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United States Nuclear Regulatory Commission
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Perry Nuclear Power Plant
Docket No. 50-440
License Amendment Request Regarding A Modification To The Emergency Service Water Alternate Intake Sluice Gate Automatic Opening Function And The Use of a Non-Safety Inflatable Seal

Ladies and Gentlemen:

Pursuant to 10 CFR 50.59 and 10 CFR 50.90, Nuclear Regulatory Commission review and approval of a license amendment involving a modification that changes the Perry Nuclear Power Plant (PNPP) as described in the Updated Safety Analysis Report (USAR) is requested. This license amendment proposes a modification to the Emergency Service Water (ESW) alternate intake sluice gate automatic opening function. The proposed modification will install a switch to allow defeating the automatic opening feature of these gates. It also requests approval of the use of a non-safety inflatable seal.

Prompt posting in the Federal Register and prompt review and approval is requested. It is anticipated that the proposed change could be required for continued plant operation during the summer months this year.

Attachment 1 provides a Summary, a Description of the Proposed Modification Change, a Safety Analysis, and an Environmental Consideration. Attachment 2 provides the Significant Hazards Consideration. Attachment 3 provides the annotated USAR pages reflecting the proposed change.

If you have questions or require additional information, please contact Mr. Gregory A. Dunn, Manager - Regulatory Affairs, at (440) 280-5305.

Very truly yours,

John K. Wood

Attachments

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

A001

I, John K. Wood, hereby affirm that (1) I am Vice President - Perry, of the FirstEnergy Nuclear Operating Company, (2) I am duly authorized to execute and file this certification as the duly authorized agent for The Cleveland Electric Illuminating Company, Toledo Edison Company, Ohio Edison Company, and Pennsylvania Power Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

John K. Wood

John K. Wood

Subscribed to and affirmed before me, the 1st day of June, 2000

Jane E. Mott

JANE E. MOTT
Notary Public, State of Ohio
My Commission Expires Feb. 20, 2005
(Recorded in Lake County)

Summary of Proposed Change

Pursuant to 10 CFR 50.59 and 10 CFR 50.90, Nuclear Regulatory Commission (NRC) review and approval of a license amendment involving a modification that changes the Perry Nuclear Power Plant (PNPP) as described in the Updated Safety Analysis Report (USAR) is requested. This license amendment proposes a modification to the Emergency Service Water (ESW) alternate intake sluice gate automatic opening function that would be limited to use during a maximum of five months during the summer. A proposed modification will install a non-safety inflatable sealing device on the gates between the ESW forebay and the alternate intake tunnel. The seal will greatly reduce the leakage of warm water from the Service Water discharge into the ESW forebay, and thus reduce the need to run ESW pumps to maintain forebay temperature below the design limit, 85 degrees Fahrenheit (°F) described in the USAR. As a result of the seal installation, a switch to allow defeating the automatic opening feature of these gates is required.

This modification is being submitted for NRC review and approval based upon a completed 10 CFR 50.59 Safety Evaluation. It was determined that utilization of the feature to allow defeating the automatic opening of the sluice gates and the use of non-safety components to inflate and maintain inflation of the seals would result in a slight "increase in the probability of occurrence of a malfunction of equipment important to safety" and a reduction of the "margin of safety as defined in the basis of technical specifications." Although 10 CFR 50.59 requires submittal of this change, due to the above conditions, the proposed modification and the contingency provision will provide a significant benefit by maintaining adequate margin to the ESW Design Temperature Limit, and by improving the reliability of the ESW system by reducing the run time of the ESW pumps.

Description of the Proposed Change

System Description:

The Emergency Service Water (ESW) System supplies cooling water to equipment required for normal and emergency shutdown of the reactor. It can also provide water to the site Fire Protection System, the Fuel Pool Cooling and Cleanup System, the Emergency Closed Cooling Water System, the Residual Heat Removal System (for containment flooding), and the Standby Liquid Control System.

