGN-2020-06674	Grand Gulf received a Reactor Scram due to a turbine trip.	01/27/2021
95002	Corrective Action Documents	CR-GGN-2020-06674	Reactor SCRAM due to a Turbine Trip	05/25/2020
95002	Corrective Action Documents	CR-GGN-2020-06674 CA-15	CAPR; Revise EN-HU-104 'Technical Task Risk & Rigor'	10/14/2020
95002	Corrective Action Documents	CR-GGN-2020-06763	During Fleet Maintenance Review of WO 511780 which installed the Speed probes during GGN outage	06/01/2020

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
			the following gaps were identified.	
95002	Corrective Action Documents	CR-GGN-2020-07217	Primary Water System Nuisance Alarm Due to PW Tank Level Deviation	06/11/2020
95002	Corrective Action Documents	CR-GGN-2020-07694	Primary Water System Nuisance Alarm due to PW Tank Level Deviation	06/29/2020
95002	Corrective Action Documents	CR-GGN-2020-07997	1N43FD01 Stuck Closed	07/12/2020
95002	Corrective Action Documents	CR-GGN-2020-08779	At 0127 hours the control room staff inserted a manual reactor SCRAM in response to pressure control valve oscillations.	08/09/2021
95002	Corrective Action Documents	CR-GGN-2020-08779	Manual Plant Scram in Response to Pressure Control Valve; Root Cause Evaluation	2
95002	Corrective Action Documents	CR-GGN-2020-08779 CA-10	CAPR; Implement EC with Design Features to Reduce Effects of Vibration on Actuator	10/01/2020
95002	Corrective Action Documents	CR-GGN-2020-08779 CA-13	CAPR; Revise EN-MP-100 'Critical Procurements'	12/17/2020
95002	Corrective Action Documents	CR-GGN-2020-09257	Reactor Feed Pump 'B' Trip and Reactor SCRAM	08/25/2020
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-10	Generate and Schedule Work Orders to Inspect Valve Positioners	11/13/2020
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-11	Develop and Implement a Proper Conditional SPV Mitigation Strategy	01/28/2021
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-12	Ensure that the Guidance to Perform Pre-Installation Inspection is Tied to Affected Valves	03/28/2021
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-13	Perform a Review of Expected Conditional SPV Components During Normal Power Maneuvers to Ensure Proper Mitigation	03/29/2021
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-14	Track Repair of RFP Low Suction Flow Annunciator	11/13/2020
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-15	Ensure the Finalized Failure Report is Accepted into Records	11/13/2020
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-17	Review Those Critical or Sensitive Components Fed by Instrument Air to Evaluate Filter Efficiency	02/28/2021
95002	Corrective Action	CR-GGN-2020-09257 CA-	Track Work Orders to Completion	12/16/2020

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Documents	19		
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-2	Scram Due to Reactor Feed Pump Trip; Root Cause Evaluation	1
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-22	Revise ARI 04-1-02-1H13-P680 for Improvements	03/15/2021
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-27	Revise Procedure 07-S-13-67	08/03/2021
95002	Corrective Action Documents	CR-GGN-2020-09257 CA-8	CAPR: Implement Work Instructions for AOV Using ABB/Bailey AV1 or AV2 Positioners to Inspect Prior to Installation	02/25/2021
95002	Corrective Action Documents	CR-GGN-2020-09300	Failure of Annunciator 1N21-FAL-L602B to alarm during Reactor Feed Pump 'B' Trip (CR-GGN-2020-09257)	08/26/2020
95002	Corrective Action Documents	CR-GGN-2020-09685	FCR 87609; Turbine Valves LVRT Guide Rod Fastener Modification	09/09/2020
95002	Corrective Action Documents	CR-GGN-2020-10715	Yellow Performance Indicator for Unplanned Scrams 4Q 2020; Root Cause Evaluation	1
95002	Corrective Action Documents	CR-GGN-2020-10715	Unplanned SCRAMs per 7,000 Critical Hours is WHITE at the end of the third quarter 2020.	08/19/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-06	Review SPVs that Rely on Operator Actions	04/07/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-08	Identify Interim Measures for On-Going Modifications	05/28/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-09	Identify Specific Requirements for Each Participant in EC Process	05/13/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-10	CAPR; Develop and Implement Roles and Responsibility Matrix Using Pilot Process	07/14/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-11	Determine Training Plan for New Requirements Based on Roles and Responsibilities	07/20/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-12	Communicate Roles to Engineering Personnel in the Modification Process	07/28/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-13	Evaluate Effectiveness of Modification Teams	06/17/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-14	Perform Recurring Observations and Feedback of Modification Teams	06/17/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-15	Incorporate CAPR Roles and Responsibilities into Fleet Procedures	04/07/2021
