Progress Energy

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
LICENSE AMENDMENT REQUEST FOR EXTENSION OF REFUELING WATER STORAGE TANK ALLOWED OUTAGE TIME

Ladies and Gentlemen:

In accordance with Title 10 of the Code of Federal Regulations (10 CFR), Part 50.90, Carolina Power and Light Company (CP&L), doing business as Progress Energy Carolinas, Inc., requests an amendment to Appendix A, Technical Specifications (TS), of Renewed Facility Operating License No. NPF-63 for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP).

The proposed amendment would revise the TS to extend the TS 3.1.2.6, "Borated Water Sources – Operating," Action b allowed outage time for restoring an inoperable Refueling Water Storage Tank (RWST) to Operable status from one hour to seven days; and to extend the TS 3.5.4, "Refueling Water Storage Tank," Action for restoring an inoperable RWST to Operable status from one hour to seven days when performing purification in Modes 1 – 4. Conforming TS Bases changes, which reflect the proposed changes, are included for information only.

The Enclosure to this letter provides an evaluation of the proposed changes. The evaluation presents both deterministic and risk-informed justifications for the acceptability of the proposed change.

CP&L requests approval of the proposed license amendment by March 21, 2012, with the amendment being implemented within 90 days.

In accordance with 10 CFR 50.91(a)(1), "Notice for Public Comment," the analysis of no significant hazards consideration using the standards in 10 CFR 50.92 is being provided to the Commission in accordance with the distribution requirements in 10 CFR 50.4. In accordance with 10 CFR 50.91(b), CP&L is providing the State of North Carolina a copy of this proposed license amendment.

This document contains no new Regulatory Commitment.

Please refer any questions regarding this submittal to Mr. David Corlett, Supervisor – Licensing/Regulatory Programs, at (919) 362-3137.

Progress Energy Carolinas, Inc.
Harris Nuclear Plant
P. O. Box 165
New Hill, NC 27562

A001
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed on
[9-1-11].

Sincerely,

Keith Holbrook
Manager – Support Services
Harris Nuclear Plant

WJ/kab

Enclosure: Evaluation of Proposed Changes

cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP
Mr. W. L. Cox, III, N.C. DENR Section Chief
Mr. V. M. McCree, NRC Regional Administrator, Region II
Mrs. B. L. Mozafari, NRC Project Manager, HNP

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Subject: *Request for License Amendment for Extension of the Refueling Water Storage Tank Allowed Outage Time During Online Purification*

ATTACHMENTS:

1. Technical Specification Page Markups
2. Retyped Technical Specification Pages
3. Technical Specification Bases Page Markups

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1.0 SUMMARY DESCRIPTION

This evaluation supports a request by Carolina Power and Light Company (CP&L), doing business as Progress Energy Carolinas, Inc. (PEC), to amend Renewed Facility Operating License NPF-63 for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP).

The proposed change would revise the Operating License (OL) to extend the allowed outage time (AOT) for the Refueling Water Storage Tank (RWST) specified by Technical Specification (TS) Limiting Condition for Operation (LCO) 3.1.2.6, "Borated Water Sources – Operating," and TS LCO 3.5.4, "Refueling Water Storage Tank," while performing refueling water purification during Modes 1 – 4 with appropriate administrative controls established.

The proposed change will revise TS LCO 3.1.2.6 and TS LCO 3.5.4 to extend the AOT from the currently specified one hour to seven days, not to exceed a cumulative seven days in any rolling 12-month period while purifying the RWST with the plant operating in Modes 1 – 4. The proposed new AOT is based on the HNP Probabilistic Risk Assessment (PRA), additional considerations, and compensatory actions. The risk evaluation and deterministic analysis supporting the proposed change have been developed in accordance with the guidelines established in NRC Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific Risk-Informed Decision-making: Technical Specifications" (Reference 1), and NRC RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (Reference 2).

Revising TS LCO 3.1.2.6 and TS LCO 3.5.4 to extend the AOT of the RWST during purification in Modes 1 – 4 will reduce unnecessary burden during refueling outages by allowing the RWST water to be cleaned while in Modes 1 – 4, thus reducing critical path time during refueling outages. Although the proposed change does not result in an improvement to operational safety, the impact is negligible as the changes in core damage frequency (CDF) and large early release frequency (LERF) are within the acceptable limits for risk.

CP&L requests that the NRC approve the proposed amendment based on the operational benefits, additional administrative controls, and acceptable safety evaluation.

2.0 DETAILED DESCRIPTION

TS LCO 3.1.2.6 currently requires an inoperable RWST be restored to Operable status within one hour or be in at least Hot Standby within the next six hours and in Cold Shutdown within the following 30 hours. The proposed change adds a note to the action statement that states:

> "Except that while performing RWST purification, the tank must be returned to OPERABLE status within 7 days, not to exceed a cumulative 7 days in any rolling 12-month period."

TS LCO 3.5.4 currently requires an inoperable RWST be restored to Operable status within one hour or be in at least Hot Standby within the next six hours and in Cold Shutdown within the following 30 hours. The action statement is currently modified by a note that states:

> "Except that while performing surveillance 4.4.6.2.2, the tank must be returned to OPERABLE status within 12 hours."

The proposed change adds a second note to the action statement that states:

> "Except that while performing RWST purification, the tank must be returned to OPERABLE status within 7 days, not to exceed a cumulative 7 days in any rolling 12-month period."

Minor editorial changes are made to accommodate the addition of the second note.

Proposed Bases changes, included for information only, clarify the administrative controls that must be implemented when RWST purification is in process and the 7-day AOT is in effect.

Poor refueling water clarity results in a loss of critical path time during a refueling outage. Purifying the RWST prior to the refueling outage mitigates cavity clarity issues, thus reducing the unnecessary operational burden during refueling outages.

The Fuel Pool Cooling and Cleanup System (FPCCS) is a non-safety, non-seismic system that is separated from the RWST by a normally closed safety related boundary valve, 1CT-23. The boundary valve is manually operated and does not receive an automatic isolation signal. The RWST is seismically qualified, and a safety-related system included in the HNP TS. To accomplish purification of the RWST in Modes 1 – 4, manual valve 1CT-23, connecting the RWST piping to Spent Fuel Pool (SFP) Pump Suction Valve piping is opened, which un-isolates safety and seismic piping from non-safety piping, requiring HNP to declare the RWST inoperable. The proposed change will extend the AOT for the RWST only when the RWST is inoperable due to repositioning 1CT-23 to the open position during RWST purification while in Modes 1 – 4.

The NRC has previously approved an extension to the HNP TS LCO 3.5.4 AOT. Amendment 71 was approved by the NRC in a Safety Evaluation (SE) dated May 6, 1997 (Reference 3). The changes approved in Amendment 71 extended the AOT to 12 hours during the performance of Surveillance Requirement (SR) 4.4.6.2.2. During the performance of SR

4.4.6.2.2, the seismically qualified RWST and associated piping are connected to the non-seismically qualified hydrotest pump suction line.

3.0 TECHNICAL EVALUATION

3.1 System Description

The RWST provides borated water to the suction of the Emergency Core Cooling System (ECCS) and Containment Spray (CT) pumps during the initial phase of a Loss of Coolant Accident (LOCA). As described in Final Safety Analysis Report (FSAR) Section 6.2.2.3.2.3, the RWST must provide a minimum inventory to assure adequate containment sump level for proper recirculation phase operation. The tank will also provide that quantity of water required for at least 20 minutes of operation during the injection phase, with two high-head safety injection (HHSI) pumps, two low-head safety injection (LHSI) pumps and two CT pumps in operation. The RWST must also provide a minimum inventory to assure a post-LOCA containment sump boron concentration sufficient to meet core subcriticality requirements for long-term cooling. The RWST is seismically-qualified, safety-related and within the scope of plant TS.

Plant design includes the capability of using the FPCCS for cleanup of the RWST, as described in FSAR Section 9.1.3.2. Two fuel pool and refueling water purification pumps can take suction from and return fluid to the RWST. The RWST fluid is purified by the fuel pool demineralizer and filter. The FPCCS is a non-safety, non-seismic system and is separated from the RWST by a normally closed, safety-related, manually-operated boundary valve 1CT-23.

The RWST and its boundary isolation valve (1CT-23) were designed in accordance with General Design Criteria 2 (GDC-2) from Appendix A to 10 CFR 50. The FPCCS boundary isolation valves are built to ASME Section 3, Class 3 specifications. The RWST isolation valve (1CT-23) is a normally closed isolation valve. This isolation valve serves as the safety Class 3 to a non-safety class break.