The source of water and the Ultimate Heat Sink for the ESW System is Lake Erie. Water enters two intake structures, located at the bottom of Lake Erie, joins together and then travels through the intake tunnel to the plant (Figure 1). Before reaching the plant, the tunnel divides into two branches. One branch goes to the Service Water pumphouse and the other branch goes to the ESW pumphouse. As the water enters the ESW pumphouse, it travels over a weir structure into the forebay area (Figure 2). From the forebay, the water passes through two parallel sets of traveling screens that remove any large debris, and then flows into the pump suction basin. The three ESW pumps for Unit 1 take their suction from the suction basin. Each pump is designed to provide cooling water to one system loop and its respective loads.

After passing through the heat loads (Figure 3), the water from all three of the ESW Loops is collected in one discharge header and is directed to the discharge tunnel entrance structure. Other non-ESW cooling water load returns are also directed to the discharge tunnel entrance structure. In the discharge tunnel entrance structure, the water is directed into an impact wall to reduce the velocity and to redirect the flow of water into the discharge tunnel, which returns the water to the lake.

An alternate intake pathway is provided in the event the normal intake tunnel and structures become obstructed. A branch tunnel connects the discharge tunnel with the ESW pumphouse forebay. Two parallel Sluice Gates located in the ESW pumphouse, normally isolate this branch but will automatically open, on low ESW forebay water level, assuming the normal intake tunnel becomes blocked. The discharge tunnel then becomes the intake pathway. ESW discharge flow is then manually aligned to three overflow standpipes in the Auxiliary Building which causes the flow to be directed outside the building. The flow returns to the lake via a swale (located on the East end of the site).

Intake Structures and Tunnel

The normal source of water to the ESW System is the Service Water Intake Tunnel. Two intake structures (Figure 4), each designed to provide 100% flow for 2 Units, are located approximately 2650 feet offshore. Each structure is located such that it has about 13.3 feet of water above the top of the structure. Both structures feed the 10-foot diameter intake tunnel, which conveys the water to both the Service Water pumphouse and the ESW pumphouse. The intake structures are approximately 36 feet in diameter located 141 feet apart. Each consists of a steel superstructure, through which the intake flow occurs, imbedded in a steel and concrete base approximately 7 feet thick imbedded in the floor of the lake through which a 6-foot diameter intake pipe passes. The superstructure is about 4 foot high and extends 7 feet above the lakebed. Each intake is protected from floating ice islands by 10 seven-foot diameter vertical reinforced concrete caissons that stick up 6 inches above the top of the intake structure. While the caissons would provide significant protection, they are not specifically designed to protect the intakes from a ship grounding. The horizontal portion of the intake tunnel is excavated in the Chagrin rock formation with about 80 to 90 feet of rock over the top. The tunnel has an inside tunnel radius of 60 inches and a minimum concrete liner thickness of 10 inches. The concrete liner has a design concrete strength of 4,000 psi. The tunnels are not intersected by any active seismic fault or any fault that might slip in a seismic event. The structures are classified as Seismic Category 1.

Discharge Structure and Tunnel

The discharge of the ESW System returns to the lake via the Discharge Tunnel and Discharge Nozzle. The 10-foot diameter Discharge Tunnel conveys the water to a 6-foot diameter riser section leading to the Discharge Nozzle. The Discharge Nozzle is located approximately 1520 feet offshore in about 12.5 feet of water. The Discharge Tunnel as well as the Discharge Nozzle is classified as Seismic Category 1 structure.

Sluice Gates

There are two 20-foot tall, 4-foot wide sluice gates. The opening from a single fully open sluice gate is approximately equal to a 10-foot diameter tunnel. Each sluice gate consists of a gate with rollers, a frame with embedments, a hoist assembly (motor-operated rising stem type), and controls. The sluice gate hoist motors are 1 hp, 480 Vac units powered by divisional safety-related power. Each motor operator has provisions for manual operation.