95002	Corrective Action Documents			
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-16	Determine Fleet Training Plan for New Requirements	04/07/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-17	Communicate Roles to Engineering Personnel in the Modification Process	04/07/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-18	Evaluate the Effectiveness of Modification Teams	06/17/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-19	Perform Recurring Observations and Feedback of Modification Teams	06/17/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-23	Implement an Oversight Plan for Supplemental Engineering	06/14/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-24	Conduct Observations of Field Work Performed by Supplemental Personnel	05/05/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-26	Eliminate Conditional SPVs during Maintenance	06/12/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-29	Validate Parts Quality Prior to Installation	05/12/2021
95002	Corrective Action Documents	CR-GGN-2020-10715 CA-7	Review Critical BOP Systems for Generation Risks	04/22/2021
95002	Corrective Action Documents	CR-GGN-2020-11199	Review Previous Turbine Trips	06/02/2021
95002	Corrective Action Documents	CR-GGN-2020-11199	Root Cause Evaluation; Turbine Trip on Low Primary Water Flow to Generator Bushing 'C' Phase	02
95002	Corrective Action Documents	CR-GGN-2020-11199	At 0239 hours a Turbine Trip and subsequent Reactor Scram were received. Cause of Turbine Trip was low flow on Primary Water Bushing 'C' Phase.	03/02/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-10	Reinforce CAP Requirements MA-40 and EN-LI-102 regarding Risk Assessments	02/25/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-11	Reinforce Extent of Cause Expectations	02/26/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-14	Self-Assessment of EC Process	06/04/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-15	Review CRs Since RF22 for conditions that could degrade leading directly to turbine or generator trip	03/24/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-16	Review System Monitoring Plans	03/24/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-17	Ongoing CR Review	03/11/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-18	Review Extent of Cause Evaluations	03/23/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-19	Review Turbine Trip ARIs	06/09/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-20	CAPR; Create a List of Generation Risk ECs	04/28/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-21	Ongoing CR Review for Trip Critical or Sensitive Systems	04/11/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-22	Ongoing CR Review Referencing CA-17 & CA-21	05/12/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-25	Ongoing CR Review Referencing CA-17, 21, and 22	06/16/2021
95002	Corrective Action Documents	CR-GGN-2020-11199 CA-7	CAPR#4; Permanent EC for Trip Setpoint	01/08/2021
95002	Corrective Action Documents	CR-GGN-2020-12131	Turbine Trip on Low Primary Water Tank Level	1
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-10	Revise Primary Water SOI to Monitor Standpipe Level	03/10/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-11	Review Head Tank Monitoring & Mitigation	04/28/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-12	Create a List of Generation Risks in ECs	04/08/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-13	Design Change to Valve FD01 Control Logic	06/23/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-14	Require FCRs for Significant Issues Found in Owner's Acceptance Review Documents	04/28/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-15	Communication to Design Engineers on Expectations for Owner's Acceptance Reviews	03/30/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-16	Review Comments Needed for Evaluations	03/25/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-17	Workshop for Design Engineers on Documentation of Generation impacts	05/14/2021
95002	Corrective Action Documents			
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-19	Training Needs Analysis	04/21/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-20	Meetings to Reinforce Operator Expectations	03/25/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-22	Observations on Operator Use of Human Performance Tools	03/25/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-23	Track Completion of CR-GGN-2020-11199 CA10, 15, & 17	04/20/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-25	Observations on Operator Use of Human Performance Tools	04/28/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-27	Observations on Operator Use of Human Performance Tools	05/27/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-28	Observations on Operator Use of Human Performance Tools	06/24/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-29	Track Actions from CR-GGN-2020-10715 CA08 through CA19	06/17/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-31	LO/NLO Continuing Training on Primary Water System Operation	07/29/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-32	Track CR-GGN-2020-10715 CA-6 to completion	06/17/2021
