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

Edwin I. Hatch Nuclear Plant Unit 1
Emergency License Amendment Request for Technical Specification 3.7.2
Regarding One-Time Extension of Completion Time for
Plant Service Water (PSW) Pump Inoperable – RAI Responses

Ladies and Gentlemen:

Pursuant to the provisions of Section 50.90 of Title 10 of the Code of Federal Regulations (CFR), on September 21, 2021, Southern Nuclear Operating Company (SNC) submitted a license amendment request (LAR) to the Technical Specifications (TS) for Hatch Nuclear Plant (HNP) Unit 1 renewed facility operating license DPR-57. The proposed amendment would revise TS 3.7.2, "Plant Service Water (PSW) System and Ultimate Heat Sink," Limiting Condition for Operation (LCO) 3.7.2, Condition A, "One PSW pump inoperable," to allow a one-time increase in the Completion Time from 30 days to 45 days. The increased Completion Time would expire on October 10, 2021 at 1620 eastern daylight time (EDT).

By email dated September 22, 2021, the NRC provided requests for additional information (RAIs) in regard to SNC's request. Enclosure 1 to this letter provides the RAIs with SNC's responses. Enclosures 2 and 3 contain marked-up TS pages and revised TS pages, respectively, reflecting the proposed TS changes. Enclosure 4 contains a markup of the TS Bases, for information only. Enclosure 5, which supersedes Section 3.3 of the original request, provides a list of Compensatory Measures to be implemented related to the changes in the amendment request.

The RAI responses have no impact on the no significant hazards consideration or the environmental considerations of the original submittal.

This letter contains no NRC commitments. If you have any questions, please contact Ryan Joyce at 205-992-6468.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 23rd day of September 2021.

Respectfully submitted,



Cheryl A. Gayheart
Regulatory Affairs Director

CAG/tle

Enclosures:

1. RAI Responses
2. HNP Unit 1 Technical Specification Marked-up Pages
3. HNP Unit 1 Revised Technical Specification Pages
4. HNP Unit 1 Technical Specification Bases Marked-up Pages (information only)
5. Revised Compensatory Measures

cc: NRC Regional Administrator, Region II
NRC NRR Project Manager – Hatch
NRC Senior Resident Inspector – Hatch
Director, Environmental Protection Division – State of Georgia
RType: CHA02.004

Edwin I. Hatch Nuclear Plant Unit 1

**Emergency License Amendment Request for Technical Specification 3.7.2
Regarding One-Time Extension of Completion Time for
Plant Service Water (PSW) Pump Inoperable – RAI Responses**

Enclosure 1

RAI Responses

REQUEST FOR ADDITIONAL INFORMATION (RAIs)

By letter dated September 20, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21264A003), the Southern Nuclear Operating Company, Inc. (SNC, the licensee) submitted a license amendment request (LAR) for the Edwin I. Hatch Nuclear Plant (Hatch), Unit 1. The proposed amendment would revise the Hatch, Unit 1 Technical Specification (TS) requirements of TS 3.7.2, "Plant Service Water (PSW) System and Ultimate Heat Sink (UHS)." Specifically, the proposed amendment would revise Limiting Condition for Operation (LCO) 3.7.2, Condition A, "One PSW pump inoperable," to add a note permitting a one-time increase in the Completion Time (CT) from 30 days to 45 days while specific compensatory measures are implemented to manage risk. The allowance for an extended completion time expires on October 10, 2021.

Regulatory Requirements

The regulation under Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Section 36(c)(2) requires that TSs contain LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the LCO can be met. Typically, the TSs require restoration of equipment in a timeframe commensurate with its safety significance, along with other engineering considerations. The regulation under 10 CFR 50.36(b) requires that TSs be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto.

In determining whether the proposed TS remedial actions should be granted, the U.S. Nuclear Regulatory Commission (NRC) staff applies the "reasonable assurance" standards of 10 CFR 50.40(a) and 50.57(a)(3). The regulation at 10 CFR 50.40(a) states that in determining whether to grant the licensing request, the Commission will be guided by, among other things, consideration about whether "the processes to be performed, the operating procedures, the facility and equipment, the use of the facility, and other technical specifications, or the proposals, in regard to any of the foregoing collectively provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in Part 20 of this chapter, and that the health and safety of the public will not be endangered." Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," describes a risk-informed approach that includes deterministic considerations to support this reasonable assurance finding.

Probabilistic Risk Assessment (PRA)

PRA - RAI 1 – PRA Change Since 10 CFR 50.69 and NFPA 805 Reviews

The NRC has previously reviewed the Hatch internal events, internal flooding, internal fire, and seismic PRAs (IEPRA, IFPRA, FPPRA, and SPRA, respectively) for determining their acceptability to support the Hatch National Fire Protection Association (NFPA) 805 program (ADAMS Accession Nos. ML18096A955 and ML19280C812), and the Hatch 10 CFR 50.69 License Amendment Request (ADAMS Accession Nos. ML18158A583 and ML19197A097). The NRC staff concluded that the information was acceptable for the application. In this emergency LAR, the licensee referred to the aforementioned LARs for discussion on PRA Technical Adequacy. In Regulatory Guide (RG) 1.200, Regulatory Position 4.2, licensees are expected to address the need for the PRA model to represent the as-designed or as-built, as-operated plant.” Therefore, crediting previously reviewed analysis is appropriate as long as the previous technical conclusions reflect that the PRA model continues to reflect the as-built, as operated plant for the current amendment.

