



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

May 30, 2019
NOC-AE-19003661
10 CFR 50.73

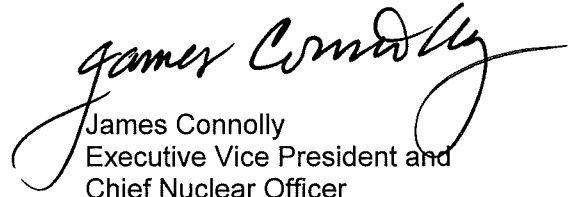
U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 2019-001-01
Unit 1 Condition Prohibited by Technical Specifications Due to Inoperable Essential Cooling Water Pump

Enclosed is a supplement to Licensee Event Report (LER) 2019-001-00, Unit 1 Condition Prohibited by Technical Specifications Due to Inoperable Essential Cooling Water Pump. The original LER was submitted to the NRC on April 29, 2019. This supplement updates the report to provide the cause of the event and to provide planned corrective actions. The updated information in the LER is denoted by revision bars located in the right-hand margin. This report is being submitted in accordance with the requirements of 10 CFR 50.73.

There are no commitments in this submittal.

If there are any questions, please contact Tim Hammons at 361-972-7347 or me at 361-972-7344.


James Connolly
Executive Vice President and
Chief Nuclear Officer

Attachment: Licensee Event Report 2019-001-01 Unit 1 Condition Prohibited by Technical Specifications Due to Inoperable Essential Cooling Water Pump

STI 34855330

cc:

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, TX 76011-4511

Glen 'Ed' Miller
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (O9E01)
11555 Rockville Pike
Rockville, MD 20852

NRC Resident Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

Attachment

**Licensee Event Report 2019-001-01 Unit 1 Condition Prohibited by Technical Specifications
Due to Inoperable Essential Cooling Water Pump**



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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1. Facility Name South Texas Unit 1	2. Docket Number 05000498	3. Page 1 OF 6
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4. Title
Unit 1 Condition Prohibited by Technical Specifications Due to Inoperable Essential Cooling Water Pump

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
02	27	2019	2019	001	01	05	30	2019	N/A	05000
									Facility Name	Docket Number
									N/A	05000

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

1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
100	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(iii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact Tim Hammons, Licensing Engineer	Telephone Number (Include Area Code) (361) 972-7347
------------------------------------------------------------	---------------------------------------------------------------

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

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
D	BI	P	R165	Y	N/A	N/A	N/A	N/A	N/A

14. Supplemental Report Expected <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date) <input checked="" type="checkbox"/> No	15. Expected Submission Date Month: N/A, Day: , Year: N/A
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Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On February 27, 2019, Essential Cooling Water (ECW) Pump 1B experienced a lack of packing leak-off that resulted in excessive heat-up of the packing. Smoke was observed at the packing gland and the pump was secured and declared inoperable. A similar lack of packing leak-off condition on ECW Pump 1B had been observed on February 18, 2019 following replacement of the pump and motor. A successful post maintenance run was conducted with additional water (external source) used to cool the stuffing box. On February 19, 2019, the pump was declared operable and was secured for approximately 9 days and 23 hours.

Based on a review of the event conditions, reasonable assurance that the pump could have met its design basis requirements after February 19, 2019, cannot be assured. Therefore, the pump is considered to have been inoperable for longer than the 7 days allowed by the associated Technical Specification. The cause of this event was determined to be less than adequate procedure guidance. Maintenance procedures did not provide sufficient warning or guidance to address packing tolerances to ensure leak-off upon start-up or actions to take for a less than adequate packing leak-off. Maintenance procedures will be revised to address this concern.



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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
South Texas Unit 1	05000-498	2019	- 001	- 01

NARRATIVE

I. Description of Reportable Event

A. Reportable event classification

This event is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B). Technical Specification 3.7.4.a allows one Essential Cooling Water (ECW) loop to be inoperable for seven days while in Modes 1 through 4 before taking action to begin shutdown without extending the allowed outage time using the Configuration Risk Management Program (CRMP). However, Unit 1 ECW Train B was determined to have been inoperable longer than the allowed outage time without taking the required action. Consequently, Unit 1 was in a condition prohibited by Technical Specifications.

B. Plant operating conditions prior to event

Prior to the event on February 27, 2019, Unit 1 was operating in Mode 1 at 100% power.

C. Status of structures, systems, and components that were inoperable at the start of the event and that contributed to the event

At the start of the event, there were no other structures, systems, or components that were inoperable that contributed to the event.

D. Background information

South Texas Unit 1 has three ECW Pumps, one for each safety equipment train. ECW pumps take suction from the Essential Cooling Pond (ECP) and deliver cooling water for removing heat from safety-related components and returns the heated water to the ECP, which acts as the ultimate heat sink. All three ECW pumps are automatically started following a Safety Injection or Loss of Offsite Power signal. ECW pumps can also be manually controlled from the switchgear room or the control room. The ECW pumps operate under all operating modes (modes 1 through 6) and provide cooling water during all emergency and non-emergency operation to the components served by the ECW system.