Background:

The original design of the ESW sluice gates (0P45-D004A/B) had non-safety inflatable rubber seals on both sides of the gate. The sealed gates prevented warm water from the plant's water discharge from entering the ESW pumphouse and being circulated back to the ESW suction. Difficulty was experienced with the original seals due to their tendency to bind in the tracks, which would prevent the gates from fully closing. The seals were removed prior to commercial operation.

Subsequent to that time, on several occasions, Lake Erie temperature has exceeded 80 °F, due to extremely warm summers (in 1987 and 1988 the lake temperature reached 80 °F, in 1999 the lake was in excess of 82 °F). As a result, when the service water discharge to the lake reaches 80 °F, (at approximately 67 °F lake temperature) normally in mid-June, an ESW pump is started and used to circulate lake water into the ESW forebay, thereby reducing the forebay temperature. Lake temperature is therefore the limiting parameter. At 81.5 °F lake temperature, the ESW forebay approaches 85 °F, the ESW design limit for accident conditions and calculated leakage with no seal installed on the gate. The elevated forebay temperature causes additional run time on the ESW pumps and is not desired. Further, the unusually high lake temperature during the summer of 1999 challenged the plant's ability to maintain the ESW forebay temperature below its design limit using this system alignment.

After the PNPP staff reviewed several proposals, the staff selected the installation of one permanent non-safety inflatable seal on each of the existing sluice gates with a requisite modification of the automatic controls for opening the gates. The seal will eliminate the leakage and reduce the heat-up of the forebay. The proposed control logic modification will prevent damage to the new seals and to the sluice gate operating mechanism, the problems that prompted removal of the original seals.

Proposed Modification:

This proposed modification will install a new non-safety inflatable seal and seal retainer on the ESW forebay side of each of the two existing sluice gates. It will also include support equipment such as non-safety hoses and reels to supply air to the seals. A new-safety related Class 1E selector switch will also be installed to enable or defeat the manual raise/lower control switch and the automatic opening signal of the sluice gates. The installation of the seals and the control switch would not result in the requirement for prior NRC approval, provided administrative controls were established to ensure the proposed selector switch was maintained in the AUTO position and the seal was maintained deflated. The administrative controls will ensure that the gates continue to operate in the current mode that allows automatic operation for low forebay level. Defeating the automatic opening signal by placing the proposed selector switch in OFF, and operating with the non-safety seals inflated require prior NRC approval.

Defeating the Automatic Opening Signal

The Class 1E control circuits for the sluice gates use local controls having CLOSE, OPEN, and STOP momentary contact pushbuttons to allow lowering or raising the gates, or to stop the gates in mid-travel. Additionally, level switches (0P45-LS-N255A/B) in the ESW forebay each provide a low-level signal, which automatically opens the respective sluice gate A/B. Installation of inflatable seals on the gates requires that the seals be deflated to raise or lower the gates in order to avoid damaging the seals. Therefore, the automatic gate-opening signal must be defeated whenever the seals are inflated. The modification installs a safety-related key operated OFF/AUTO selector switch in each local gate control panel, 0H51-P971 and 0H51-P972. In the AUTO position, the switch contact is closed, allowing the circuit to function exactly the same as the current design. In the OFF position, the switch contact is open, preventing operation of both the open (raise) and the close (lower) control circuits. Thus, the automatic open capability and the manual electric open and close capability will be defeated. Local and control room gate position indicating lights remain functional, as well as the circuits' loss of power alarm and the forebay low level alarm. The modifications to the gate control circuitry will not affect the ability to open or auto-open the sluice gates when the seal is deflated and the key operated switch is in AUTO.

The keys for the key operated switches will be administratively controlled. During the months that the gates are in the closed position, the key operated switches will be placed in the OFF position, and the seals will be inflated. Local manual control and automatic opening will therefore be prevented. During the remainder of the year, the seals will be deflated and the key operated switches will be placed in the AUTO position. This will re-establish both automatic opening and local manual electric control.