- a. *Describe any updates or potential upgrades made to the PRA models since the approval of the 10 CFR 50.69 and NFPA 805 programs.*
- b. *If there were updates or potential upgrades made to the PRA, evaluate their impact to the current requested license amendment.*

SNC Response

The only updates that have taken place were documented in the Hatch Diesel Generator Liner Replacement One-Time Technical Specification Completion Time Extension LAR (ADAMS Accession Number ML20213C715) and associated RAI responses (ML20236S786). The NRC staff found the changes to the PRA model to be adequately described and justified to support the risk analysis for the EDG one-time AOT extension.

PRA - RAI 2 – Compensatory Measures License Condition

The RG 1.177, Tier 2 evaluation identifies which systems, structures, and components (SSCs), in combination with the component already out of service, could result in a risk significant configuration. The licensee presented a number of SSCs which have been identified as compensatory measures with increased importance during this outage. The SSCs that become more important are associated with the other plant service water (PSW) pumps, high pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), the 1B Emergency Diesel Generator, and the Containment Hardened Vent.

If any of these SSCs become Inoperable during this additional 15-days to the CT, there is a potential that the configuration risk profile in the facility would exceed the acceptance criteria required for the requested outage period . Therefore,

- a. Describe the licensee’s plan to address any potential outages of the SSCs identified as a part of the Tier 2 evaluation.*
- b. Alternatively, propose a mechanism that avoids a risk significant configuration from an outage of the SSCs mentioned above.*
- c. In Attachment 4, section 2.1.3, Calculation Approach, the licensee described the addition of recovery rules. Describe which rules were applied and if the PSW pump 1C outage configuration has any impact to them.*

SNC Response

- a. Describe the licensee’s plan to address any potential outages of the SSCs identified as a part of the Tier 2 evaluation.*

As described in the response to RAI 2.b, the equipment identified in the Tier 2 evaluation is currently protected. Protecting this equipment during the extended Completion Time will be required per proposed TS 3.7.2 Required Action A.2.1, and will ensure the equipment is protected against inadvertent operation or contact that may impede it from fulfilling its design function. The SNC response to RAI 2.b further describes measures in place to ensure protected equipment will remain Operable.

- b. Alternatively, propose a mechanism that avoids a risk significant configuration from an outage of the SSCs mentioned above.*

All the equipment identified from the Tier 2 evaluation is currently protected. Operations initiated a Standing Order to formally track the protected equipment.

Risk Mitigation procedures are used to ensure that all work is properly screened while the 1C PSW is inoperable.

Protected Equipment is controlled by governing SNC Procedure NMP-OS-010. Physical barriers or signage is used to alert personnel to maintain a safe distance from the Protected Equipment to prevent unintended consequences from operation, maintenance, or nearby activity. Protected equipment has a physical barrier preventing access or work in the area and requires shift manager permission to enter the area. Operations personnel performing operator rounds are allowed to enter areas of protected equipment to ensure equipment conditions

remain in the expected condition. In addition, operators monitor plant equipment to ensure no unauthorized work and periodically walk down postings and spot check behaviors and conditions to support effective equipment protection.

c. In Attachment 4, section 2.1.3, Calculation Approach, the licensee described the addition of recovery rules. Describe which rules were applied and if the PSW pump 1C outage configuration has any impact to them.

The recovery rule file applies a recovery fault tree to the cutsets and joint human failure probabilities based on the base case human reliability analysis dependency analysis. The recovery fault tree uses the same database as the fault tree used in quantification. The recovery fault tree is used for Consequential LOSP scenarios. The recovery fault tree and the main fault tree use the same database; no changes were made to the recovery fault tree structure or logic. Failure of the 1C PSW has no impact on the existing recovery rules.

PRA - RAI 3 – Facts and Observations (F&Os)

The licensee did not provide details on any open F&Os and disposition in the LAR. In Attachment 4, Section 1.5, the licensee stated that “all of the F&Os [for each hazard model] have been addressed.” However, the licensee also stated there are “two open findings related to internal flooding documentation that do not impact the outcome of this assessment.” RG 1.200, Regulatory Position 4.2 stated that NRC staff expects a licensee to discuss “the resolution of the peer review...findings and observations that are applicable to the parts of the PRA required for the application.”

Provide details of any open F&Os and associated applicability to the results of this LAR.

SNC Response

Two Internal Events related F&Os remain open. Both open F&Os are related to documentation, and have been incorporated into the documentation, but have not been through the F&O closure process.

F&O 1-9: This is related to SRs AS-B3 and AS-C2. The F&O is related to missing discussion on the phenomenological conditions expected for each accident sequence related to SBO with usage of fire water. Based on the Hatch Equipment Qualification Program, equipment located in potentially harsh environment conditions, including inside containment, are expected to perform its safety function when exposed to normal, abnormal, and accident environment. For all other areas, the models do not credit use of equipment in the area of events that cause adverse environmental events, such as ISLOCA events and steam line breaks outside containment. The Internal flooding analysis evaluates the susceptibility of components to spray and flooding separately. A discussion on environmental considerations for the SBO sequence where fire water is used was added to the documentation. This finding is a documentation issue; there is no impact on the unavailability of PSW 1C pump being out of service.