3.2 Maintenance Rule Program

The Maintenance Rule (MR) requires that an evaluation be performed when equipment covered by the MR does not meet its performance criteria. The reliability and availability of the RWST is monitored under the MR program. If the pre-established reliability or availability performance criteria are not achieved for the RWST, it is considered for 10 CFR 50.65(a)(1) actions. These actions would require increased management attention and goal setting in order to restore its performance to an acceptable level. The actual out of service time for the RWST is monitored to ensure that the reliability and availability performance criteria are met.

The HNP RWST MR status is (a)(2), with an average unavailability of 0.00 percent over the last 18 months and no Functional Failures over the last 36 months (through June 2011). The system

is not subject to MSPI monitoring or requirements. The RWST MR status is not expected to be significantly adversely impacted by the proposed amendment because purification of the RWST is only required prior to a refueling outage.

3.3 Configuration Risk Management Program (CRMP)

Procedural controls assessing risk impact are used for scheduling station maintenance activities and help ensure that there is no significant increase in plant risk due to a severe accident while RWST purification is performed. These elements provide adequate justification for approval of the requested TS change by providing a high degree of assurance that the RWST will be capable of providing fluid to the ECCS.

Plant configurations and changes in plant configurations are assessed for risk at HNP. In accordance with station procedures, when risk significant structures, systems, and components (SSCs) are made unavailable, actions are taken to protect redundant / diverse SSCs. Risk informed assessments are performed for all planned plant configurations as part of the work planning process. HNP uses a blended quantitative and qualitative risk assessment process. Plant configurations are pre-planned to manage the risk. If unplanned equipment unavailability occurs during entry into the proposed extended AOT, station procedures direct that the risk be re-evaluated, and if found to be unacceptable, compensatory actions are taken until such a time that the risk is reduced to an acceptable level. Risk thresholds are procedurally specified for the assessment of the need for compensatory actions or other actions to manage the risk.

3.4 Technical Analysis for Proposed 7-day AOT

This section provides the technical analysis of the proposed changes with regard to the principles that adequate defense-in-depth is maintained, sufficient safety margins are maintained, and the calculated increases in CDF and LERF are small and consistent with the guidance of RG 1.174 and RG 1.177.

3.4.1 Deterministic Assessment of Proposed RWST AOT Extension

The effect of this proposed change would be to allow continued power operation up to an additional six days and 23 hours while performing RWST purification. While aligned for RWST purification, the seismically qualified RWST and associated piping are connected to the non-seismic FPCCS by opening boundary isolation valve 1CT-23. Because the RWST is required to be seismically-qualified, opening 1CT-23 to connect the FPCCS (non-seismic) to the RWST results in a deviation from GDC-2, making the RWST inoperable and resulting in entry into the required action to restore to Operable status within one hour. Although the RWST is declared inoperable during purification activities, it is still capable of performing the functions described in FSAR Section 6.2.2.3.2.3.

The AOTs provided in the plant TS are designed to permit limited operation with temporary relaxation of the LCO requirement. The acceptability of the maximum length of the AOT interval relative to the potential occurrences of design basis events needs to be considered. Since extending the AOT for an inoperable RWST does not change the design basis for the ECCS, the risk impact of RWST unavailability during the extended AOT interval was evaluated quantitatively using a probabilistic approach.

In order to mitigate the effects of the seismic to non-seismic interface, CP&L will implement certain administrative controls during RWST purification while in Modes 1 – 4. Isolation of the FPCCS from the RWST via the CT System is performed by manually closing valve 1CT-23. A dedicated attendant will be stationed in the Reactor Auxiliary Building, will be briefed on their responsibilities, and will be in continuous communications with the control room. In the unlikely occurrence of line break caused by a seismic event, the dedicated attendant will be instructed to close 1CT-23, thus isolating the seismic piping from the non-seismic piping and limiting the loss of fluid from the RWST.

CP&L has evaluated the effect of the RWST purification alignment on the ECCS flowpaths supplied by the RWST. CP&L has verified that the RWST purification alignment has little or no effect on the net positive suction head (NPSH) of the ECCS and CT pumps supplied by the RWST.

3.4.2 Risk Assessment

HNP intends to perform purification of the RWST prior to refueling outages in order to reduce operator burden during refueling outages. Plant configuration changes for purification of the RWST, as well as the maintenance of equipment having risk significance, are managed by the CRMP. The CRMP helps ensure that these activities are carried out with no significant increase in plant risk.

The proposed changes are evaluated to determine that current regulations and applicable requirements continue to be met, that adequate defense-in-depth and sufficient safety margins are maintained, and that any increase in CDF and LERF is small and consistent with the NRC Safety Goal Policy Statement, USNRC, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement" (Reference 4).

The justification for the use of an RWST extended AOT is based upon risk-informed and deterministic evaluations consisting of three main elements:

> ***Tier 1: Assessment of the impact of the proposed TS change using a valid and appropriate PRA model and comparison with appropriate acceptance guidelines.*** The modeling approach is consistent with the NRC guidance for the calculation of the requested risk measures using the HNP PRA for internal events, internal floods, fire hazards, and seismic sequences. RG 1.177 is followed to calculate the change in risk

measure for incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP). These conditional probabilities are performed to calculate the risk change while in the extended RWST AOT. As part of the Tier 1 analysis for the RWST AOT risk assessment, an integrated assessment of the impact of the AOT extension is calculated assuming the failure of the dedicated attendant to close 1CT-23. This calculation is then used for comparison with the criteria set in RG 1.174.

Tier 2: Evaluation of equipment relative to the contribution to risk while in the extended RWST AOT. Examination of out of service combinations can be evaluated for their risk significance to determine if additional measures may be required.

Tier 3: Implementation of the CRMP while in the extended RWST AOT. The CRMP is used for scheduling of station maintenance activities and helps ensure that there is no significant increase in plant risk due to a severe accident while RWST purification is performed. These elements provide adequate justification for approval of the requested TS change by providing a high degree of assurance that the RWST will be capable of providing fluid to the ECCS.

3.4.2.1 Compensatory Measures

The following compensatory measures are implemented during operation in the extended RWST AOT:

1. Maintenance and testing on the Auxiliary Feedwater (AFW), Main Feedwater (MFW) and supporting equipment will be managed in order to provide assurance that these systems will be available to provide cooling in the event the RWST is potentially failed.

2. High risk plant configurations, required for surveillance testing or maintenance activities that could result in plant trip, will be managed.

3. Maintenance activities on Reactor Coolant System (RCS) safety relief valves (SRVs), power-operated relief valves (PORVS) and associated block valves will be managed.

3.4.2.2 Summary of Plant-Specific Risk Assessment Results

An evaluation has been performed to assess the impact of extending the AOT associated with the RWST from the current TS AOT of one hour to seven days, not to exceed a cumulative seven days in any rolling 12-month period, while performing purification with administrative controls in place. This plant-specific risk assessment followed the guidance of RG 1.174, RG 1.177, and RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities" (Reference 5). RG 1.174 describes a general approach to risk-informed regulatory decision-making and includes discussion of specific topics

common to all risk-informed regulatory applications. RG 1.177 provides guidance specifically for risk-informed TS changes. RG 1.200 describes one acceptable approach for determining whether the technical adequacy of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making for light-water reactors.

In implementing risk-informed decision-making, TS changes are expected to meet the following set of key principles:

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change;
2. The proposed change is consistent with the defense-in-depth philosophy;
3. The proposed change maintains sufficient safety margins;
4. When proposed changes result in an increase in core damage frequency or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement; and
5. The impact of the proposed change should be monitored using performance measurement strategies.

Each of these key principles is discussed below.

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change.

   As stated in 10 CFR 50.36(c), TS will include items in the following category:

   > *(2)(i), 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.*

   This change to revise the RWST AOT revises the remedial actions permitted by the TS, but does not remove nor revise any LCO from the TS. Therefore, this proposed change meets current regulations.

2. The proposed change is consistent with the defense-in-depth philosophy

   As described in Position 2.2.1 of Regulatory Guide 1.177, consistency with the defense-in-depth philosophy is maintained if:

   - A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.

- Over-reliance on programmatic activities to compensate for weaknesses in plant design is avoided.
- System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the system, and uncertainties (e.g., no risk outliers).
- Defenses against potential common cause failures are preserved, and the potential for the introduction of new common cause failure mechanisms is assessed.
- Independence of physical barriers is not degraded.
- Defenses against human errors are preserved.
- The intent of the General Design Criteria in 10 CFR Part 50, Appendix A is maintained.

These defense-in-depth objectives apply to all risk-informed applications. The use of the multiple risk metrics of CDF and LERF and controlling the change resulting from the implementation of this proposed AOT would maintain a balance between prevention of core damage, prevention of containment failure, and consequence mitigation. The risk evaluation results are for placing the RWST on purification via the FPCCS only and require the RWST to be considered available for all initiating events. Alignments for RWST cleanup other than using the FPCCS as described in this LAR are not addressed by this evaluation.

