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January 19, 2010

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

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Additional Information Supporting License Amendment Request for a
One-Time Extension of the Essential Service Water Train Completion Time

- References:
1. Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time," dated September 24, 2009
 2. Letter from M. J. David (U. S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Request for Additional Information Related to One-Time Extension of Essential Service Water Train Completion Time (TAC Nos. ME2293 and ME2294)," dated December 18, 2009

In Reference 1, Exelon Generation Company, LLC (EGC), requested a license amendment for Byron Station, Units 1 and 2, to revise Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.7.8, "Essential Service Water (SX) System," to extend the Completion Time (CT) from 72 hours to 144 hours. This proposed change will only be used one time during the Byron Station Unit 2 spring 2010 refueling outage (i.e., B2R15) to restore a unit-specific SX train to operable status.

In Reference 2, the NRC requested that EGC provide additional information in support of their review of Reference 1. Attachments 1, 2, 3, 4, and 5 provide the requested information.

EGC has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), a copy of this letter and its non-proprietary attachments are being provided to the designated State of Illinois official.

The regulatory commitments contained in this letter are summarized in Attachment 5. The regulatory commitments provided in Attachment 5 are in addition to the commitment previously provided to the NRC in Reference 1.

Should you have any questions concerning this letter, please contact Ms. Lisa A. Schofield at (630) 657-2815.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 19th day of January 2010.

Respectfully,

A handwritten signature in black ink, appearing to read "Patrick R. Simpson", with a long, sweeping horizontal line extending from the end of the signature.

Patrick R. Simpson
Manager – Licensing
Exelon Generation Company, LLC

Attachments:

1. Additional Information Supporting License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time
2. BY-LAR-003, Revision 1, Risk Management Responses to NRC RAIs on SX One-Time CT Extension
3. Supporting Documentation
4. SX System Piping and Instrumentation Diagrams
5. Summary of Regulatory Commitments

cc:

NRC Regional Administrator, Region III
NRC Senior Resident Inspector, Byron Station
NRR Project Manager, Braidwood Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1
Additional Information Supporting License Amendment Request for a
One-Time Extension of the Essential Service Water Train Completion Time

In a letter dated December 18, 2009, the NRC requested that EGC provide additional information related to the application for a one-time extension of the essential service water train Completion Time (CT). Attachments 1, 2, 3, 4, and 5 provide the requested information.

Question 1

The licensee identified that it used a separate fire probabilistic fire assessment (PRA) model to assess the risk impact from internal fires for this LAR. This model was identified as being "not fully realistic," and undergoing a significant revision to incorporate methods defined in NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," September 2005. While the licensee provided some of the characteristics of the fire PRA model, the NRC staff requests the following additional information relevant to the technical adequacy of this model for this LAR.

Question 1.a

- a. Address how the current Byron fire PRA model satisfies the technical elements identified in Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities," Revision 1, January 2007, Section 1.2.4. Provide an appropriate justification of any outstanding plant changes not incorporated into the fire PRA model per RG 1.200, Revision 1, Section 4.2.

Response

The response to Question 1.a is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.a.

Question 1.b

- b. Describe where the existing fire PRA methods deviate from the methods described in NUREG/CR-6850, and justify the methods actually used.

Response

The response to Question 1.b is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.b.

Question 1.c

- c. Describe how spurious component operations are addressed in the fire PRA model.

Response

The response to Question 1.c is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.c.

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Question 1.d

- d. Describe how plant components modeled in the PRA, but not in the scope of the plant's fire safe shutdown licensing basis, have been addressed in the fire PRA. Specifically identify how cable route information for such components is handled if these components are credited in the fire PRA.

Response

The response to Question 1.d is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.d.

Question 1.e

- e. Identify how the human reliability analysis was modified for the fire PRA to account for the impacts of fire on these actions; identify any fire-specific recovery actions credited in the fire PRA, their failure probabilities, and the basis for the probabilities.

Response

The response to Question 1.e is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.e.

Question 1.f

- f. No large early-release frequency analysis was completed for fires, justified based on no impact of service water on containment isolation capability. Provide a more specific justification based on the fire PRA results obtained evaluating the specific sequences which dominate the fire risk profile and their conditional probability of a large early release.

Response

The response to Question 1.f is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.f.

Question 1.g

- g. Identify the reviews (internal, external, and/or peer) completed for the fire PRA model to assure its quality.

Response

The response to Question 1.g is provided in Section 2.1.1 of Attachment 2 to this submittal as the response to Question 1.g.

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Question 2

The licensee has not specifically addressed how the cause/effect relationship was modeled in the PRA for this application.

Question 2.a

- a. Describe which basic event(s) in the PRA models (internal events and fire PRA) were modified to evaluate the SX outage, including the separate impacts on mitigation and initiating events.

Response

The response to Question 2.a is provided in Section 2.1.2 of Attachment 2 to this submittal as the response to Question 2.a.

Question 2.b

- b. Describe how any compensatory measures have been credited in the analysis, addressing both the baseline model and the configuration-specific assessment.

Response

The response to Question 2.b is provided in Section 2.1.2 of Attachment 2 to this submittal as the response to Question 2.b.

Question 2.c

- c. Identify whether recovery of inoperable SX pumps is credited, either for mitigation or for the calculation of initiating event frequency, and if so, justify the recovery probability applied.

Response

The response to Question 2.c is provided in Section 2.1.2 of Attachment 2 to this submittal as the response to Question 2.c.

Question 2.d

- d. Provide a sensitivity analysis for crediting any compensatory measures or recovery actions, which are unique for this evaluation.

Response

The response to Question 2.d is provided in Section 2.1.2 of Attachment 2 to this submittal as the response to Question 2.d.

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Question 3

The tier 2 evaluation identifies compensatory measures in Table 3, "Byron SX A Train Outage Summary of Compensatory Measures," in Attachment 1 of the LAR as regulatory commitments, but the description of these items is vague.

Question 3.a

- a. Describe specifically what restrictions on availability are being committed by use of the term "protected equipment."

Response

The response to Question 3.a is provided in Section 2.1.3 of Attachment 2 to this submittal as the response to Question 3.a.

A copy of OP-AA-108-117, "Protected Equipment Program," is provided in Attachment 3.

Reference Summary of Regulatory Commitments in Attachment 5.

Question 3.b

- b. Identify specifically each component which is "protected," without the use of undefined plant acronyms.

Response

The response to Question 3.b is provided in Section 2.1.3 of Attachment 2 to this submittal as the response to Question 3.b.

Question 3.c

- c. Describe the process applied and basis to determine the scope of the protected equipment.

Response

The response to Question 3.c is provided in Section 2.1.3 of Attachment 2 to this submittal as the response to Question 3.c.

Question 3.d

- d. Describe the fire zones qualitatively, and identify how these zones were selected for a compensatory measure.

Response

The response to Question 3.d is provided in Section 2.1.3 of Attachment 2 to this submittal as the response to Question 3.d.

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Question 4

In Attachment 5 of the LAR, the tier 3 evaluation identifies the plant Configuration Risk Management Program being applied to assess risk of emergent conditions. However, as identified in RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998, there is no discussion of how external event risk, specifically fire risk, which comprises 90 percent of the total risk reported for this TS change, is assessed within the tier 3 evaluation. Describe how this significant risk contributor is evaluated.

Response

The response to Question 4 is provided in Section 2.1.4 of Attachment 2 to this submittal.

Reference Summary of Regulatory Commitments in Attachment 5.

Question 5

The LAR identifies the use of the fire protection system to maintain flow from the charging pumps to the reactor coolant pump seals, using dedicated operators and non-seismic connections. The NRC staff's understanding of the current guidance is that seal cooling cannot be restored after about 10 -15 minutes of interruption, due to seal heatup and concerns for thermal shock of the seals. Provide a more detailed discussion of this action as to the duration of the action, and impact on interruption of reactor coolant pump seal cooling and any relevant assumptions made regarding seal performance upon restoration of cooling.

Response

The response to Question 5 is provided in Section 2.1.5 of Attachment 2 to this submittal.

Question 6

Throughout the submittal, reference is made to RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998. However, the current version of RG 1.174 is dated November 2002. Explain why the current version of RG 1.174 was not used as a basis for this submittal.

Response

The response to Question 6 is provided in Section 2.1.6 of Attachment 2 to this submittal.

Question 7

NUREG-0800, Standard Review Plan (SRP) 16.1, Revision 1, "Risk-Informed Decision Making: Technical Specifications," describes NRC staff acceptance criteria regarding "defense in depth," considerations for TS changes. Criterion II.1A.(iii)(3) states that the licensee should consider, "Whether the TS change specifies that voluntary removal of equipment from service should not be scheduled when adverse weather conditions or other situations that likely may subject the plant to abnormal conditions are predicted."

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The licensee has considered adverse weather conditions in its PRA analysis for external events, but has made no specified provision for adverse weather in its TS change in accordance with the guidelines of SRP 16.1, if adverse weather actually occurs.

Explain why the TS change (specifically, in Attachment 1, Table 3) does not specify that the removal of 1/2SX001A from service will not be scheduled when adverse weather conditions or other situations that likely may subject the plant to abnormal conditions are predicted. The NRC staff notes that implementation of Attachment 1, Table 3 is a regulatory commitment per Attachment 4 of the LAR.

Response

The response to Question 7 is provided in Section 2.1.7 of Attachment 2 to this submittal.

Reference Summary of Regulatory Commitments in Attachment 5.

Question 8

The licensee has stated, in Attachment 5 of the LAR, that defense in depth is maintained, in part, because a best estimate flow analysis has shown that a single SX pump can provide cooling on both units with the exception of the reactor containment fan coolers (RCFC) and emergency diesel generators (EDGs) on the unit without an SX pump and one train of RCFCs on the unit with an available SX pump.

Question 8.a

- a. If, during the one-time extension of the CT, an SX pump is lost, describe the sequence of events and operator actions that will bring both units to safe shutdown.

Response

Prior to the start of the one-time extension of the CT, Unit 2 will already be in cold shutdown (i.e., MODE 5). If, during the work window, the Unit 1 Train B (1B) Essential Service Water System (SX) pump is lost, established procedures will be followed to provide for alternate cooling and to place Unit 1 into MODE 5. Specifically, Operations would initially enter Unit 1 Byron Abnormal Operating Procedure, 1BOA PRI-7, "Essential Service Water Malfunction Unit 1," Revision 104, which directs a crosstie to the Unit 2 Train B (2B) SX Train. This procedure requires that temperatures of vital equipment are monitored, non-essential loads are shed, and, if necessary, alternate non-safety related cooling sources are established.

In parallel, Technical Specification (TS) 3.7.8, "Essential Service Water (SX) System," would require an immediate Limiting Condition for Operation (LCO) 3.0.3 entry for two Unit 1 specific SX trains being inoperable. LCO 3.0.3 requires Unit 1 to be placed into a MODE in which LCO 3.7.8 is not applicable (i.e., MODE 5). If Unit 1 was at power at the time, then LCO 3.0.3 would require Unit 1 to be in MODE 5 within 37 hours. This shutdown would be accomplished via standard unit shutdown procedures.

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Conversely, if, during the work window, the 2B SX train is lost, Operations would initially enter Unit 2 Byron Abnormal Operating Procedure 2BOA PRI-7, "Essential Service Water Malfunction Unit 2," Revision 105, which would direct a crosstie to the 1B SX Train. Similar to 1BOA PRI-7, this procedure requires that temperatures of vital equipment are monitored, non-essential loads are shed, and, if necessary, alternate non-safety related cooling sources are established. If temperature limits of vital Unit 1 equipment are not being exceeded, then these actions would not necessarily require an immediate shutdown of Unit 1.

Copies of 1BOA PRI-7 and 2BOA PRI-7 are provided in Attachment 3.

Question 8.b

- b. If the SX pump of the operating unit were lost, all RCFCs in the operating unit would lose SX flow. With no RCFCs available in the operating unit, explain why the other means of containment heat removal, i.e., the containment spray system of the operating unit, are not on the protected system list during the extended CT.

Response

The response to Question 8.b is provided in Section 2.1.8 of Attachment 2 to this submittal as the response to Question 8.b.

Question 8.c

- c. If the SX pump of the operating unit were lost, both EDGs of the operating unit would be lost. Describe the feasibility of making provisions for temporary use of fire protection water, or another available water source, to supply at least one EDG of the unit without an SX pump during the extended CT and subsequent shutdown.

Response

If the Unit 1 (i.e., the operating unit) SX pump were lost during the extended CT, Byron Abnormal Operating Procedure 1BOA PRI-7 provides guidance on aligning Unit 2 (i.e., the shutdown unit) SX to Unit 1 SX through the unit crosstie valves, 1/2SX005. Aligning Unit 2 SX to Unit 1 SX will provide SX to the Unit 1 EDGs.

Byron Abnormal Operating Procedure 0BOA PRI-7, "Loss of Ultimate Heat Sink Unit 0," Revision 0, provides guidance on aligning the Fire Protection (FP) system to the SX system in the event of a complete loss of SX pump capability coincident with an inability to crosstie to the opposite unit SX supply. Aligning FP to SX will allow at least one EDG to be supplied with cooling in the event of a loss of an SX pump during the extended CT and subsequent shutdown.

Copies of 1BOA PRI-7 and 0BOA PRI-7 are provided in Attachment 3.

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Question 8.d

- d. Provide piping and instrumentation drawings for the SX system from the units' current licensing basis.

Response

The requested piping and instrumentation diagrams are provided in Attachment 4 to this submittal.

ATTACHMENT 2

BY-LAR-003, Revision 1

Risk Management Responses to NRC RAIs on SX One-Time CT Extension



PRA APPLICATION NOTEBOOK

BY-LAR-003

Risk Management Responses to NRC RAIs on SX One-Time CT Extension

REVISION 1

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Document Review		
RM DOCUMENTATION NO. BY-LAR-003 REV: 1 PAGE NO. 2		
STATION: Byron UNIT(S) AFFECTED: 1 AND 2		
TITLE: Risk Management Responses to NRC RAIs on SX One-Time CT Extension		
SUMMARY (Include UREs incorporated): This document provides the responses to questions asked by the NRC in a Request For Additional Information during their review of the SX One-Time CT extension LAR. URE(s) Impacted: <u>None</u> Number of pages: <u>Total 24 pages, including this page.</u> RM Document Level: <u>Category 1, per ER-AA-600-1012.</u>		
☐ Review Required after periodic Update		
☒ Internal RM Documentation ☐ External RM Documentation Electronic Calculation Data Files: NA (Program Name, Version, File Name extension/size/date/hour/min)		
Method of Review: ☒ Detailed ☐ Alternate ☐ Review of External Document This RM documentation supersedes: BY-LAR-003 REV. 0 in its entirety. Prepared by: <u>Joe Edom</u> / / Print Sign Date Prepared by: <u>Usama Farradj</u> / / Print Sign Date Reviewed by: <u>Young In</u> / / Print Sign Date Approved by: <u>Greg Krueger</u> / / Print Sign Date		
Do any ASSUMPTIONS / ENGINEERING JUDGEMENTS require later verification? ☐ Yes ☒ No Tracked By: AT#, URE# etc.):		

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Revision Summary

Revision Summary		
Revision	Date	Summary
0	Refer to the Document Review form	Original Issue
1	1/15/10	Editorial changes to Section 2.0.

Configuration Control

The Exelon Byron PRA model is updated in accordance with ER-AA-600, "Risk Management". This procedure requires periodic updates of the PRA Model and on-going reviews of design changes for PRA model impact. Model and Support Application documentation is controlled in accordance with ER-AA-600-1012, "Risk Management Documentation". Any outstanding changes to the model or documentation are documented in the Updating Requirements Evaluations Database in File URE-BB 2003.mdb. This database is located on the Risk Management K:\ drive at the Exelon Cantera office.

1.0 PURPOSE & SCOPE

This document provides responses to questions the NRC has asked in a Request for Additional Information (RAI) (Reference 2) from their review of the Byron Station SX One-Time CT extension (Reference 1). These questions were formally transmitted to Exelon via Reference 2. The response to each of the questions is provided in Section 2 below.

2.0 RAI RESPONSES

The RAI responses are provided below.

2.1 PRA Responses

The format used below provides a copy of the NRC question and the associated Exelon response.

2.1.1 NRC Statement: The licensee identified that it used a separate fire probabilistic risk assessment (PRA) model to assess the risk impact from internal fires for this LAR. This model was identified as being “not fully realistic,” and undergoing a significant revision to incorporate methods defined in NUREG/CR-6850, “EPRI/NRC-RES Fire PRA methodology for Nuclear Power Facilities,” September 2005. While the licensee provided some of the characteristics of the fire PRA model, the NRC staff requests the following additional information relevant to the technical adequacy of this model for this LAR.

Question 1.a:

Address how the current Byron fire PRA model satisfies the technical elements identified in Regulatory Guide (RG) 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities,” Revision 1, January 2007, Section 1.2.4. Provide an appropriate justification of any outstanding plant changes not incorporated into the fire PRA model per RG 1.200, Rev. 1, Section 4.2.

Response:

The Byron fire PRA (FPRA) model uses the methodology defined in NUREG/CR-6850, and generally includes the technical elements identified in RG1.200 Rev. 1 Section 1.2.4, as discussed in the response to RAI question 1.c.

The Assessment Process section of Appendix B (Fire Risk Evaluation) of the SX CT

One Time Extension Application Notebook (BY-LAR-001) identifies the changes made to the Revision 6C fire PRA model to ensure consistency with the current Revision 6E internal events PRA model. The 6C fire PRA model was developed using the 6C internal events PRA model as its basis. A review of the changes made in the 6D and 6E revisions of the internal events PRA model was performed and the changes impacting the quantification for this evaluation were incorporated into the 6C fire PRA model to provide a current application specific model for this assessment. A discussion of outstanding plant changes that have been evaluated to be important to the model but have not yet been addressed in the Revision 6E internal events PRA model, and their potential impacts, has been provided in Attachment 6 of the LAR.

Question 1.b:

Describe where the existing fire PRA methods deviate from the methods described in NUREG/CR-6850, and justify the methods actually used.

Response:

The following is a discussion of the fire PRA model status with respect to the methodology of NUREG/CR-6850.

1. Multiple Spurious Operation (MSO) Review (NUREG/CR-6850 Task 2) - MSOs are reviewed and considered; however, an expert panel was not used. The Byron FPRA review incorporates a review of potential MSO scenarios identified by the PWR Owner's Group in WCAP-16933-NP ("PWR Generic List of Fire-Induced Multiple Spurious Operation Scenarios," PWR Owners Group, 2008 Version). These potential MSO scenarios were reviewed and an action item list generated with respect to additional review required to determine the need and to incorporate, as necessary, these scenarios into the internal events model for use in FPRA quantification.

The risk assessment performed for the SX CT Extension application focuses on identifying areas of increased risk due to the extended SX Train A system outage. The primary areas of increased risk for this application are associated with those areas in which a fire will disable the Train B SX system. Any increased risk due to addition of multiple spurious operation scenarios to the fire PRA analysis model are expected to have similar impacts on both the baseline and SX CT Extension models, as any MSO-related potential vulnerabilities will be equally applicable to the baseline model and the model for this application. In addition, conservatism associated with the fire PRA methodology ignition frequencies and fire sizes will tend to overwhelm any incremental impact of the MSOs. Although not yet formally established, it is expected that as the industry fire PRA methodologies become more

consistent with actual fire event frequencies and damage footprints, the reduction in fire risk will be significantly greater than the potential increase in risk due to the incorporation of MSO impacts. A review of recent FPRAs indicates that the increased risk associated with evaluation of MSO impact is not a major contributor to the overall fire risk given the conservatisms currently in the FPRAs. The impact of the MSO risk is not expected to be train specific and will therefore not impact the application risk results in a manner significantly different from its impact on the baseline fire PRA model.

2. Instrumentation Review (NUREG/CR-6850 Task 2) - The new requirements of NUREG/CR-6850 regarding the explicit identification and modeling of instrumentation required to support PRA credited operator actions have not yet been addressed. The industry treatment for this task is still being developed.

The impact of instrumentation cues on the credited internal events HEPs will not result in train specific risk increases which would impact this application. Human failure events (HFEs) associated with actions outside of the control room have been conservatively failed in the model, with the exception of actions which are credited beyond a timeframe of 2 hours after the fire event, since at this timeframe the fire event impact on the associated HEPs is expected to be negligible. As industry methodology for evaluation of the impact of instrumentation cues on post fire shutdown becomes more clearly defined, the methodologies will be incorporated into the fire PRA and may potentially result in an increase in baseline risk which will be well within the anticipated reduction due to future reduction of conservatisms associated with current fire frequency and fire damage assumptions. For this application, the use of additional dedicated operations staff in the field and in the main control room to monitor the performance of the available pumps and take action as necessary (as described in Section 2.3.1.2 of the LAR) directly provides additional mitigation against a loss of instrumentation from a fire or other event.

3. The Balance of Plant (BOP) (NUREG/CR-6850 Task 2) - The BOP is not fully treated in the current fire PRA model. BOP support system failure has been conservatively assumed in cases where details regarding associated cable routing have not been obtained for the FPRA. Additional modeling may be performed in future FPRA model updates to reduce the baseline fire CDF due to this assumption if the need arises.