Inflation and deflation of the seals will be accomplished by local manual action. Failure of the seals to inflate or inadvertent deflation would result in a condition similar to that, which currently exists. The gate would leak heated discharge water to the forebay. Although the probability analysis referenced in this document does not take credit for manual operation, the gates will retain the ability to be opened locally by deflating the seals and by using the open control switch after placing the proposed switch back in AUTO.

Plant Operation with the Sluice Gate Seals Inflated

The sluice gates in the closed position and the sluice gate seals, when inflated, provide isolation between the discharge tunnel and the ESW forebay so that recirculation of plant discharge water does not raise the ESW forebay above its design temperature limit. Performing this function assures that the ESW system is fully operable during all modes of operation and ensures ESW provides cooling water at or below its design temperature limit, i.e., the ESW system is capable of removing the maximum design heat load from the heat exchangers that it cools.

The sluice gates are safety-related and seismically designed and are therefore structurally adequate to provide isolation between the discharge tunnel and ESW forebay. These design features ensure that the sluice gates will not catastrophically fail and thus they will perform their isolation function while in the closed position.

The sluice gate seals, inflation system and air supply system are non-safety related (Figure 5). Air is normally supplied by the Instrument Air System and will be backed up by air bottles. The back-up air bottles, part of the air system located locally, ensure the seals remain inflated should the normal air source fail. When the seals are inflated, verification of seal integrity, utilizing instrumentation installed as part of the air system modification, will be provided twice daily. Any significant leaks in the sealing system will be identified and repaired. Since the air supply system is non-safety, two check valves, in series in the instrument air supply system, will be provided for isolation and redundancy. The redundant check valves will prevent the seals from becoming depressurized during a loss of instrument air event. The check valve integrity will be verified on an annual basis, prior to inflating the seals. Verification of seal integrity will ensure that the inflatable seals are performing their intended isolation function during normal plant operation, thus the ESW forebay temperature will not exceed its design temperature limit. Chapter 15 of the USAR states that non-safety systems are assumed to be available to mitigate plant transients. Verification of seal integrity and verification of an adequate back-up air supply system provides assurance that the non-safety seals will be available to prevent leakage during transient mitigation and therefore the operability of the ESW system will be assured.

Accident analysis methodology defined in Chapter 15 of the USAR indicates that the seals and sealing system cannot be credited during mitigation of accidents (e.g., LOCA) since the components are non-safety related. However, frequent administrative oversight that will verify the integrity of the seals and the availability of the back-up air supply will ensure that the seals will be available to prevent sluice gate leakage and prevent the forebay from exceeding its design limit temperature during accident mitigation. The frequent verification of seal inflation integrity will provide assurance that a reliable sluice gate sealing system is installed and capable of performing its function. Therefore, given the administrative controls regarding the integrity of the seals and the redundant air supply source for the seals, it is concluded that the non-safety sealing system is adequate to prevent leakage and maintain the ESW forebay temperature below its design limit during all modes of plant operation (normal, and accident and transient mitigation). Consequently, operation of the non-safety sealing system does not introduce any new failure modes or effects. Further, a probabilistic analysis has demonstrated that seal failure coincident with a LOCA and coincident with lake temperature above 81.5°F, (loss of the ESW system, forebay exceeding design limit due to sluice gate leakage) is a highly improbable event (2.34E-06) and would result in a negligible increase (7.4E-08) to the Core Damage Frequency. The results of this probabilistic study support the previous conclusions outlined above regarding the ability of the sluice gate seals to perform their isolation function during use of the ESW system for accident mitigation.

Safety Analysis

Impact on General Design Criteria (GDC) and Regulatory Guides (RG)

Compliance with GDC 44, "Cooling Water" for the ultimate heat sink at the PNPP is assured given the compliance with the requirements of RG 1.27 (USAR Table 1.8-1). RG 1.27, "Ultimate Heat Sink for Nuclear Power Plants" states in part:

> "For once-through cooling systems, there should be at least two aqueducts connecting the source(s) with the intake structures... ...unless it can be demonstrated that there is extremely low probability that a single aqueduct can functionally fail as the result of natural or site-related phenomena."