F&O 6-8: This is related to SR HR-G6. The finding was related to the Hatch Human Reliability Analysis document where the consistency check did not include comparison of HEPs in regard to scenarios context, plant history, procedures, operational practices, and experience. The internal events HRA documentation was revised to incorporate a better consistency analysis. A discussion on requirements from NUREG-1792 and feasibility requirements from NUREG-1921 to be used for internal events HFES were added to the HRA notebook. HFES and their HEP were reviewed relative to each other to check their reasonableness given the scenario context including plant procedures, plant history, operational practices and experiences and documented in the HRA notebook. Thus, the documentation associated with this issue has been revised. There is no impact on the unavailability of PSW 1C pump being out of service.

PRA - RAI 4 – Common Cause Failure

In Attachment 4, Section 2 of the LAR, the licensee described its approach to adjusting for common cause failures. It provided a total random failure rate (Qt) for failure-to-start (FTS) and failure-to-run (FTR) of 1.79E-6/hour (hr) and 1.48E-3/hr, respectively. The NRC staff ran the Hatch Nuclear Plant SPAR model and produced incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP) values that were more conservative (higher) than that of the SNC model. Comparing the available hazards in SPAR and the SNC models revealed little differences between internal events but a large difference in the contribution of internal fires.

Recognizing the SNC Fire PRA model is best available information due to the NFPA 805 transition and related plant modifications being reflected in the licensee's model, the NRC staff requests that the licensee run the fire PRA model with the NRC's adjusted common-cause failures (CCF) for PSW Pump FTS and FTR using the following values:

Adjusted CCF FTS : 8.033 E-3

Adjusted CCF FTR : 2.077 E-3

Please provide the updated ICCDP and ICLERP estimates for all hazards (internal events, fire, internal flood, and seismic) using the OTMHM with the NRC's adjusted CCF FTS and CCF FTR probabilities.

SNC Response

RAI 4 provided Hatch plant specific common-cause failure rates for the PSW pumps Fail to Run (FTR) and Fail to Start (FTS) for all combinations of common-cause failures. This RAI requests that the common cause failure values from the Hatch SPAR model be applied to the One Top Multi Hazard Model (OTMHM) and re-quantified for the FTR scenario and FTS scenarios in Attachment 4 of the original request. The RAI also requests that the same evaluations be performed for the specific fire hazard model. The method used for quantification followed that described in Attachment 4 of the original request, except with the modification of the scenario specific Flag Files. To simulate the FTR single CCF value used in the Hatch Nuclear Plant SPAR model, the flag file H1_CBM_REV_8_FLG_OTMHM_PSW1C_CCF_FTR.FLG was modified such that common-cause for 4/4 pumps fail basic event was set to: CC-PS-15 PROB 2.077E-03. All other PSW common cause basic events in the flag file were set to False. Similarly, for the FTS scenario, the flag file H1_CBM_REV_8_FLG_OTMHM_PSW1C_CCF_FTS.FLG was modified such that common-cause for 4/4 pumps fail basic event was set to: CC-SW-15 PROB 8.033E-03. All other PSW common cause basic events in the flag file were set to False. The 4/4 CCF basic event was selected because it is included as a failure event for each pump and will replace all permutations of possible combinations.

These changes resulted in the following CDF and LERF changes for the Fire PRA for the scenarios reported in Attachment 4 of the original request (see tables below). As expected, the CDF increased due to applying a higher CCF, but is still within the threshold. A review of the results (cutsets) reveals no risk insights not already addressed by the original request.

Table RAI 4-1 Fire PRA and OTMHM Updated CCF Results

	RBA-21-007-H Value	Updated Value	Updated Base Case Delta	% of CDF/LERF Change
FIRE FTR CDF	6.20E-05	6.35E-05	4.94E-06	2%
FIRE FTR LERF	3.82E-06	3.84E-06	5.97E-08	1%
FIRE FTS CDF	5.93E-05	5.95E-05	9.09E-07	0.4%
FIRE FTS LERF	3.81E-06	3.83E-06	5.01E-08	0.5%
OTMHM FTR CDF	8.25E-05	8.87E-05	2.43E-05	8%
OTMHM FTR LERF	4.96E-06	4.72E-06	3.42E-07	-5%
OTMHM FTS CDF	7.89E-05	9.27E-05	2.83E-05	18%
OTMHM FTS LERF	4.87E-06	5.41E-06	1.03E-06	11%

Table RAI 4-2 ICCDP/ICLERP Values

	RBA-21-007-H ICCDP/ICLERP	Updated ICCDP/ICLERP	% Change
OTMHM FTR ICCDP	2.22E-06	2.99E-06	35%
OTMHM FTR ICLERP	4.63E-08	4.21E-08	-9%
OTMHM FTS ICCDP	1.78E-06	3.49E-06	96%
OTMHM FTS ICLERP	6.12E-08	1.27E-07	108%

Technical Specifications

Background

Hatch Technical Specification (TS) 1.3, "Completion Times" establishes the CT convention and provides guidance for its use. Hatch TS LCO 3.0.1 through 3.0.8 contain usage requirements for LCOs. Part of the NRC staff's review includes evaluation of the proposed TS change for conformance to the conventions and requirements contained in the existing TS to ensure a proposed change, once implemented, will continue to provide adequate assurance of public health and safety.

STSB - RAI 5

The current proposed text of the TS NOTE above the existing 30 day CT for Required Action A.1 states "A Completion Time of 45 days is permitted for Pump 1C while the compensatory measures described in Section 3.3 of SNC letter NL-21-0852 dated September 21, 2021 are implemented."