The risk evaluation did not identify any other required limitations for alternate equipment out of service and compensatory measures. Below are some actions that will be considered during purification activities that would provide defense-in-depth.

- The RWST provides a means of decay heat removal through the RCS feed-and-bleed strategy. Consequently, in order to maintain defense-in-depth, the status of the AFW system (secondary heat removal) should be evaluated through the online scheduling process when placing the RWST in the purification line-up while at-power.
- The risk evaluation did not credit any operator action. Stationing an operator at the valve when the RWST is aligned for purification while at power is a recommended action to provide additional defense-in-depth.
- Insights obtained from risk review of the significant sequences indicated that the plant should manage challenges to unit load rejections and availability of the following when the RWST is aligned for purification while at power:
  - RCS PORVs and SRVs;
  - AFW and MFW; and
  - Work which could increase the likelihood of a reactor trip or turbine run-back.

This recommendation does not imply that work associated with these functions must be avoided, but rather, that there should be a considered sensitivity to scheduling work.

Although administrative controls related to the dedicated attendant will be implemented to ensure the capability to isolate the non-seismic portion of the purification alignment in case of a line break caused by a seismic event, the controls and actions required to close valve 1CT-23 are small in scope and do not constitute an over-reliance on programmatic activities. Although manual actions are required to close valve 1CT-23 in case of a line break caused by a seismic event, the required actions are not complex. In addition, the administrative control requires continuous communications be maintained between the dedicated attendant and the Control Room to provide assurance that the Control Room personnel are kept informed of the status of valve 1CT-23 and additional operators are dispatched to close the valve should that become necessary. Defenses against potential common cause failures are maintained and the potential introduction of new common cause failure mechanisms has been assessed. Therefore, there is no impact of common cause for this application because the RWST is a single tank and a single purification flowpath. There are no common interfaces, SSCs and initiating events. Thus, there is no common cause adjustment required.

3. The proposed change maintains sufficient safety margins

Criterion 2 of Appendix A to 10 CFR 50, describes the design bases for protection against natural phenomena. SSCs important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The intent of Criterion 2 is maintained: 1) by declaring the RWST to be inoperable during performance of RWST purification and 2) by limiting the time the piping configuration is allowed to a period of seven days, not to exceed a cumulative seven days in any rolling 12-month period.

Plant design includes the capability of using the FPCCS for cleanup of the RWST. The proposed change does not involve a change in the plant design. The proposed change allows the RWST to be inoperable for additional time. Although the RWST is declared inoperable during purification activities, it is still capable of performing the functions described in FSAR Section 6.2.2.3.2.3. Equipment will be operated in the same configuration and manner that is currently allowed. As the inoperability caused by connecting the non-seismic FPCCS system to the RWST is limited by the action statement, the proposed AOT extension does not conflict with approved Codes and Standards.

The extended AOT is only applicable during RWST purification via the FPCCS. Should the RWST be determined to be inoperable as a result of, for example, volume, boron concentration, or temperature not within limits, the one hour AOT would be applicable. For these types of inoperable conditions, there is no change in the TS requirements.

Therefore, the proposed change maintains sufficient safety margins.

4. When proposed changes result in an increase in CDF or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

   The impacts on CDF and risk are described in the following PRA discussions.

5. The impact of the proposed change should be monitored using performance measurement strategies.

   The three-tiered approach described in Subsection 3.4.2, above, provides assurance that defense-in-depth will not be significantly impacted by the proposed change.

PRA Capability and Insights

HNP is using the NRC staff identified three-tiered approach to evaluate the risk associated with the proposed extended RWST AOT. The Tier 1 evaluation provides the impact on plant risk of the proposed TS change as expressed by the change in core damage frequency (ΔCDF), ICCDP, the change in large early release frequency (ΔLERF), and ICLERP. The Tier 2 evaluation identifies potentially high-risk configurations that could exist if equipment, in addition to that associated with the change, were to be taken out of service simultaneously or other risk-significant operational factors, such as concurrent system or equipment testing, were also involved. The objective of this part of the evaluation is to ensure that appropriate restrictions on dominant risk-significant configurations associated with the change are in place. The Tier 3 evaluation discusses the overall CRMP to ensure that other potentially lower probability, but nonetheless risk-significant configurations resulting from maintenance and other operational activities are identified and compensated for.

The increases in CDF and LERF in the table below represent the risk impact of the RWST being in the purification lineup. The ICCDP and ICLERP represent the impact of a 7-day AOT for RWST purification.

Results of Risk Evaluation for Shearon Harris			
Risk Metric	Risk Metric Results	Risk Significance Guideline	Meets Acceptance Guideline
ΔCDF_{ave}(/yr)	5.4E-07	<1.0E-06	Yes[1]
$\Delta LERF_{ave}$(/yr)	8.8E-09	<1.0E-07	Yes[1]
ICCDP	1.0E-08	<1.0E-06	Yes
ICLERP	1.7E-10	<1.0E-07	Yes

(1) Region III of RG 1.174 – very small risk changes

The HNP plant-specific PRA model results are valid in that the RWST is part of the detailed system fault tree model in the linked fault tree model. The 2010 update to the HNP PRA model is the most recent evaluation of the risk profile for internal event challenges. The HNP PRA modeling is highly detailed, including a wide variety of initiating events, modeled systems, operator actions, and common cause events. The PRA model quantification process used for the HNP PRA is based on the event tree / fault tree methodology, which is a well-known methodology in the industry. The RWST online purification mode of operation is evaluated in the HNP PRA by adding fault tree logic to fail the RWST when a seismic event occurs while in the online purification mode.

There have been several assessments to support a conclusion that the HNP PRA model adequately meets the PRA standard such that it can be used to support risk applications in accordance with RG 1.200. The guidance in RG 1.200 also requires that additional information be provided as part of a license amendment request (LAR) submittal to demonstrate the technical adequacy of the PRA model used for the risk assessment.

A review of PRA model important sequences shows that an operator action to isolate the RWST from the non-seismic piping during a seismic event is an important action. This operator action was not credited in the risk analysis as the risk metrics were sufficiently low without crediting this action. In addition, if a seismic event occurs causing a plant trip, a potential RCS pressure challenge shows to be important and makes the PORV LOCA events and/or stuck-open SRV events important due to loss of inventory with potentially no make-up capability. Finally, failures of the secondary-side heat removal systems are important to maintain heat removal capability in the event primary-side heat removal capability is lost.

Avoidance of Risk-Significant Plant Configurations

A review of accident sequence results, while the RWST is in the online purification mode, was performed to identify potential risk-significant configurations. This evaluation of equipment out of service against the Tier 1 ICCDP and ICLERP acceptance guidelines did not identify any risk-significant configurations. However, during a seismic event some equipment failures become more important as indicated by Fussell-Veseley and/or Risk Achievement Worth. These components include AFW, MFW and supporting power supplies, RCS SRVs, PORVs and block valves and supporting air supply, and common cause failure (CCF) of Component Cooling Water (CCW) pumps.

As described in Section 3.4.2.1 of this enclosure, certain "high risk" maintenance activities, testing activities, and plant configurations will be managed during operation in the extended RWST AOT.

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Risk-Informed Configuration Risk Management

The HNP Configuration Risk Management process is described in Section 3.3 of this Enclosure.

Technical Adequacy of the PRA

The technical adequacy of the PRA is compatible with the requested change in RWST AOT. The scope of the change is narrow and focused in terms of impacts on the PRA model, therefore the change in risk and the uncertainty associated with the change is minimal. RG 1.200 is used as a guide to document the technical adequacy of the HNP PRA model. The HNP PRA model for internal events and fire, through the peer review process and resolution of the findings, has been shown to meet the ASME standard to the required Capability Category, which makes the HNP PRA model technically adequate, as adjusted for external events hazards, to be used for this requested TS change.

The assessment that the PRA model is technically correct is demonstrated by the PRA maintenance updates and that the model reflects the as-designed, as-built, as-operated plant. The MOR2010 model reflects the plant design at the start of Cycle 17. The plant change process requires the responsible engineer to receive PRA review of plant modification packages that impact the PRA model. Based upon the issuance of the MOR2010 and the PRA review of plant modifications, there are no required changes to the PRA model since the issuance of MOR2010.