With one of the three ECW loops inoperable in Modes 1, 2, 3, or 4, the ACTION statement for Technical Specification 3.7.4 requires that within 7 days all three loops must be returned to operable status or the requirements of the CRMP must be applied, or the unit must be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

E. Narrative summary of the event

The condition of ECW Pump 1B packing was discovered during a normal pump start. Although the ECW pumps are safety-related and are required to start and run without Operator aid, normal practice is to have a plant operator check ECW pump status before and after starting. The ECW operating procedure provides information that on an ECW pump start an adequate stream of about one-half gallon per minute (gpm) seal leakage should be maintained. When the pump has run for about 20 minutes, seal leak-off should be adjusted to about one-quarter gpm. The maximum flooding rate in the Essential Cooling Water Intake Structure should be limited to 2.3 gpm, based on allowing seven days of operation before providing temporary drainage and while allowing only one-half the design basis flood accumulation. The ECW pumps are packed with four rings of John Crane C1050, Polytetrafluoroethylene (PTFE) filament, PTFE dispersion, with added lubricating oil.



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E. Narrative summary of the event (continued)

When ECW Pump 1B was started on February 27, 2019, the plant operator at the pump observed no seal leakage and, eventually, vapors (smoke) exiting from the stuffing box. ECW Pump 1B was secured after running for approximately 221 seconds. When the packing was later replaced, the top three packing rings were observed to be black (scorched) at their surface facing the pump shaft. During the 221 second pump run, the pump developed normal discharge pressure and normal flow rates with normal flow to each of the system loads. Because the pump made it through the more demanding startup transient without receiving any indications of motor overload, the motor appears to be reasonably capable of continuing to drive the pump with the existing amount of packing friction. Previous experience with ECW pump bearing issues has demonstrated the motor sizing and breaker trip settings are such that even severe damage to shaft sleeve material does not result in a motor trip.

The contact surface of the packing was scorched and was starting to produce small flakes of black material. If the pump had not been secured, heat from packing friction would have continued to have been generated and the packing surface would have continued to degrade. Because the PTFE packing rings have a higher coefficient of thermal expansion than most metal and other packing materials, continued heat up of the shaft and packing results in further compression of the packing. The most likely prospect with continued pump operation would be eventual loss of packing material from the inner diameter of the packing rings. As material is extruded from the gland, the pressure of the water in the pump stuffing box below the packing would eventually increase leakage along the shaft until the amount of water leaking up past the packing rings began removing the friction heat. As leakage continued to increase, the amount of water flow up along the shaft would eventually quench the shaft and packing, bringing the temperature back to near ECW pond temperature. With the cooling of the packing and the high coefficient of thermal expansion of PTFE, stuffing box leakage on the order of several gpm could develop. Because of the tight clearance of the elbow bearing of this newly refurbished pump and because the bottom packing ring had not been degraded by heat, stuffing box leakage flow can be expected to remain well below 20 gpm. Although ECW Pump 1B packing leak-off could increase well above normal rates, a spray shield covering the south opening in the motor stand protects the nearby motor control center from water spray.

Possible shaft leakage on the order of several gpm would exceed the 2.3 gpm screening criterion for leakage into an ECW pump bay. The 2.3 gpm criterion relies on seven days of operation before a means of dewatering the pump bay can be implemented (credit is not taken for the non-safety sump pump). With leakage exceeding 2.3 gpm, ECW Pump 1B could not be ensured to meet its design requirements for continued operation without operator action.

On February 18, 2019, when ECW Pump 1B was started for system fill and vent, a similar packing condition was observed and the pump was secured after running for approximately 138 seconds. On February 19, 2019, the pump was restarted a few hours later with maintenance adding water to the top of the gland and shaft to keep the stuffing box from heating. The system was successfully filled and vented and after about an hour of monitoring the pump and keeping the gland cool with external water, stuffing box leakage reached the point that gland temperature remained satisfactory. After running for about 14.8 hours, ECW Pump 1B was secured following successful surveillance testing and returned to service. ECW Pump 1B remained idle until February 27, 2019.



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E. Narrative summary of the event (continued)

Because ECW Pump 1B did not complete a long run-in period after the run on February 19, 2019, the packing condition of excessive tightness that leads to continued heating could have existed shortly after the pump was secured on February 19, 2019. Because continued pump operation, such as for an automatic start in response to a design basis accident, could progress to a condition where the 2.3 gpm leakage into an ECWIS pump bay criterion would be exceeded, reasonable assurance that ECW Pump 1B could have met its design basis requirements without operator action after February 19, 2019, cannot be assured.

Timeline (Note: All times are Central Standard Time):

February 13, 2019 [1819]: ECW Train 1B declared inoperable with ECW Pump 1B pressure dropping.