Conservatisms in the analysis associated with the assumption that BOP systems are unavailable post-fire do not result in a train specific impact on the baseline or SX application fire risk. Reduction in this area of conservatism will

result in an overall reduction of the estimated fire risk.

4. Large Early Release Frequency (LERF) (NUREG/CR-6850 Task 2 and 5) - LERF is not considered in the current fire PRA model; it is expected to be addressed in a future update.

The fire risk impact on LERF quantification would normally be expected to be primarily associated with the potential fire induced failure of containment boundary components eliminating potential mechanisms for the isolation of paths for large early releases. The ability to isolate such containment boundaries will not be impacted by the SX outage configuration. A review of the internal events LERF results indicates that the change in LERF is very small as compared to the CDF results, and it is expected that the potential impact of the SX application configuration to the fire LERF results would also be negligible.

5. The scoping fire modeling evaluations (NUREG/CR-6850 Tasks 8 and 11) used in the scenario development effort for the Byron FPRA update did not incorporate an evaluation of the potential impact of hot gas layer formation. A practical treatment of hot gas layer formation is not yet available in the industry.

The impact of hot gas layer formation is not expected to be a significant contributor to risk at a newer plant such as Byron with typically large volumes for dissipation of a hot gas layer. The anticipated fire brigade response to fires will result in control of a fire prior to creation of a significant hot gas layer.

Any impact of hot gas layer formation would be applicable to both the baseline and SX CT application quantification and is not likely to alter the risk insights obtained from the current evaluation.

6. Limited Analysis Iterations (NUREG/CR-6850 Task 9-12) - The process of conducting a FPRA is iterative, whereby high risk compartments and associated conservative assumptions are identified and additional analyses are performed to refine the assumptions and reduce those compartment risks. The scenarios developed for the Byron FPRA are refined as necessary for a specific application. Such an activity was conducted for the SX LAR: additional focus was applied to those scenarios that might be affected by the impact on SX equipment availability during the extended CT, and the scenarios were modified as necessary (for both the baseline and application specific configuration analyses) to more accurately characterize the risk in these areas. The scope of HRA performed for the FPRA was limited to the failure of operator actions outside control room. For specific scenarios where

substantial time is available (see response in item 2 above) credit is taken for these actions using screening HEPs. HEPs for control room actions were not modified to attempt to incorporate the impact of fire. The key HEPs associated with control room actions reflect high stress actions which are unlikely to be further increased by the fire. In addition, the compensatory action to provide dedicated operations monitoring of the SX system during this evolution will allow the operators to focus on evaluation of any failures and will allow for prompt response by dedicated personnel thus significantly reducing the failure probability of such actions.

Further iteration and refinement of the fire scenarios is expected to reduce both the overall baseline and SX application specific fire risk.

7. Multi-Compartment Review (NUREG/CR-6850 Task 11) - This subtask has not yet been performed for the Byron FPRA. This task would review the fire analysis compartment boundaries to ensure they are sufficiently robust to prevent the spread of fire between FPRA analysis compartments or that such propagations are adequately addressed by the developed scenarios. The design and plant layout of Byron make fire propagation to multiple compartments unlikely compared to the fire risk in individual compartments.

As discussed in item 5 above, hot gas layer impacts, including potential impacts on structural steel required to support fire barriers, are expected to be limited for the Byron plant. The potential for such hot gas layer buildup to result in fire spreading between fire compartments is expected to be even more limited. Any such impacts will not be train specific and are not expected to significantly impact the areas of high risk identified for this SX CT application.

8. Control Room Abandonment Analysis (NUREG/CR-6850 Task 11) – Detailed analysis of control room abandonment scenarios incorporating fire modeling of the postulated spectrum of fires considered in conjunction with the operating modes of the control room HVAC system has not been performed. The proposed SX maintenance configuration does not create unique control room abandonment response requirements. The ability to control SX given the need for control room abandonment will not be affected, as controls for both units' trains are available at the remote shutdown panels.
9. Seismic Fire Interactions (NUREG/CR-6850 Task 13) - This task reviews previous assessments to identify any specific interaction between suppression system and credited components or adverse impact of fire protection system interactions that should be accounted for in the FPRA. The results of the IPEEE

are considered appropriate for the Byron FPRA in this regard. NUREG/CR-6850 does not require a quantification of the seismic fire interaction risk.

Seismic fire interaction methodologies specified in NUREG/CR-6850 do not result in quantifiable results which would impact the fire PRA model. Any potential vulnerabilities are not expected to be train specific. Therefore, seismic fire contribution to overall fire risk is expected to be very small at Byron, and would not affect the conclusions of the analyses supporting the SX CT LAR.

10. Uncertainty and Sensitivity Analysis (NUREG/CR-6850 Task 15) - This task explores the impacts of possible variation of input parameters used in the development of the model and the inputs to the analysis on the FPRA results. This task has not yet been performed for the Byron FPRA because the industry is still developing appropriate methodology for the analysis.

The conservative nature of the current analysis inputs (ignition frequency and extent of fire damage) ensure that the overall fire risk estimated is conservative and such conservatism is not train specific, and will therefore not impact the SX CT application risk in a manner different than it would impact the baseline fire risk.

11. Conservatism in the NUREG/CR-6850 methodology associated with ignition frequencies and their correlation to heat release rates as well as the credit given for manual fire suppression response tend to cause an overestimation of total fire risk. However, the model, with this conservatism, will continue to provide a reasonable assessment of relative fire risk between various locations within the plant. This information provides useful insights for the current fire risk profile as well as for assessment of the impact of future applications on the total plant fire risk.

To reduce the conservatism associated with this aspect (heat release rates) of the NUREG/CR-6850 methodology, the transient heat release rate used in the Byron FPRA was based on the heat release rate specified in NUREG/CR-6850 as the heat release rate associated with a motor fire (for any size motor). This deviation in the methodology was implemented based on a review of the EPRI Fire Events Database for fires categorized as transient fires. This review determined that the vast majority of transient fires are associated with electrical cable fires related to temporary cable installations. The temporary cable and its insulation was the transient combustible and a fault in the associated electrical circuit provided the necessary ignition source to create the transient fire. The motor fire more closely represents these types of transient fires than a transient combustible heat release rate which is associated with a large quantity of

transient combustibles which are unlikely to contain or be exposed to an ignition source.

The quantification results for this application include an additional conservatism associated with the implementation of compensatory actions that are not credited in the FPRA quantification. These compensatory actions provide a significant reduction in risk during the SX system outage which if quantified would further reduce the increased risk associated with this application. Quantification of these compensatory actions was not attempted since no clear guideline exists for crediting such compensatory actions with respect to the FPRA methodology.

Question 1.c:

Describe how spurious component operations are addressed in the fire PRA model.

Response:

See response to RAI 1.b, item 1, above.

Question 1.d:

Describe how plant components modeled in the PRA, but not in the scope of the plant's fire safe shutdown licensing basis, have been addressed in the fire PRA. Specifically identify how cable route information for such components is handled if these components are credited in the fire PRA.

Response:

Components for which fire routing data is not available via the safe shutdown analysis are assumed to be failed in all fire zones in the FPRA. However, such assumed failure has been excluded for particular plant locations when that location has been judged to be unlikely to include cables for specific systems which are normally assumed to be failed. This exclusion approach was used in a limited number of fire scenarios. One set of scenarios where it was used is in the SX pump room in which the auxiliary building HVAC components, which are not routed in the SSD analysis, were assumed to be available for fires in the SX pump rooms. The basis for this exclusion of failure of the auxiliary building HVAC components is related to the remote location of the SX pump room (in the basement of the auxiliary building) and the lack of auxiliary building HVAC components and power supplies located in the pump room which could impact other auxiliary building areas. The SX pumps are cooled by dedicated emergency cooling units which are separate from the auxiliary building HVAC system. Therefore, exclusion

of this auxiliary building HVAC impact is determined to be more realistic.

Question 1.e:

Identify how the human reliability analysis was modified for the fire PRA to account for the impacts of fire on these actions; identify any fire-specific recovery actions credited in the fire PRA, their failure probabilities, and the basis for the probabilities.

Response:

See response to RAI 1.b, items 2 and 6, above.

Question 1.f:

No large early-release frequency analysis was completed for fires, justified based on no impact of service water on containment isolation capability. Provide a more specific justification based on the fire PRA results obtained evaluating the specific sequences which dominate the fire risk profile and their conditional probability of a large early release.

Response:

See response to RAI 1.b, item 4, above.

Question 1.g:

Identify the reviews (internal, external, and/or peer) completed for the fire PRA model to assure its quality.

Response:

The methodology used for the EXELON fire PRA has been consistently applied at many of the EXELON sites and has been reviewed as part of the fire PRA documentation review process. In addition, a challenge review by engineers performing fire PRAs on other EXELON projects has been performed and the results incorporated into the Byron fire PRA.

2.1.2 **NRC Statement:** The licensee has not specifically addressed how the cause/effect relationship was modeled in the PRA for this application.

Question 2.a:

Describe which basic event(s) in the PRA models (internal events and fire PRA) were modified to evaluate the SX outage, including the separate impacts on mitigation and initiating events.

Response:

The maintenance terms for the 1A and 2A SX pumps were set to True for the quantification of the results supporting this LAR. These events fail the 1A and 2A SX pumps in the PRA model logic which reflects the expected plant configuration. This is applicable to the Internal Events and Fire models. The Byron PRA model has links to automatically adjust the initiating events for loss of SX events when either a single SX pump or 2 SX pumps of the same train on different units are unavailable.

The maintenance terms associated with the following equipment were set to False in the quantification of the results supporting this LAR. These terms correspond in part to the list of items contained in Table 3 of the LAR. Setting these terms to False reflects the intent to maintain this equipment function in an available state. This is applicable to the Internal Events and Fire models.

0A Fire Protection Pump
0B Fire Protection Pump
1SX005 - SX Unit Cross-tie Valve
2SX005 - SX Unit Cross-tie Valve
Aux Building Ventilation Supply and Exhaust Plenums (Unit 1)
Unit 1 1A Auxiliary Feedwater Train
Unit 1 1B Auxiliary Feedwater Train
Unit 1 Start-up Transformer (SAT 142)
Unit 2 Start-up Transformer (SAT 242)
Unit 1 Bus 141 Div 1 4160VAC ESF Bus
Unit 1 Bus 142 Div 2 4160VAC ESF Bus
Unit 2 Bus 241 Div 1 4160VAC ESF Bus
Unit 2 Bus 242 Div 2 4160VAC ESF Bus
Unit 1 Component Cooling Water Heat Exchanger
Unit 1 125VDC Div 1 Battery Charger
Unit 1 125VDC Div 2 Battery Charger
Unit 2 125VDC Div 1 Battery Charger
Unit 2 125VDC Div 2 Battery Charger
Unit 1 1A Emergency Diesel Generator
Unit 1 1B Emergency Diesel Generator
Unit 2 2A Emergency Diesel Generator
Unit 2 2B Emergency Diesel Generator

Unit 1 120VAC Instrument Power Inverter 1IP111
Unit 1 120VAC Instrument Power Inverter 1IP112
Unit 1 120VAC Instrument Power Inverter 1IP113
Unit 1 120VAC Instrument Power Inverter 1IP114
Unit 1 1B Essential Service Water (SX) Pump
Unit 2 2B Essential Service Water (SX) Pump
Unit 1 1SX033 - SX Train Cross-tie Valve
Unit 1 1SX034 - SX Train Cross-tie Valve
Unit 2 2SX033 - SX Train Cross-tie Valve
Unit 2 2SX034 - SX Train Cross-tie Valve

One of the compensatory actions utilized in this quantification was to have one of the SX005 valves in the Open position. This enhances the likelihood of success in providing SX cooling from the opposite Unit. To facilitate the credit for this condition the failure to open term for the 2SX005 valve was set to False. This is applicable to the Internal Events and Fire models.

Another compensatory action was to perform the action to isolate one train of the Reactor Containment Fan Coolers (RCFC) to insure adequate flow is available for equipment cooling from the SX system. This action was addressed in the quantification by setting the Unit 2 Operator Action basic event associated with the isolation of the Unit 2 RCFC flowpath to False. This is applicable to the Internal Events and Fire models.

Dependency between SX Crosstie and Fire Protection Alternate Cooling Alignment to CV pumps operator actions

The Base PRA model assumes a high dependency between the SX Crosstie and Fire Protection Alternate Cooling Alignment to the CV pumps operator actions where the probability of the Fire Protection operator action basic event is set to 0.51. With the use of dedicated SX operators for the duration of 1/2SX001A valves replacement, the dependency between these two operator actions can be eliminated. In the sensitivity analysis, a low dependency is assumed, and the basic event probability is set to 0.051 which is incorporated in the quantification of the results. This is applicable to the Internal Events and Fire models.

Dependency between SX Crosstie and Establishment of a Cool Suction Source for the CV pumps operator actions

The Base PRA model does not consider the dependency between the operator actions for the SX Crosstie and establishment of a cool suction source for the CV pumps. The SX Crosstie action is based on 1BOA PRI-7, "Essential Service Water Malfunction Unit 1" and takes its initial cue from Loss of SX (LOSX) indications where the following annunciator or indications may cause entry into the SX MALFUNCTION procedure:

- Abnormal temperatures on equipment cooled by SX.
- SX PUMP TRIP (1-2-A1)

- **SX PUMP DSCH HDR PRESS LOW (1-2-A2)**

The operator action to establish a cool suction source for the CV pumps is based on 1BOA PRI-6, "Component Cooling Malfunction Unit 1", Step 1a Response Not Obtained where the initial cue is provided by CC surge tank level < 13%. There is no direct dependence between the two actions, but the time windows may be overlapping since LOSX will lead to loss of Component Cooling Water (CCW). Therefore, upon reviewing the dependence between the two actions, it was determined that a medium dependence should be assigned between the two actions. The associated basic event for this operator action was added in the recovery file 'QRX-6E-SX04.txt' to account for the medium dependence between two actions. This change was incorporated into the base model quantification for this evaluation. For the planned plant configuration, this dependence will be removed with the use of dedicated SX operators during 1/2SX001A work window. This is applicable to the Internal Events and Fire models.

Question 2.b:

Describe how any compensatory measures have been credited in the analysis, addressing both the baseline model and the configuration-specific assessment.

Response:

As described in the response to 2.a above, several maintenance terms were set to False to reflect the prohibition of performing maintenance activities on those components while in this specific plant configuration. In the base PRA model these terms would be set to the associated probability as defined in the model documentation.

Dedicated operations personnel provide the basis for a reduction in the dependency of two operator actions, performing the crosstie of the SX system between units and implementation of the alternate cooling to the CV pump lube oil coolers from the Fire Protection system. For the configuration specific evaluation, this probability has been reduced to 0.051 to reflect the reduction in the dependency from the establishment of dedicated operations personnel. In the base PRA model, there is no credit for the use of dedicated operations personnel as planned for the replacement of the 1(2)SX001A valves. This dependency is accounted for in the Base PRA model by setting the probability for the operator action to align fire protection alternate cooling to the CV pumps given failure to cross-tie the SX systems (1FP-PRI-7X-HMVCA) basic event to 0.51.

Question 2.c:

Identify whether recovery of inoperable SX pumps is credited, either for mitigation or for the calculation of initiating event frequency, and if so, justify the recovery probability applied.

Response:

No recovery of the 1A or 2A SX pumps is credited in the analysis supporting this one-time CT extension.

Question 2.d:

Provide a sensitivity analysis for crediting any compensatory measures or recovery actions, which are unique for this evaluation.

Response:

The following information is provided to address this question.

Table 2.d-1 lists the sensitivity cases referenced in question 2.d that were performed for this LAR. Additional sensitivities performed to address modeling uncertainty are discussed in Attachment 7 to the LAR.

The results from these sensitivity cases are provided in Table 2.d-2.

Table 2.d-1 – Sensitivity Cases	
Case	Description
B12CE	The base case is quantified and compared to Rev. 6E1 results to ensure the correct model is used.
B12E-SX	SX LAR CDF - All Compensatory Actions The model is quantified for the configuration considering both mechanical compensatory measures and the impact from dedicated SX operators.
B12E-SX01	SX LAR Sensitivity 1 - No Compensatory Actions The model is quantified for the configuration with no compensatory measures to assess the risk impact of the configuration, and to help determine compensatory measures.
B12E-SX02	SX LAR Sensitivity 2 – Only Mechanical Compensatory Actions The model is quantified for the configuration considering mechanical compensatory measures to determine the risk reduction achieved with mechanical compensatory measures.
B12E-SX03	SX LAR Sensitivity 3 - OA Dependency with SX Cross-tie (SX-XTIE) Operator Action The model is quantified for the configuration with dedicated SX operator as only compensatory measure to assess the impact from dedicated SX operators. The low dependency between SX Cross-tie operator action (0SX-XTIE---HMVOA) and alignment of fire protection alternate cooling to CV pumps (1FP-PRI-7X-HMVCA) is assumed, instead of high dependency as in the base model.
B12E-SX04	SX LAR Sensitivity 4 - OA Dependency with CV-ALL Action The model is quantified for the configuration assuming a medium dependency between SX Cross-tie (0SX-XTIE---HMVOA) and establishment of a cool suction source for the CV pumps (1CV-ALL----HPMOA) operator actions. The base model does not account for dependency between these actions, but the dependency between these two actions will be eliminated with dedicated SX operators.

Table 2.d-2 Sensitivity Case Results							
Case	Case Descriptions	CDF(0)	CDF(1)	ICCDP	T(ct) (days)	Acceptance Criteria	RIF
B12CE	Byron Base CDF for B12 Configuration	1.80E-05					
B12E-SX	SX LAR CDF - All Compensatory Actions	1.80E-05	2.59E-05	1.29E-07	6	< 5.0E-07	1.44
B12E-SX01	SX LAR Sensitivity 1 - No Compensatory Actions	1.80E-05	7.58E-05	9.50E-07	6	< 5.0E-07	4.20
B12E-SX02	SX LAR Sensitivity 2 - Only Mechanical Comp Actions	1.80E-05	6.59E-05	7.86E-07	6	< 5.0E-07	3.65
B12E-SX03	SX LAR Sensitivity 3 - OA Dependency with SX-XTIE Action	1.80E-05	3.58E-05	2.93E-07	6	< 5.0E-07	1.99
B12E-SX04	SX LAR Sensitivity 4 - OA Dependency with CV-ALL Action	1.80E-05	2.59E-05	1.29E-07	6	< 5.0E-07	1.44

2.1.3 **NRC Statement:** The tier 2 evaluation identifies compensatory measures in Table 3, "Byron SX A Train Outage Summary of Compensatory Measures," in Attachment 1 of the LAR as regulatory commitments, but the description of these items is vague.

Question 3.a:

Describe specifically what restrictions on availability are being committed by use of the term "protected equipment".

Response:

Equipment listed as "protected" will be subject to the following restrictions:
No intrusive maintenance that would render or potentially render the equipment incapable of performing its function.

Monitoring of equipment performance, such as during operator rounds, to insure reliability of the equipment is maintained and any indication of degrading performance is identified early, is allowed.

Exelon has developed procedure, OP-AA-108-117, "Protected Equipment Program", that provides guidance on the protection of equipment associated with the Configuration Risk Management program. This procedure will be implemented at Byron station by the start of the B2R15 outage where the 1(2)SX001A valve replacement is scheduled. This procedure provides the guidance described below regarding "protected equipment".

Step 4.4.2 of this procedure provides the following specific guidance on work activities:

4.4.2 The following evolutions should not be performed on protected equipment:

- Corrective or elective maintenance,
- Preventative maintenance which is intrusive in nature,
- Preventative maintenance or non-critical surveillance testing where an unsatisfactory outcome could render the equipment unavailable,
- Any evolution where human performance error could result in damage to or loss of the protected equipment unless the Shift Manager agrees there is reasonable assurance that no adverse effects could occur,
- Equipment or system operation which renders the protected equipment unavailable, or
- Work on electrical sources that could fault switchgear or load control centers.

This procedure also provides the following guidance for allowed activities in step 4.4.1:

4.4.1 Generally, work on or within 2 feet of protected equipment will not be allowed.

Exceptions to this rule are as follows:

- Operator performing rounds, inspections, and alarm response.
- Fire Brigade Members and the Medical Response Team during response to emergencies.
- Personnel performing Abnormal Operating Procedures / Emergency Operating Procedures / Emergency Plan actions.
- Security Officers who have received an appropriate brief from Shift Management and are performing their official rounds or alarm response.
- Radiation Protection personnel performing non-intrusive radiological surveys and are responding to radiation alarms / changing plant conditions.
- Fire Patrols who have received an appropriate brief from Shift Management and are performing their official duties.
- Electrical and instrument maintenance activities on loads supplied by protected switchgear, load control center, or vital instrument busses provided that the load is isolated from the protected equipment by a clearance or over-current protection (e.g. fuse or breaker) is available to isolate the protected power supply from equipment fault or personnel error at an energized work location.
- Changing burned out light bulbs.
- Other activities as approved by the Shift Manager.