95002	Corrective Action Documents	CR-GGN-2020-12131 CA-9	Issue a Learning Clock for Operations	02/25/2021
95002	Corrective Action Documents	CR-GGN-2020-12153	1N43FD01 Mechanical Interlock Broken on 42 Device	12/12/2020

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Corrective Action Documents	CR-GGN-2021-00476	Division II Diesel Generator Lube Oil Pressure Low	01/17/2021
95002	Corrective Action Documents	CR-GGN-2021-00486	Division II Diesel Generator Lube Oil Pressure 39-40psig	01/18/2021
95002	Corrective Action Documents	CR-GGN-2021-00953	Primary Water System "Leakage Water Level High" Alarm Not Functioning	02/02/2021
95002	Corrective Action Documents	CR-GGN-2021-01105	CFAM Elevation Issued for GGN Operations Due to Human Performance	02/05/2021
95002	Corrective Action Documents	CR-GGN-2021-01261	Division II Diesel Monthly Run Low Lube Oil Pressure	02/12/2021
95002	Corrective Action Documents	CR-GGN-2021-01849	Diesel Generator 12 Functional Test - Low Lube Oil Pressure	03/07/2021
95002	Corrective Action Documents	CR-GGN-2021-02018	Division II Low Oil Pressure During Functional Test	03/13/2021
95002	Corrective Action Documents	CR-GGN-2021-02093	Division II Subcovers Potentially Missing Rocker Shaft Plugs	03/16/2021
95002	Corrective Action Documents	CR-GGN-2021-03320	Plant Scram on Turbine Overspeed Trip; Root Cause Evaluation	2
95002	Corrective Action Documents	CR-GGN-2021-03320	Pre-inspection Self-Assessment identified the following required revisions to the root cause evaluation for CR-GG-2020-6674, Turbine Overspeed Trip Plant SCRAM	06/14/2021
95002	Corrective Action Documents	CR-GGN-2021-04064	Incorrect Component Classification of 1N21R085B, RFP 'B' Recirc Valve	05/22/2021
95002	Corrective Action Documents	CR-GGN-2021-04101	EN-HU-104 performed was the previous revision and did not contain the critical characteristic table required for the independent station review	05/27/2021
95002	Corrective Action Documents	CR-GGN-2021-04144	EC 88482 for TDM Solenoid Connectors and EC 89184 for Thrust Bearing Wear Detection did not include a High Consequence Risk Factor Table as required by EN-HU-104	07/27/2021
95002	Corrective Action Documents	CR-GGN-2021-04161	Root Cause CR-GGN-2019-01504 CA-035 was not implemented effectively.	06/01/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Corrective Action Documents	CR-GGN-2021-0469	Division 2 Diesel Generator Run - Operators identified 2-inch Crack	01/16/2021
95002	Corrective Action Documents	CR-GGN-2021-04700	Primary water trips have not been enabled since 12-11-2020	08/25/2021
95002	Corrective Action Documents	CR-GGN-2021-06469	Action Closure Review Board Rejected a Number of Corrective Action Closure Packages Prepared for 95002 Inspection	08/21/2021
95002	Corrective Action Documents	CR-GGN-2021-06696	In EC72780 Section 7.0 the keywords used for the Operating Experience search was not recorded in the OE section.	08/31/2021
95002	Corrective Action Documents	CR-GGN-2021-06734	EC 88268 Division I Diesel Subcover didn't identify Risk Category, Risk Rank 4 should have been shown	09/01/2021
95002	Corrective Action Documents	CR-GGN-2021-0802	Disposition CA to Perform RCE for a Significant Condition Adverse to Quality Extended Twice by Engineering	03/02/2021
95002	Corrective Action Documents	CR-GGNS-2010-01397	Liquid Penetrant Exam Division II Diesel Sub-cover rocker arm	03/03/2010
95002	Corrective Action Documents	CR-GGNS-2010-01503	Reactor Feed Pump 'A' Trip, Resulting in 'A' Recirc FCV failing to close	03/08/2010
95002	Corrective Action Documents	CR-GGNS-2012-12201	Lube Oil Leaks on SDG 12	11/07/2012
95002	Corrective Action Documents	CR-GGNS-2016-05488	Common Cause Review for the Three Unplanned 12016 Scrams	3
95002	Corrective Action Documents	CR-GGNS-2017-04258	Lube Oil Seepage on Division II Standby Diesel Generator	04/26/2017
95002	Corrective Action Documents	CR-GGNS-2018-01265	Division II Diesel Generator Oil Leak from Cylinder Inspection Cover	02/12/2018
95002	Corrective Action Documents	CR-GGNS-2018-01347	Division II Diesel Generator Oil Leak from Valve Covers	02/13/2018
95002	Corrective Action Documents	CR-GGNS-2018-09645	White Performance Indicator Exceeded: Unplanned Power Changes per 7000 Critical Hours	5
95002	Corrective Action Documents	CR-GGNS-2020-12131	Turbine Trip on Low Primary Water Tank Level; Root Cause Evaluation	1
95002	Corrective Action	CR-HQN-2020-01869	EN-DC-115, Engineering Change Process, for	09/29/2020

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Documents		Operating Experience (OE) appears to have a weakness in evaluating OE for EC development.	