A review of the PNPP licensing basis potential natural and site-related phenomena indicated only shipping accidents and earthquakes have the potential for causing catastrophic failure of the normal SW/ESW intake during the warm weather months. Events associated with icing such as extremely deep ice cover or damage due to ice movement are not probable during the period the proposed modification would be in service

The Marine Casualty and Pollution Database was used to identify ship groundings. The ship grounds for all of Lake Erie for an 8-year period from 1992 through 1999 were reviewed. All groundings were found to be in or in the direct approach to harbors or ports. Perry is neither near nor in the direct approach for any harbor. The nearest shipping channels are approximately 7 miles offshore or about 6 ½ miles from the underwater intakes.

To do appreciable damage to both intakes simultaneously, a vessel would require a draft of between 12 and 27 feet. A draft of less than 12 feet would pass over the intake without contact, while a vessel with a draft of greater than 27 feet would run aground prior to reaching the intakes. The vessel would have to ground with some forward velocity at an angle that would cause it to impact both intakes. Any sideways movement due to either initial motion or the effect of grounding will result in a reduction in impact energy and would not cause substantial damage to the intakes due to the presence of the caissons and the robustness of the intakes. Given that a vessel impacts both intakes it is unlikely that blockage of all flow will occur. Each intake is designed to supply the required service water and ESW flows for two units with a very low intake velocity. Complete collapse or movement of both of the intake structures which causes closure of both of the pipes leading to the tunnels would be necessary for complete flow blockage. The possibility of loss of normal ESW flow given the above is considered to be unlikely.

The tunnels and intake structures are designed as Seismic Category I. Hence, it would take an earthquake significantly stronger than the Safe Shutdown Earthquake (SSE) of 0.15g to cause failure. The intake structure itself is a rigid welded steel structure imbedded in a concrete foundation which is placed in fully grouted bedrock on the lake bottom. It carries essentially no loads except its own weight. Its failure, even for very high seismic accelerations, is considered very unlikely.

While the intake tunnel is designed to withstand a 0.15g earthquake, the NRC staff has previously postulated that higher accelerations could cause damage and ultimately failure of the tunnel to allow the necessary flow to the ESW pumps. This issue was addressed in a Cleveland Electric Illuminating Company (CEI) response to a Structural Engineering Branch Request for Additional Information (RAI) in a letter dated June 2, 1982. The letter stated that collapse of the upper concrete liner and 2.5 feet of rock along the entire length of the horizontal tunnel still allowed sufficient ESW flow for 2 units even under the worst lake level conditions. Since Perry has only one unit (the second unit was cancelled), considerable additional margin exists. In addition, the letter addressed a review of 71 rock tunnels that had been subjected to seismic ground motions. The 71 cases involved 13 different earthquakes whose

Richter magnitude varied from 5.8 to 8.3. Six of the earthquakes occurred in California, six in Japan, and one in Alaska. The levels of response were correlated with the calculated peak surface ground motion. There were no reports of even falling stones in unlined tunnels or cracks in lined tunnels up to 0.19 g. Up to 0.25 g there were only a few incidences of minor cracking in concrete lined tunnels. Between 0.25 g and 0.52 g there was only one partial collapse. It was associated with landsliding and the tunnel was lined with masonry. The results of this review indicated the intake tunnel would withstand seismic acceleration above 0.15 g and that significant blockage of the intake tunnel was highly unlikely.

A probabilistic analysis was performed to verify that the "extremely low probability" criteria of RG 1.27 could be met for the proposed modification. It calculated the likelihood of losing ESW flow through the normal ESW intake during a 5-month period each year with the automatic operation of the alternate intake sluice gates disabled. Since RG 1.27 provides no guidance as to what is meant by "extremely low probability," the Standard Review Plan (SRP) 2.2.3 "Evaluation of Potential Accidents" was used to provide guidance. The SRP states that design basis events with 1E-7 per year chance of consequences in excess of the 10 CFR 100 exposure guidelines are acceptable. The analysis indicated that the probability each year of normal intake tunnel loss due to an earthquake is 2E-9 and due to a shipping accident is 8E-8. The combined or total probable loss would be 8E-8. The value obtained in the analysis was compared to the value from SRP 2.2.3. The analysis concluded that the probability of failure of the normal ESW intake is extremely low and hence the automatic operation of the alternate intake sluice gates during a 5-month period each year is not needed. Therefore compliance with the RG will be maintained.