Please address the following aspects of the proposed NOTE:

5a) *Given the current CT is 30 days and the plant remains in Condition A since entry in August and the current CT will expire September 25, please explain why 45 days was chosen for the NOTE instead of the alternative of stating the allowance in terms of number of days requested in excess of the current 30 day CT.*

At the end of Section 2.5 on page E-8, compensatory measures are mentioned as they relate to the allowance: "The allowance would only apply to the 1C PSW pump and only as long as the compensatory measures described in Section 3.3 of this application are implemented."

5b) *Please provide a discussion of whether establishing the compensatory measures is a prerequisite to using the allowance before exceeding 30 days in the condition where the 1C pump is inoperable.*

5c) *Please provide a discussion of how operators would respond if any of the compensatory measures are found to be not implemented after commencing use of the allowance.*

The current text of the NOTE states the allowance expires at 1620 EDT on October 10, 2021.

5d) *Please provide a discussion of whether or not there is a need for text explicitly stating the allowance would no longer apply after restoration of the 1C pump.*

SNC Response

5a) *Given the current CT is 30 days and the plant remains in Condition A since entry in August and the current CT will expire September 25, please explain why 45 days was chosen for the NOTE instead of the alternative of stating the allowance in terms of number of days requested in excess of the current 30 day CT.*

SNC has revised the requested change for Technical Specification 3.7.2, Condition A. As seen in Enclosure 2 of this response letter, a new Required Action A.2.2 is requested to extend the Completion Time to 45 days if the Compensatory Measures as described in Enclosure 5 of this response letter have been established (i.e., Required Action A.2.1). Within 30 days of entering

Condition A, either Required Action A.1 (restore PSW pump to OPERABLE status) or Required Action A.2 (Establish compensatory measures as described in letter NL-21-0862, dated September 23, 2021) must be met. This change to the request in the original application is not a change in intent, but SNC believes it is clearer and better aligns with TS usage rules.

5b) *Please provide a discussion of whether establishing the compensatory measures is a prerequisite to using the allowance before exceeding 30 days in the condition where the 1C pump is inoperable.*

As shown in the revised markups in Enclosure 2, the pump must meet either Required Action A.1 or Required Actions A.2.1 within 30 days. Required Action A.2.1 must be met prior to and during the extended Completion Time of Required Action A.2.2. Required Action A.2.1 enforces the compensatory measures as described in Enclosure 5 to this letter before exceeding the 30 days in the condition where the 1C pump is inoperable.

5c) *Please provide a discussion of how operators would respond if any of the compensatory measures are found to be not implemented after commencing use of the allowance.*

Referencing the revised markups in Enclosure 2, after commencing the use of the allowance, the plant would be in Required Actions A.2.1 and A.2.2. If during the extended Completion Time it is discovered that any of the compensatory measures are found to be not implemented (i.e., Required Action A.2.1 not met), then the plant would be in Condition E, which would require Unit 1 to be in Mode 3 in 12 hours. If the Compensatory Measures can be restored while the plant is in Condition E, then Condition E can be exited, and the plant would resume under Required Actions A.2.1 and A.2.2. The Condition A Completion Time would not reset, but would continue from the time the 1C PSW pump was first declared inoperable (specifically the 45 day "clock" would continue from 1620 EDT, August 26, 2021). This concept is discussed in Example 1.3-2 of Plant Hatch Technical Specification 1.3, Completion Times.

It is noted that SNC would evaluate any failure to maintain a compensatory measure during the extended TS Completion Time for potential reportability to the NRC.

5d) *Please provide a discussion of whether or not there is a need for text explicitly stating the allowance would no longer apply after restoration of the 1C pump.*

Referencing the revised markups in Enclosure 2, SNC has added a note stating that Required Actions A.2.1 and A.2.2 apply only to the 1C PSW pump and are only applicable until October 10, 2021. SNC cannot invoke this allowance to extend the Condition A Completion Time for any reason other than the current 1C PSW pump repair. SNC notes that restoration of the 1C PSW pump to Operable subsequent to current repairs would "reset" Condition A. It would not be possible to utilize the extended Completion Time of 45 days, nor even the standard Completion Time of 30 days, before the applicability of Required Actions A.2.1 and A.2.2 would expire October 10, 2021 based on Note 2 to Required Actions A.2.1 and A.2.2. To further clarify intent, SNC has added Note 1 to the Required Actions stating, "Only applicable during 1C PSW pump repair".

STSB - RAI 6

Section 4.1 of the request, on page E-11 of the application states: "The proposed amendment does not alter the remedial actions or shutdown requirements required by 10 CFR 50.36(c)(2)(i)." The NRC staff evaluates acceptability of remedial actions based on the actions required as well as time allowed to complete the actions. In this case, the staff believes both the action and time component of remedial actions would be altered.

Please provide a discussion explaining how the allowance increases time allowed in MODE 1 with an inoperable 1C PSW pump contingent on certain compensatory measures being in place.

SNC Response

The quoted sentence above was from the Regulatory Evaluation of the original request, and was meant to highlight that requirements of 10 CFR 50.36(c)(2)(i) will still be met based on the proposed change. Specifically, 10 CFR 50.36(c)(2)(i) states that "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met." The proposed change meets this regulatory requirement. When the limiting condition for operation (LCO 3.7.2) is not met, SNC will either shutdown the reactor (TS 3.7.2 Condition E) or follow remedial action permitted by the TS (TS 3.7.2 Condition A) until the condition can be met.