Question 3.b:

Identify specifically each component which is “protected,” without the use of undefined plant acronyms.

Response:

The equipment listed in Table 3 of the LAR is repeated here with an equipment description:

0A Fire Protection Pump
0B Fire Protection Pump
1SX005 - SX Unit Cross-tie Valve
2SX005 - SX Unit Cross-tie Valve
Aux Building Ventilation Supply and Exhaust Plenums (Unit 1)
Unit 1 1A Auxiliary Feedwater Train
Unit 1 1B Auxiliary Feedwater Train
Unit 2 2A Auxiliary Feedwater Train
Unit 1 Start-up Transformer (SAT 142)
Unit 2 Start-up Transformer (SAT 242)
Unit 1 Bus 141 Div 1 4160VAC ESF Bus

Unit 1 Bus 142 Div 2 4160VAC ESF Bus
Unit 2 Bus 241 Div 1 4160VAC ESF Bus
Unit 2 Bus 242 Div 2 4160VAC ESF Bus
Unit 0 Component Cooling Water Heat Exchanger
Unit 1 Component Cooling Water Heat Exchanger
Unit 2 Component Cooling Water Heat Exchanger
Unit 1 125VDC Div 1 Battery & Battery Charger
Unit 1 125VDC Div 2 Battery & Battery Charger
Unit 2 125VDC Div 1 Battery & Battery Charger
Unit 2 125VDC Div 2 Battery & Battery Charger
Unit 1 1A Emergency Diesel Generator
Unit 1 1B Emergency Diesel Generator
Unit 2 2A Emergency Diesel Generator
Unit 2 2B Emergency Diesel Generator
Unit 1 120VAC Instrument Power Inverter 1IP111
Unit 1 120VAC Instrument Power Inverter 1IP112
Unit 1 120VAC Instrument Power Inverter 1IP113
Unit 1 120VAC Instrument Power Inverter 1IP114
Unit 1 1B Essential Service Water (SX) Pump
Unit 2 2B Essential Service Water (SX) Pump
Unit 1 1SX033 - SX Train Cross-tie Valve
Unit 1 1SX034 - SX Train Cross-tie Valve
Unit 2 2SX033 - SX Train Cross-tie Valve
Unit 2 2SX034 - SX Train Cross-tie Valve
Station Switchyard - Offsite Power Supplies
Unit 1 1A CV Pump Alternate Cooling - Alternate Cooling to the Centrifugal Charging Water pumps from the Fire Protection system
Unit 1 1B CV Pump Alternate Cooling - Alternate Cooling to the Centrifugal Charging Water pumps from the Fire Protection system
Unit 2 2B Component Cooling Water train
Unit 2 2A Centrifugal Charging Water (CV) train or Unit 2 2A Safety Injection (SI) train
OR
Unit 2 2B Centrifugal Charging Water (CV) train or Unit 2 2B Safety Injection (SI) train
Unit 2 2A Residual Heat Removal train or Unit 2 2B Residual Heat Removal train
Spent Fuel Pool Cooling - Maintain 1 train available
Unit 1 Safety Injection (SI) signals - Prohibit surveillance testing on Solid State Protection System (SSPS) / Engineered Safeguards Feature Actuation System (ESFAS) SI logic

Question 3.c:

Describe the process applied and basis to determine the scope of the protected equipment.

Response:

The results from the previous submittal for a one-time CT extension were reviewed to capture the insights from that analysis related to equipment availability. These results were then compared against the current model results to compare insights, again related to equipment availability. The results of these reviews provided a list of equipment functions that had importance for the planned plant configuration. This list formed the basis for the equipment functions shown in Table 3 in the LAR.

Question 3.d:

Describe the fire zones qualitatively, and identify how these zones were selected for a compensatory measure.

Response:

The following fire zones were identified as part of the insights gained from the fire PRA model to enhance defense-in-depth and improve the risk profile for the planned station configuration:

- 5.1-1 Division 12 ESF switchgear room (focus on switchgear 142)
- 11.3-0 Auxiliary building general area, elev, 364 (focus on MCC 132X1)
- 11.1B-0 Unit 2 auxiliary building basement (SX B Train Pump Room)
- 11.6-1 Division 12 containment electrical penetration area
- 11.6-0 Aux building general area elev. 426 (focus on SWGR 134X)
- 11.3-1 Unit 1 containment pipe penetration area (focus on MCC 131X1)
- 11.4-0 Aux building general area, elev. 383 (focus on 1AF01PA, 2AF01PA and MCC 132X3)
- 5.5-1 Unit 1 auxiliary electrical equipment room (focus on 1PA23J)
- 5.2-1 Division 11 ESF switchgear room (focus on switchgear 141)

These zones contain fire scenarios which are the highest fire risk scenarios in the CT extension configuration fire PRA quantification.

2.1.4 NRC Question: In Attachment 5 of the LAR, the tier 3 evaluation identifies the plant Configuration Risk Management Program being applied to assess risk of emergent conditions. However, as identified in RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," there is no discussion of how external event risk, specifically fire risk, which comprises 90 percent of the total risk reported for this TS change, is assessed within the tier 3 evaluation. Describe how this significant risk contributor is evaluated.

Response:

Evaluation of risk insights from both the internal events and fire PRA results was performed with the identification of risk management actions for the planned configuration. Should there be any planned or emergent changes to the analyzed configuration, the impact of the changes will be evaluated to determine if there is any significant impact on internal events and fire PRA risk insights to confirm that appropriate risk management actions have been defined and are in place.

2.1.5 NRC Question: The LAR identifies the use of the fire protection system to maintain flow from the charging pumps to the reactor coolant pump seals, using dedicated operators and non-seismic connections. The NRC staff's understanding of the current guidance is that seal cooling cannot be restored after about 10 - 15 minutes of interruption, due to seal heatup and concerns for thermal shock of the seals. Provide a more detailed discussion of this action as to the duration of the action, and impact on interruption of reactor coolant pump seal cooling and any relevant assumptions made regarding seal performance upon restoration of cooling.

Response:

The action consists of providing a connection from the Fire Protection system to the lube oil cooler for the charging pump. There are separate connections for each of the charging pumps. The hose connection from the fire protection system is staged and the connections to the SX cooling water lines use a "quick connect" style connection. The guidance to perform this action is provided in station procedure 1(2)BOA PRI-7, "Essential Service Water Malfuction Unit 1(2)", Attachment B. It should be noted that the direction provided by this procedure does not secure the associated charging pump, so RCP seal cooling is not lost during this evolution. These steps direct the connection of the hose and manipulation of the associated manual valves to isolate the SX portion of the cooling water supply and opening of the fire protection supply. This action is routinely covered in Operations Requalification training through the Job Performance Measure mechanism to evaluate operator performance. Times to perform the action, based on input from the Operations Training organization are on the order of 10 minutes. Another method of providing cooling to the charging pumps is through the use of fire protection pumps cross-tied into the SX system as directed by procedure 0BOA PRI-7, "Loss of Ultimate Heat Sink". At the present time, this capability is not credited in the Byron PRA model.

Upon Loss of Dual Unit SX system (i.e., Loss of Ultimate Heat Sink), 0BOA PRI-7 directs the operators to crosstie FP system to SX system. This crosstie is not credited in the PRA model and SX CT LAR sensitivity analysis. This is conservative where an alternate success path for CV Pump lube oil cooling is not credited.

2.1.6 NRC Question: Throughout the submittal, reference is made to RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998. However, the current version of RG 1.174 is dated November 2002. Explain why the current version of RG 1.174 was not used as a basis for this submittal.

Response:

The reference to the 1998 version of RG 1.174 was a "cut and paste" error associated with the previous SX one-time CT extension. The evaluation performed to support this submittal was based on RG 1.174, Revision 1, dated November 2002.

2.1.7 NRC Statement: NUREG-0800, Standard Review Plan (SRP) 16.1, Revision 1, "Risk-Informed Decision Making: Technical Specifications," describes NRC staff acceptance criteria regarding "defense in depth," considerations for Technical Specification (TS) changes. Criteria II.1A.(iii)(3) states that the licensee should consider, "Whether the TS change specifies that voluntary removal of equipment from service should not be scheduled when adverse weather conditions or other situations that likely may subject the plant to abnormal conditions are predicted."

The licensee has considered adverse weather conditions in its PRA analysis for external events, but has made no specified provision for adverse weather in its TS change in accordance with the guidelines of SRP 16.1, if adverse weather actually occurs.

Explain why the TS change (specifically in Attachment 1, Table 3) does not specify that the removal of 1/2SX001A from service will not be scheduled when adverse weather conditions or other situations that likely may subject the plant to abnormal conditions are predicted. The NRC staff notes that implementation of Attachment 1, Table 3 is a regulatory commitment per Attachment 4 of the LAR.

Response: Exelon will add the following information to Table 3 -

Adverse Environmental Conditions - The one-time extended CT condition will not be entered should adverse environmental conditions exist or are imminent (forecast within the next 12 hours). For the purpose of Table 3 of the submittal, Adverse Environmental Conditions are defined as any of the following:

- Area environmental conditions such as icing, wind, or storms causing unexpected repeated station power line trips
- Tornado Warning

- Actual switchyard voltage alarms or notifications indicating voltage below that required for offsite source technical specification operability limits
- Predicted Unit trip contingency switchyard voltage below minimum required switchyard voltage (unless a site specific analysis has been performed).
- Notified that at the current time a condition exists such that if a transmission line or other transmission facility were to trip, then site will be below voltage operability limits.

Should Adverse Environmental Conditions develop after the extended CT condition has been entered, then work will proceed to complete the 1(2)SX001A valve replacement.

2.1.8 NRC Statement: The licensee has stated, in Attachment 5 in the LAR, that defense in depth is maintained, in part, because a best estimate flow analysis has shown that a single SX pump can provide cooling on both units with the exception of the Reactor Containment Fan Coolers (RCFC) and Emergency Diesel Generators (EDGs) on the unit without an SX pump and one train of RCFCs on the unit with an available SX pump.

Question 8.b:

If the SX pump of the operating unit were lost, all RCFCs in the operating unit would lose SX flow. With no RCFCs available in the operating unit, explain why the other means of containment heat removal, i.e., the containment spray system of the operating unit, are not on the protected system list during the extended CT.

Response:

The initial premise of the statement in question 8 assumes that a loss of the remaining SX pump on the operating unit leads to a loss of SX for that unit. The Byron SX system design provides for the ability to cross-connect the unit SX supplies through the 1SX005 and 2SX005 valves. The direction to open these valves is provided in procedure 1(2)BOA PRI-7, "Essential Service Water Malfunction Unit 1(2)". As noted in our submittal, two compensatory actions will be implemented to address this potential event and reduce its significance. The first is that one of the SX005 valves will be maintained in the open position for the duration of the 1(2)SX001A valve maintenance. This reduces the actions required to be taken to cross-tie the SX system and enhances the likelihood of successfully performing this action. The second compensatory action is that one train of RCFCs on the shutdown unit will be isolated as a means of reducing the total demand on the SX system.

With the SX crosstie between units established, cooling will be provided to one train of

RCFCs. To ensure containment cooling is maintained, the B train of RCFCs will be considered protected for the duration of the extended CT. Containment spray for Byron provides pressure reduction but does not provide a containment heat removal function. The only available means of removing heat from containment post LOCA are the RCFCs and the Residual Heat Removal System. The B Train of the Residual Heat Removal System will also be protected for the duration of the extended CT. Best estimate Thermal-Hydraulic analysis has shown that containment sprays are not required to prevent containment failure during a LOCA or Steam Line Break Inside Containment provided a train of RCFCs is available. Therefore, there is no need to protect a train of Containment Sprays during the extended CT.

3.0 SUMMARY

The above information is provided to address the request for additional information provided by the NRC in Reference 2.

4.0 REFERENCES

- 1) Exelon Letter RS-09-121, dated September 24, 2009, P. Simpson (Exelon Generation Company, LLC) to U. S. Nuclear Regulatory Commission, "License Amendment Request for a One-Time Extension of the Essential Service Water Train Completion Time" Byron Station, Units 1 and 2, Facility Operating License Nos. NPF-37 and NPF-66, NRC Docket Nos. STN 50-454 and STN 50-455
- 2) NRC Letter ML93200660, dated December 18, 2009 Letter from M. J. David (U. S. Nuclear Regulatory Commission) to C. G. Pardee (Exelon Generation Company, LLC), " BYRON STATION, UNIT NOS. 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION RELATED TO ONE-TIME EXTENSION OF ESSENTIAL SERVICE WATER TRAIN COMPLETION TIME (TAC NOS. ME2293 AND ME2294)"

ATTACHMENT 3
Supporting Documentation

List of Attached Documents

1. 1BOA PRI-7, "Essential Service Water Malfunction Unit 1," Revision 104
2. 2BOA PRI-7, "Essential Service Water Malfunction Unit 2," Revision 105
3. 0BOA PRI-7, "Loss of Ultimate Heat Sink Unit 0," Revision 0
4. OP-AA-108-117, "Protected Equipment Program," Revision 0

A. PURPOSE

This procedure provides actions required in the event of a malfunction of the Essential Service Water system.

B. SYMPTOMS OR ENTRY CONDITIONS

- 1) The following conditions may cause entry into this procedure:
 - SX basin level rapidly dropping.
 - Indications of a SX break in the Aux Bldg.
 - Indications of a SX break in the CNMT.
 - Abnormal temperatures on equipment cooled by SX.
- 2) The following annunciators may cause entry into this procedure:
 - CNMT DRAIN LEAK DETECT FLOW HIGH (1-1-A2)
 - SX PUMP TRIP (1-2-A1)
 - SX PUMP DSCH HDR PRESS LOW (1-2-A2)
 - SX PUMP DSCH HDR TEMP HIGH LOW (1-2-B2)
 - SX PUMP SUCT PRESS LOW (1-2-C1)
 - SX STRN DP HIGH (1-2-C2)
 - SX PUMP SUCT VLV PIT LEVEL HIGH (1-2-D2)
 - SX MAKEUP PP AUTO START (0-37-B7)
 - SX CLG TWR BASIN LEVEL HIGH LOW (0-37-A8)
 - SX CLG TWR LOW SPEED FAN TRIP (0-37-A6)
 - SX CLG TWR HIGH SPEED FAN TRIP (0-37-B6)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	***** * <u>NOTE</u> * * With this procedure in effect the * * Emergency Director shall evaluate * * for EMERGENCY PLAN conditions. * ***** ***** * <u>NOTE</u> * * Both Units may be affected by a * * malfunction in one or both Essential * * Service Water trains. * ***** ***** * <u>NOTE</u> * * If a loss of SX is due to a loss of * * the SX MDCT, 0BOA PRI-7. LOSS OF * * ULTIMATE HEAT SINK should be * * referenced. * *****	
1	<u>CHECK SX PUMPS:</u> a. SX pump(s) - <u>AT LEAST ONE</u> <u>RUNNING</u> a. Perform the following to start the standby pump: 1) Manually open RCFC SX inlet and outlet valves: o 1A SX pump: • 1SX016A • 1SX027A o 1B SX pump: • 1SX016B • 1SX027B Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1	(continued)	
		2) Start the SX pump. <u>IF</u> the pump can <u>NOT</u> be started, <u>THEN GO TO</u> ATTACHMENT A (Page 18). <u>IF NO</u> SX pump is available on Unit 2, <u>THEN GO TO</u> OBOA PRI-7. LOSS OF ULTIMATE HEAT SINK.
b.	SX STRN DP HIGH (1-2-C2) - <u>NOT LIT</u>	b. Locally backwash strainer(s) per BOP SX-4, ESSENTIAL SERVICE WATER STRAINER MANUAL OPERATION.
c.	SX PUMP DSCH HDR PRESS LOW (1-2-A2) - <u>NOT LIT</u>	c. Perform the following: 1) Start an additional SX pump. 2) Locally verify the SX Strainers are <u>NOT</u> backwashing. 3) Locally adjust SX outlet from CC heat exchanger valve(s) while maintaining outlet temperature(s) less than <u>105° F</u> (Normal) <u>120° F</u> (RH in S/D Cooling) <u>130° F</u> (Post LOCA): - o 1SX007 (346 M16) - o 0SX007 (346 L16 AB1)
		Step continued on next page

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1	(continued)	
	<u>IF</u> SX pump discharge header pressure can <u>NOT</u> be restored, <u>THEN</u> perform the following: 1) Monitor temperatures to equipment cooled by SX. 2) Shutdown ANY unnecessary equipment: - o DG(s) - o MCR chiller(s) - o SI pump(s) - o RCFC(s) - o CNMT chiller(s) 3) Close the SX outlet valve for ANY shutdown RCFC train(s): - o 1SX027A - o 1SX027B 4) <u>IF</u> CENT CHG pump temperatures are approaching the limits of TABLE A (Page 25), <u>THEN</u> align FP to CENT CHG pump lube oil cooler per ATTACHMENT B (Page 23) while continuing with this procedure: - o CENT CHG pump 1A - o CENT CHG pump 1B 5) Shutdown any vital equipment exceeding the limits of TABLE A (Page 25). Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1	(continued)	
		6) At Shift Manager discretion align UNIT 2 SX to cool unit 1 CC loads via the Unit 0 CC HX: a) Open CC HX 0 SX inlet valve: • 2SX005 (330 P19 AB2) b) Open CC HX 0 SX outlet valve: • 0SX146 • 0SX147 c) Align the Unit 0 CC HX to Unit 1 per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT.
d. Locally check tripped SX pump(s) - <u>NOT ROTATING</u>		d. Perform the following: 1) Dispatch an operator to energize the affected pump's suction valve: - o 1SX001A at 131X3 cub E4 - o 1SX001B at 132X1 cub C1 2) Close the affected pump's suction valve: - o 1SX001A - o 1SX001B