95002	Corrective Action Documents	CR-HQN-2021-00879	During development of engineering changes for GGNS, there were two examples with use of EN-HU-104, Technical Task Risk & Rigor, that indicate there may be confusion with identification of High Consequence Risk Factor Table.	05/27/2021
95002	Corrective Action Documents	CR-HQN-2021-01191	The Comparison Tables in the revised Pre-Job Brief form were found to lack a detailed description of how generation could be impacted	08/19/2021
95002	Corrective Action Documents	CR-HQN-2021-01232	The Comparison Tables developed and utilized during reviews as required by EN-HU-104, Technical Task Risk & Rigor, for ECs 87853 and 88515 were not included with the ECs documentation.	08/24/2021
95002	Corrective Action Documents	CR-HQN-2021-01432	95002 Inspector Question - Basis for EN-HU-104 Attachment 9.1 Consequence Risk Factor Medium Risk for Operability issue affecting multiple trains of safety-related system	08/26/2021
95002	Corrective Action Documents	OE-GGN-2006-00794	Perform OE Impact Evaluation of INPO TR4-41, Review of Main Feedwater System Related Events	02/27/2006
95002	Corrective Action Documents	OE-NOE-2005-00321	TR4-41 Review of Main Feedwater System Related Events Requires a Plant Impact Review	10/07/2005
95002	Corrective Action Documents	OE-NOE-2006-00371	TR4-41 Addendum Review of Main Feedwater System Related Events Requires a Plant Impact Review	10/11/2006
95002	Corrective Action Documents	OE-NOE-2009-00060	TR4-41 Addendum Review of Main Feedwater System Related Events Requires a Plant Impact Review	02/11/2009
95002	Corrective Action Documents Resulting from Inspection	CR-GGN-2021-06602	PCRS Access	08/26/2021
95002	Corrective Action Documents	CR-GGN-2021-06619	Inappropriate closure of a Work Order tied to a Corrective Action	08/26/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Resulting from Inspection			
95002	Corrective Action Documents Resulting from Inspection	CR-GGN-2021-06628	95002 Inspection NRC Identified - EC88268 Incorrectly Classified as Non-Safety Related	08/26/2021
95002	Corrective Action Documents Resulting from Inspection	CR-GGN-2021-06637	Programmatic Weakness in the Application of Operating Experience	08/27/2021
95002	Corrective Action Documents Resulting from Inspection	CR-GGN-2021-07033	Due Dates for the Final Effectiveness Review for CR-GGN-2020-10715 is Incorrect	09/14/2021
95002	Corrective Action Documents Resulting from Inspection	CR-HQN-2021-01456	EN-MA-101-03 Revision Error	09/01/2021
95002	Engineering Changes	0000081856	Reactor Feed Pump Turbine Trip Low Suction Flow Trip Hardening	0
95002	Engineering Changes	EC 0000083472	Diesel Div 1&2 Sub-Cover Replacement	0
95002	Engineering Changes	EC 0000087609	Turbine Valves LVRT Guide Rod Fastener Modification	0
95002	Engineering Changes			
95002	Engineering Changes	EC 0000087660	CR-GGN-2020-11199 CAPR#2; Time Delay for Primary Water Flow Path Trip Signals	0
95002	Engineering Changes	EC 0000088018	Replace Air Regulator of 1N21F513 with High Volume Air Regulator and Modify Piping to Regulate the Associated Volume Boosters with a Common Supply Line	0
95002	Engineering Changes	EC 0000088018 EN-HU-104 Consequence	Evaluate the Replacement Air Regulator and Piping Configuration for 1N21F513	09/16/2020

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		Attachments		
95002	Engineering Changes	EC 0000088268	Division 1 Diesel Subcover Replacement	0