Plant Systems

SCPB – RAI 7

The second key principle of RG 1.174 relates to evaluation of defense-in-depth, which includes consideration of the potential for common cause failures. Section 2.1, “Emergency Circumstances,” of the Enclosure to the LAR described that operators found the 1C PSW pump to have excessive vibration on August 26, 2021, and subsequently shut down the pump and declared it inoperable. Troubleshooting identified the 1C PSW pump had the following conditions:

- *All four motor to pump discharge fasteners were loose and could be turned by hand*
- *One of the pump discharge head to floor fasteners was loose*
- *A significant gap existed between the seal box drive collar and gland plate assembly*
- *The suction head was no longer connected to the pump column and remained submerged in the intake suction pit*

Please provide an assessment of potential causes of these conditions, including common maintenance practices (e.g., fastener torque procedure and practices, shaft alignment procedures and practices, and adequacy of post-maintenance testing applicable to the PSW pumps), condition monitoring practices (e.g., type, frequency and acceptance criteria for in-service tests), material or component degradation, and design defects. Also, please assess the applicability of these factors in presenting a challenge to the continued operability of the other Hatch Unit 1 PSW pumps currently considered operable. Describe any Southern Nuclear Operating Company operating experience indicating a similar failure mode on deep-draft water pumps involving loosened fasteners or separated components and the identified cause.

SNC Response

The cause associated with the conditions that led to securing the 1C PSW pump on August 26, 2021 is currently under investigation by SNC and specialty vendors. Based on systematic troubleshooting efforts, the leading theory is fatigue induced failure of the pump shaft, which led to excessive vibration in the pump and motor. The excessive vibration from the failure of the pump shaft led to loosening of the pump and motor fasteners identified during troubleshooting. As a part of the broadness review, the other PSW pumps and motors were visually inspected for loose fasteners, and none were found. Additionally, these pumps have been monitored by operations and no signs of unacceptable conditions are present. Therefore, there is reasonable assurance the other PSW pumps are able to perform their safety function for their mission time.

Likely causes of fatigue induced failure of the pump shaft include 1) an internal flaw in the pump shaft, 2) misalignment of the pump and motor during motor replacement activity in January 2021, or 3) age related degradation of the components securing the pump shaft.

It is not likely that an internal flaw exists on the other PSW pumps shafts. Each time a pump is replaced the shaft component is also replaced. The 1C PSW pump was last replaced in 2013, 1A in 2017, 1B in 2021, and 1D in 2018. Due to the difference in age of these pump shafts, it is

unlikely that they are of the same batch or lot of material. Additionally, the PSW shafts are fabricated to the ASTM 582-416A standard and are provided with a unique certificate of conformance.

In January 2020, HNP maintenance processes for installing and aligning vertical pumps and motors were updated to include pump to motor alignment verifications. This was in response to recent OE at HNP. Since the update of the maintenance practices, only the 1B and 1C PSW pumps have been exposed to this new process. The 1A and 1D PSW pumps and motors have not been worked on since 2017 and 2018, respectively. If this new practice introduced increased stresses on the pump shaft, which may have contributed to the shaft failure, only the 1B and 1C PSW pumps would be vulnerable. However, since the 1B pump was replaced in May of 2021, no adverse conditions have been reported. Therefore, there is confidence that this pump will remain operable for the duration of this extended completion time.

Degradation due to wear and age of the components securing the pump shaft, e.g., lineshaft bearings, pump bowl bearings, etc., may have introduced a high cycle fatigue failure mechanism. Pumps that have been replaced in recent years would be much less likely to have this failure mechanism present due to lower run times. The 1A, 1B, and 1D PSW pumps have considerably less run time than the 1C PSW pump when it failed, thus are less susceptible to age or wear degradation.

SNC and industry OE were reviewed by both SNC fleet pump and motor SMEs and a pump consultant. Specifically, OE related to loose fasteners and vibration related failures was searched back to 2002. None was found involving loose fasteners or vibration related failures on vertical pumps.

The plant service water pumps are monitored by the condition-based monitoring (CBM) and in-service testing (IST) programs. The purpose of these programs is to monitor pump performance over time in order to identify declines in performance. The programs are in line with industry practices.

The CBM program utilizes technologies and techniques to measure mechanical and / or electrical condition indicators of performance. The PSW pumps are monitored by vibration (monthly), thermography (yearly), and oil (semi-annually) analysis. These parameters are trended to identify deviation from historical performance and compared to industry standards. Based on the industry standards components are classified as acceptable, watchlist, marginal, or unacceptable.

The IST program is governed by ASME O&M Code and provides guidance for test performance and acceptance criteria / ranges. Per the IST program, the PSW pumps are monitored quarterly (90 days), and monitors pump performance parameters along with vibration in the horizontal and axial directions. During IST surveillances the PSW pump's flow is adjusted to 6000 gpm, which is a constant for each pump, and discharge pressures are adjusted to account for varying river water levels. The values of each of these parameters are compared to a reference value for the specific pump which monitors for degradation over a period. If a pump reaches the ALERT range per ASME code the pump will be placed on increased frequency testing (45 days). If a pump reaches the REQUIRED ACTION range per ASME the pump's operability must be evaluated and remain on increased frequency. The 1C pump in June 2021 was

observed to have low differential pressure placing the pump in the ALERT range which required increased frequency but did not threaten the operability of the component.