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2	<u>CHECK SX PUMP DISCHARGE HEADER TEMPERATURE:</u> a. Temperature - <u>GREATER THAN 50°F</u>	a. Perform the following: 1) Verify SX tower hot water basin bypass valves for running pumps are OPEN: - o 1A SX pump: - o 0SX162A - o 0SX162C - o 1B SX pump: - o 0SX162B - o 0SX162D 2) Stop <u>ALL</u> SX tower fans: • 0SX03CA through 0SX03CH
Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2 (continued)	b. Temperature - <u>LESS THAN 80° F</u> b. Start <u>ALL</u> SX tower fans by performing the following: 1) Open <u>ALL</u> riser valves: • 0SX163A through 0SX163H 2) Verify the hot water basin bypass valves are closed: • 0SX162A • 0SX162B • 0SX162C • 0SX162D 3) Start <u>ALL</u> fans in high speed: • 0SX03CA through 0SX03CH 4) <u>IF</u> any fan fails to start in high speed, <u>THEN</u> close its associated riser valve unless needed for the running SX pump(s) return flowpath(s). 5) Refer to Tech Spec 3.7.9. Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2	(continued)	
	<u>IF</u> ALL SX tower fans fail to start, <u>THEN</u> perform the following to establish an alternate method of SX cooling: 1) Verify WW sand filters are shutdown. 2) Close both SX basin CW makeup valves: • 0CW100A • 0CW100B 3) Establish WW makeup flow to SX basins from the MCR: a) Place WW makeup valves in AUTO: • 0WW019A • 0WW019B b) Place SX basin level controllers in MANUAL and raise demand until WW makeup valves indicate dual valve position: • 0LK-SX064 • 0LK-SX065 c) Start both WW pumps. 4) Verify SX blowdown flow established. • 0SX161A (400 C6 GL) • 0SX161B (400 C6 GL) Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2	(continued)	
	5) Adjust SX basin level controllers as necessary to maintain SX basin levels between <u>90%</u> to <u>100%</u>. <u>IF</u> WW makeup flow can <u>NOT</u> be established from the MCR, <u>THEN</u> perform the following: 1) Dispatch an operator to locally open WW makeup valves: • 0WW019A (860 J1 SXCT) • 0WW019B (860 J1 SXCT) 2) Start both WW pumps. 3) Locally throttle WW makeup valve(s) as necessary to maintain basin levels between <u>90%</u> to <u>100%</u>.	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	***** * <u>NOTE</u> * * A loss of IA pressure will cause the * SX basin levels indication to slowly * fail low as the IA header * * depressurizes. * ***** ***** * <u>NOTE</u> * * The SX tower basins are crosstied * above 64%. A leak from one basin * will cause both basin levels to * drop. * *****	
3	<u>CHECK SX TOWER BASIN:</u> a. Level - <u>LESS THAN 100%</u>	
	a. Perform the following: 1) Close any open SX basin CW makeup valve(s): o 0CW100A o 0CW100B 2) Secure WW makeup to SX basins: a) Stop any running deep well pump(s) aligned to a SX basin. b) Close associated SX basin deep well makeup valve(s): o 0WW019A o 0WW019B 3) Stop running SX makeup pump(s) . 4) Realign riser and bypass valves as necessary to maintain basin levels. Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3	(continued)	
	b. Level - <u>GREATER THAN 80% AND STABLE</u>	5) Dispatch operator to check for basin overflow. b. Perform the following: 1) Makeup to SX basin(s) as necessary to restore level: - o Establish CW makeup: 1) Place CW makeup valve(s) in AUTO: - o 0CW100A - o 0CW100B 2) Adjust SX basin level controller(s) as necessary to restore level: - o 0LK-SX064 - o 0LK-SX065 - o Establish WW makeup: 1) Place WW makeup valve(s) in AUTO: - o 0WW019A - o 0WW019B 2) Place SX basin level controller(s) in MANUAL and raise demand until WW makeup valve(s) indicate dual valve position: - o 0LK-SX064 - o 0LK-SX065 3) Start WW pump(s).
	Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3	(continued)	
		2) Dispatch an operator to close SX blowdown valves: • OSX161A (400 C6 GL) • OSX161B (400 C6 GL) 3) Dispatch Operator to look for leaks SXCT area. 4) Verify SX strainer backwash isolated. <u>IF</u> basin level continues to drop then start both SX makeup pumps.
	c. Level - <u>GREATER THAN 60%</u>	c. Perform the following: 1) Dispatch operator(s) to check for leaks in the Aux Bldg. 2) Verify both SX makeup pumps running. 3) Shutdown <u>ANY</u> equipment exceeding the limits of TABLE A (Page 25). 4) Refer to Tech Spec 3.7.9.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4	<u>CHECK CC OUTLET TEMPERATURE:</u> a. CC heat exchanger outlet temperature(s) - <u>LESS THAN 105° F</u>: • 1TI-674 (Unit 1 CC HX) • 0TI-675 (Unit 0 CC HX)	a. Perform the following: 1) Locally throttle SX outlet from CC heat exchanger valve(s) to maintain CC temperature less than <u>105° F</u>: - o 1SX007 (346 M16) - o 0SX007 (346 L16 AB1) 2) <u>IF</u> RCP THERMAL BARR CC WTR TEMP HIGH (1-7-E3) is LIT, <u>THEN</u> maintain seal injection flow between <u>8 GPM</u> and <u>13 GPM</u> per pump.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5	<u>CHECK SX SYSTEM INTACT:</u>	
a.	Running CENT CHG pump oil temperature(s) - <u>NORMAL</u>	a. Align emergency FP cooling per ATTACHMENT B (Page 23).
o	1A CENT CHG pump	
	• Computer Group #59	
o	1B CENT CHG pump	
	• Computer Group #59	
b.	Check running equipment temperature - <u>LESS THAN MAXIMUM LIMITS:</u>	b. Shutdown <u>ANY</u> equipment exceeding the limits of TABLE A (Page 25).
	• Refer to TABLE A (Page 25)	
c.	SX PUMP DSCH HDR PRESS LOW (1-2-A2) - <u>NOT LIT</u>	c. Dispatch operator(s) to perform the following:
		• Check for leaks in the Aux Bldg.
		• Dispatch Operator to look for leaks SXCT area.
		• Verify SX strainer backwash isolated.
Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 5	(continued)	
	d. CNMT indications - <u>NORMAL</u>: • CNMT sump flow recorders (1PM12J) - <u>NORMAL</u>: • Floor Drain Sump (1FT-RF008) • RX Cavity Sump (1FT-RF010)	d. Perform the following to isolate one RCFC train: 1) Shutdown NON-running SX pump's train RCFCs: - o Train 1A: • 1A and 1C RCFCs - o Train 1B: • 1B and 1D RCFCs 2) Close associated RCFC train isol valves: - o 1SX016A and 1SX027A - o 1SX016B and 1SX027B <u>IF</u> leak is <u>NOT</u> stopped, <u>THEN</u> perform the following: 1) Unisolate previously isolated RCFC train. 2) Swap running SX pumps. 3) Isolate other RCFC train.
Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 5	(continued)	
e. Aux Bldg indications - <u>NORMAL</u> :	e. Perform the following:	
1) No report of locally observed leak	1) Locate and isolate the leak.	
2) SX PUMP SUCT VLV PIT LEVEL HIGH (1-2-D2) - <u>NOT LIT</u>	o <u>IF</u> Unit 1 CC HX must be isolated, <u>THEN</u> align Unit 0 CC HX to cool Unit 1 loads per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT.	
3) Contact Radwaste Operator to verify following:	o <u>IF</u> one SX train must be isolated, <u>THEN</u> swap running equipment to the NON-affected train.	
• Leak detection sumps - <u>NOT IN ALARM</u>	o <u>IF</u> a SX break beyond the capacity of system makeup can <u>NOT</u> be isolated, <u>THEN</u> perform the following:	
• Aux Bldg sumps - <u>NORMAL</u>	1) Stop Unit 1 SX pumps.	
	2) Close the riser and bypass valves on the SX tower with the lowest level.	
	2) Evaluate potential equipment damage due to flooding.	
	Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 5	(continued)	
		3) <u>WHEN</u> SX system integrity has been restored, <u>THEN</u> perform the following: a) Vent affected portions of the SX system as necessary per BOP SX-7, FILLING AND VENTING THE SX SYSTEM. b) RETURN TO Step 1 (Page 2) .
6	<u>REFER TO TECH SPECS:</u>	
	• 3.5.2 • 3.7.8 • 3.7.9 • Other Tech Specs as applicable	
7	<u>RETURN TO PROCEDURE AND STEP IN EFFECT</u>	
	-END-	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 1 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
1	<u>START STANDBY UNIT 2 SX PUMP:</u>	
	a. Check RCFC SX isol valves for standby SX pump - <u>OPEN</u>: - o 2A SX pump: • 2SX016A • 2SX027A - o 2B SX pump: • 2SX016B • 2SX027B b. Start standby UNIT 2 SX pump	a. Manually or locally open valve(s): - o 2SX016A (374 +29 RXB2 P-15) - o 2SX027A (374 +29 RXB2 P-14) - o 2SX016B (401 +2 RXB2 P-7) - o 2SX027B (401 +2 RXB2 P-9) b. GO TO Step 3 (Next Page) .
* 2	<u>CROSSTIE TO BOTH UNIT 2 SX PUMPS:</u>	
	a. Open Unit 0 CC HX inlet valves: • 1SX005 • 2SX005 b. Check SX pump crosstie valves - <u>OPEN</u>: • 1SX033 • 1SX034 • 2SX033 • 2SX034 c. Check UNIT 2 SX pump discharge pressure - <u>GREATER THAN 90 PSIG</u> d. GO TO Step 6 (Page 22)	a. Locally open valve(s): - o 1SX005 (330 P19 AB2) - o 2SX005 (330 P19 AB2) b. Manually or locally open valve(s): - o 1SX033 (330 Q17 AB1) - o 1SX034 (330 Q19 AB2) - o 2SX033 (330 P16 AB1) - o 2SX034 (330 P20 AB2) c. GO TO Step 5 (Page 21) .

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 2 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u> 3 <u>ALIGN FOR SINGLE PUMP CROSSTIE:</u> a. Stop RCFCs for non-running UNIT 2 SX pump: - o 2A SX pump: • 2A RCFC • 2C RCFC - o 2B SX pump: • 2B RCFC • 2D RCFC b. Close RCFC SX isol valves for non-running UNIT 2 SX pump: - o 2A SX pump: • 2SX016A • 2SX027A - o 2B SX pump: • 2SX016B • 2SX027B c. Stop ONE pair of UNIT 1 RCFCs for SX isol: - o 1A and 1C RCFCs - o 1B and 1D RCFCs d. Close associated UNIT 1 RCFC train SX isol valves: - o 1SX016A and 1SX027A - o 1SX016B and 1SX027B e. Monitor CNMT temperature and pressure on both units		
		b. <u>IF</u> NEITHER SX isol valves can be manually closed, <u>THEN</u> locally close the SX inlet isol valve: - o 2SX016A (374 +29 RXB2 P-15) - o 2SX016B (401 +2 RXB2 P-7) d. <u>IF</u> NEITHER SX isol valves can be manually closed, <u>THEN</u> locally close the SX inlet isol valve: - o 1SX016A (374 +29 RXB1 P-15) - o 1SX016B (401 +2 RXB1 P-7)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 3 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u> 4 <u>CROSSTIE TO SINGLE UNIT 2 SX PUMP:</u> a. Open Unit 0 CC HX inlet valves: • 1SX005 • 2SX005 b. Check SX pump crosstie valves - <u>OPEN</u>: • 1SX033 • 1SX034 • 2SX033 • 2SX034 a. Locally open valve(s): ○ 1SX005 (330 P19 AB2) ○ 2SX005 (330 P19 AB2) b. Manually or locally open valve(s): ○ 1SX033 (330 Q17 AB1) ○ 1SX034 (330 Q19 AB2) ○ 2SX033 (330 P16 AB1) ○ 2SX034 (330 P20 AB2)		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 4 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
5	<u>MONITOR SX SYSTEM:</u>	
a.	Maintain the following:	a. Perform the following:
	• UNIT 2 SX pump(s): • Motor amps - <u>LESS THAN 180 AMPS</u> • Discharge pressure - <u>GREATER THAN 90 PSIG</u> • CC heat exchanger outlet temperature - <u>LESS THAN 105°F:</u> • 1TI-674 (Unit 1 CC HX) • 2TI-674 (UNIT 2 CC HX) • 0TI-675 (Unit 0 CC HX)	- o Isolate SX to Unit 1 RCFC train(s): a) Shutdown RCFC train(s): - o 1A and 1C RCFC - o 1B and 1D RCFC b) Close RCFC SX outlet valve(s): - o 1SX027A - o 1SX027B c) Monitor CNMT temperature and pressure. - o Locally throttle CC heat exchanger(s) SX outlet valve(s) as necessary: - o 0SX007 (346 L16 AB1) - o 1SX007 (346 M16) - o 2SX007 (346 M20) - o Shutdown ANY unnecessary DGs.
b.	Check running CENT CHG pump oil temperature(s) on computer group #59 - <u>NORMAL</u> - o 1A CENT CHG pump - o 1B CENT CHG pump - o 2A CENT CHG pump - o 2B CENT CHG pump	b. Align emergency FP cooling per ATTACHMENT B (Page 23).
Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 5 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
Step 5	(continued)	
	c. Monitor temperatures on UNIT 1 equipment cooled by SX per TABLE A (Page 25) d. Shutdown ANY equipment exceeding the limits of TABLE A (Page 25) e. Realign riser and bypass valves per BOP SX-T2, SX TOWER OPERATION GUIDELINES	
6	<u>CHECK CHILLERS OPERATING:</u>	
	a. Control room chillers - <u>ONE RUNNING</u> b. CNMT chillers - <u>ONE RUNNING</u>	a. Start one chiller per BOP VC-10, STARTUP OF THE CONTROL ROOM CHILLED WATER SYSTEM. b. <u>IF</u> SX flowpath to one RCFC train is available, <u>THEN</u> start the associated chiller per BOP VP-1, RCFC REFRIGERATION UNIT AND CHILLED WATER SYSTEM STARTUP.
7	<u>RETURN TO MAIN BODY, Step 2 (Page 6)</u>	
-END-		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT B (PG 1 OF 2)</u> <u>ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER</u> ***** * <u>NOTE</u> * * Consideration should be given to * * aligning the standby pump to ensure * * cooling upon an auto start. * ***** ***** * <u>NOTE</u> * * Initiating emergency FP cooling to * * the 1B and 2B CENT CHG pump oil * * coolers may cause a Fire Suppression * * Alarm in Zone(s) 1S-60 and 2S-53. * ***** 1 <u>ALIGN FP COOLING TO AFFECTED CENT CHG PUMP(S):</u> a. Connect FP supply hose(s). b. Open FP hose supply isol valve: - o 1A Cent Chg pump 0FP5170 (364 +2 V18 AB2) - o 1B Cent Chg pump 1FP5162 (364 X13 RXB1) - o 2A Cent Chg pump 0FP5171 (364 +3 V18 AB2) - o 2B Cent Chg pump 2FP5162 (364 X21 RXB2) c. Open CENT CHG pump oil cooler FP supply valve: - o 1A Cent Chg pump 1SX2200A (364 +1 V15 RXB1) - o 1B Cent Chg pump 1SX2200B (364 +2 Z15 RXB1) - o 2A Cent Chg pump 2SX2200A (364 +2 V21 RXB2) - o 2B Cent Chg pump 2SX2200B (364 +2 Z21 RXB2) Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT B (PG 2 OF 2)</u> <u>ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER</u> Step 1 (continued) d. Close CENT CHG pump oil cooler SX supply valve: - o 1A Cent Chg pump 1SX2199A (364 +4 V15 RXB1) - o 1B Cent Chg pump 1SX2199B (364 +2 Z15 RXB1) - o 2A Cent Chg pump 2SX2199A (364 +2 V21 RXB2) - o 2B Cent Chg pump 2SX2199B (364 +2 Z21 AB2) e. Place a portable fan in door opening as necessary to maintain running CENT CHG pump room(s) temperature - <u>NORMAL</u> 2 <u>RETURN TO PROCEDURE AND STEP IN EFFECT</u> -END-		

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

TABLE A (PG 1 OF 1)
VITAL EQUIPMENT TEMPERATURE LIMITS

1 MONITOR RUNNING EQUIPMENT TEMPERATURE LIMITS:

- RCPs temperature (Computer Groups #10 and #11) - LESS THAN MAXIMUM LIMITS:
 - RCP Mtr Radial Brng - 195° F
 - RCP Mtr Thrust Brng - 195° F
 - RCP Lower Radial Brng - 225° F
 - RCP Seal Leakoff - 235° F
- CENT CHG Pumps temperature (Computer Group #59) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 205° F
 - Outbd Brng - 205° F
 - Thrust Brng - 195° F
- SX Pumps temperature (Computer Group #64) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 175° F
 - Outbd Brng - 175° F
- SI Pumps temperature (Computer Group #52) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 205° F
 - Outbd Brng - 205° F
 - Thrust Brng - 205° F
- Motor Driven AF Pump temperatures (Computer Group #74) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 165° F
 - Outbd Brng - 165° F
 - Thrust Brng - 165° F
- Diesel Driven AF Pump temperatures - LESS THAN MAXIMUM LIMITS:
 - Maximum temperatures per BOP AF-7T1, DIESEL DRIVEN AUXILIARY FEEDWATER PUMP OPERATING LOG
- DGs temperature - LESS THAN MAXIMUM LIMITS:
 - Maximum temperatures per BOP DG-11T2, DIESEL GENERATOR OPERATING LOG

-END-

A. PURPOSE

This procedure provides actions required in the event of a malfunction of the Essential Service Water system.

B. SYMPTOMS OR ENTRY CONDITIONS

- 1) The following conditions may cause entry into this procedure:
 - SX basin level rapidly dropping.
 - Indications of a SX break in the Aux Bldg.
 - Indications of a SX break in the CNMT.
 - Abnormal temperatures on equipment cooled by SX.
- 2) The following annunciators may cause entry into this procedure:
 - CNMT DRAIN LEAK DETECT FLOW HIGH (2-1-A2)
 - SX PUMP TRIP (2-2-A1)
 - SX PUMP DSCH HDR PRESS LOW (2-2-A2)
 - SX PUMP DSCH HDR TEMP HIGH LOW (2-2-B2)
 - SX PUMP SUCT PRESS LOW (2-2-C1)
 - SX STRN DP HIGH (2-2-C2)
 - SX PUMP SUCT VLV PIT LEVEL HIGH (2-2-D2)
 - SX MAKEUP PP AUTO START (0-37-B7)
 - SX CLG TWR BASIN LEVEL HIGH LOW (0-37-A8)
 - SX CLG TWR LOW SPEED FAN TRIP (0-37-A6)
 - SX CLG TWR HIGH SPEED FAN TRIP (0-37-B6)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	***** * <u>NOTE</u> * * With this procedure in effect the * * Emergency Director shall evaluate * * for EMERGENCY PLAN conditions. * ***** ***** * <u>NOTE</u> * * Both Units may be affected by a * * malfunction in one or both Essential * * Service Water trains. * ***** ***** * <u>NOTE</u> * * If a loss of SX is due to a loss of * * the SX MDCT, 0BOA PRI-7. LOSS OF * * ULTIMATE HEAT SINK should be * * referenced. * *****	
1	<u>CHECK SX PUMPS:</u> a. SX pump(s) - <u>AT LEAST ONE</u> <u>RUNNING</u> a. Perform the following to start the standby pump: 1) Manually open RCFC SX inlet and outlet valves: o 2A SX pump: • 2SX016A • 2SX027A o 2B SX pump: • 2SX016B • 2SX027B Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1	(continued)	
		2) Start the SX pump. <u>IF</u> the pump can <u>NOT</u> be started, <u>THEN GO TO</u> ATTACHMENT A (Page 18). <u>IF NO</u> SX pump is available on Unit 1, <u>THEN GO TO</u> OBOA PRI-7. LOSS OF ULTIMATE HEAT SINK.
b.	SX STRN DP HIGH (1-2-C2) - <u>NOT LIT</u>	b. Locally backwash strainer(s) per BOP SX-4, ESSENTIAL SERVICE WATER STRAINER MANUAL OPERATION.
c.	SX PUMP DSCH HDR PRESS LOW (1-2-A2) - <u>NOT LIT</u>	c. Perform the following: 1) Start an additional SX pump. 2) Locally verify the SX Strainers are <u>NOT</u> backwashing. 3) Locally adjust SX outlet from CC heat exchanger valve(s) while maintaining outlet temperature(s) less than <u>105° F</u> (Normal) <u>120° F</u> (RH in S/D Cooling) <u>130° F</u> (Post LOCA): - o 2SX007 (346 M20) - o 0SX007 (346 L16 AB1)
		Step continued on next page

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1	(continued)	<u>IF</u> SX pump discharge header pressure can <u>NOT</u> be restored, <u>THEN</u> perform the following: 1) Monitor temperatures to equipment cooled by SX. 2) Shutdown ANY unnecessary equipment: - o DG(s) - o MCR chiller(s) - o SI pump(s) - o RCFC(s) - o CNMT chiller(s) 3) Close the SX outlet valve for ANY shutdown RCFC train(s): - o 2SX027A - o 2SX027B 4) <u>IF</u> CENT CHG pump temperatures are approaching the limits of TABLE A (Page 25), <u>THEN</u> align FP to CENT CHG pump lube oil cooler per ATTACHMENT B (Page 23) while continuing with this procedure: - o CENT CHG pump 2A - o CENT CHG pump 2B 5) Shutdown any vital equipment exceeding the limits of TABLE A (Page 25). Step continued on next page

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 1	(continued)	
	d. Locally check tripped SX pump(s) - <u>NOT ROTATING</u>	6) At Shift Manager discretion align UNIT 1 SX to cool unit 2 CC loads via the Unit 0 CC HX: a) Open CC HX 0 SX inlet valve: • 1SX005 (330 P19 AB2) b) Open CC HX 0 SX outlet valve: • 0SX146 • 0SX147 c) Align the Unit 0 CC HX to Unit 2 per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT. d. Perform the following: 1) Dispatch an operator to energize the affected pump's suction valve: - o 2SX001A at 231X3 cub E4 - o 2SX001B at 232X1 cub C1 2) Close the affected pump's suction valve: - o 2SX001A - o 2SX001B

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
2	<u>CHECK SX PUMP DISCHARGE HEADER TEMPERATURE:</u> a. Temperature - <u>GREATER THAN 50°F</u>	a. Perform the following: 1) Verify SX tower hot water basin bypass valves for running pumps are OPEN: - o 2A SX pump: - o 0SX162A - o 0SX162C - o 2B SX pump: - o 0SX162B - o 0SX162D 2) Stop <u>ALL</u> SX tower fans: • 0SX03CA through 0SX03CH

Step continued on next page

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2	(continued)	
b.	Temperature - <u>LESS THAN 80° F</u>	b. Start <u>ALL</u> SX tower fans by performing the following: 1) Open <u>ALL</u> riser valves: • 0SX163A through 0SX163H 2) Verify the hot water basin bypass valves are closed: • 0SX162A • 0SX162B • 0SX162C • 0SX162D 3) Start <u>ALL</u> fans in high speed: • 0SX03CA through 0SX03CH 4) <u>IF</u> any fan fails to start in high speed, <u>THEN</u> close its associated riser valve unless needed for the running SX pump(s) return flowpath(s). 5) Refer to Tech Spec 3.7.9. Step continued on next page

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2	(continued)	
	<u>IF</u> ALL SX tower fans fail to start, <u>THEN</u> perform the following to establish an alternate method of SX cooling: 1) Verify WW sand filters are shutdown. 2) Close both SX basin CW makeup valves: • 0CW100A • 0CW100B 3) Establish WW makeup flow to SX basins from the MCR: a) Place WW makeup valves in AUTO: • 0WW019A • 0WW019B b) Place SX basin level controllers in MANUAL and raise demand until WW makeup valves indicate dual valve position: • 0LK-SX064 • 0LK-SX065 c) Start both WW pumps. 4) Verify SX blowdown flow established. • 0SX161A (400 C6 GL) • 0SX161B (400 C6 GL) Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 2	(continued)	
	5) Adjust SX basin level controllers as necessary to maintain SX basin levels between <u>90%</u> to <u>100%</u>. <u>IF</u> WW makeup flow can <u>NOT</u> be established from the MCR, <u>THEN</u> perform the following: 1) Dispatch an operator to locally open WW makeup valves: • 0WW019A (860 J1 SXCT) • 0WW019B (860 J1 SXCT) 2) Start both WW pumps. 3) Locally throttle WW makeup valve(s) as necessary to maintain basin levels between <u>90%</u> to <u>100%</u>.	