For the internal events model, having the RWST aligned for cleanup is assumed not to adversely impact any other PRA credited systems. A review of the FPCCS flowpath that is used for RWST cleanup was performed to evaluate whether additional internal event failures could occur as a result of having the system in service (e.g., spurious lifting of relief valves in the flowpath, open vent/drain valves in the flowpath, or diversions in the flowpath), as well as a review of how mitigation of the internal event initiators that are modeled might be impacted by having the RWST aligned in cleanup mode. The risk increase for internal events of having the RWST aligned in cleanup mode is considered negligible because there are no relief valves in the flowpath and a vent or drain valve in the flowpath being left open would be a slowly evolving event and would likely be recognized and corrected (by operator rounds, sump alarms, RWST level alarms, etc.) prior to a substantial loss of RWST inventory. The internal event scenarios where having the RWST aligned in cleanup mode might have an impact are those where a Safety Injection and/or CT actuation occurs (e.g., a Large Break LOCA) and the RWST is required to provide NPSH for the HHSI, LHSI, and CT pumps. A deterministic analysis demonstrated that having the RWST aligned in cleanup mode will not detrimentally impact the function of these pumps.

The HNP seismic PRA model does not meet the ASME standard, therefore an evaluation using the seismic curves from NUREG-1488, "Revised Livermore Seismic Hazard Estimates for 69 Sites East of the Rocky Mountains" (Reference 6), was used in this evaluation. The base PRA

model was adjusted for two different seismic acceleration ranges: (1) the range from 0.05g to 0.075g, during which it is assumed that a Turbine (Reactor) Trip will occur, and (2) the range from 0.075g to 0.15g, during which it is assumed that an unrecoverable Loss of Offsite Power (LOOP) will occur and Instrument Air Compressors, the Dedicated Shutdown Diesel Generator (DSDG), and the Alternate Seal Injection functions will be lost. In both cases, it is assumed that if the RWST is aligned for purification during a seismic event, the purification path will fail and drain the RWST. A summary of the risk assessment methodology used to assess the risk is provided in the scope discussion below.

Key assumptions and approximations relevant to the results are provided in the assumptions discussion below. For the internal events model, key assumptions and approximations were specifically reviewed during 2007 focused peer review of the HNP PRA model. The conclusion from the peer review on assumptions and uncertainties was that the HNP model had established a set of screening criteria which formed the basis for its characterization of the assumptions. This process was applied to all identified assumptions and a small set of "key" assumptions were identified for which sensitivity studies were performed. This complies with the SRs related to identifying and characterizing assumptions and sources of uncertainty and is consistent with the NRC clarification to RG 1.200.

Model History. The 1993 Individual Plant Examination (IPE) (Level 1 PRA model) was first reviewed and accepted for the intended purpose (response to Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities") and has been updated to ensure the model represents the as-built and operated plant. The updates addressed plant modifications, data updates, and modeling improvements.

The Level 1 PRA was expanded to meet IPE for External Events (IPEEE) requirements, and was submitted and accepted for that purpose. The HNP IPEEE contains the most current information for external events except for the fire model. The HNP PRA model history, through the 2005 model, was described as part of HNP Renewal of Operating License (Reference 9). Approval was documented in the NRC's Generic Environmental Impact Statement for License Renewal (Reference 10).

2006 Update. The 2006 update was a general update to incorporate, specifically, manual transfer of "C" Charging Safety Injection Pump (CSIP). This modification installed a manual transfer scheme that provided the capability to power CSIP 1C-SAB from either 6.9 KV Bus 1A-SA or 1B-SB within a matter of minutes. This revision also corrected an error in the EDG ventilation success logic and developed an alternative method for quantification of the model using Equipment Out of Service (EOOS), a Configuration Risk Management computer program.

2007 Update. The 2007 update incorporated findings and observations (F&O) resolutions for the April 2006 HNP PRA Self-Assessment to meet ASME Internal Events Standards for Category II compliance. Major revisions included expansion of plant-specific data, Human Reliability

Analysis (HRA) updates, and addition of new or more detailed heating, ventilation and air conditioning (HVAC) models for CSIP rooms, Switchgear rooms, and Emergency Service Water (ESW) pump rooms. The model revision also included addition of logic to address fire induced multiple spurious failures, developed in conjunction with HNP adoption of the NFPA 805 program for fire induced vulnerabilities. Other general updates to the model included an update to the initiating event frequencies, revision of the station blackout (SBO) induced seal LOCA, and LOOP recovery. Motor Control center modeling was improved to support the NFPA 805 LAR (Reference 8) with the required level of detail.

2010 Update. The major change for the 2010 update was the addition of the Alternate Seal Injection – Dedicated Shutdown Diesel Generator (ASI-DSDG). The installation of the ASI-DSDG modification provided a diverse and redundant power source for alternate seal injection and also to the emergency DC battery chargers, as described in the NFPA 805 LAR. This reduced the effect of the 4-hour coping duration of the batteries by providing a means to supply DC power to the DC busses during SBO. The LOOP initiator was separated into plant, grid, switchyard and weather induced LOOPs, which allowed the model to apply recovery actions to the higher frequency events (plant and switchyard). Other changes related to de-energizing charging pump discharge header cross-connect valves, adding temporary air compressors, and updates from fire model were added to the 2010 model.

Required PRA Capability. The following table provides the required Capability Category for the RWST AOT. The HNP internal events PRA meets or exceeds the specified Capability Category listed.

PRA Technical Element	RWST AOT - Capability Category
Initiating Event (IE)	Specific to analysis
Accident Sequence (AS)	II
Success Criteria (SC)	II
Data Analysis (DA)	II
System Analysis (SY)	II
Human Reliability (HR)	II
Internal Flooding (IF)	Specific to analysis
LERF (LE)	I
Quantification (QU)	II

LERF (LE) Analysis at Capability Category I is adequate for this application because the difference between Capability Category I and Capability Category II for this application would reduce the LERF contribution. This application is not LERF sensitive in that the risk impact of RWST purification has insignificant contribution to steam generator tube rupture (SGTR) and interconnecting system LOCA (ISLOCA). The HNP Plant Specific PRA LERF is 81 percent driven by SGTR and ISLOCA. The risk of this application is driven by a seismic event which

has an insignificant impact on LERF contribution, thus Capability Category I is appropriate for this application.

Flooding Special Evaluation. Because the RWST is aligned to approximately 550 feet of additional piping when in purification mode, consideration was given to the risk increase of a random, non-seismic pipe break in the purification flowpath. A plant walkdown of the purification flowpath revealed no targets of risk concern that would be impacted by spray or flooding from a break in the flowpath, so the only potential impact of a break would be depletion of the RWST. To assess this risk impact, a new basic event was added to the base model fault tree. Using the adjusted fault tree, the model was then quantified and the resultant CDF compared to the base model CDF. Adjusting the increase in CDF to account for the 7-day per year exposure time results in an ICCDP of 6.51E-11, which is negligible.

Peer Reviews. The self-assessment in 2006 categorized the findings for the supporting requirements that did not meet Category II of the ASME standard as SB. Other observations were graded as SC. The SB findings were further subdivided into technical or documentation issues. The technical SB findings from the self-assessment have been reviewed and the resolutions exceed the requirements for this application. The focused peer review observations that were either Category I or Supporting Requirement (SR) Not Met have been resolved to meet the capability requirements of this application. Also during the NRC Staff Review of the HNP Fire PRA Model, two internal events F&O were identified and resolved to Capability Category II, which is sufficient for this application.

Scope of PRA for TS Change Evaluations

The scope and level of the PRA is sufficient to evaluate this TS AOT change as documented in this submittal.

Internal events. A review of the FPCCS flowpath that is used for RWST cleanup was performed to evaluate whether additional internal event failures could occur as a result of having the system in service (e.g., spurious lifting of relief valves in the flowpath, open vent/drain valves or diversions in the flowpath). A review of how mitigation of the internal event initiators that are modeled might be impacted by having the RWST aligned in cleanup mode was also performed.

The risk increase for internal events of having the RWST aligned in cleanup mode is considered negligible because there are no relief valves in the flowpath and a vent or drain valve in the flowpath being left open would be a slowly-evolving event and would likely be recognized and corrected (by operator rounds, sump alarms, RWST level alarms, etc.) prior to a substantial loss of RWST inventory.

The internal event scenarios where having the RWST aligned in cleanup mode might have an impact are those where a Safety Injection and/or CT actuation occurs (e.g., a Large Break

LOCA) and the RWST is required to provide NPSH for the HHSI, LHSI, and CT pumps. A deterministic analysis demonstrated that having the RWST aligned in cleanup mode will not detrimentally impact the function of these pumps.

External Events. An evaluation was performed to consider external events. The HNP plant-specific IPEEE concluded that the external hazards that need to be considered for risk evaluations are seismic events, plant fires, external floods, high winds, and transportation and nearby facility accidents. Of those external hazards, only seismic events were found to be pertinent to evaluating the alignment of the RWST for cleanup. The evaluation of the potential risk increase from these external events is as follows:

Seismic Events

In order to assess the risk impact of having the RWST aligned to the FPCCS for cleanup while at power during a seismic event, the base PRA model was adjusted for two different seismic acceleration ranges: (1) the range from 0.05g to 0.075g, during which it is assumed that a Turbine (Reactor) Trip will occur; and (2) the range from 0.075g to 0.15g, during which it is assumed that an unrecoverable LOOP will occur and Instrument Air Compressors, and ASI-DSDG functions will be lost. In both cases, it is assumed that if the RWST is aligned for purification during a seismic event, the purification path will fail and drain the RWST. No credit was given for an operator to manually isolate the RWST from the leak.