Performance Review:

A review of performance data for the 1P41-C001C (i.e., "1C") PSW pump was performed, and all reviewed data was within HNP Standards under the In-Service Testing (IST) Program and ASME Code. This includes a review of the pump flow, discharge pressure, differential pressure and vibrations from 2016 to present. This review showed only a consistent declining trend in differential pressure from the reference value. However, the pump remained on normal testing frequency per IST governance and ASME Code until June 29, 2021. It is not abnormal for a pump of this age to show a declining trend in monitored parameters. Following the IST Surveillance performance on June 29, 2021, the 1C PSW pump entered the ALERT range which requires placement on increased testing frequency. The pump was scheduled to be replaced in May of 2022 prior to failure. In January 2021, the 1C PSW pump motor was replaced as a part of its 6-year preventive maintenance. Since that time all observed parameters remained in specifications with no observable change due to motor replacement. In addition to the IST surveillance data, condition-based monitoring (CBM) data was also reviewed since motor replacement. No observable parameters were identified out of tolerance per CBM standards; therefore, SNC could not have foreseen the failure of PSW pump 1C on August 26, 2021 based on the trending data available.

The 1P41-C001A (1A PSW) pump is currently in the Required Action Range per IST program and ASME code requirements. An operability support basis document was developed which concluded the pump has adequate flow and pressure to perform its safety function and is therefore operable. The pump was placed in the Required Action Range per ASME code due to low differential pressure in November 2020. In May of 2021 it was identified the vibration had also reached the ALERT range. Currently the pump is scheduled for replacement in November 2021 and last replacement occurred in 2017. The trend data supports the operability of the pump beyond its replacement.

The 1P41-C001B (1B PSW) pump was last replaced in May 2021. In July 2021 the 1B PSW pump motor was replaced as a part of its 6-year PM. Comprehensive Pump Testing was performed after motor replacement. There are no current adverse conditions that have been identified or reported and all observed parameters remain within specification since pump and motor replacement earlier this year.

The 1P41-C001D (1D PSW) pump was last replaced in 2018. A review of the performance data for the 1D PSW pump was performed and identified elevated vibration in both the N-S and E-W direction; however, this pump remains on normal testing frequency per IST governance and ASME Code. This data review included a review of the pump flow, discharge pressure, differential pressure and vibrations from 2018 to present. All reviewed data is still within acceptable parameters under the In-Service Inspection (IST) Program and ASME Code.

SCPB – RAI 8

The second key principle of RG 1.174 relates to evaluation of defense-in-depth, which includes avoidance of over-reliance on compensatory measures. Section 3.3, “Compensatory Measures,” of the Enclosure to the LAR described several actions involving classification of components as “protected” and deferring preventive maintenance on FLEX pumps. Please explain (1) the meaning of “protected” as it relates to component maintenance, (2) the risk-informed basis for designating only the 1A PSW pump rather than all operable PSW pumps as “protected,” and (3) the TS required surveillances expected to be performed on the 1B diesel generator and the standby service water pump during the proposed extended completion time and their effect on availability. Also, please describe (1) the modeling of the FLEX equipment in the risk assessment, (2) the current operational status and reliability experience with the FLEX equipment modeled to compensate for PSW system failures (e.g. portable generators and cooling water pumps), and (3) the expected effect of deferred maintenance on the reliability of this FLEX equipment.

SNC Response

Please explain (1) the meaning of “protected” as it relates to component maintenance, ...

Per SNC procedure NMP-OS-010, Protected Equipment means:

- Systems or components that have been identified as essential to ensuring that safety functions or unit generation is maintained for given plant conditions.
- Components or equipment redundant to equipment that has failed, is taken out of service, degraded, or is otherwise unavailable when the redundant equipment is required for current plant conditions.

Physical barriers or signage is used to alert personnel to maintain a safe distance from the Protected Equipment in order to prevent unintended consequences from operation, maintenance, or nearby activity. It is noted that when protecting a system, SNC also protects systems supporting the primary system.

(2) the risk-informed basis for designating only the 1A PSW pump rather than all operable PSW pumps as “protected,”...

The 1A PSW pump was listed based solely on what required per SNC procedure NMP-OS-010, Protected Train/Division and Protected Equipment Program, for the 1C PSW pump being inoperable. Pumps 1B and 1D individual and common cause failures (excluding common cause events that include pump 1C) did not have a large change in importance. However, SNC has updated the compensatory measures, as shown in Enclosure 5 to this response, to protect the 1B and 1D PSW pumps as well as the 1A PSW pump.

3) the TS required surveillances expected to be performed on the 1B diesel generator and the standby service water pump during the proposed extended completion time and their effect on availability.

There are no planned surveillances on the 1B EDG or the standby PSW pump during the time frame discussed.

Also, please describe (1) the modeling of the FLEX equipment in the risk assessment,...

Currently permanently installed FLEX equipment and related actions are only modeled in the Seismic PRA model for defense in depth purposes. There is no credit for other FLEX equipment or actions in the Seismic model. Review of the fault tree used to calculate the Base and scenario specific CDF and LERF for all hazards confirmed that the model flag FL-FLEX is set to credit FLEX for Seismic PRA only. When the credit is changed in the base case, the resulting calculated delta risk results show no change.