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	***** * <u>NOTE</u> * * A loss of IA pressure will cause the * SX basin levels indication to slowly * fail low as the IA header * depressurizes. * ***** ***** * <u>NOTE</u> * * The SX tower basins are crosstied * above 64%. A leak from one basin * will cause both basin levels to * drop. * *****	
3	<u>CHECK SX TOWER BASIN:</u> a. Level - <u>LESS THAN 100%</u>	
	a. Perform the following: 1) Close any open SX basin CW makeup valve(s): o 0CW100A o 0CW100B 2) Secure WW makeup to SX basins: a) Stop any running deep well pump(s) aligned to a SX basin. b) Close associated SX basin deep well makeup valve(s): o 0WW019A o 0WW019B 3) Stop running SX makeup pump(s) . 4) Realign riser and bypass valves as necessary to maintain basin levels. Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3	(continued)	
	b. Level - <u>GREATER THAN 80% AND STABLE</u>	5) Dispatch operator to check for basin overflow. b. Perform the following: 1) Makeup to SX basin(s) as necessary to restore level: - o Establish CW makeup: 1) Place CW makeup valve(s) in AUTO: - o 0CW100A - o 0CW100B 2) Adjust SX basin level controller(s) as necessary to restore level: - o 0LK-SX064 - o 0LK-SX065 - o Establish WW makeup: 1) Place WW makeup valve(s) in AUTO: - o 0WW019A - o 0WW019B 2) Place SX basin level controller(s) in MANUAL and raise demand until WW makeup valve(s) indicate dual valve position: - o 0LK-SX064 - o 0LK-SX065 3) Start WW pump(s).
	Step continued on next page	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 3	(continued)	
		2) Dispatch an operator to close SX blowdown valves: • OSX161A (400 C6 GL) • OSX161B (400 C6 GL) 3) Dispatch Operator to look for leaks SXCT area. 4) Verify SX strainer backwash isolated. <u>IF</u> basin level continues to drop then start both SX makeup pumps. c. Level - <u>GREATER THAN 60%</u>
		c. Perform the following: 1) Dispatch operator(s) to check for leaks in the Aux Bldg. 2) Verify both SX makeup pumps running. 3) Shutdown <u>ANY</u> equipment exceeding the limits of TABLE A (Page 25). 4) Refer to Tech Spec 3.7.9.

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
4	<u>CHECK CC OUTLET TEMPERATURE:</u> a. CC heat exchanger outlet temperature(s) - <u>LESS THAN 105° F</u>: • 2TI-674 (Unit 2 CC HX) • 0TI-675 (Unit 0 CC HX)	a. Perform the following: 1) Locally throttle SX outlet from CC heat exchanger valve(s) to maintain CC temperature less than <u>105° F</u>: - o 2SX007 (346 M20) - o 0SX007 (346 L16 AB1) 2) <u>IF</u> RCP THERMAL BARR CC WTR TEMP HIGH (2-7-E3) is LIT, <u>THEN</u> maintain seal injection flow between <u>8 GPM</u> and <u>13 GPM</u> per pump.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
5	<u>CHECK SX SYSTEM INTACT:</u>	
a.	Running CENT CHG pump oil temperature(s) - <u>NORMAL</u>	a. Align emergency FP cooling per ATTACHMENT B (Page 23).
o	2A CENT CHG pump	
•	Computer Group #59	
o	2B CENT CHG pump	
•	Computer Group #59	
b.	Check running equipment temperature - <u>LESS THAN MAXIMUM LIMITS:</u>	b. Shutdown <u>ANY</u> equipment exceeding the limits of TABLE A (Page 25).
•	Refer to TABLE A (Page 25)	
c.	SX PUMP DSCH HDR PRESS LOW (2-2-A2) - <u>NOT LIT</u>	c. Dispatch operator(s) to perform the following:
		• Check for leaks in the Aux Bldg.
		• Dispatch Operator to look for leaks SXCT area.
		• Verify SX strainer backwash isolated.
Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 5	(continued)	
	d. CNMT indications - <u>NORMAL</u>: • CNMT sump flow recorders (2PM12J) - <u>NORMAL</u>: • Floor Drain Sump (2FT-RF008) • RX Cavity Sump (2FT-RF010)	d. Perform the following to isolate one RCFC train: 1) Shutdown NON-running SX pump's train RCFCs: - o Train 2A: • 2A and 2C RCFCs - o Train 2B: • 2B and 2D RCFCs 2) Close associated RCFC train isol valves: - o 2SX016A and 2SX027A - o 2SX016B and 2SX027B <u>IF</u> leak is <u>NOT</u> stopped, <u>THEN</u> perform the following: 1) Unisolate previously isolated RCFC train. 2) Swap running SX pumps. 3) Isolate other RCFC train.
Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 5 (continued)	e. Aux Bldg indications - <u>NORMAL</u>: 1) No report of locally observed leak 2) SX PUMP SUCT VLV PIT LEVEL HIGH (2-2-D2) - <u>NOT LIT</u> 3) Contact Radwaste Operator to verify following: • Leak detection sumps - <u>NOT IN ALARM</u> • Aux Bldg sumps - <u>NORMAL</u>	e. Perform the following: 1) Locate and isolate the leak. - o <u>IF</u> Unit 2 CC HX must be isolated, <u>THEN</u> align Unit 0 CC HX to cool Unit 2 loads per BOP CC-10, ALIGNMENT OF THE U-0 CC PUMP AND U-0 HX TO A UNIT. - o <u>IF</u> one SX train must be isolated, <u>THEN</u> swap running equipment to the NON-affected train. - o <u>IF</u> a SX break beyond the capacity of system makeup can <u>NOT</u> be isolated, <u>THEN</u> perform the following: 1) Stop Unit 2 SX pumps. 2) Close the riser and bypass valves on the SX tower with the lowest level. 2) Evaluate potential equipment damage due to flooding. Step continued on next page

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 5	(continued)	
		3) <u>WHEN</u> SX system integrity has been restored, <u>THEN</u> perform the following: a) Vent affected portions of the SX system as necessary per BOP SX-7, FILLING AND VENTING THE SX SYSTEM. b) RETURN TO Step 1 (Page 2) .
6	<u>REFER TO TECH SPECS:</u>	
	• 3.5.2 • 3.7.8 • 3.7.9 • Other Tech Specs as applicable	
7	<u>RETURN TO PROCEDURE AND STEP IN EFFECT</u>	
	-END-	

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 1 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
1	<u>START STANDBY UNIT 1 SX PUMP:</u>	
	a. Check RCFC SX isol valves for standby SX pump - <u>OPEN</u>: - o 1A SX pump: • 1SX016A • 1SX027A - o 1B SX pump: • 1SX016B • 1SX027B b. Start standby UNIT 1 SX pump	a. Manually or locally open valve(s): - o 1SX016A (374 +29 RXB1 P-15) - o 1SX027A (374 +29 RXB1 P-14) - o 1SX016B (401 +2 RXB1 P-7) - o 1SX027B (401 +2 RXB1 P-9) b. GO TO Step 3 (Next Page) .
* 2	<u>CROSSTIE TO BOTH UNIT 1 SX PUMPS:</u>	
	a. Open Unit 0 CC HX inlet valves: • 2SX005 • 1SX005 b. Check SX pump crosstie valves - <u>OPEN</u>: • 2SX033 • 2SX034 • 1SX033 • 1SX034 c. Check UNIT 1 SX pump discharge pressure - <u>GREATER THAN 90 PSIG</u> d. GO TO Step 6 (Page 22)	a. Locally open valve(s): - o 2SX005 (330 P19 AB2) - o 1SX005 (330 P19 AB2) b. Manually or locally open valve(s): - o 2SX033 (330 P16 AB1) - o 2SX034 (330 P20 AB2) - o 1SX033 (330 Q17 AB1) - o 1SX034 (330 Q19 AB2) c. GO TO Step 5 (Page 21) .

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 2 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u> 3 <u>ALIGN FOR SINGLE PUMP CROSSTIE:</u> a. Stop RCFCs for non-running UNIT 1 SX pump: - o 1A SX pump: • 1A RCFC • 1C RCFC - o 1B SX pump: • 1B RCFC • 1D RCFC b. Close RCFC SX isol valves for non-running UNIT 1 SX pump: - o 1A SX pump: • 1SX016A • 1SX027A - o 1B SX pump: • 1SX016B • 1SX027B c. Stop ONE pair of UNIT 2 RCFCs for SX isol: - o 2A and 2C RCFCs - o 2B and 2D RCFCs d. Close associated UNIT 2 RCFC train SX isol valves: - o 2SX016A and 2SX027A - o 2SX016B and 2SX027B e. Monitor CNMT temperature and pressure on both units		
		b. <u>IF</u> NEITHER SX isol valves can be manually closed, <u>THEN</u> locally close the SX inlet isol valve: - o 1SX016A (374 +29 RXB1 P-15) - o 1SX016B (401 +2 RXB1 P-7) d. <u>IF</u> NEITHER SX isol valves can be manually closed, <u>THEN</u> locally close the SX inlet isol valve: - o 2SX016A (374 +29 RXB2 P-15) - o 2SX016B (401 +2 RXB2 P-7)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 3 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
4	<u>CROSSTIE TO SINGLE UNIT 1 SX PUMP:</u>	
a.	Open Unit 0 CC HX inlet valves:	a. Locally open valve(s):
	• 2SX005 • 1SX005	○ 2SX005 (330 P19 AB2) ○ 1SX005 (330 P19 AB2)
b.	Check SX pump crosstie valves - <u>OPEN</u> :	b. Manually or locally open valve(s):
	• 2SX033 • 2SX034 • 1SX033 • 1SX034	○ 2SX033 (330 P16 AB1) ○ 2SX034 (330 P20 AB2) ○ 1SX033 (330 Q17 AB1) ○ 1SX034 (330 Q19 AB2)

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 4 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
5	<u>MONITOR SX SYSTEM:</u>	
a.	Maintain the following:	a. Perform the following:
	• UNIT 1 SX pump(s): • Motor amps - <u>LESS THAN 180 AMPS</u> • Discharge pressure - <u>GREATER THAN 90 PSIG</u> • CC heat exchanger outlet temperature - <u>LESS THAN 105°F:</u> • 2TI-674 (Unit 2 CC HX) • 1TI-674 (UNIT 1 CC HX) • 0TI-675 (Unit 0 CC HX)	- o Isolate SX to Unit 2 RCFC train(s): a) Shutdown RCFC train(s): - o 2A and 2C RCFC - o 2B and 2D RCFC b) Close RCFC SX outlet valve(s): - o 2SX027A - o 2SX027B c) Monitor CNMT temperature and pressure. - o Locally throttle CC heat exchanger(s) SX outlet valve(s) as necessary: - o 0SX007 (346 L16 AB1) - o 2SX007 (346 M20) - o 1SX007 (346 M16) - o Shutdown ANY unnecessary DGs.
b.	Check running CENT CHG pump oil temperature(s) on computer group #59 - <u>NORMAL</u> - o 2A CENT CHG pump - o 2B CENT CHG pump - o 1A CENT CHG pump - o 1B CENT CHG pump	b. Align emergency FP cooling per ATTACHMENT B (Page 23).

Step continued on next page

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT A (PG 5 OF 5)</u> <u>ESSENTIAL SERVICE WATER SYSTEM CROSSTIE</u>		
Step 5	(continued)	
	c. Monitor temperatures on UNIT 2 equipment cooled by SX per TABLE A (Page 25) d. Shutdown ANY equipment exceeding the limits of TABLE A (Page 25) e. Realign riser and bypass valves per BOP SX-T2, SX TOWER OPERATION GUIDELINES	
6	<u>CHECK CHILLERS OPERATING:</u>	
	a. Control room chillers - <u>ONE RUNNING</u> b. CNMT chillers - <u>ONE RUNNING</u>	a. Start one chiller per BOP VC-10, STARTUP OF THE CONTROL ROOM CHILLED WATER SYSTEM. b. <u>IF</u> SX flowpath to one RCFC train is available, <u>THEN</u> start the associated chiller per BOP VP-1, RCFC REFRIGERATION UNIT AND CHILLED WATER SYSTEM STARTUP.
7	<u>RETURN TO MAIN BODY, Step 2 (Page 6)</u>	
-END-		

REV. 105	ESSENTIAL SERVICE WATER MALFUNCTION UNIT 2	2BOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT B (PG 1 OF 2)</u> <u>ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER</u> ***** * <u>NOTE</u> * * Consideration should be given to * * aligning the standby pump to ensure * * cooling upon an auto start. * ***** ***** * <u>NOTE</u> * * Initiating emergency FP cooling to * * the 1B and 2B CENT CHG pump oil * * coolers may cause a Fire Suppression * * Alarm in Zone(s) 1S-60 and 2S-53. * ***** 1 <u>ALIGN FP COOLING TO AFFECTED CENT CHG PUMP(S):</u> a. Connect FP supply hose(s). b. Open FP hose supply isol valve: - o 2A Cent Chg pump 0FP5171 (364 +3 V18 AB2) - o 2B Cent Chg pump 2FP5162 (364 X21 RXB2) - o 1A Cent Chg pump 0FP5170 (364 +2 V18 AB2) - o 1B Cent Chg pump 1FP5162 (364 X13 RXB1) c. Open CENT CHG pump oil cooler FP supply valve: - o 2A Cent Chg pump 2SX2200A (364 +2 V21 RXB2) - o 2B Cent Chg pump 2SX2200B (364 +2 Z21 RXB2) - o 1A Cent Chg pump 1SX2200A (364 +1 V15 RXB1) - o 1B Cent Chg pump 1SX2200B (364 +2 Z15 RXB1) Step continued on next page		

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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>ATTACHMENT B (PG 2 OF 2)</u> <u>ALIGNING EMERGENCY FP COOLING TO CENT CHG PUMP OIL COOLER</u> Step 1 (continued) d. Close CENT CHG pump oil cooler SX supply valve: - o 2A Cent Chg pump 2SX2199A (364 +2 V21 RXB2) - o 2B Cent Chg pump 2SX2199B (364 +2 Z21 AB2) - o 1A Cent Chg pump 1SX2199A (364 +4 V15 RXB1) - o 1B Cent Chg pump 1SX2199B (364 +2 Z15 RXB1) e. Place a portable fan in door opening as necessary to maintain running CENT CHG pump room(s) temperature - <u>NORMAL</u> 2 <u>RETURN TO PROCEDURE AND STEP IN EFFECT</u> -END-		

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

TABLE A (PG 1 OF 1)
VITAL EQUIPMENT TEMPERATURE LIMITS

1 MONITOR RUNNING EQUIPMENT TEMPERATURE LIMITS:

- RCPs temperature (Computer Groups #10 and #11) - LESS THAN MAXIMUM LIMITS:
 - RCP Mtr Radial Brng - 195° F
 - RCP Mtr Thrust Brng - 195° F
 - RCP Lower Radial Brng - 225° F
 - RCP Seal Leakoff - 235° F
- CENT CHG Pumps temperature (Computer Group #59) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 205° F
 - Outbd Brng - 205° F
 - Thrust Brng - 195° F
- SX Pumps temperature (Computer Group #64) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 175° F
 - Outbd Brng - 175° F
- SI Pumps temperature (Computer Group #52) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 205° F
 - Outbd Brng - 205° F
 - Thrust Brng - 205° F
- Motor Driven AF Pump temperatures (Computer Group #74) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 165° F
 - Outbd Brng - 165° F
 - Thrust Brng - 165° F
- Diesel Driven AF Pump temperatures - LESS THAN MAXIMUM LIMITS:
 - Maximum temperatures per BOP AF-7T1, DIESEL DRIVEN AUXILIARY FEEDWATER PUMP OPERATING LOG
- DGs temperature - LESS THAN MAXIMUM LIMITS:
 - Maximum temperatures per BOP DG-11T2, DIESEL GENERATOR OPERATING LOG

-END-

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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A. PURPOSE

This procedure provides actions required in the event of a complete loss of Ultimate Heat Sink (UHS) cooling capability.

B. SYMPTOMS OR ENTRY CONDITIONS

- 1) The following conditions may cause entry into this procedure:
 - o A complete loss of SX pump capability coincident with an inability to crosstie to an alternate unit SX supply.
- 2) The following procedures may cause entry into this procedure:
 - o 1/2BOA PRI-7, ESSENTIAL SERVICE WATER MALFUNCTION

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	<u>CAUTION</u> Recovery actions in this procedure may place a Unit in BCA-0.0, LOSS OF ALL AC POWER, care will be required to coordinate procedures with abnormal entry conditions. <u>CAUTION</u> Temperatures of running equipment cooled by SX and CC should be monitored for overheating using TABLE A. ***** * <u>NOTE</u> * * With this procedure in effect the * * Emergency Director shall evaluate * * for EMERGENCY PLAN conditions. * ***** ***** * <u>NOTE</u> * * This procedure isolates SX cooling * * to the CC HXs. Unit-1 and Unit-2 * * should perform BOA PRI-6 concurrent * * with this procedure. * ***** 1 <u>CHECK SX PUMP AVAILABLE:</u> a. Any SX pump available for start: - o SX pump 1A - o SX pump 1B - o SX pump 2A - o SX pump 2B b. RETURN TO procedure and step in effect. a. Perform the following for each affected Unit while continuing with this procedure at Step 2 (Next Page): 1) Trip the Reactor. 2) GO TO BEP-0, REACTOR TRIP OR SAFETY INJECTION.	

STEP

ACTION/EXPECTED RESPONSE

RESPONSE NOT OBTAINED

CAUTION

If Alternate cooling can not be established to the D/Gs before they overheat, they should be secured until cooling is established.

CAUTION

If AC power is unavailable, it will be necessary to restore SX flow and equipment in stages. With cooling to the 1B D/G, bus 144 may be energized to power additional FP cooling using the 0A Fire pump.

2 CHECK 4KV ESF BUSSES ENERGIZED BY OFFSITE POWER:

- 141
- 142
- 241
- 242

Concurrently perform the following without delay:

- a. Dispatch an operator to locally crosstie FP to SX:
 - 1) Close CC HX SX outlet isol valves:
 - 1SX007 (346 L16 AB1)
 - 2SX007 (346 L20 AB2)
 - 0SX007 (346 L16 AB1)
 - 2) Unlock (A-2 key) and open SX to FP X-tie Isol valves:
 - 0SX172 (383 +2 M20 AB2)
 - 0SX174 (346 +10 P15 AB1)
- b. Isolate SX to RCFC trains by manually or locally closing:
 - 1SX016A (374 RXB1 P-15)
 - 1SX016B (401 RXB1 P-7)
 - 2SX016A (401 RXB2 P-15)
 - 2SX016B (401 RXB2 P-7)
- c. IF bus 142 is energized by a diesel, THEN energize bus 144 from bus 142:
 - 1) Place 0B WS pump in PTL.
 - 2) Synchronize and close ACB 1421.