The annual frequency of a seismic event for a range of accelerations occurring near HNP (i.e., the Seismic Hazard curve) was determined from NUREG-1488. The seismic risk was conservatively calculated up to an acceleration of 0.25g. Since it was assumed that for a given seismic event either a Turbine Trip or a LOOP would occur, the conditional probability for these events was set to '1' (does occur). From these, initiator frequencies for a seismically-induced turbine trip for the range from 0.05g to 0.075g, a seismically-induced LOOP from 0.075g to 0.15g, and a seismically-induced LOOP for 0.15g to 0.25g were determined. These were then used as the initiating event frequencies for quantification. The conditional probabilities for all other initiating events were set to '0' (does not occur).

Fire

The potential increase in risk from plant fires due to having the RWST aligned in cleanup mode was qualitatively considered and determined to be negligible. As part of the validation of negligible risk, additional risk is considered to be due to having a FPCCS pump running. A plant walk-down of the purification flowpath revealed no targets that would be impacted by a fire in the FPCCS pump motor. Thus, with no targets and no equipment for fire-induced spurious operation, the proposed change results in a negligible increase in risk.

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External Flooding
The FPCCS is inside the Reactor Auxiliary Building (RAB) and the Fuel Handling Building (FHB). Consistent with the HNP IPEEE analysis, the potential increase in risk from external flooding due to having the RWST aligned in cleanup mode is not a significant hazard.

High Winds
The potential increase in risk from high winds due to having the RWST aligned in cleanup mode was qualitatively considered and determined to be negligible. The portion of the FPCCS used for RWST purification is located below ground level inside the RAB and the FHB and, thus, is not susceptible to being impacted by high winds. High Winds could cause an extended LOOP, but with the RWST aligned for purification, the only impact would be a loss of power to the purification flowpath pump. The ability of the RWST to perform its safety function is not impacted beyond a potential small missile target per the design basis requirements. Thus a High Winds PRA model is not required for this application.

Transportation/Nearby Facility Accidents
The potential increase in risk from transportation accidents or nearby facility accidents due to having the RWST aligned in cleanup mode was qualitatively considered and determined to be negligible. The portion of the FPCCS used for RWST purification is located below ground level inside the RAB and the FHB and, thus, would be afforded more protection against any transportation or nearby facility accidents than the RWST, which is outside.

Shutdown Risk. The potential increase in shutdown risk due to having the RWST aligned in cleanup mode was qualitatively considered and determined to be negligible. Having the RWST aligned for cleanup will not adversely impact any other PRA credited systems. Any presumed flow diversions and NPSH pump considerations are assumed to be inconsequential.

PRA Detail Needed for TS Changes

The PRA analysis for the proposed TS change uses the HNP full power internal events Level 1 CDF model and the associated Level 2 LERF model to calculate the risk. The risk impact of having the RWST aligned for purification was assessed for both internal and external events, and it was determined that this configuration is only risk-significant during a seismic event.

Since the FPCCS (which is used for RWST cleanup) is not modeled in the PRA, a surrogate basic event was added to the fault tree to represent a failure (breach) of the purification line. This event was assumed to fail the RWST. No credit was taken for an operator action to isolate the leak.

FPCCS breaches (for non-seismic events), based on failure data for closed cooling water system piping were assessed for internal flooding and the effect on the RWST and, due to the low probability of occurrence given the length of piping and the limited amount of time the RWST would be in cleanup mode, was determined to have a negligible risk impact.
Component misalignments resulting in open drain paths or internal flow diversions in the FPCCS were also assessed and determined to be negligible.

For the purposes of this risk evaluation, a seismic event of sufficient magnitude is necessary to fail the purification line downstream of the manual isolation valve (1CT-23). The FPCCS is not specifically modeled in the PRA, but the risk evaluation assumes that a failure of the purification line fails the RWST and, consequently, impacts the plant. The considerations of equipment failure and plant consequences during a range of seismic events are addressed in the Assumptions in Completion Time and Surveillance Frequency Evaluations discussion. This conservative approach provides enough detail to perform a satisfactory risk assessment for this TS change.

The AOT for the RWST on purification was established at seven days per year, not to exceed a cumulative seven days in any rolling 12-month period.

<u>Modeling of Initiating Events</u>

Initiating events caused by failures in various plant support systems (e.g., Normal Service Water, DC Power, Instrument Air, Component Cooling Water) are included in the HNP PRA model as initiator fault trees. The risk significance of this TS change is limited to seismic events or potential internal flooding due to pipe breaks, which are conservatively assumed to cause a loss of the RWST inventory through a breach in the FPCCS piping. Therefore, and because the RWST is normally a standby component, the change does not affect the failure probability or the unavailability of the components in these support systems and, thus, does not affect the frequency for these initiating events.

The impact of flooding resulting from a breach in the purification line has no impact on initiating event frequencies since there are no target SSCs that would lead to a plant trip or transient that would be impacted by the flooding.

<u>Screening Criteria</u>

Internal plant events and external events (other than seismic events) were assessed as having negligible risk impact on this proposed TS change, because having the RWST aligned for purification has no detrimental impact on the functionality of the RWST unless there is a breach in the purification flow path. A breach in purification was determined to only be likely during a seismic event at the plant. A flooding event due to this piping break was also evaluated and found to have negligible risk impact. As such, the quantitative portion of the PRA evaluation

was limited in scope to the impact of seismic events. For the range of seismic events of concern, it was assumed that the result would be either a seismically induced plant trip or a non-recoverable LOOP. HRA values were assumed to be unchanged by having the RWST aligned for cleanup.

By virtue of the methodology used to determine the risk impact of this TS change, many cutsets that would have been truncated were included for review in the cutset files. This was accomplished by quantifying with the initiating events set to a value of '1', rather than at the frequency for a seismic event in the applicable range of seismic accelerations. The seismic event frequencies were applied to the risk calculation external to the PRA model. These cutsets were reviewed to determine changes in importance for components when the RWST is aligned for purification versus when it is not.

Truncation Limits

A sensitivity study was performed to ensure that PRA model quantification at its nominal truncation level of 1E-11 provided accurate results. This study entailed performing quantification at a truncation level one decade lower (1E-12) than the nominal truncation level. This sensitivity study revealed that truncating one decade lower resulted in an increase in ΔCDF and ICCDP of less than 0.1 percent and increase in ΔLERF and ICLERP of less than 1 percent. This meets the criteria for all Capability Categories delineated in supporting requirement QU-B3 of the ASME/ANS RA Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Operations" (Reference 13), which states:

> *"Establish truncation limits by an iterative process of demonstrating that the overall model results converge and that no accident sequences are inadvertently eliminated. For example, convergence can be considered sufficient when successive reductions in truncation value of one decade result in decreasing changes in CDF or LERF, and the final change is less than 5%."*

Therefore, the PRA results obtained at the nominal truncation level of 1E-11 meet the requirements of RG 1.200.

Assumptions in Completion Time and Surveillance Frequency Evaluations

Using PRAs to evaluate TS changes requires consideration of the number of assumptions made within the PRA that can have a significant influence on the ultimate acceptability of the proposed changes.

A risk evaluation was performed using the at-power PRA model which was adjusted to address specific assumptions and considerations related to this LAR.

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1. The RWST is limited to be in the cleanup (purification) mode via the FPCCS for a cumulative seven days per year. This is conservative and bounds the actual plant historical data.

2. For conditions when the FPCCS is intact, having the RWST aligned for cleanup will not adversely impact any other PRA credited systems. Any presumed flow diversions and NPSH pump considerations are assumed to be inconsequential.

3. Conservatively, no credit is taken for operator action to close a valve to isolate a leak in the purification flowpath.

4. Since the data provided in NUREG/CR-6544, "A Methodology for Analyzing Precursors to Earthquake-Initiated and Fire-Initiated Accident Sequences" and NUREG-1488 are for seismic events of 0.05g or greater, it is assumed that all plant components will remain intact and/or operating for all seismic events with peak ground acceleration less than 0.05g.

5. Seismic event(s) greater than 0.05g are assumed to result in a failure of the purification flowpath. This is based upon a seismic walkdown and evaluation of the purification flowpath which indicated that some components in the flowpath have little capability to withstand a seismic event. A minimum acceleration of 0.05g was selected because that is lowest value on the seismic hazard curves in the references NRC Risk Assessment of Operational Events Handbook, Volume 2 – External Events (Reference 15), and NUREG-1488.