95002	Engineering Changes	EC 0000088268	Division I Diesel Subcover Replacement Design Verification Checklist	0
95002	Engineering Changes	EC 0000088547	CR-GGN-2020-11199 CAPR#3; Generator Bushing Primary Water Low Flow Alarm Setpoint Change Increase to 31.5GPM	0
95002	Engineering Changes	EC 0000088572	CAPR#1 CR-GGN-2020-11199; Update Drawing per Work Order 550604	0
95002	Engineering Changes	EC 0000088665	EHC Main Pump Motor Set 1N32C300A&B Replace Magnaloy Motor Dampening Bar Sets with Steel Mounting Bars	0
95002	Engineering Changes	EC 0000088665 EN-HU-104 Consequence Risk Checklist	EC-88665, 1N32C300A/B Pump Vibration Reduction EC	04/15/2021
95002	Engineering Changes	EC 0000090361	Cut/Cap 1N11F045B and 1N11F368 Valves and Associated Piping to Eliminate Risk of Flow Induced Vibration	0
95002	Engineering Changes	EC 0000090618	Replacement 28V Power Supply for RC&IS Obsolete Lambda Model MLGS-EEA-28-OV	0
95002	Engineering Changes	EC 0000072780	Turbine Control Protection System - Non-Safety	0
95002	Engineering Changes	EC 0000087061	Modification to the Speed Bracket	0
95002	Engineering Changes	EC 0000088574	Raise Primary Water Tank Low Level Alarm Setpoint from 85% to 90%	0
95002	Engineering Changes	EC 0000089459	Turbine Control System Actuator Replacements	0
95002	Engineering Changes	EC 0000090618 EN-HU-104 Consequence Risk Checklist	EC 90618 - Replace 1C11PS28 Obsolete Power Supply with New Equivalent Power Supply	07/14/2021
95002	Engineering Changes	Management Standard No. 51 - EC 0000090361	Attachment 6; Supervisor Checklist	07/07/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Engineering Changes	Management Standard No. 51 Checklist - EC 0000088665	Attachment 6; Supervisor Checklist	05/25/2021
95002	Miscellaneous		Grand Gulf Nuclear Station 2021 Business Plan	Phase 2, Revision 0
95002	Miscellaneous		Summary of qualifications and experience level of the Engineers associated with the TCS project.	
95002	Miscellaneous		Maintenance Guideline - Pre-installation Parts Inspections	1
95002	Miscellaneous	2021 Grand Gulf Nuclear Station Operations Action Plan	2021 Grand Gulf Nuclear Station Operations Action Plan	
95002	Miscellaneous	460004254	Nuclear Tandem Compound, Six-Flow Turbine with Two Stages of Reheat	2
95002	Miscellaneous	Contract 10507770-05	Contract Between Entergy and Westinghouse Re: Turbine Control System	5
95002	Miscellaneous	FLP-ESPO-HUPERF4TECHWORKER	Human Performance for Technical Worker	2
95002	Miscellaneous	LF201185-R-001	GGNS RFP B Recirc Valve 1N21F503B Positioner Failure Analysis	0
95002	Miscellaneous	Operations Standing Order No: 20-021	1N43DF01 Leakage Water Return Valve Mitigating Actions	12/13/2020
95002	Miscellaneous	Purchase Order	PO 10471355	04/10/2018
95002	Miscellaneous	Training Lesson Plan GLP-NLOR-N43-21CYC09	Primary Water System	16
95002	Miscellaneous	Training Lesson Plan GLP-OPS-N4300	Primary Water System	16
95002	Miscellaneous	Training Lesson Plan GLP-OPS-TCSU-19CYC1	Training Lesson Plan GLP-OPS-TCSU-19CYC1, Turbine Control System Upgrade	0
95002	Miscellaneous	Vendor Manual 460002831	Bailey Characterizable Positioners	0
95002	Procedures			
95002	Procedures	04-1-02-1H13-P680	Alarm Response Instruction Panel No: 1H13-P680	261

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
95002	Procedures	07-S-13-67	ABB/Bailey AV1 or AV2 Series Positioner Pre-Installation Inspection	1
95002	Procedures	EN-DC-115	Engineering Change Process	31