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3	<u>CHECK ALTERNATE SX SUPPLY AVAILABLE:</u> a. Check FP system - <u>AVAILABLE:</u> - o 0B FP pump - <u>OPERABLE</u> - o 0A FP pump - <u>OPERABLE</u>	a. <u>IF</u> the WS system available, <u>THEN</u> crosstie WS to supply FP: 1) Increase WS system pressure: - o Start additional WS pump(s). - o Consult TSC to throttle WS valves to increase WS header pressure. 2) <u>WHEN</u> WS pressure is greater than FP pressure, <u>THEN</u> unlock (A-2 key) and open WS to FP X-tie Isol valve: • 0FP507 (401 +20 K35 TB2)

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
<u>CAUTION</u> Minimum SX flow supplied from FP system requires isolation of SX flow to CC HXs and RCFC trains.		
4	<u>PREPARE ALTERNATE SX SUPPLY:</u> a. Dispatch an operator to locally close CC HX SX outlet isols: • 1SX007 (346 L16 AB1) • 2SX007 (346 L20 AB2) • 0SX007 (346 L16 AB1) b. Crosstie SX Train supply headers: 1) Open Unit 0 CC HX SX inlet valves: • 1SX005 • 2SX005 2) Check SX train isol valves - <u>OPEN</u>: • Unit 1 valves: • 1SX004 • 1SX033 • 1SX034 • Unit 2 valves: • 2SX004 • 2SX033 • 2SX034	1) Locally open valve(s): ○ 1SX005 (330 +6 P19 AB2) ○ 2SX005 (330 +4 P19 AB2) 2) Manually or locally open valve(s): ○ 1SX004 (330 +11 Q17 AB1) ○ 1SX033 (330 +5 Q17 AB1) ○ 1SX034 (330 +5 Q19 AB2) ○ 2SX004 (330 +6 P17 AB1) ○ 2SX033 (330 +5 P16 AB1) ○ 2SX034 (330 +5 P20 AB2)
Step continued on next page		

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
Step 4	(continued)	
	c. Minimize SX system load:	
	1) Isolate RCFC flow:	
	a) Close Unit 1 isol valves:	a) Locally close valve(s).
	• 1SX016A • 1SX016B	- o 1SX016A (374 RXB1 P-15) - o 1SX016B (401 RXB1 P-7)
	b) Close Unit 2 isol valves:	b) Locally close valve(s).
	• 2SX016A • 2SX016B	- o 2SX016A (374 RXB2 P-15) - o 2SX016B (401 RXB2 P-7)
	2) Stop unrequired DGs and place in - <u>PULL OUT</u>	
	- o 2A DG - o 1A DG - o 2B DG - o 1B DG	

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	<pre> ***** * NOTE * * One fire pump will ONLY support one DG at a reduced flow rate. Two fire * * pumps can supply all 4 DGs. * ***** ***** * NOTE * * 1B DG is preferred because 0A Fire pump is powered from 144, 2B DG can * * be connected to 144 using jumpers. * ***** </pre>	
5	<u>ALIGN ALTERNATE SX SUPPLY:</u>	
	a. Dispatch an operator to crosstie FP to SX - <u>LOCALLY UNLOCK</u> (A-2 key) <u>AND OPEN</u>: • 0SX172 (383 +2 M20 AB2) • 0SX174 (346 +10 P15 AB1) b. Check BOTH FP pumps - <u>RUNNING</u>: • FIRE PUMP 0A RUNNING alarm (0-38-B7) - <u>LIT</u> • FIRE PUMP 0B RUNNING alarm (0-38-B8) - <u>LIT</u>	b. Perform the following: 1) Dispatch an operator to locally start pump(s). <u>IF</u> power is <u>NOT</u> available to the 0A fire pump, <u>THEN</u> consult TSC to establish a power supply. 2) Stop unsupported DGs and place in - <u>PULL OUT</u>: • 1A DG • 2A DG • 2B DG 3) Monitor SX flow to 1B DG using: • 1FI-SX133, (401 P10 AB1) 4) Unlock and throttle SX to 1B DG to <u>600 GPM</u> minimum: - o 1SX057B (401 +5 P10 AB1)

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	***** * <u>NOTE</u> * * FP header pressures less than 70 * * PSIG risk runout of pumps. * *****	
6	<u>CHECK SX CAPABILITIES:</u>	
	a. Check running CENT CHG pump(s) oil temperature(s) - <u>NORMAL</u> o Computer Group #59 b. Check SX system pressure - <u>GREATER THAN 80 PSIG</u>	a. Align emergency FP cooling per 1/2BOA PRI-7, SX MALFUNCTION ATTACHMENT B. b. Consult TSC to determine loads available to throttle or isolate to increase system pressure: o Establish minimum <u>600</u> <u>GPM</u> SX flow to running DG(s): a) Monitor SX flow: • 1A DG 1FI-SX132, (401 P-10 AB1) • 1B DG 1FI-SX133, (401 P-10 AB1) • 2A DG 2FI-SX132, (401 N-25 AB2) • 2B DG 2FI-SX133, (401 N-24 AB2) b) Obtain keys and unlock and throttle close: - o 1SX057A (Key 1177) (401 +8 P10 AB1) - o 1SX057B (Key 1178) (401 +5 P10 AB1) - o 2SX057A (Key 2151) (401 +6 Q25 RXB2) - o 2SX057B (Key 2152) (401 +5 Q25 RXB2) o Other unrequired SX system loads.

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	***** * <u>NOTE</u> * * SX return flow may overflow the MDCT * * to the storm sewer and CROP. * *****	
7	<u>ALIGN SX RETURN FLOW:</u>	
	a. Verify CROP level will remain - <u>LESS THAN OVERFLOW</u> b. Isolate CW blowdown: • OCW018A • OCW018B c. Maintain CW flume level - <u>GREATER THAN 15 FEET</u>	a. Operate the diesel CROP pump as required. c. Initiate CW makeup per BOP CW-9, CIRCULATING WATER MAKE-UP PUMP START-UP

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	<pre> ***** * NOTE * * SX will remain unavailable to cool * * Unit-1 and Unit-0 CC HX. * ***** ***** * NOTE * * Installation of jumpers may be * * required to support energizing * * necessary equipment. * ***** </pre>	
8	<u>DETERMINE RECOVERY PLAN:</u> a. Monitor temperatures of running equipment cooled by SX and CC using TABLE A (Next Page) b. Consult TSC for long term recovery plan c. Evaluate methods to increase available SX cooling: - o Throttling excess flow to running components - o Isolate SX flow to unneeded equipment - o Optimize alignment of required equipment d. Evaluate methods to crosstie Unit-2 CC system to supply cooling to Unit-1 components e. Evaluate methods of maintaining adequate water supplies: - o Energize makeup equipment - o Obtain water from outside supplies -END-	

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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TABLE A (PG 1 OF 2)
VITAL EQUIPMENT TEMPERATURES

1 MONITOR RUNNING EQUIPMENT
TEMPERATURE LIMITS:

- RCPs temperature (Computer Groups #10 and #11) - LESS THAN MAXIMUM LIMITS:
 - RCP Mtr Radial Brng - 195°F
 - RCP Mtr Thrust Brng - 195°F
 - RCP Lower Radial Brng - 225°F
 - RCP Seal Leakoff - 235°F
- CENT CHG Pumps temperature (Computer Group #59) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 205°F
 - Outbd Brng - 205°F
 - Thrust Brng - 195°F
- SX Pumps temperature (Computer Group #64) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 175°F
 - Outbd Brng - 175°F
- SI Pumps temperature (Computer Group #52) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 205°F
 - Outbd Brng - 205°F
 - Thrust Brng - 205°F
- Motor Driven AF Pump temperatures (Computer Group #74) - LESS THAN MAXIMUM LIMITS:
 - Inbd Brng - 165°F
 - Outbd Brng - 165°F
 - Thrust Brng - 165°F

Step continued on next page

REV. 0	LOSS OF ULTIMATE HEAT SINK UNIT 0	OBOA PRI-7
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STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
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TABLE A (PG 2 OF 2)
VITAL EQUIPMENT TEMPERATURES

Step 1 (continued)

- o Diesel Driven AF Pump
temperatures - LESS THAN
MAXIMUM LIMITS:
 - Maximum temperatures per BOP
AF-7T1, DIESEL DRIVEN
AUXILIARY FEEDWATER PUMP
OPERATING LOG
- o DGs temperature - LESS THAN
MAXIMUM LIMITS:
 - Maximum temperatures per BOP
DG-11T2, DIESEL GENERATOR
OPERATING LOG

-END-

(Final)

PROTECTED EQUIPMENT PROGRAM

1. PURPOSE

- 1.1. This procedure provides guidance for protecting equipment in order to minimize plant risk. This involves limiting or prohibiting operation or maintenance of plant equipment when SSCs are made unavailable.
- 1.2. The intent of protecting systems and components is to provide additional administrative barriers to guard against inadvertently rendering a component or system, which is important to unit risk and nuclear safety, inoperable or unavailable. It is also applicable to those systems and activities that pose a potential risk to generation.
- 1.3. Protected equipment actions taken in accordance with this procedure support the Configuration Risk Management Program and are classified as risk management actions for the purpose of compliance with 10CFR50.65 (a)(4). Failure to meet the requirements of this procedure is a potential violation of 10CFR50.65 (a)(4).
- 1.4. This procedure applies to online and shutdown conditions.
 - The online goal is to maintain plant risk within acceptable levels by maintaining defense in depth of key safety functions, preventing inadvertent plant trips, transients, or Technical Specification Limiting Conditions for Operations (LCO) entries.
 - The shutdown goal is to maintain shutdown risk within acceptable levels by maintaining defense in depth of key safety functions.
- 1.5. It is acceptable to protect additional equipment at the discretion of the Shift Manager. The Shift Manager has final authority on what equipment will be protected and allowing work on or around protected equipment.
- 1.6. The intent of this procedure is not to have equipment permanently protected. If a SSC were to become unavailable and the unavailability of the SSC alone causes a red risk condition, then protecting of this equipment under normal plant conditions is not required.

2. **TERMS AND DEFINITIONS**

2.1. **Key Safety Functions:** They are listed as follows:

- Decay Heat Removal
- Spent Fuel Pool Cooling (Outage)
- Inventory Control
- Electrical Power (includes both onsite & offsite power)
- Reactivity Control
- Primary Containment Integrity (Containment Isolation, Containment Pressure and Temperature Control)

2.2. **Predetermined Protection Schemes:** A standardized protection scheme that uses PARAGON (the Exelon Configuration Risk Management Software) for risk significant SSCs to determine what equipment to protect. Protection schemes for Technical Specifications and unit generation are determined manually by knowledge of Technical Specification requirements and plant operations. Predetermined protection schemes are maintained in either an electronic database or a site specific procedure/T&RM that can be administered by Operations. The use of standardized postings ensures a consistent application of the protected equipment program and reduces work activity conflicts associated with the protected train.

2.3. **Protected Equipment:** Any SSC which has been identified as being essential to ensure that either defense-in-depth of a Key Safety Function is maintained, unit generation is maintained or overall risk levels are maintained.

2.4. **SSC:** Structure, System, or Component

3. **RESPONSIBILITIES**

3.1. **Equipment Operator and / or Reactor Operator**

- Installs protected equipment postings and barriers.
- Walks down protected equipment postings each shift.

3.2. **Shift Supervisor**

- Ensures protected equipment is tracked.

3.3. **Shift Manager**

- Has overall authority of the protected equipment program.
- Authorizes work on or within two feet of protected equipment.
- Communicates protected equipment status changes to the station duty team and Shutdown Safety Manager (if applicable).

3.4. Shutdown Safety Review Board

- Determines the protected equipment requirements for all scheduled outages based on plant configuration and planned defense-in-depth.

3.5. Work Week Manager and / or Cycle Manager

- In conjunction with Risk Engineers and Operations Services, determines the protected equipment requirements for all online workweek activities and unplanned outages.

4. **MAIN BODY**

4.1. Development of Protected Equipment

4.1.1. The Shutdown Safety Manager or designee determines the protected equipment requirements for all scheduled outages based on plant configuration and planned defense-in-depth.

4.1.2. Outage Management and Operations determines the protected equipment requirements for all unplanned outages.

4.1.3. Online Work Management and Operations determines the protected equipment requirements for all online workweek activities.

4.1.4. Shift Management will promptly determine the systems and components to be protected for emergent issues affecting risk significant SSC availability.

4.2. When to Protect Equipment

4.2.1. **When** SSCs are planned to or become unavailable, **then PROTECT** redundant equipment if plant configuration is such that redundant equipment unavailability or manipulation would cause:

1. An overall online or outage risk assessment change to red risk (**CM-2, CM-3, CM-4**),
2. A loss of generation capability of > 20 MWe, or
3. An entry into Tech Spec 3.0.3 (3.0.1 for TMI) or a shutdown Tech Spec LCO of 12 hrs or less.

4.2.2. **When** SSCs are planned to or become unavailable and overall online or outage risk results in an actual orange or red risk, **then PROTECT** the redundant SSCs. (**CM-2, CM-3, CM-4**)

4.2.3. **When** SSCs are planned to or become unavailable and outage risk for a key safety function results in an actual orange or red risk, **then PROTECT** the redundant SSCs.

- 4.2.4. **When** a degrading trend in a critical plant parameter for a SSC has been identified, **then PROTECT** the redundant SSC if the unavailability of the redundant SSC results in an actual orange or red risk condition.
- For example, if a site has two fuel pool cooling pumps and the running pump is identified as having an increasing trend in outboard bearing temperature during an outage when increased fuel pool loading exists and a loss of one FPC pump would cause an orange condition, then the redundant fuel pool cooling pump (i.e., pump without the degrading condition) should be protected.
- 4.2.5. At a minimum, **PROTECT** the following during outage conditions: **(CM-1)**
- One in-service decay heat removal train and required support systems with fuel in the reactor vessel,
 - One reactor inventory make-up train and required support systems with fuel in the reactor vessel, and
 - One spent fuel pool cooling train once core offload starts until the time to boil in the spent fuel pool is greater than 24 hours.
- 4.2.6. **PROTECT** equipment as directed by site specific procedures.
- NOTE: Single components within a switchyard may be protected by locking the switchyard or by flagging off the single component.
- 4.2.7. **When** entire switchyards or areas with fences and gates are being protected, **then PROTECT** the equipment using one of the following two methods:
- A lock and/or chain different than that used for normal access.
 - A physical barrier placed in front of the gate used for normal access.
- 4.2.8. **When** deemed prudent by the Shift Manager, **then IMPLEMENT** additional equipment protection.
- 4.2.9. The Shift Manager has final authority in determining systems and equipment to be protected. Adding additional components or modifying where signs / barriers are posted is acceptable provided a reduction in the scope of the protected equipment does not occur. Reducing the scope of protected equipment is not acceptable.
- 4.3. Posting of Protected Equipment Signs and Robust Barriers
- 4.3.1. Protected equipment and systems are to be clearly identified in the field to prevent inadvertent work on or near the protected equipment. Physical barriers are to be used whenever possible, particularly in cases where bumping into a component may cause an inadvertent trip or system transient. **(CM-1)**
- 4.3.2. Protected equipment postings are to be encompassing enough to alert personnel from all directions. **(CM-1)**

- 4.3.3. For short duration equipment unavailability, such as surveillance testing of less than one shift (typically less than 8 to 12 hrs), posting is not required.
- 4.3.4. Relying solely on the work schedule to prevent work on or activity around protected equipment is not acceptable.
- 4.3.5. **PROTECT** equipment using at least one of the following posting methods: **(CM-1)**
- Barrier rope, devices, or tape that establishes a boundary around the protected equipment with applicable postings to warn personnel of vital information regarding protected equipment status.
 - Placement of highly visible reminders such as “little men,” orange cones, or easels that can also bear signage to delineate the protected equipment. Reusable laminated signs are also an alternative.
 - Magnetic placards that are placed on breaker doors or panels to mark the protected equipment.
 - Barrier rope, physical devices, tape and other similar devices or door handle covers for room doors.
 - Protective Covers (clamshells, plastic cylinders or rings) may be placed over devices that should not be manipulated, as long as operability is not affected.
- 4.3.6. **WHEN** equipment protection is required, **THEN POST** the following:
- The equipment being protected,
 - Main power supply feed breaker or driving force supply isolation valve, and
 - Instrumentation, which if tripped, would render the protected equipment unavailable. Consider both the transmitters and the associated trip units.
- 4.3.7. The following considerations and examples should also be evaluated when protecting equipment:
- For extent of protection, barriers must extend back at least one component. For example:
 - Concerning pumps, the local and remote control switches, the pump general area, the power supply (i.e. back to the pump feeder breaker), specific instruments (or instrument racks as appropriate) that could cause a pump trip, and support systems (e.g. cooling water) back to the first isolation valve from the pump.
 - For valves, the local and remote control switches, the valve general area, the valve driving force (i.e. main power supply feed breaker or air supply isolation valve), and interlocked valves (i.e. valves that when stroked could cause the valve being protected to change position).
 - During outage conditions, extent of protection for a decay heat removal train and an inventory make-up train must extend back to an available offsite feed and an available emergency feed. Additionally, a train of support systems must be protected. For example:

- For a decay heat removal pump, in addition to what is stated in the above bullet under pumps, also include the bus, one normal electrical supply feed and one emergency electrical supply feed to the bus (including the emergency diesel generator), a heat exchanger cooling water supply pump and control, associated trip instrumentation of the power supply and cooling water pump.
- Concerning electrical buses, load centers and MCC's:
 - When protecting a breaker on a bus, load center or MCC, protecting an entire bus, load center or MCC is an acceptable method of protection. However, work on individual breaker compartments, when the entire bus, load center or MCC is protected, should not be allowed.
 - If an entire bus, load center or MCC is protected, then racking breakers in on that bus, load center or MCC is not permitted unless step 4.4.3 is followed. Racking out or removing breakers is permitted provided a procedure is used and a pre-job brief has been performed in accordance with HU-AA-1211.
 - If an entire bus, load center or MCC is not protected but a single breaker on the bus, load center or MCC is protected, then breaker compartment work that could in no way affect the entire bus is permissible when individual breakers are protected. For example, a compartment elevator inspection would be allowed, but breaker relay trip testing would not be allowed as a human performance issue could lead to a bus trip.
- For large components, consider posting room doors or general area ingress.
- When protecting an entire system, consider placing barriers on control panel controls, in front of room/area ingress points, in front of the main load center under which a majority of the breakers are located, and around instrument racks that provide system trips.

CAUTION

Though a consistent list of protected equipment when taking an SSC out of service is desirable, additional SSCs that may also be out of service at the same have the potential to increase the list of protected equipment. The configuration specific results must be reviewed to validate the protected equipment list.

4.3.8. **UTILIZE** predetermined protection schemes (if available).

1. Deletion of elements from the predetermined protection scheme must be approved by the Shift Manager and must be covered by another posting method.
2. More extensive postings must include all elements of the predetermined protection scheme.

4.4. Work on or Near Protected Equipment (CM-1)

4.4.1. Generally, work on or within 2 feet of protected equipment will not be allowed. Exceptions to this rule are as follows:

- Operator performing rounds, inspections, and alarm response.
- Fire Brigade Members and the Medical Response Team during response to emergencies.
- Personnel performing Abnormal Operating Procedures / Emergency Operating Procedures / Emergency Plan actions.
- Security Officers who have received an appropriate brief from Shift Management and are performing their official rounds or alarm response.
- Radiation Protection personnel performing non-intrusive radiological surveys and are responding to radiation alarms / changing plant conditions.
- Fire Patrols who have received an appropriate brief from Shift Management and are performing their official duties.
- Electrical and instrument maintenance activities on loads supplied by protected switchgear, load control center, or vital instrument busses provided that the load is isolated from the protected equipment by a clearance or over-current protection (e.g. fuse or breaker) is available to isolate the protected power supply from equipment fault or personnel error at an energized work location.
- Changing burned out light bulbs.
- Other activities as approved by the Shift Manager.

NOTE: It is understood that emergent equipment failures may occur and a required surveillance test may need to be performed on the protected equipment to prevent the test from becoming overdue. Planned system or component outages should take into account protected equipment requirements and the surveillance test schedule prior to removing the equipment from service.

4.4.2. The following evolutions should not be performed on protected equipment:

- Corrective or elective maintenance,
- Preventative maintenance which is intrusive in nature,
- Preventative maintenance or non-critical surveillance testing where an unsatisfactory outcome could render the equipment unavailable,
- Any evolution where human performance error could result in damage to or loss of the protected equipment unless the Shift Manager agrees there is reasonable assurance that no adverse effects could occur,
- Equipment or system operation which renders the protected equipment unavailable, or
- Work on electrical sources that could fault switchgear or load control centers.

- 4.4.3. **If** work on protected equipment is absolutely required, **then COMPLY** with the following:
- Work must be authorized by the Shift Manager,
 - Work group will receive a protected equipment pre-job briefing from the Shift Manager,
 - Discuss the conditions that would make the protected equipment being worked on unavailable. Identify barriers in the planned work that will prevent the equipment from becoming unavailable,
 - Continuous work group supervisory oversight of the work activity,
 - Operations will consider whether additional posting is required due to work in the area, and
 - Operations supervision will provide periodic monitoring of work in the affected area.
- 4.4.4. **If** work within 2 feet of protected equipment is absolutely required, **then COMPLY** with the following:
- Work must be authorized by the Shift Manager,
 - Work group will receive a protected equipment pre-job briefing from the Shift Manager,
 - Discuss the conditions that would make the protected equipment become unavailable. Identify barriers in the planned work that will prevent the equipment from becoming unavailable,
 - Periodic work group supervisory oversight of the work activity, and
 - Operations will consider whether additional posting is required due to work in the area.
- 4.5. Protected Equipment Tracking Sheets
- 4.5.1. **TRACK** protected equipment using a tracking log.
- 4.5.2. The tracking log may be hard copy or electronic facsimile and has no retention requirements.
- 4.5.3. The tracking log will be completed by Operations and it shall contain the following minimum information:
- Equipment number or noun name
 - Location and type of posting device
 - Installation check-off information
 - Removal check-off information

4.6. Protected Equipment Verification and Communication (CM-1)

4.6.1. **WALKDOWN** protected equipment postings during rounds **and VERIFY** the following:

1. The postings remain properly established.
2. No unauthorized work is being performed on or within 2 feet of the protected equipment.
3. There is nothing in the area (e.g., scaffolding) that could interfere with the functioning of the protected equipment.

4.6.2. **ENSURE** frequent communications to station and supplemental workers identify the status of protected equipment and any planned protected equipment changes.