(2) the current operational status and reliability experience with the FLEX equipment modeled to compensate for PSW system failures (e.g. portable generators and cooling water pumps),...

The on-site 600V flex generators and the booster pumps components used in the core cooling FLEX strategy are currently functional, and all PMs are current on these components. A review of recent Condition Reports did not reveal any reliability issues associated with this equipment.

(3) the expected effect of deferred maintenance on the reliability of this FLEX equipment.

In the event that a total loss of PSW occurs, the station would implement the core cooling FLEX strategy. For this strategy, the on-site 600V flex generators, and the booster pumps would be utilized. Preventive maintenance activities (PMs) for these components were scheduled during the timeframe of the original request. No preventive maintenance will be performed on the FLEX pumps to ensure their availability during the extended Completion Time (Reference Enclosure 5) to prevent them from being unavailable while the 1C PSW is out of service for maintenance. The PMs will be rescheduled in the PM window. Due to these PMs being rescheduled later in the PM window, there is no impact to the functionality of these components.

ADDITIONAL HPCI PERFORMANCE INFORMATION

In response to an NRC request during a teleconference on September 22, 2021, SNC is providing this additional discussion on High Pressure Coolant Injection (HPCI) performance.

On September 8, 2021, during a valve surveillance, the HPCI discharge valve failed to re-open after stroking closed. This caused HPCI to be declared inoperable. After systematic troubleshooting, it was determined that a legacy human performance error had occurred in 2006 regarding staking the motor pinion gear key. Proper staking is covered in training. The procedure has a step to stake the key and refers a worker to diagrams in the procedure showing where to stake. A review was performed to verify the training and procedural guidance for staking is adequate. This review confirmed the staking of the three most recent MOVs was done correctly (even though the maintenance personnel involved were fairly inexperienced), and provided reasonable assurance that similar staking errors were unlikely. The HPCI valve motor was replaced and it was confirmed the pinion gear key was properly staked. HPCI is currently operable.

Edwin I. Hatch Nuclear Plant Unit 1

**Emergency License Amendment Request for Technical Specification 3.7.2
Regarding One-Time Extension of Completion Time for
Plant Service Water (PSW) Pump Inoperable – RAI Responses**

Enclosure 2

HNP Unit 1 Technical Specification Marked-up Pages

3.7 PLANT SYSTEMS

3.7.2 Plant Service Water (PSW) System and Ultimate Heat Sink (UHS)

LCO 3.7.2 Two PSW subsystems and UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One PSW pump inoperable.	A.1 Restore PSW pump to OPERABLE status. <u>OR</u> -----NOTES----- 1. Only applicable during 1C PSW pump repair. 2. Only applicable until October 10, 2021 at 1620 EDT. -----	30 days
	A.2.1 Establish compensatory measures as described in letter NL-21-0862 dated September 23, 2021, Enclosure 5. <u>AND</u>	30 days
	A.2.2 Restore PSW pump to OPERABLE status.	45 days
B. One PSW turbine building isolation valve inoperable.	B.1 Restore PSW turbine building isolation valve to OPERABLE status.	30 days
C. One PSW pump in each subsystem inoperable.	C.1 Restore one PSW pump to OPERABLE status.	7 days
D. One PSW turbine building isolation valve in each subsystem inoperable.	D.1 Restore one PSW turbine building isolation valve to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E. Required Action and associated Completion Time of Condition A, B, C, or D not met.</p>	<p>E.1 -----NOTE----- LCO 3.0.4.a is not applicable when entering MODE 3. ----- Be in MODE 3.</p>	<p>12 hours</p>
<p>F. One PSW subsystem inoperable for reasons other than Conditions A and B.</p>	<p>-----NOTES----- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for diesel generator made inoperable by PSW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.7, "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown," for RHR shutdown cooling made inoperable by PSW System. ----- F.1 Restore the PSW subsystem to OPERABLE status.</p>	<p>72 hours</p>
<p>G. Required Action and associated Completion Time of Condition F not met.</p> <p><u>OR</u></p> <p>Both PSW subsystems inoperable for reasons other than Conditions C and D.</p> <p><u>OR</u></p> <p>UHS inoperable.</p>	<p>G.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>G.2 Be in MODE 4.</p>	<p>12 hours</p> <p>36 hours</p>

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**Emergency License Amendment Request for Technical Specification 3.7.2
Regarding One-Time Extension of Completion Time for
Plant Service Water (PSW) Pump Inoperable – RAI Responses**