February 18, 2019 [2241]: Started ECW Pump 1B for Train 1B fill and vent following completion of ECW Pump 1B pump and motor replacement.

February 18, 2019 [2243]: Secured ECW Pump 1B due to insufficient packing leak-off.

February 19, 2019 [0047]: Started ECW Pump 1B for Train 1B fill and vent.

February 19, 2019 [0109]: ECW Pump 1B packing and stuffing box heat up due to lack of packing leak-off documented in corrective action program (Condition Report 19-1954). The Condition Report documents a plan to loosen the packing and pour water onto the stuffing box and packing until leak-off is sufficient to keep packing cool.

February 19, 2019 [1536]: Secured ECW Pump 1B following surveillance testing.

February 19, 2019 [1712]: ECW Train 1B declared operable following completion of maintenance, post maintenance testing, and package closure.

February 27, 2019 [1353]: Started ECW Pump 1B to support work week activities.

February 27, 2019 [1357]: Secured ECW Pump 1B due to loss of seal leak-off. Train 1B ECW declared inoperable.

February 28, 2019 [1303]: Started ECW Pump 1B for post maintenance testing following packing replacement.

March 1, 2019 [1305]: Secured ECW Pump 1B after a 24-hour run.

March 1, 2019 [1434]: Started ECW Pump 1B for post maintenance testing.

March 1, 2019 [1445]: Declared ECW Pump 1B operable.

F. Method of discovery

This event was discovered after starting ECW Pump 1B to support work week activities.

II. Component failures

A. Failure Mode, mechanism, and effects of failed component

The failed component in this event is ECW Pump 1B. The pump failed as a result of a lack of packing leak-off. There



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was smoke and evidence that the packing was heating up.

B. Cause of component failure

The cause was determined to be less than adequate procedure guidance. Maintenance procedures did not provide sufficient warning or guidance to address packing tolerances to ensure leak-off upon start-up or actions to take for a less than adequate packing leak-off.

C. Systems or secondary functions that were affected by failure of components with multiple functions

Train B ECW was declared inoperable. The following Train B safety systems were also declared inoperable because the ECW System supplies cooling for these systems: Engineered Safety Features Standby Diesel Generator, Emergency Core Cooling System, Residual Heat Removal System, Component Cooling Water System, Essential Chilled Water System, Containment Spray System, Reactor Containment Fan Cooler System, and Control Room Makeup and Cleanup Filtration System.

D. Failed component information

Essential Cooling Water System {BI}
Pump {P}
Manufacturer: Hayward – Tyler Pump Company {R165}
Model: 24VSN

III. Analysis of the event

A. Safety system responses that occurred

No safety systems were required to respond as a result of this event.

B. Duration of safety system inoperability

ECW Pump 1B is considered inoperable from the conclusion of the successful post maintenance run following pump replacement on 02/19/2019 at 1536, until the pump was declared operable on 03/01/2019 at 1445 for a period of 9 days and 23 hours.

C. Safety consequences and implications

The expected leak rate (less than 20 gpm) caused by the postulated failed packing had the pump not been secured is minimal in comparison to the total flow obtained by the ECW pump and would not affect the ability of the pump to provide sufficient cooling to the credited loads. Because ECW Train B produced design flow rates to all serviced components, ECW Pump 1B was considered capable of performing its safety functions in support of reactor safe shutdown, residual heat removal, and in support of equipment for accident mitigation (except when it was taken out of service to replace the packing). Therefore, this event is not considered to be a Safety System Functional Failure.

A review of flooding calculations for the ECW Intake Structure determined that the net volume of space available before submerging an ECW pump motor is 6296 cubic feet (includes 15% conservatism). Based on the maximum consequential leak rate of 20 gpm, ECW Pump 1B would have been unaffected for approximately 39 hours.

The event did not result in any offsite release of radioactivity or increase of offsite dose rates, and there were no



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personnel injuries or damage to any other safety-related equipment associated with this event. Therefore, there was no adverse effect on the health and safety of the public.

IV. Cause of the event

The cause of this event was determined to be less than adequate procedure guidance. Maintenance procedures did not provide sufficient warning or guidance to address packing tolerances to ensure leak-off upon start-up or actions to take for a less than adequate packing leak-off.

V. Corrective actions

ECW Pump 1B packing was replaced to return the system to an operable status. The ECW pump maintenance procedure will be revised to address the following:

- a. Secure the pump if no leak-off obtained upon start-up.
- b. Inspect packing and repack pump, as necessary.
- c. Upon a repack of the pump, rotate the shaft to ensure that the packing is not binding.
- d. Dimensional measurements of replacement parts such as packing should be taken prior to installation. Adjust (reshape) as necessary to ensure sufficient packing leak-off upon start-up.

VI. Previous similar events

An operating experience review identified previous events at South Texas involving pump packing issues with large pumps and a limited few specific to a lack of packing leak-off. None of the events met the threshold for a Licensee Event Report and corrective action was limited to repacking the pump.