4.6.3. **REVIEW** protected equipment at the following meetings or briefings:

- Operations shift turnover meetings
- Daily / shiftly standard department (including contractors) briefings
- Daily POD meeting
- Shiftly Outage briefings
- Daily Online Work Control meetings

4.6.4. **COMMUNICATE** protected equipment status changes and emergent conditions requiring equipment to be protected to station and supplemental workers.

1. Communications may include a plant PA announcement.

4.6.5. **COMMUNICATE** switchyard protected equipment to the Transmission Operator **and INFORM** them that the protected equipment is considered vital and no actions should be performed that could jeopardize power availability.

5. **DOCUMENTATION**

5.1. None

6. **REFERENCES**

6.1. Commitments

- 6.1.1. CM-1: INPO SOER 09-1, Shutdown Safety (Steps 4.2.5, 4.3.1, 4.3.2, 4.3.5, 4.4, 4.6)
- 6.1.2. CM-2: Braidwood License Amendment #108 (Steps 4.2.1.1 and 4.2.2)
- 6.1.3. CM-3: Byron License Amendment #114 (Steps 4.2.1.1 and 4.2.2)
- 6.1.4. CM-4: Clinton License Amendment #141 (Steps 4.2.1.1 and 4.2.2)

6.2. Procedures

- 6.2.1. HU-AA-1211, Briefings – Pre-Job, Heightened Level of Awareness, Infrequent Plant Activity and Post-Job Briefings
- 6.2.2. OU-AA-103, Shutdown Safety Management Program
- 6.2.3. WC-AA-101, Online Work Control Process

7. **ATTACHMENTS**

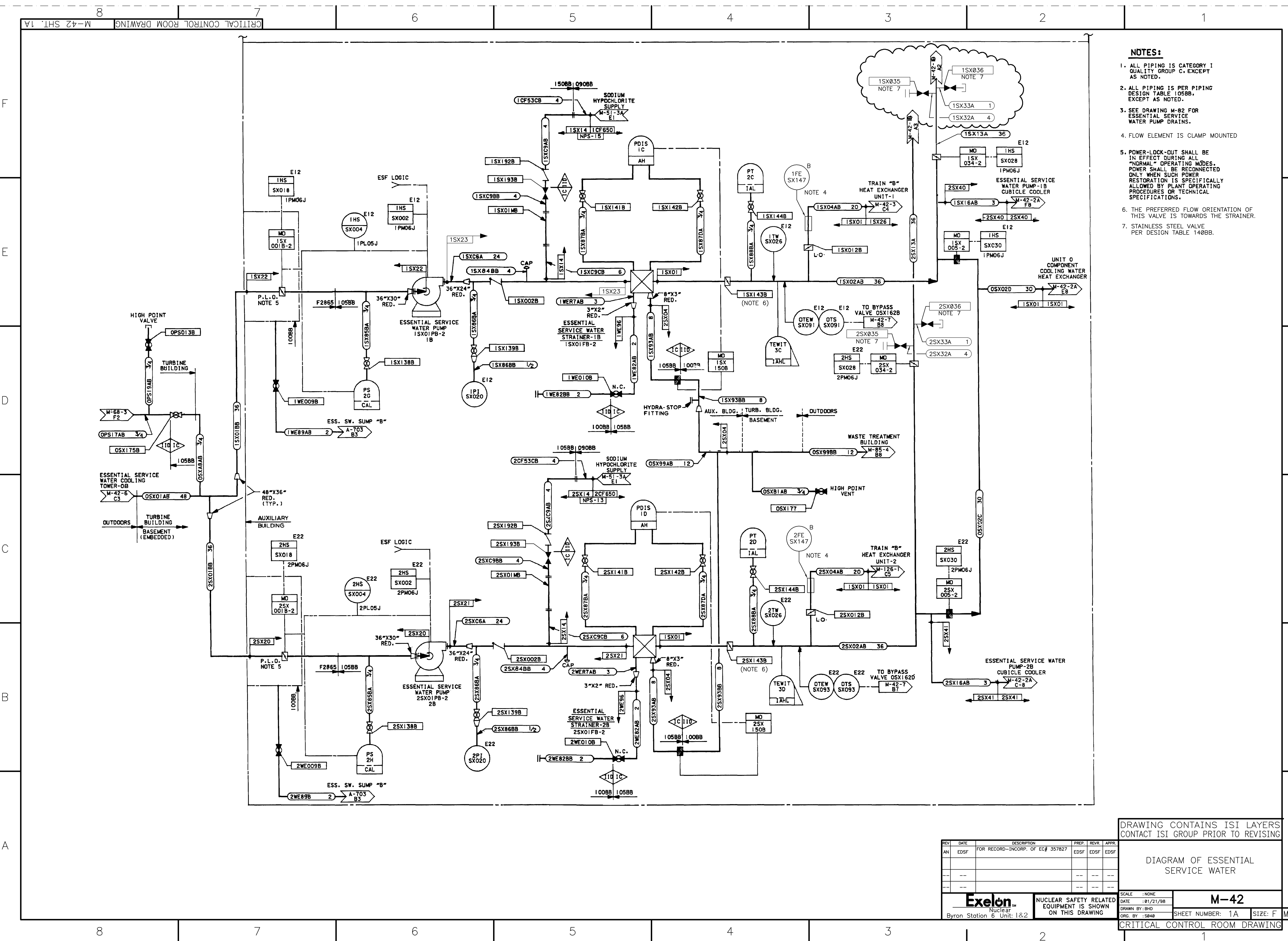
- 7.1. None

ATTACHMENT 4
SX System Piping and Instrumentation Diagrams

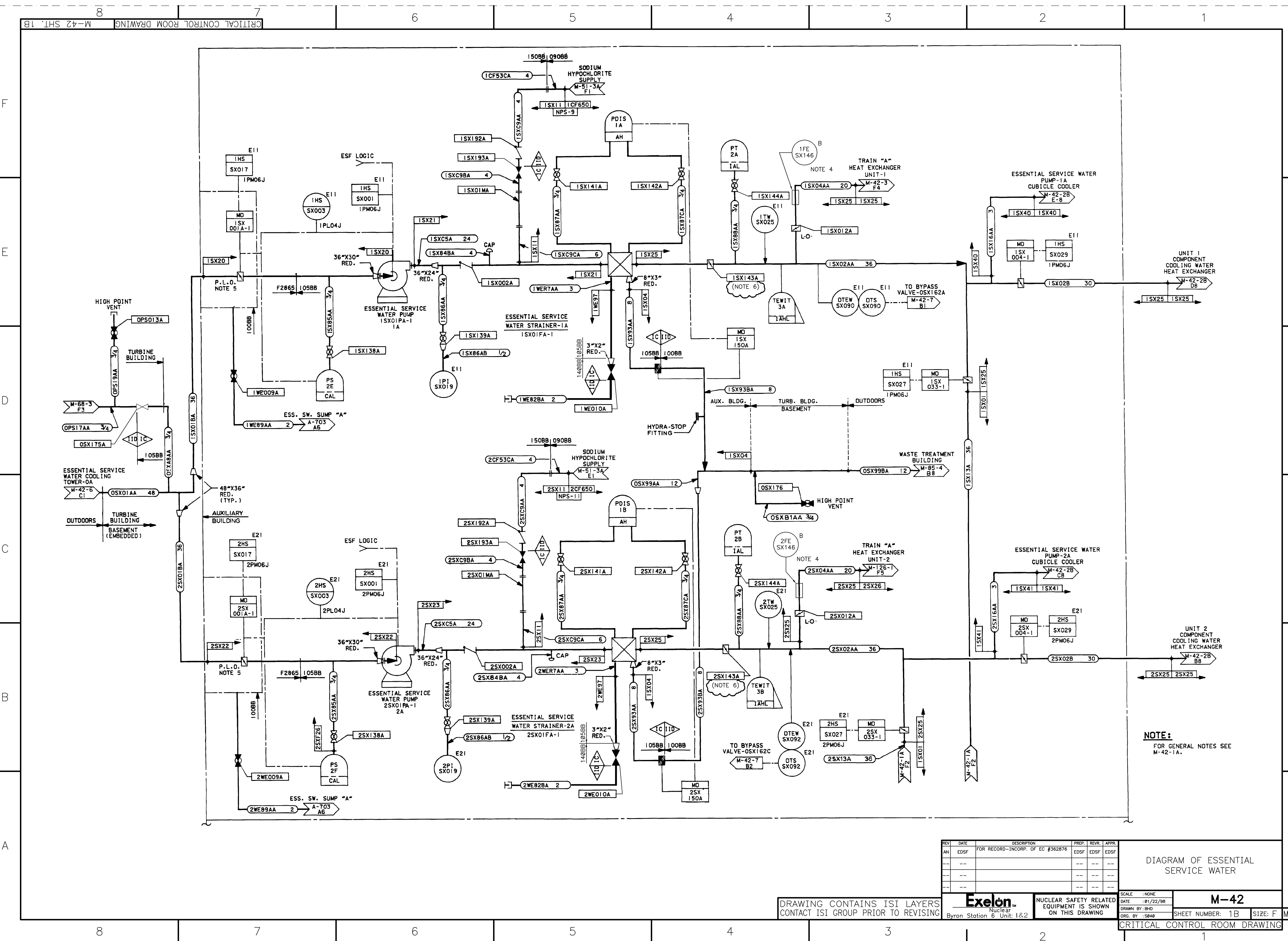
List of Attached Documents

1. M-42, Sheet 1A, "Diagram of Essential Service Water," Revision AN
2. M-42, Sheet 1B, "Diagram of Essential Service Water," Revision AN
3. M-42, Sheet 2A, "Diagram of Essential Service Water," Revision AW
4. M-42, Sheet 2B, "Diagram of Essential Service Water," Revision AW
5. M-42, Sheet 3, "Diagram of Essential Service Water," Revision AZ
6. M-42, Sheet 4, "Diagram of Essential Service Water," Revision AN
7. M-42, Sheet 5A, "Diagram of Essential Service Water (Primary Containment Vent System)," Revision AE
8. M-42, Sheet 5B, "Diagram of Essential Service Water (Primary Containment Vent System)," Revision AE
9. M-42, Sheet 6, "Diagram of Essential Service Water," Revision AZ
10. M-42, Sheet 7, "Diagram of Essential Service Water," Revision AE
11. M-126, Sheet 1, "Diagram of Essential Service Water," Revision AZ
12. M-126, Sheet 2, "Diagram of Essential Service Water," Revision AD
13. M-126, Sheet 3, "Diagram of Essential Service Water (Primary Containment Ventilation System)," Revision AE

DRAWING CONTAINS ISI LAYERS



DRAWING CONTAINS ISI LAYERS



NOTES:

- UNLESS OTHERWISE INDICATED ALL PIPING IS SAFETY CATEGORY I. QUALITY GROUP C.
- SPEC. F2865 OUTDOOR HEADERS.
- UNLESS OTHERWISE INDICATED ALL PIPING ON THIS DRAWING IS PER PIPING DESIGN TABLE 105BB.
- VALVE EQUIPPED WITH A ROTATIONAL STOP TO LIMIT FLOW. SEE DWG. F-2918-2 SD-C-109231.
- VALVE INTERNALS REMOVED.
- STAINLESS STEEL VALVE PER DESIGN TABLE 0140BB.

REVISION TABLE:

REV	DATE	DESCRIPTION	PREP.	REV.	APPR.
AW	EDSF	FOR RECORD--INCORP. OF EC# 367626	EDSF	EDSF	EDSF
---	---	---	---	---	---
---	---	---	---	---	---
---	---	---	---	---	---

EXELON
Byron Station 6 Unit 1&2

DIAGRAM OF ESSENTIAL SERVICE WATER

SCALE: 1"=100'
DATE: 10/22/98
DRAWN BY: BHD
ORG. BY: 5840

SHEET NUMBER: 2A
SIZE: F
CRITICAL CONTROL ROOM DRAWING

1. UNLESS OTHERWISE INDICATED ALL PIPING IS SAFETY CATEGORY I, QUALITY GROUP C.
2. SPEC. F2865 OUTDOOR HEADERS.
3. UNLESS OTHERWISE INDICATED ALL PIPING ON THIS DRAWING IS PER PIPING DESIGN TABLE 105BB.
4. VALVE EQUIPPED WITH A ROTATIONAL STOP TO LIMIT FLOW. SEE DWG. F-2918-2 SD-C-109231.
5. VALVE INTERNALS REMOVED.
6. STAINLESS STEEL VALVE PER DESIGN TABLE 0140BB.

ORG. BY : S040	SHEET NUMBER: 2A	SIZE: F	M05
CRITICAL CONTROL ROOM DRAWING			

FOR NOTES SEE DWG. M-42 SHT. 2A

**DRAWING CONTAINS ISI LAYERS
CONTACT ISI GROUP PRIOR TO REVISING**

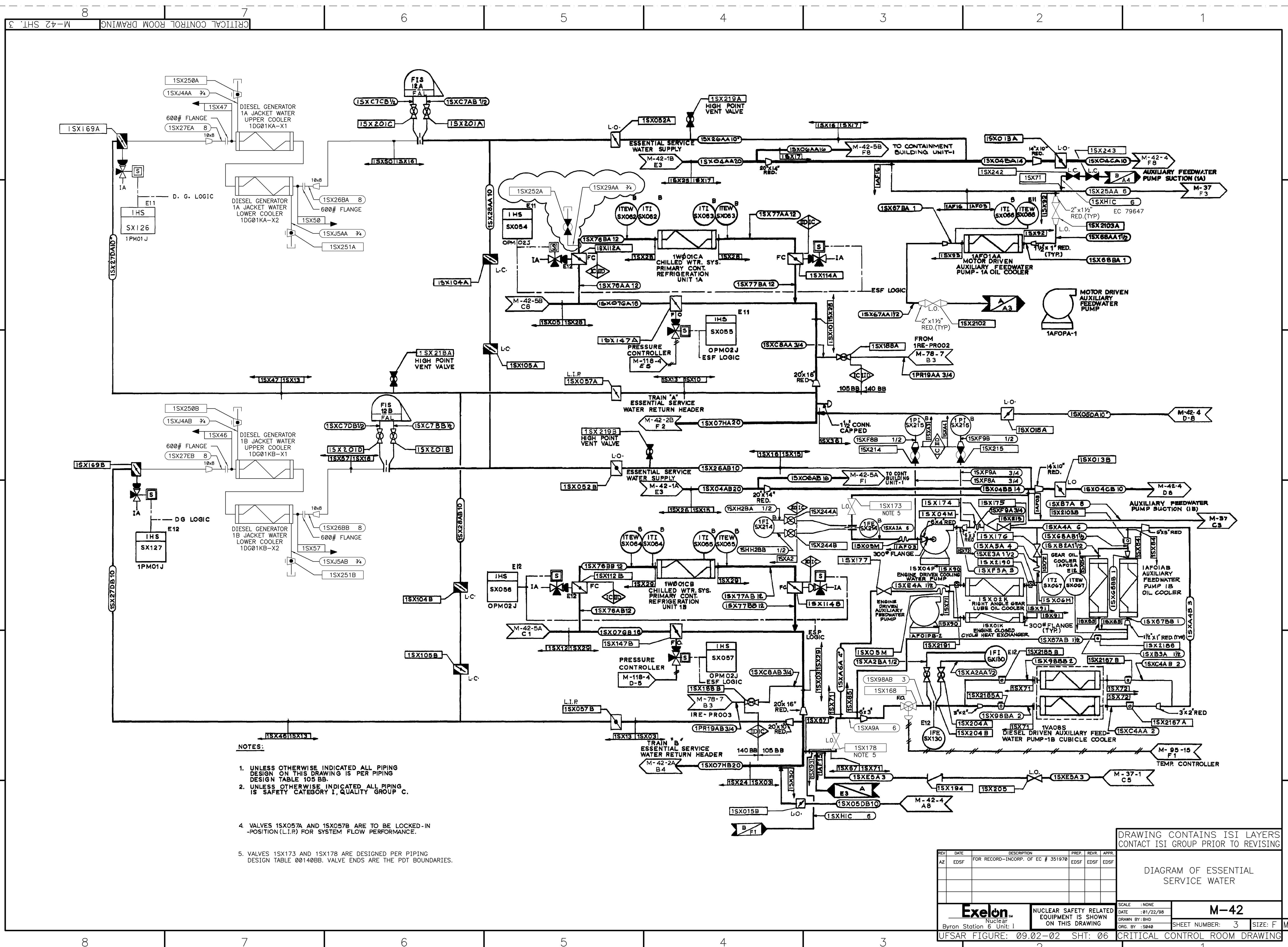
REV	DATE	DESCRIPTION	PREP.	REVR.	APPR.
AW	EDSF	FOR RECORD-INCORP. OF EC# 360951	EDSF	EDSF	EDSF

Exelon
Nuclear Safety Related Equipment is Shown on This Drawing

SCALE : NONE
DATE : 01/22/98
DRAWN BY: BHD
ORG. BY : SBH

M-42
SHEET NUMBER: 2B SIZE: F

CRITICAL CONTROL ROOM DRAWING



- NOTES:
1. UNLESS OTHERWISE INDICATED ALL PIPING DESIGN ON THIS DRAWING IS PER PIPING DESIGN TABLE 105 BB.
 2. UNLESS OTHERWISE INDICATED ALL PIPING IS SAFETY CATEGORY I, QUALITY GROUP C.
 3. VALVES 1SX057A AND 1SX057B ARE TO BE LOCKED-IN POSITION (L.I.P.) FOR SYSTEM FLOW PERFORMANCE.
 4. VALVES 1SX173 AND 1SX178 ARE DESIGNED PER PIPING DESIGN TABLE 00140BB. VALVE ENDS ARE THE PDT BOUNDARIES.

REV

DATE

DESCRIPTION

PREP

REV

APPR

AZ	EDSF	FOR RECORD-INCORP. OF EC # 351978	EDSF	EDSF	EDSF

Exelon

Nuclear Safety Related Equipment is Shown on this Drawing

Byron Station 6 Unit 1

UFSAR FIGURE: 09.02-02 SHT: 06

DRAWING CONTAINS ISI LAYERS CONTACT ISI GROUP PRIOR TO REVISING

DIAGRAM OF ESSENTIAL SERVICE WATER

SCALE: NONE

DATE: 01/22/98

DRAWN BY: BHO

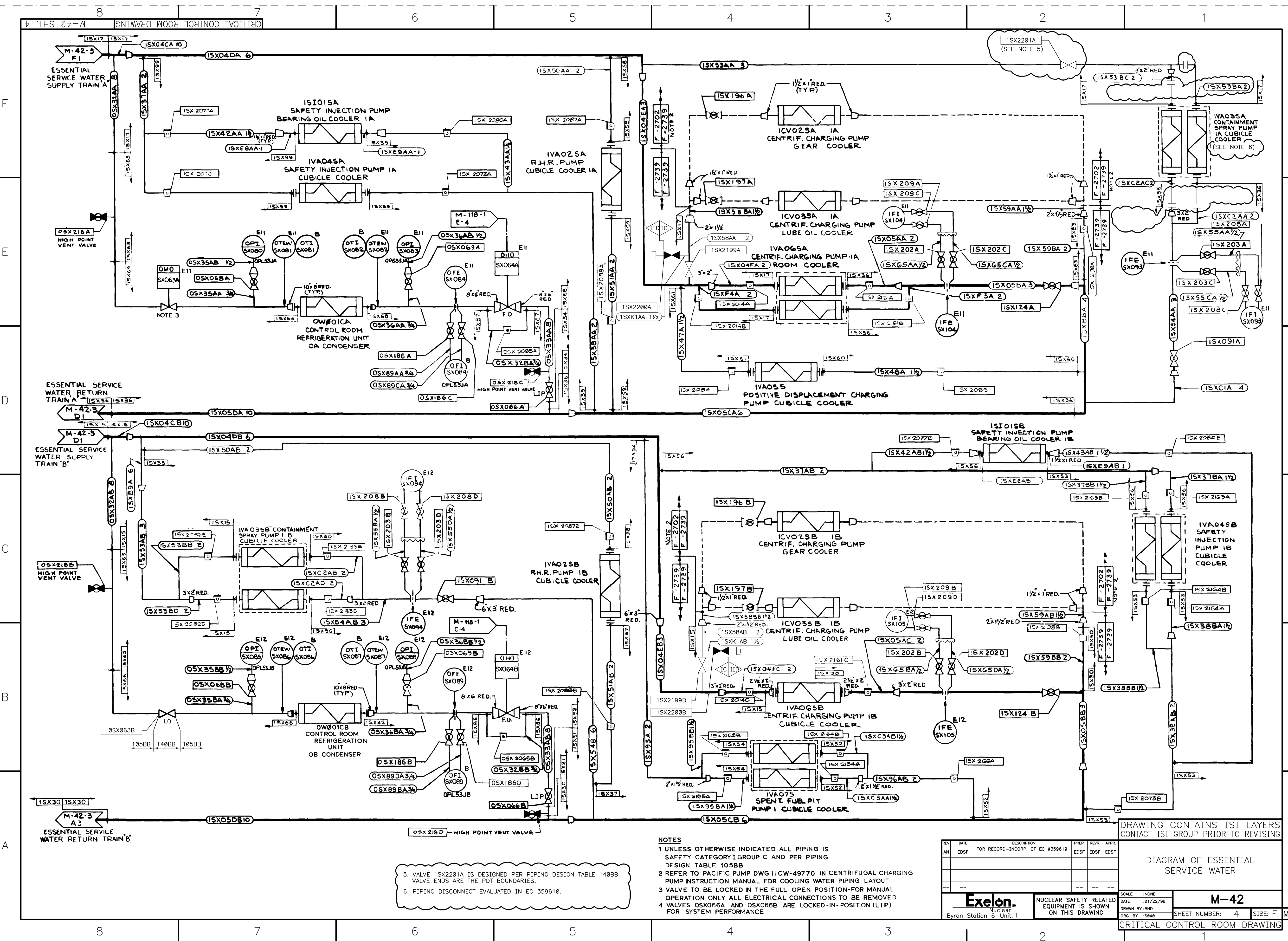
CHK BY: SBA

SHEET NUMBER: 3

SIZE: F

M05

DRAWING CONTAINS ISI LAYERS



- NOTES
- 1 UNLESS OTHERWISE INDICATED ALL PIPING IS SAFETY CATEGORY I GROUP C AND PER PIPING DESIGN TABLE 105BB
 - 2 REFER TO PACIFIC PUMP DWG 11CW-49770 IN CENTRIFUGAL CHARGING PUMP INSTRUCTION MANUAL FOR COOLING WATER PIPING LAYOUT
 - 3 VALVE TO BE LOCKED IN THE FULL OPEN POSITION-FOR MANUAL OPERATION ONLY ALL ELECTRICAL CONNECTIONS TO BE REMOVED
 - 4 VALVES OSX066A AND OSX066B ARE LOCKED-IN-POSITION (LIP) FOR SYSTEM PERFORMANCE