Selector Switch

The new selector switch is procured as safety-related Class 1E, is fully qualified environmentally and seismically, and is also qualified in regard to mechanical and electrical operational cycles. Based on these characteristics, the switch is deemed to be highly reliable and will not introduce any new failure modes to the sluice gate control circuit. In addition, the key operated feature of the selector switch ensures that inadvertent positioning of the switch, i.e., a operator error, is not possible. Re-positioning of the switch will be procedurally controlled and will require conscious operator action along with use of a key. Therefore, it is concluded that addition of the new selector switch will not introduce any new failure modes and it will not cause or create any malfunctions of equipment. Administrative controls will be in place to ensure that the automatic opening, on low forebay level, function of the sluice gates is not intentionally blocked when the potential exists for the lake to freeze or for more than 5 months per year.

Inflatable Seal

The sluice gate seal and supporting air system are non-safety related. During most of the year, the seals will be deflated. During this time they will not interfere with the operation of the gate and they have no safety function. When they are inflated, the gate is unavailable to open. The function of the seal is to prevent mixing of the warm discharge with the forebay water in order to maintain forebay temperature below its design limit of 85°F. The twice-daily inspections of the seals and air systems for leaks will verify the requisite reliability. Loss of the seals concurrent with the lake temperature less than 81.5 °F will not result in exceeding the design limit (operation of the ESW pumps to circulate the forebay water may be required). Therefore, the only time the seals are a concern is when they are inflated and the lake temperature is between 81.5 and 85 °F. The affect of their failure is the same as the lake temperature exceeding 85 °F. Actions taken in that case would be the same. Due to their reliability and the limited temperature range that they would be relied upon, it has been determined that the failure of the seal system would have minimal impact on safety. In addition, a probabilistic study was performed that indicated that seal failure, concurrent with a high lake temperature, concurrent with a LOCA, was highly unlikely and would result in a negligible increase in Core Damage Frequency (7.4E-08).

Conclusion

The disabling of the automatic opening of the sluice gates with the proposed selector switch was evaluated and determined that the requirements of RG 1.27 are met which ensures compliance with GDC 44. In addition, the use of non-safety class components for the inflatable seals and air supply system was also evaluated and determined to be acceptable due to the negligible increase in Core Damage Frequency. Therefore, the ESW System will continue to function to supply cooling water to equipment required for normal and emergency shutdown of the reactor. Furthermore, the proposed modification will provide a significant benefit by improving the reliability of the ESW system.