95002	Procedures	EN-DC-141	Design Inputs	18
95002	Procedures	EN-DC-149	Acceptance of Vendor Documents	15
95002	Procedures	EN-DC-153	Preventative Maintenance Component Classification	21
95002	Procedures	EN-FAP-HR-004	Knowledge Transfer and Retention (KT&R) Process	4
95002	Procedures	EN-FAP-MP-009	Enhanced Procurement Process for SPV/Critical Spares	5
95002	Procedures	EN-HU-102	Human Performance Traps and Tools	18
95002	Procedures	EN-HU-104	Technical Task Risk & Rigor	11
95002	Procedures	EN-HU-104	Technical Task Risk & Rigor	9
95002	Procedures	EN-HU-104	Technical Task Risk & Rigor	10
95002	Procedures	EN-HU-104, Attachment 9.1	EC 88262; Division 1 Diesel Subcover Replacement	05/27/2021
95002	Procedures	EN-HU-106	Procedure and Work Instruction Use and Adherence	9
95002	Procedures	EN-MA-101	Conduct of Maintenance	33
95002	Procedures	EN-MA-101-03	Maintenance Work Preparation Process	12
95002	Procedures	EN-MA-106	Planning	1
95002	Procedures	EN-OE-100	Operating Experience Program	34
95002	Procedures	EN-OM-132	Nuclear Risk Management Process	3
95002	Procedures			
95002	Procedures	EN-WM-100	Work Request Generation, Screening, and Classification	17
95002	Procedures	JA-PI-01	Analysis Manual	13
95002	Procedures	Management Standard No. 50	GGN Design Review Board Guideline	1
95002	Procedures	Management Standard No. 51	GGN Technical Product Quality Guideline	8
95002	Procedures	Management Standard No. 57	GGN Design Change Roles and Responsibilities	0
95002	Procedures	SOI 04-1-01-N43-1	Primary Water System	64
95002	Self-		Pre-Inspection Assessment Worksheet for IP 95002	04/14/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Assessments		Inspection, CR-GGN-2020-12131, “Turbine Trip on Low Primary Water Tank Level”	
95002	Self-Assessments		USA Utilities Services Alliance Grand Gulf Nuclear Station Nuclear Safety Culture Assessment	1
95002	Self-Assessments		Pre-Inspection Assessment Worksheet for IP 95002 Inspection, CR-GGN-2020-9257, Automatic SCRAM due to B Reactor Feed Pump Trip”,	04/13/2021
95002	Work Orders	00517874-01	1P75E001B Replace Left Bank #1 Subcover Assembly	02/14/2019
95002	Work Orders	511754	N11F026D-CV Replace HP Actuator with New Design per EC-72780	07/23/2020
95002	Work Orders	511780	1N30ZEN200 Install New SP & TBWD Detectors per EC-72780	11/30/2020
95002	Work Orders	WO-00547001-01	1N43N066; Add Time Delay for Primary Water Flow Transmitters per EC87660	10/15/2020
95002	Work Orders	WO-00549388-01	1N37F001A/B/C; Install EC-87632 & FCR-87609 on Stop Valve Actuator	11/25/2020
95002	Work Orders	WO-00550604-01	1N43N060 Retube and add Test Valves per JS02 CR-GGN-2020-09431	11/23/2020
95002	Work Orders	WO-00554157-01	1N432607: Implement EC-88547 (Increase Setpoint to 31.5GPM)	03/01/2021
95002	Work Orders	WO-GGN-00528791-01	1N21F503B Rework Actuator Per VM, Repack as Necessary 07-S-1	02/09/2020
95002	Work Orders	WO-GGN-00545789-01	1N43N051/1N43N052, T/S and Correct Level Discrepancies	08/14/2020
95002	Work Orders	WO-GGN-00547880-01	1H13P828JC08: Troubleshoot Control System Sheet 407	11/15/2020
95002	Work Orders	WO-GGN-00548011-01	1N43DF01 Valve Stuck Close	09/30/2020
95002	Work Orders	WO-GGN-00550018-01	1N21F503B T/S and Repair Actuator	11/25/2020
95002	Work Orders	WO-GGN-00550137-01	1N21R085A Replace Positioner (Extent of Condition)	01/28/2021
95002	Work Orders	WO-GGN-00552902-01	1N21R085A Inspect Positioners/Contingency Replace	02/09/2021