5. VALVE 1SX2201A IS DESIGNED PER PIPING DESIGN TABLE 140BB. VALVE ENDS ARE THE PDT BOUNDARIES.

6. PIPING DISCONNECT EVALUATED IN EC 359610.

REV	DATE	DESCRIPTION	PREP	REV	APPR
AN	EDSF	FOR RECORD-INCORP. OF EC #359610	EDSF	EDSF	EDSF

Exelon Nuclear
Byron Station 6 Unit: I

NUCLEAR SAFETY RELATED EQUIPMENT IS SHOWN ON THIS DRAWING

DRAWING CONTAINS ISI LAYERS
CONTACT ISI GROUP PRIOR TO REVISING

DIAGRAM OF ESSENTIAL SERVICE WATER

SCALE: NONE

DATE: 01/22/98

DRAWN BY: BHO

CHK. BY: JSAB

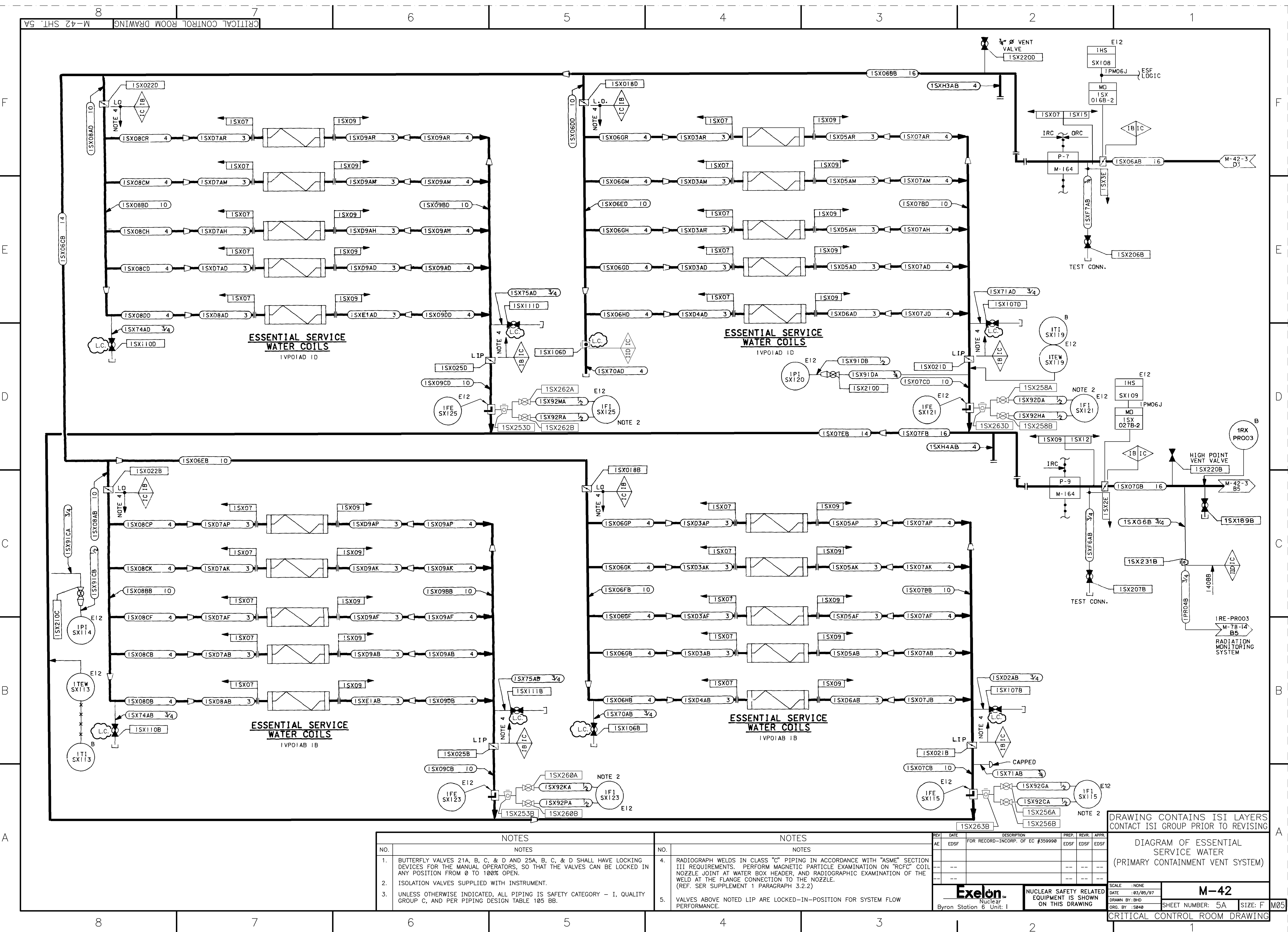
SHEET NUMBER: 4

SIZE: F

M-42

CRITICAL CONTROL ROOM DRAWING

DRAWING CONTAINS ISI LAYERS



This diagram illustrates the Primary Containment Vent System (PCVS) for the M-42 station, showing the flow paths for Essential Service Water Coils (ESWCs) and associated piping components.

The system is divided into three main sections, each labeled "ESSENTIAL SERVICE WATER COILS":

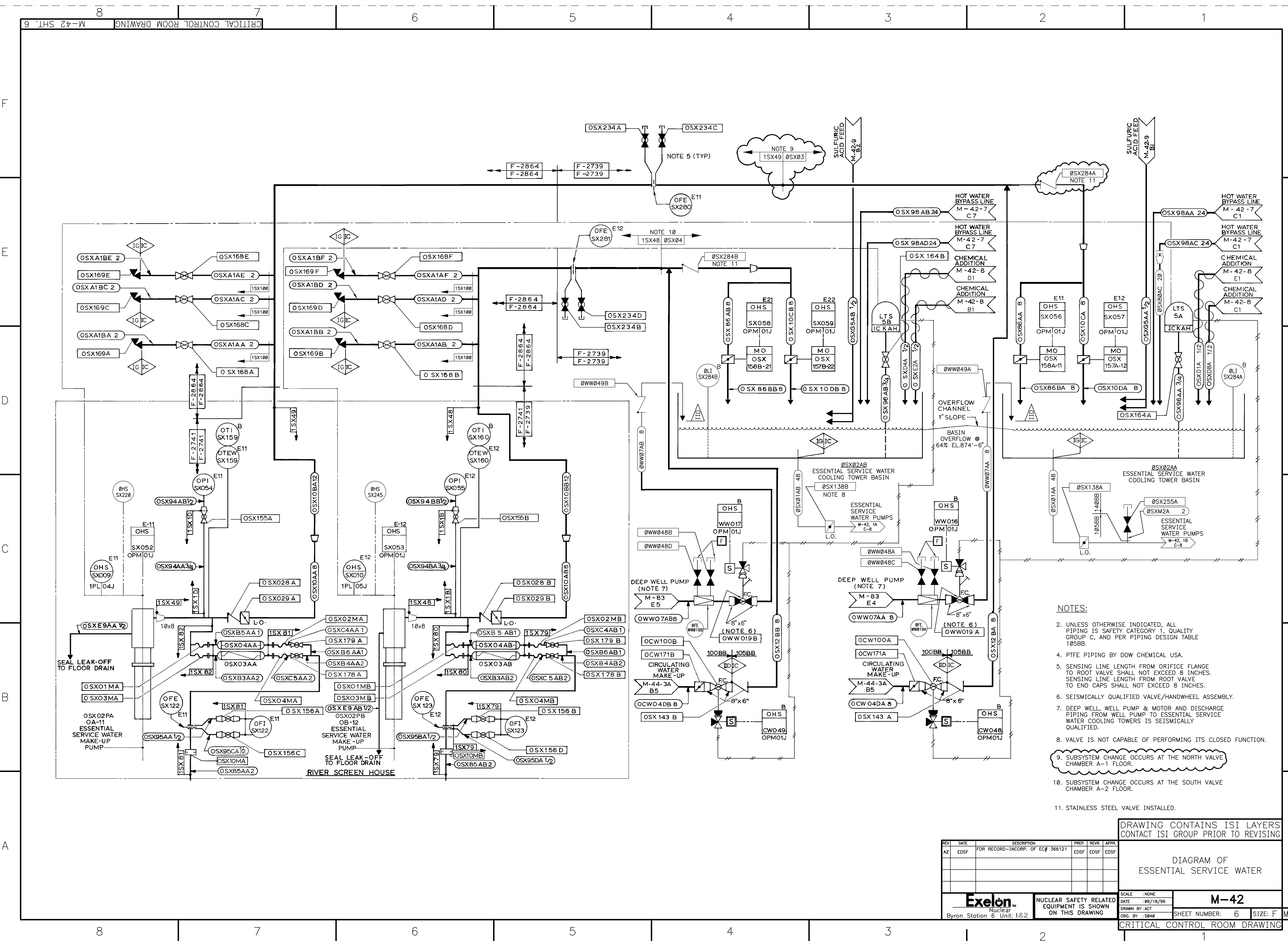
- Top Section:** Features four parallel loops of ESWCs. Each loop consists of two coils connected in series. The top-left loop includes coils 1SX06AA, 1SX06BA, 1SX06CA, and 1SX06DA. The top-right loop includes coils 1SX08AA, 1SX08BA, 1SX08CA, and 1SX08DA. The bottom-left loop includes coils 1SX07AA, 1SX07BA, 1SX07CA, and 1SX07DA. The bottom-right loop includes coils 1SX09AA, 1SX09BA, 1SX09CA, and 1SX09DA. Each loop is controlled by a set of valves (e.g., 1SX06A, 1SX06B, etc.) and has its own set of pressure gauges (e.g., 1SI06A, 1SI06B, etc.).
- Middle Section:** Contains two additional ESWC loops, one on the left and one on the right. These loops are similar in configuration to the others, with their own sets of coils, valves, and gauges.
- Bottom Section:** Shows the distribution and return lines for the entire system, including various control valves, gauges, and instrumentation points.

Key components and labels include:

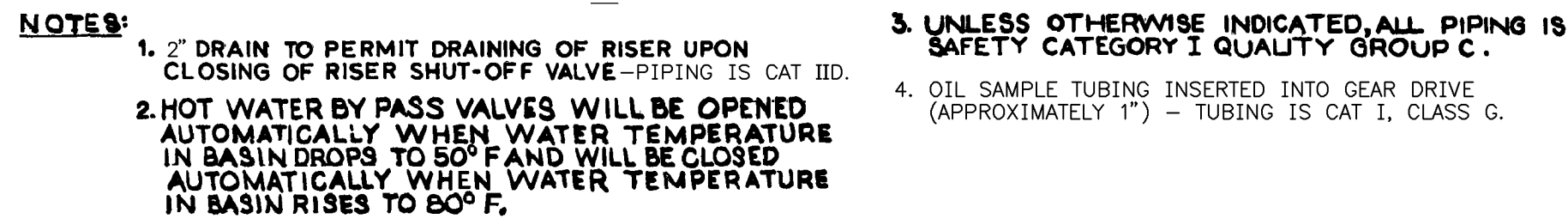
- Piping:** Labeled with codes such as 1SX06AA, 1SX06BA, 1SX06CA, 1SX06DA, 1SX07AA, 1SX07BA, 1SX07CA, 1SX07DA, 1SX08AA, 1SX08BA, 1SX08CA, 1SX08DA, 1SX09AA, 1SX09BA, 1SX09CA, 1SX09DA.
- Valves:** Indicated by symbols like 1SX06A, 1SX06B, 1SX06C, 1SX06D, 1SX07A, 1SX07B, 1SX07C, 1SX07D, 1SX08A, 1SX08B, 1SX08C, 1SX08D, 1SX09A, 1SX09B, 1SX09C, 1SX09D.
- Gauges:** Represented by circles with labels like 1SI06A, 1SI06B, 1SI06C, 1SI06D, 1SI07A, 1SI07B, 1SI07C, 1SI07D, 1SI08A, 1SI08B, 1SI08C, 1SI08D, 1SI09A, 1SI09B, 1SI09C, 1SI09D.
- Instrumentation:** Includes labels for pressure transmitters (e.g., 1SI06A, 1SI06B), level indicators (e.g., 1SI06A, 1SI06B), and other sensors.
- Notes:** Several notes are present throughout the diagram, providing specific instructions or warnings related to the system's operation and maintenance.

The drawing is titled "DIAGRAM OF ESSENTIAL SERVICE WATER (PRIMARY CONTAINMENT VENT SYSTEM)" and is identified as "M-42". It is a critical control room drawing, as indicated by the label "CRITICAL CONTROL ROOM DRAWING" at the bottom.

DRAWING CONTAINS ISI LAYERS



CRITICAL CONTROL ROOM DRAWING	M-42 SHT. 7
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 Nuclear Byron Station 6 Unit: 1&2	NUCLEAR SAFETY RELATED EQUIPMENT IS SHOWN ON THIS DRAWING
	UFSAR FIGURE: 09.02-02 SHT: 11

CD	SCALE : NONE	M-42	
	DATE : 01/22/98		
	DRAWN BY: BHD	SHEET NUMBER: 7	SIZE: F
	ORG. BY : S040		
CRITICAL CONTROL ROOM DRAWING			

8 7 6 5 4 3 2 1

CRITICAL CONTROL ROOM DRAWING

M-126 SHT. 1

1

2

3

4

5

6

7

8

Diagram illustrating the Essential Service Water system, showing various pumps, valves, and piping connections. Key components include:

- AUXILIARY FEED WATER PUMP SUCTION (2A)
- MOTOR DRIVEN AUXILIARY FEEDWATER PUMP
- 2AFO1AA MOTOR DRIVEN AUXILIARY FEEDWATER PUMP - 2A OIL COOLER
- ESF LOGIC
- CHILLED WATER SYS. PRIMARY CONT. REFRIGERATION UNIT - 2A 2W#01CA
- ESSENTIAL SERVICE WATER SUPPLY
- TRAIN "A" ESSENTIAL SERVICE WATER RETURN HEADER
- CHILLED WATER SYS. PRIMARY CONT. REFRIGERATION UNIT - 2B 2W#01CB
- ESSENTIAL SERVICE WATER SUPPLY
- TRAIN "B" ESSENTIAL SERVICE WATER RETURN HEADER
- DIESEL GENERATOR 2A JACKET WATER UPPER COOLER 2DG01KA-X1
- DIESEL GENERATOR 2A JACKET WATER LOWER COOLER 2DG01KA-X2
- DIESEL GENERATOR 2B JACKET WATER UPPER COOLER 2DG01KB-X1
- DIESEL GENERATOR 2B JACKET WATER LOWER COOLER 2DG01KB-X2

NOTES:

- UNLESS OTHERWISE INDICATED ALL PIPING IS PER DESIGN TABLE 105BB.
- UNLESS OTHERWISE INDICATED ALL PIPING IS SAFETY CATEGORY 1, QUALITY GROUP C.
- VALVES 2SX173 AND 2SX178 ARE DESIGNED PER PIPING DESIGN TABLE 00140BB. VALVE ENDS ARE THE PDT BOUNDARIES.

REV. DATE DESCRIPTION PREP. REV. APRR. AZ EDSF FOR RECORD-INCORP. OF EC 364909 EDSF EDSF EDSF

DATE: 04/04/00

DRAWN BY: DLB

ORG. BY: 5040

SCALE: NONE

NUCLEAR SAFETY RELATED EQUIPMENT IS SHOWN ON THIS DRAWING

DIAGRAM OF ESSENTIAL SERVICE WATER

M-126

SHEET NUMBER: 1

SIZE: F

CRITICAL CONTROL ROOM DRAWING

DRAWN BY: DLB	SHEET NUMBER: 1		SIZE: F
ORG. BY : S040			
CRITICAL CONTROL ROOM DRAWING			

ExelonSM
Nuclear
Byron Station 6 Unit: 2

SCALE	: NONE
DATE	: 04/04/0
DRAWN BY	: DLB
ORG. BY	: S040

CRITICAL CONTROL ROOM DRAWING

NOTES:

- UNLESS OTHERWISE INDICATED ALL PIPING IS SAFETY CATEGORY I GROUP C AND PER PIPING DESIGN TABLE 103.5B
- REFER TO PACIFIC PUMP DWG #C-49770 IN CENTRIFUGAL CHARGING PUMP INSTRUCTION MANUAL FOR COOLING WATER PIPING LAYOUT.
- VALVE EQUIPPED WITH ROTATIONAL STOP TO LIMIT FLOW. SEE DWG. F-2918-2 SD-C-109230 (1 1/2") SD-C-109231 (2")

REVISION TABLE:

REV	DATE	DESCRIPTION	PREP	REV	APPR
AA	03/23/00	FOR RECORD-INCORP. OF AS-BUILT DCR #998345	BHD	DLB	WTP
AB	09/01/00	FOR RECORD-INCORP. DCR #998486, (ADDED ISI INFORMATION)	RM	SK	WTP
AC	01/05/01	FOR RECORD-INCORP. OF TO #1396 (DCP #998575)	BHD	AGS	WTP
AD	07/30/01	FOR RECORD-INCORP. OF TO #1495 (DCP #998554)	BHD	JHL	WTP

DIAGRAM OF ESSENTIAL SERVICE WATER

Exelon
Nuclear
Byron Station Unit 1

NUCLEAR SAFETY RELATED EQUIPMENT IS SHOWN ON THIS DRAWING

SCALE: NONE
DATE: 03/23/00
DRAWN BY: BHD
SHEET NUMBER: 2
SIZE: F

M-126
CRITICAL CONTROL ROOM DRAWING

[illegible]

PPR.	DIAGRAM OF ESSENTIAL SERVICE WATER (PRIMARY CONTAINMENT VENTILATION SYSTEM)
DSF	
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ORG. BY : S040	SHEET NUMBER: 3	SIZE: F
CRITICAL CONTROL ROOM DRAWING		

_____ 1 _____

ATTACHMENT 5
Summary of Regulatory Commitments

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC ACTION (Yes/No)
The one-time extended CT condition will not be entered should adverse environmental conditions exist or are imminent (forecast within the next 12 hours). Adverse Environmental Conditions are defined as any of the following: ▪ Area environmental conditions such as icing, wind, or storms causing unexpected repeated station power line trips; ▪ Tornado Warning; ▪ Actual switchyard voltage alarms or notifications indicating voltage below that required for offsite source Technical Specifications operability limits; ▪ Predicted Unit trip contingency switchyard voltage below minimum required switchyard voltage (unless a site specific analysis has been performed); ▪ Notified that at the current time a condition exists such that if a transmission line or other transmission facility were to trip, then site will be below voltage operability limits. Should adverse environmental conditions develop after the extended CT condition has been entered, the work will proceed to complete the 1/2SX001A valve replacement.	Upon implementation of the one-time extension of the SX train Completion Time.	Yes	No

ATTACHMENT 5
Summary of Regulatory Commitments

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC ACTION (Yes/No)
OP-AA-108-117, "Protected Equipment Program," will be implemented at Byron Station by the start of the B2R15 refueling outage when the 1/2SX001A valve replacement is scheduled.	Required to be implemented prior to Byron Unit 2 B2R15 refueling outage.	Yes	No
Any planned or emergent changes to the analyzed configuration will be evaluated for impact to determine if there is any significant impact on internal events and fire PRA risk insights to confirm that appropriate risk management actions have been defined and implemented.	Upon implementation of the one-time extension of the SX train Completion Time.	Yes	No