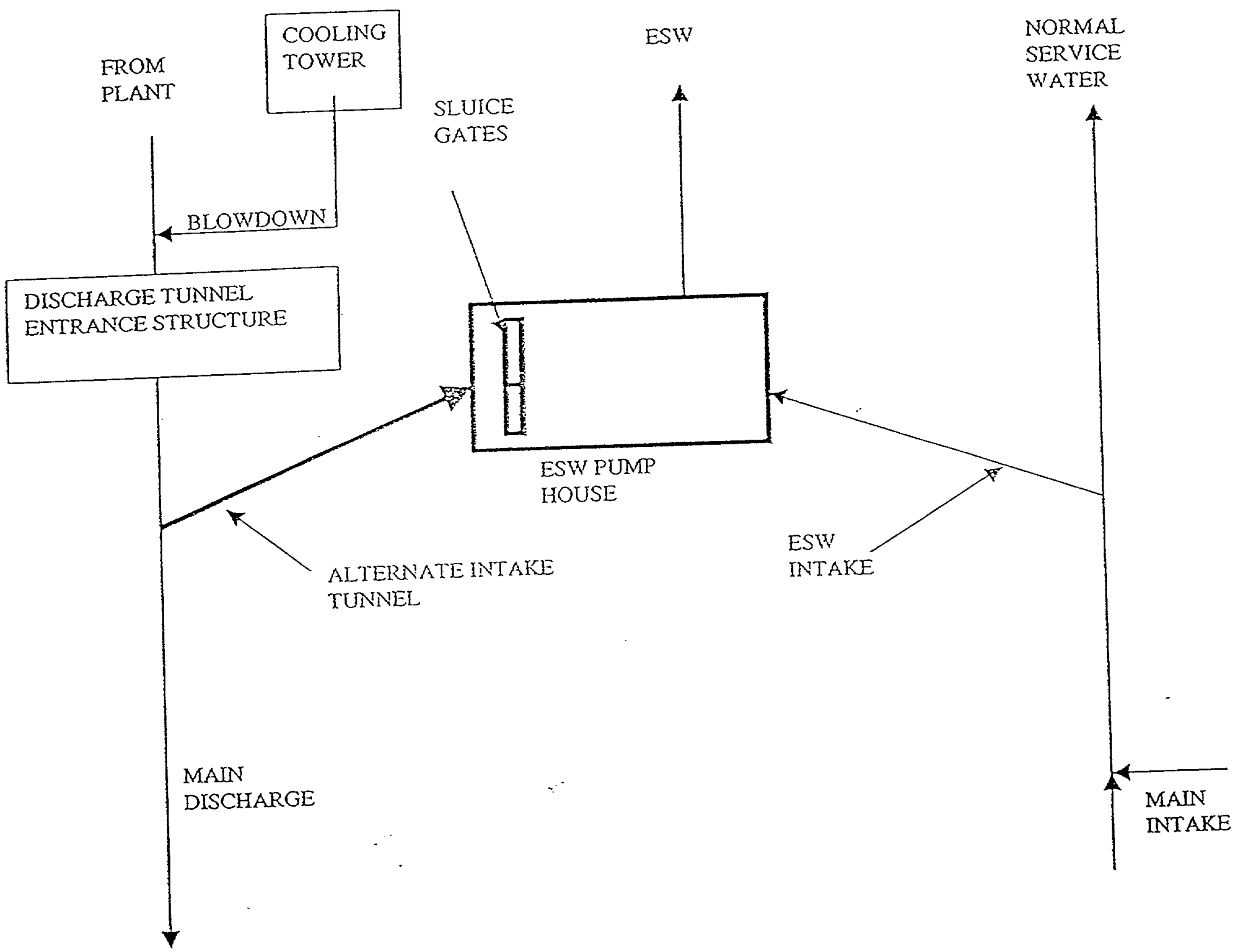
Environmental Consideration

The proposed License Amendment request was evaluated against the criteria of 10 CFR 51.22 for environmental considerations. The proposed change does not significantly increase individual or cumulative occupational radiation exposures, does not significantly change the types or significantly increase the amounts of effluents that may be released off-site and, as discussed in Attachment 2, does not involve a significant hazards consideration. Based on the foregoing, it has been concluded that the proposed License Amendment meets the criteria given in 10 CFR 51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement.