6. Seismic event(s) greater than 0.05g are assumed to result in a Turbine (Reactor) Trip.

7. Seismic event(s) greater than 0.075g (Operational Basis Earthquake (OBE)) are assumed to result in a LOOP based on the generic High Confidence/Low Probability of Failure for offsite power provided in NUREG/CR-6544.

8. Seismic event(s) greater than 0.075g (OBE) are assumed to result in a loss of Instrument Air, a loss of the DSDG, and a loss of Alternate Seal Injection capability, since these components have not been evaluated for seismic capability.

9. According to the HNP FSAR, Section 2.5.0.2, "all Seismic Category I systems are designed for a minimum of 10 loading cycles under Safe Shutdown Earthquake conditions." Therefore, it is assumed that the Seismic Category I systems (i.e., the RWST and ECCS) will not remain intact and/or functional above Safe Shutdown Earthquake (SSE) (0.15g). Additionally, if the FPCCS was designed to withstand a SSE, there would be no question about the functionality or operability of the RWST while it was aligned for cleanup. Therefore, the range of concern for vulnerability to seismic hazards is from 0.05g to 0.15g. The seismic range from 0.05g to 0.25g was conservatively chosen for this evaluation.

The CT risk evaluation was performed using only the PRA for power operation. The risk impact of systems needed for shutdown (Residual Heat Removal systems, Service Water systems, AFW systems) was considered. The PRA for power operation considers risk until safe and stable conditions are achieved. The power operation PRA is adequate to assess risk for shutting down for this particular LAR.

Sensitivity and Uncertainty Relating to Assumptions in TS Change Evaluations

Uncertainty. The HNP PRA model of record (MOR) has been analyzed for Assumptions and Uncertainties. NUREG-1855, "Guidance on Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making" (Reference 11), and Electric Power Research Institute (EPRI) Document 1016737, "Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessments" (Reference 12), were both used as detailed guidance in performing the analysis.

The HNP assumptions and uncertainty calculation was reviewed for the impact on this evaluation of the assumptions and uncertainties in the HNP MOR. Two key assumptions were found to have potential impact:

1. LOOP frequency uses a screening method and also assumes that hurricanes will not affect HNP.

   For this application, a LOOP is assumed to occur for seismic events greater than 0.075g and, thus, the LOOP initiating event frequency is set to '1' during quantification. Because the LOOP frequency used in the MOR was not used in this analysis, this item has no impact on the results of this analysis.

2. Assumptions regarding the ASI-DSDG seismic capability.

   The ASI-DSDG is assumed failed for seismic events greater than 0.075g, so these assumptions have no impact on the analysis for this range of seismic events. For the range of seismic events from 0.05g – 0.075g, the assumption is that the seismic event will result in a Turbine Trip. During a Turbine Trip, offsite power remains available to supply power to the CSIPs, which are the normal means of supplying Reactor Coolant Pump seal injection. As a sensitivity, the Turbine Trip cases were re-quantified with the ASI-DSDG failure to start basic events set to 'TRUE.' This resulted in an increase of 3.5E-12 for ICCDP and 2E-14 for ICLERP, which is negligible.

Some uncertainty exists with regard to model completeness. The HNP MOR is complete and adequate with regard to internal events and reflects the plant as designed and operated. A review of plant modifications revealed no changes that had not been assessed in the HNP MOR.

However, the model does not meet the ASME/ANS standard with regard to seismic PSA, so specific seismic analysis had to be performed for this evaluation and there is some uncertainty associated with this analysis in addition to those described in the reference documents. For instance, it is conservatively assumed that any seismic event greater than 0.05g with the RWST aligned for purification will immediately result in a loss of the RWST. There is some likelihood that the purification flowpath would survive the seismic event or that a resultant pipe break would be isolated before the RWST inventory dropped below the minimum level required for it to remain functional. Likewise, there is some likelihood that a seismic event would not result in a Turbine Trip or a LOOP.

Conversely, since, by design, the ECCS and CT systems (including the RWST) are only required to withstand the SSE, it is uncertain what magnitude seismic event above the SSE these systems are capable of withstanding. NUREG/CR-6544 indicates that the components in those systems have higher seismic capabilities than the SSE; but this evaluation is bounded by the SSE because, if the purification flowpath was determined to be capable of withstanding a SSE (and to have no other detrimental impacts on the required functions of the ECCS and CT systems), there would be no reason to consider the RWST inoperable or unavailable while it is aligned for cleanup.

This risk evaluation for this LAR is narrowly focused with conservative assumptions applied. Due to the limited scope of this LAR, the sensitivity and uncertainty studies associated with the MOR were supplemented based on a qualitative review of this analysis as well as a number of sensitivity studies to evaluate the impact if key assumptions in this evaluation were changed. Because the resultant risk parameters (i.e., ΔCDF, ΔLERF) of this analysis are very low even with the application of conservative assumptions, changing the assumptions to be more conservative does not result in a significant risk increase of having the RWST aligned for cleanup. The additional sensitivities studies performed are described below.

Sensitivity. Because there is uncertainty in this evaluation, a number of sensitivity studies were performed to ensure that the results remained consistent. In all cases, the results were as expected and remained below the acceptance criteria of 1E-06 for ICCDP and 1E-07 for ICLERP.

- The exposure time was increased from seven days per year to 30 days per year. As expected, the results increased linearly with the increase in exposure time but were still less than the acceptance criteria thresholds. This resulted in an ICCDP of 4.41E-08 and an ICLERP of 7.24E-10, which are still below the acceptance criteria thresholds.

- The frequencies for seismic events at HNP were increased by a factor of ten and a factor of 50. As expected, the results increased linearly with the increase in seismic event frequencies but were still less than the acceptance criteria thresholds. This resulted in an ICCDP of 1.03E-07 and an ICLERP of 1.69E-09 (for ten times IE frequency), and an

ICCDP of 5.15E-07 and an ICLERP of 8.46E-09 (for 50 times IE frequency), which are still below the acceptance criteria thresholds.

- The range of seismic events was expanded from 0.05g-0.15g to 0.05g-1.0g. Additionally, it was assumed that for the range of seismic events from 0.25g-1.0g, a small break LOCA would occur and the ECCS systems and RWST (except the purification flowpath) would remain intact. This resulted in a ICCDP of 5.91E-07 and a ICLERP of 4.44E-08, which are still below the acceptance criteria thresholds.

Conclusion

Within the constraints of the 7-day annual exposure time, aligning the RWST to the FPCCS for purification while the plant is at power results in a minimal increase in risk. Operator recovery actions are conservatively not credited after a postulated break in the purification flowpath. The risk increases are estimated to be 5.4E-07 for CDF and 8.8E-09 for LERF. In both cases, the risk is not considered to be significant.

The ICCDP and ICLERP, 1.0E-08 and 1.7E-10 respectively, for the 7-day AOT are sufficiently below the guidelines of < 1.0E-06 and < 1.0E-07, respectively, to characterize the risk change as small. Hence, the guidelines of RG 1.177 for the increased RWST AOT have been met. Furthermore, the calculated changes in LERF due to the extension of the RWST AOT, as mitigated by the compensating measures listed above, have been shown to meet the risk significance criteria of RG 1.174 with substantial margin, i.e., Region III which represents "very small risk changes". These calculations support the increase in RWST AOT from a quantitative risk-informed perspective, consistent with application of the plant operational and maintenance practices discussed in this evaluation.

The conclusion of these evaluations is that the risk implications associated with the change in RWST AOT from one hour to seven days, not to exceed a cumulative seven days in any rolling 12-month period, represents a very small risk increment which supports the requested amendment to the HNP OL.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 50, Appendix A, General Design Criteria for Nuclear Power Plants

Criterion 2 describes the design bases for protection against natural phenomena. It states that:

> *"Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches, without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed."*

By opening valve 1CT-23 to purify the refueling water, the RWST must be declared inoperable because of this design criterion.

4.2 Precedent

The NRC has previously approved an extension to the HNP TS 3.5.4 AOT. HNP Amendment 71 was approved by the NRC in a Safety Evaluation dated May 6, 1997 (Reference 3). The changes approved in Amendment 71 extended the RWST AOT to 12 hours during the performance of Surveillance Requirement (SR) 4.4.6.2.2. During the performance of SR 4.4.6.2.2, the seismically qualified RWST and associated piping are connected to the non-seismically qualified hydrotest pump suction line. Although the technical justification for Amendment 71 was not risk-informed, the Amendment establishes a precedent for extending the RWST AOT based on the implementation of administrative controls similar to those proposed in this requested change.