Enclosure 3

HNP Unit 1 Revised Technical Specification Pages

3.7 PLANT SYSTEMS

3.7.2 Plant Service Water (PSW) System and Ultimate Heat Sink (UHS)

LCO 3.7.2 Two PSW subsystems and UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One PSW pump inoperable.	A.1 Restore PSW pump to OPERABLE status. <u>OR</u> -----NOTES----- 1. Only applicable during 1C PSW pump repair. 2. Only applicable until October 10, 2021 at 1620 EDT. -----	30 days
	A.2.1 Establish compensatory measures as described in letter NL-21-0862 dated September 23, 2021, Enclosure 5. <u>AND</u>	30 days
	A.2.2 Restore PSW pump to OPERABLE status.	45 days
B. One PSW turbine building isolation valve inoperable.	B.1 Restore PSW turbine building isolation valve to OPERABLE status.	30 days
C. One PSW pump in each subsystem inoperable.	C.1 Restore one PSW pump to OPERABLE status.	7 days
D. One PSW turbine building isolation valve in each subsystem inoperable.	D.1 Restore one PSW turbine building isolation valve to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E. Required Action and associated Completion Time of Condition A, B, C, or D not met.</p>	<p>E.1 -----NOTE----- LCO 3.0.4.a is not applicable when entering MODE 3. ----- Be in MODE 3.</p>	<p>12 hours</p>
<p>F. One PSW subsystem inoperable for reasons other than Conditions A and B.</p>	<p>-----NOTES----- 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for diesel generator made inoperable by PSW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.7, "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown," for RHR shutdown cooling made inoperable by PSW System. ----- F.1 Restore the PSW subsystem to OPERABLE status.</p>	<p>72 hours</p>
<p>G. Required Action and associated Completion Time of Condition F not met.</p> <p><u>OR</u></p> <p>Both PSW subsystems inoperable for reasons other than Conditions C and D.</p> <p><u>OR</u></p> <p>UHS inoperable.</p>	<p>G.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>G.2 Be in MODE 4.</p>	<p>12 hours</p> <p>36 hours</p>

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Plant Service Water (PSW) Pump Inoperable – RAI Responses**

Enclosure 4

HNP Unit 1 Technical Specification Bases Marked-up Pages (information only)

BASES

APPLICABILITY
(continued)

The LCO for the PSW System and UHS is not applicable in MODES 4 and 5, and defueled. However, portions of the PSW System and UHS may be required to perform necessary support functions for OPERABILITY of the supported systems. Thus, the LCOs of the individual systems, which require portions of the PSW System and the UHS to be functional to support individual system OPERABILITY, will govern PSW System and UHS requirements during operation in MODES 4 and 5 and defueled.

ACTIONS

A.1

With one PSW pump inoperable, the inoperable pump must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE PSW pumps (even allowing for an additional single failure) are adequate to perform the PSW heat removal function; however, the overall reliability is reduced. The 30 day Completion Time is based on the remaining PSW heat removal capability to accommodate additional single failures, and the low probability of an event occurring during this time period.

A.2.1 and A.2.2

The Completion Time to restore one PSW pump to OPERABLE status to facilitate the 1C PSW pump repair may be extended to 45 days total, provided action is taken within 30 days to establish compensatory and risk management controls.

The A.2.1 and A.2.2 Required Actions are modified by two Notes. Note 1 ensures that the A.2.1 and A.2.2 Required Actions are only applied during the 1C PSW pump repair. Note 2 limits the time period the A.2.1 and A.2.2 Required Actions may be used.

The extended Completion Time is subject to additional compensatory controls specified in SNC letter NL-21-0862, dated September 23, 2021, that consist of controls that must be established and maintained during the extended Completion Time. These controls are based on procedural protection, operation of redundant functions, and recommended actions based on risk insights.

If Required Action A.2.1 is met, the allowed time to restore the PSW pump to OPERABLE status can be extended to 45 days from entry into Condition A. With the unit in this condition, the remaining OPERABLE PSW pumps (even allowing for an additional single

(continued)

BASES

ACTIONS

A.2.1 and A.2.2 (continued)

failure) are adequate to perform the PSW heat removal function; however, the overall reliability is reduced. The 45-day Completion Time is based on the remaining PSW heat removal capability to accommodate additional single failures, the low probability of an event occurring during this time period, and the established compensatory measures of SNC letter NL-21-0862.

B.1

With one PSW turbine building isolation valve inoperable, the inoperable valve must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE PSW turbine building isolation valve in the subsystem is adequate to isolate the non-essential loads, and, even allowing for an additional single failure, the other PSW subsystem is adequate to perform the PSW heat removal function; however, the overall reliability is reduced. The 30 day Completion Time is based on the remaining PSW heat removal capability to accommodate additional single failures, and the low probability of an event occurring during this time period.

(continued)

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**Emergency License Amendment Request for Technical Specification 3.7.2
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Plant Service Water (PSW) Pump Inoperable – RAI Responses**

Enclosure 5

Revised Compensatory Measures

Enclosure 5 to NL-21-0862
Revised Compensatory Measures

The following compensatory measures are required during the extended Completion Time.

- The following equipment is protected as required by SNC Procedure NMP-OS-010-002 (Reference 3) for 1C PSW pump out-of-service:
 - 1A PSW Pump
 - 1E 4160V Frame 3 (power supply to 1A PSW Pump)
 - 1A PSW Pump Control Switch
- Travelling water screen 1B will be placed in RUN if the 1A screen is taken out of service.
- HNP Operations (each shift) will review the abnormal procedure for loss of PSW, SNC Procedure 34AB-P41-001-01 (Reference 4).
- PSW Pumps 1A, 1B, and 1D will be protected with work limited to TS required surveillances only.
- High Pressure Coolant Injection (HPCI) will be protected with work limited to TS required surveillances only.
- Reactor Core Isolation Cooling (RCIC) will be protected with work limited to TS required surveillances only.
- No maintenance will be performed on 1T48F081 or 1T48F082, the Containment Hardened Vent path.
- The 1B diesel generator and the Standby Service Water (SSW) pump will be protected, and work limited to TS required surveillances only.
- All three Unit 1 startup transformers and their associated 230KV breakers will be protected.
- No preventive maintenance will be performed on the FLEX pumps to ensure their availability during the extended Completion Time.