4.3 Significant Hazards Consideration

The proposed change would revise the Shearon Harris Nuclear Power Plant, Unit No. 1, Renewed Facility Operating License NPF-63, to extend the allowed outage time (AOT) for the Refueling Water Storage Tank (RWST) specified in Technical Specification (TS) Limiting Condition for Operation (LCO) 3.1.2.6, "Borated Water Sources – Operating," and TS LCO 3.5.4, "Refueling Water Storage Tank," while performing purification during Modes 1 – 4 if appropriate administrative controls are established.

CP&L has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1) Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The RWST has a safety function that assists in accident mitigation. However, the RWST is not involved in any initiating event that could result in any accident. Therefore, extending the RWST AOT from one hour to seven days while the RWST is aligned for purification, not to exceed a cumulative seven days in any rolling 12-month period, does not increase the probability of a previously evaluated accident.

   The RWST is required to provide borated water to the suction of Emergency Core Cooling System (ECCS) and Containment Spray (CT) pumps during the initial phase of a LOCA. There is incremental risk associated with continued operation for an additional six days and 23 hours with the RWST aligned for purification; however, the calculated impact on risk is very small and is consistent with the acceptance guidelines contained in Regulatory Guides 1.174 and 1.177.

   The consequences of previously evaluated accidents will remain the same during the proposed 7-day AOT as during the current 1-hour AOT.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2) Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The Fuel Pool Cooling and Cleanup System (FPCCS) was intended to be aligned periodically to the RWST. The proposed change will allow the FPCCS to be aligned to the RWST through a manually operated open valve for a period of up to seven days, not to exceed a cumulative seven days in any rolling 12-month period. The proposed change does not involve a change in the plant design, system operation, or procedures involved with the RWST other than operating procedures aligning the system for purification. The proposed change allows the RWST to be inoperable for additional time only when purifying refueling water using the FPCCS. Equipment will be operated in the same configuration and manner that is consistent with design and currently allowed. There are no new failure modes or mechanisms created due to plant operation for an extended period during RWST purification. Extended operation with an inoperable RWST does not involve any modification in the operational limits or physical design of plant systems. There are no new accident precursors generated due to the extended AOT.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3) Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

There is incremental risk associated with continued operation for an additional six days and 23 hours with the RWST aligned for purification; however, the calculated impact on risk is very small and is consistent with the acceptance guidelines contained in Regulatory Guides 1.174 and 1.177. The proposed change does not alter a design basis or safety limit. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, CP&L concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92, and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

The proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

6.0 REFERENCES

1. Regulatory Guide 1.177, "An Approach for Plant-Specific Risk-Informed Decision-making: Technical Specifications," Revision 1, May 2011.

2. Regulatory Guide 1.174, "An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 2, May 2011.

3. NRC Safety Evaluation, "Issuance of Amendment No. 71 to Facility Operating License No. NPF-63 Regarding Refueling Water Storage Tank Technical Specification Change to Permit Reactor Coolant System Isolation Valve Testing – Shearon Harris Nuclear Power Plant, Unit 1 (TAC No. M98143)," dated May 6, 1997, Accession No. ML020590254.

4. NRC Safety Goal Policy Statement, USNRC, "Use of Probabilistic Risk Assessment Methods in Nuclear Activities: Final Policy Statement," Federal Register, Volume 60, p.42622, August 16, 1995.

5. RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 1, January 2007.

6. NUREG-1488, "Revised Livermore Seismic Hazard Estimates for 69 Sites East of the Rocky Mountains," April 1994.

7. NUREG/CR-6544, "A Methodology for Analyzing Precursors to Earthquake-Initiated and Fire-Initiated Accident Sequences," April 1998.

8. Letter from the NRC to C. Burton, "Shearon Harris Nuclear Power Plant, Unit 1 - Issuance of Amendment Regarding Adoption of National Fire Protection Association Standard 805, 'Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants'," dated June 28, 2010. (ADAMS Accession No. ML101750602)

9. Shearon Harris Nuclear Plant License Renewal Application, "Applicant's Environmental Report – Operating License Renewal Stage, Shearon Harris Nuclear Plant, Progress Energy," dated November 2006. (ADAMS Accession No. ML063350276)

10. NUREG-1437, Supplement 33, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Shearon Harris Nuclear Power Plant, Unit 1," dated August 31, 2008 (ADAMS Accession No. ML082250290)

11. NUREG-1855, Volume 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," March 2009

12. EPRI Document 1016737, "Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessments," December 2008.

13. ASME/ANS RA-Sa-2009, "Standard for Level 1 / Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," April 2009.

14. NRC Risk Assessment of Operational Events Handbook, Volume 1, "Internal Events," Revision 1.

15. NRC Risk Assessment of Operational Events Handbook, Volume 2, "External Events," Revision 1.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
LICENSE AMENDMENT REQUEST FOR EXTENSION OF
REFUELING WATER STORAGE TANK ALLOWED OUTAGE TIME

ATTACHMENT 1
TECHNICAL SPECIFICATION MARKUPS
(2 pages)

LIMITING CONDITION FOR OPERATION

3.1.2.6 As a minimum, the following borated water source(s) shall be OPERABLE as required by Specification 3.1.2.2:

a. The boric acid tank with:

   1. A minimum contained borated water volume of 24,150 gallons, which is ensured by maintaining indicated level of greater than or equal to 74%,

   2. A boron concentration of between 7000 and 7750 ppm, and

   3. A minimum solution temperature of 65°F.

b. The refueling water storage tank (RWST) with:

   1. A minimum contained borated water volume of 436,000 gallons, which is equivalent to 92% indicated level.

   2. A boron concentration of between 2400 and 2600 ppm,

   3. A minimum solution temperature of 40°F, and

   4. A maximum solution temperature of 125°F.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With the boric acid tank inoperable and being used as one of the above required borated water sources, restore the boric acid tank to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and borated to a SHUTDOWN MARGIN specified in the CORE OPERATING LIMITS REPORT (COLR), plant procedure PLP-106 at 200°F; restore the boric acid tank to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the RWST (1) inoperable, restore the tank to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Add: (1) except that while performing RWST purification, the tank must be returned to OPERABLE status within 7 days, not to exceed a cumulative 7 days in any rolling 12-month period.

3/4.5.4 REFUELING WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water storage tank (RWST) shall be OPERABLE with:

a. A minimum contained borated water volume of 436,000 gallons, which is equivalent to 92% indicated level.

b. A boron concentration of between 2400 and 2600 ppm of boron,

c. A minimum solution temperature of 40°F, and

d. A maximum solution temperature of 125°F.

APPLICABILITY: MODES 1, 2, 3, and 4.

Replace with (1), (2)

ACTION:

With the RWST inoperable, restore the tank to OPERABLE status within 1 hour* or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWST shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying the contained borated water volume in the tank, and

2. Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWST temperature when the outside air temperature is less than 40°F or greater than 125°F.

Replace with:
(1) except that while performing surveillance 4.4.6.2.2. the tank must be returned to OPERABLE status within 12 hours.
(2) Except that while performing RWST purification. the tank must be returned to OPERABLE status within 7 days, not to exceed a cumulative 7 days in any rolling 12-month period .

*Except that while performing surveillance 4.4.6.2.2, the tank must be returned to OPERABLE status within 12 hours.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
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REFUELING WATER STORAGE TANK ALLOWED OUTAGE TIME

ATTACHMENT 2
RETYPED TECHNICAL SPECIFICATION PAGES
(2 pages)

LIMITING CONDITION FOR OPERATION

3.1.2.6 As a minimum, the following borated water source(s) shall be OPERABLE as required by Specification 3.1.2.2:

a. The boric acid tank with:

1. A minimum contained borated water volume of 24,150 gallons, which is ensured by maintaining indicated level of greater than or equal to 74%,

2. A boron concentration of between 7000 and 7750 ppm, and

3. A minimum solution temperature of 65°F.

b. The refueling water storage tank (RWST) with:

1. A minimum contained borated water volume of 436,000 gallons, which is equivalent to 92% indicated level,

2. A boron concentration of between 2400 and 2600 ppm,

3. A minimum solution temperature of 40°F, and

4. A maximum solution temperature of 125°F.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With the boric acid tank inoperable and being used as one of the above required borated water sources, restore the boric acid tank to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and borated to a SHUTDOWN MARGIN specified in the CORE OPERATING LIMITS REPORT (COLR), plant procedure PLP-106 at 200°F; restore the boric acid tank to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the RWST inoperable, restore the tank to OPERABLE status within 1 hour [1] or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

[1] Except that while performing RWST purification, the tank must be returned to OPERABLE status within 7 days, not to exceed a cumulative 7 days in any rolling 12-month period.

3/4.5.4 REFUELING WATER STORAGE TANK

LIMITING CONDITION FOR OPERATION

3.5.4 The refueling water storage tank (RWST) shall be OPERABLE with:

a. A minimum contained borated water volume of 436,000 gallons, which is equivalent to 92% indicated level.

b. A boron concentration of between 2400 and 2600 ppm of boron.

c. A minimum solution temperature of 40°F, and

d. A maximum solution temperature of 125°F.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With the RWST inoperable, restore the tank to OPERABLE status within 1 hour [(1),(2)] or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.5.4 The RWST shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying the contained borated water volume in the tank, and

2. Verifying the boron concentration of the water.

b. At least once per 24 hours by verifying the RWST temperature when the outside air temperature is less than 40°F or greater than 125°F.

---

(1) Except that while performing surveillance 4.4.6.2.2, the tank must be returned to OPERABLE status within 12 hours.

(2) Except that while performing RWST purification, the tank must be returned to OPERABLE status within 7 days, not to exceed a cumulative 7 days in any rolling 12-month period.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
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LICENSE AMENDMENT REQUEST FOR EXTENSION OF
REFUELING WATER STORAGE TANK ALLOWED OUTAGE TIME

ATTACHMENT 3
TECHNICAL SPECIFICATION BASES MARKUPS
(for information only)
(5 pages)

No changes on this page. Included for completeness.

MODERATOR TEMPERATURE COEFFICIENT (Continued)

The Surveillance Requirements for measurement of the MTC at the beginning and near the end of the fuel cycle are adequate to confirm that the MTC remains within its limits since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 551°F. This limitation is required to ensure: (1) the moderator temperature coefficient is within its analyzed temperature range, (2) the trip instrumentation is within its normal operating range, (3) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and (4) the reactor vessel is above its minimum RT_{NDT} temperature.

3/4.1.2 BORATION SYSTEMS

The Boron Injection System ensures that negative reactivity control is available during each mode of facility operation. The components required to perform this function include: (1) borated water sources, (2) charging/safety injection pumps, (3) separate flow paths, (4) boric acid transfer pumps, and (5) an emergency power supply from OPERABLE diesel generators.

With the RCS average temperature above 350°F, a minimum of two boron injection flow paths are required to ensure single functional capability in the event an assumed failure renders one of the flow paths inoperable. The boration capability of either flow path is sufficient to provide the required SHUTDOWN MARGIN as defined by Specification 3/4.1.1.2 after xenon decay and cooldown to 200°F. The maximum expected boration capability requirement occurs at BOL

BORATION SYSTEMS (Continued)

from full power equilibrium xenon conditions and requires 24,150 gallons of 7000 ppm borated water be maintained in the boric acid storage tanks or 436,000 gallons of 2400-2600 ppm borated water be maintained in the refueling water storage tank (RWST).

With the RCS temperature below 350°F, one boron injection flow path is acceptable without single failure consideration on the basis of the stable reactivity

Specification 3.1.2.6 Action b is modified by a Note stating that an RWST allowed outage time of 7 days is permitted during performance of RWST purification. For defense-in-depth, during RWST purification using the 7-day AOT, a dedicated attendant in continuous communication with the Control Room must be stationed at valve 1CT-23. The dedicated attendant is to remain within the Reactor Auxiliary Building (RAB) whenever valve 1CT-23 is open during RWST purification. The dedicated attendant will manually close valve 1CT-23 in case of a line break caused by a seismic event.
During performance of RWST purification using the 7-day AOT, the following compensatory measures must be implemented:

1. Maintenance and testing on the Auxiliary Feedwater (AFW), Main Feedwater (MFW) and supporting equipment will be managed in order to provide assurance that these systems will be available to provide cooling in the event the RWST is potentially failed.
2. High risk plant configurations, required for surveillance testing or maintenance activities that could result in plant trip will be managed.
3. Maintenance activities on Reactor Coolant System (RCS) safety relief valves (SRVs), power-operated relief valves (PORVS) and associated block valves will be managed.

BORATION SYSTEMS (Continued)

condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity changes in the event the single boron injection flow path becomes inoperable.

The limitation for a maximum of one charging/safety injection pump (CSIP) to be OPERABLE and the Surveillance Requirement to verify all CSIPs except the required OPERABLE pump to be inoperable below 325°F provides assurance that a mass addition pressure transient can be relieved by the operation of a single PORV.

The boron capability required below 200°F is sufficient to provide the required SHUTDOWN MARGIN as defined by Specification 3/4.1.1.2 after xenon decay and cooldown from 200°F to 140°F. This condition requires either 7150 gallons of 7000 ppm borated water be maintained in the boric acid storage tanks or 106,000 gallons of 2400-2600 ppm borated water be maintained in the RWST.

The gallons given above are the amounts that need to be maintained in the tank in the various circumstances. To get the specified indicated levels used for surveillance testing, each value had added to it an allowance for the unusable volume of water in the tank, allowances for other identified needs, and an allowance for possible instrument error. In addition, for human factors purposes, the percent indicated levels were then raised to either the next whole percent or the next even percent and the gallon figures rounded off. This makes the LCO values conservative to the analyzed values.

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between 7.0 and 11.0 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

The BAT minimum temperature of 65°F ensures that boron solubility is maintained for concentrations of at least the 7750 ppm limit. The RWST minimum temperature is consistent with the STS value and is based upon other considerations since solubility is not an issue at the specified concentration levels. The RWST high temperature was selected to be consistent with analytical assumptions for containment heat load.

The OPERABILITY of one Boron Injection System during REFUELING ensures that this system is available for reactivity control while in MODE 6.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that: (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of rod misalignment on associated accident analyses are limited. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits.

ECCS SUBSYSTEMS (Continued)

The Surveillance Requirements provided to ensure OPERABILITY of each component ensures that at a minimum, the assumptions used in the safety analyses are met and that subsystem OPERABILITY is maintained. Surveillance Requirements for throttle valve position and flow balance testing provide assurance that proper ECCS flows will be maintained in the event of a LOCA. Maintenance of proper flow resistance and pressure drop in the piping system to each injection point is necessary to: (1) prevent total pump flow from exceeding runout conditions when the system is in its minimum resistance configuration, (2) provide the proper flow split between injection points in accordance with the assumptions used in the ECCS-LOCA analyses, and (3) provide an acceptable level of total ECCS flow to all injection points equal to or above that assumed in the ECCS-LOCA analyses.

3/4.5.4 REFUELING WATER STORAGE TANK

The OPERABILITY of the refueling water storage tank (RWST) as part of the ECCS ensures that a sufficient supply of borated water is available for injection into the core by the ECCS. This borated water is used as cooling water for the core in the event of a LOCA and provides sufficient negative reactivity to adequately counteract any positive increase in reactivity caused by RCS cooldown. RCS cooldown can be caused by inadvertant depressurization, a LOCA, or a steam line rupture.

The limits on RWST minimum volume and boron concentration assure that: (1) sufficient water is available within containment to permit recirculation cooling flow to the core and (2) the reactor will remain subcritical in the cold condition following mixing of the RWST and the RCS water volumes with all shutdown and control rods inserted except for the most reactive control assembly. These limits are consistent with the assumption of the LOCA and steam line break analyses.

The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between 7.0 and 11.0 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

INSERT 1

~~An~~ RWST allowed outage time of 12 hours is permitted during performance of Technical Specification surveillance 4.4.6.2.2 with a dedicated attendant stationed at valve 1CT-22 in communication with the Control Room. The dedicated attendant is to remain within the RWST compartment whenever valve 1CT-22 is open during the surveillance. The dedicated attendant can manually close valve 1CT-22 within 30 minutes in case of a line break caused by a seismic event. Due to the piping configuration, a break in the non-seismic portion of piping during this surveillance could result in draining the RWST below the minimum analyzed volume.

INSERT 2

INSERT 1:

The ACTION is modified by two Notes. The first Note states that an

INSERT 2:

The second Note states that an RWST allowed outage time of 7 days is permitted during performance of RWST purification. For defense-in-depth, during RWST purification using the 7-day AOT, a dedicated attendant in continuous communication with the Control Room must be stationed at valve 1CT-23. The dedicated attendant is to remain within the Reactor Auxiliary Building whenever valve 1CT-23 is open during RWST purification. The dedicated attendant will manually close valve 1CT-23 in case of a line break caused by a seismic event.

During performance of RWST purification using the 7-day AOT, the following compensatory measures must be implemented:

1. Maintenance and testing on the Auxiliary Feedwater (AFW), Main Feedwater (MFW) and supporting equipment will be managed in order to provide assurance that these systems will be available to provide cooling in the event the RWST is potentially failed.
2. High risk plant configurations, required for surveillance testing or maintenance activities that could result in plant trip will be managed.
3. Maintenance activities on Reactor Coolant System (RCS) safety relief valves (SRVs), power-operated relief valves (PORVS) and associated block valves will be managed.