COMMITMENTS WITHIN THIS LETTER

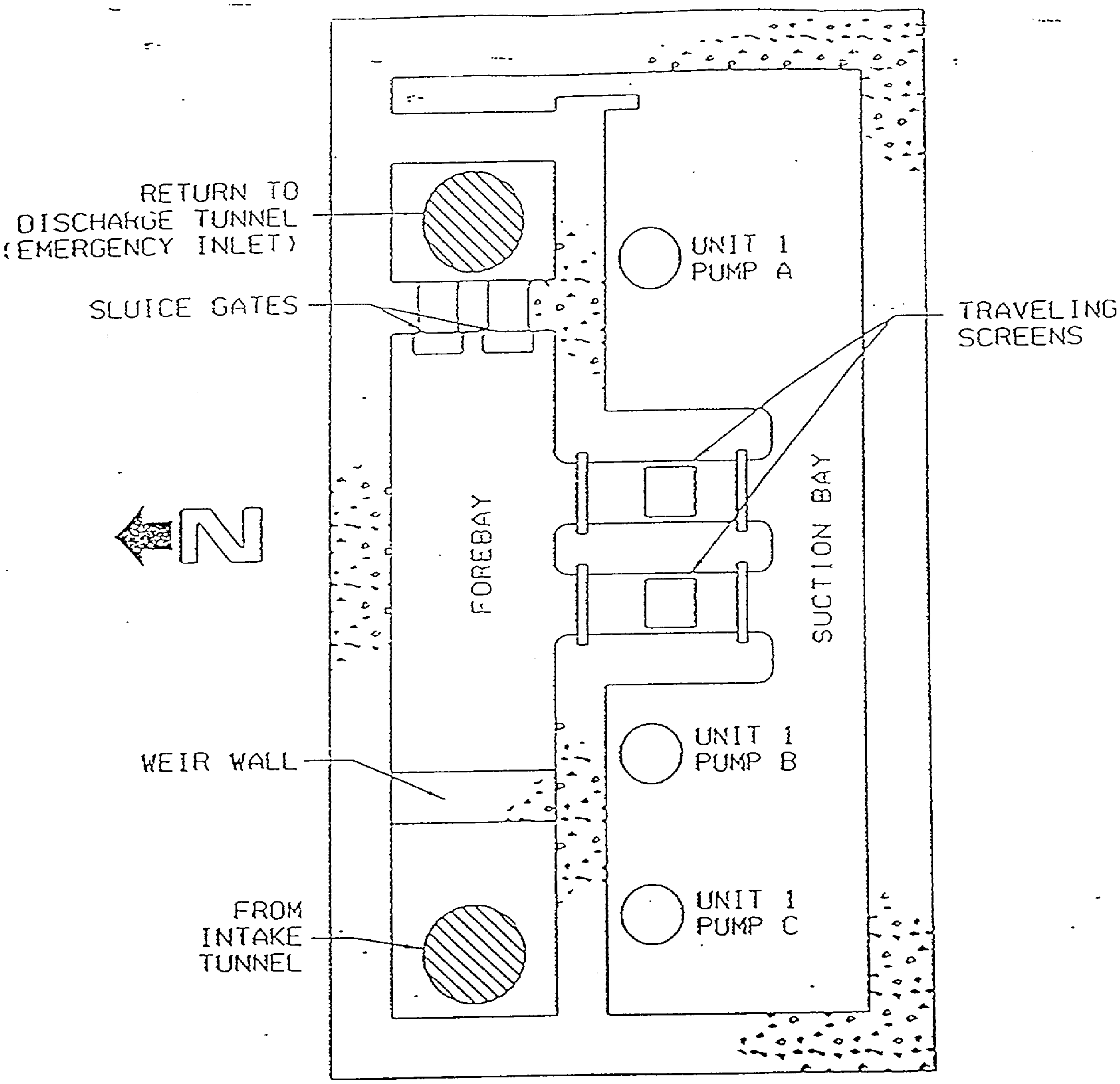
The following table identifies those actions, which are considered to be regulatory commitments. Any other actions discussed in this document represent intended or planned actions, are described for the NRC's information, and are not regulatory commitments. Please notify the Manager - Regulatory Affairs at the Perry Nuclear Power Plant of any questions regarding this document or any associated regulatory commitments.

Commitments
When the seals are inflated, verification of seal integrity will be provided twice daily.
The redundant check valve integrity will be verified on an annual basis, prior to inflating the seals, to ensure their integrity.
Administrative controls will be in place to ensure that the automatic opening, on low forebay level, function of the sluice gates is not intentionally blocked when the potential exists for the lake to freeze or for more than 5 months per year.



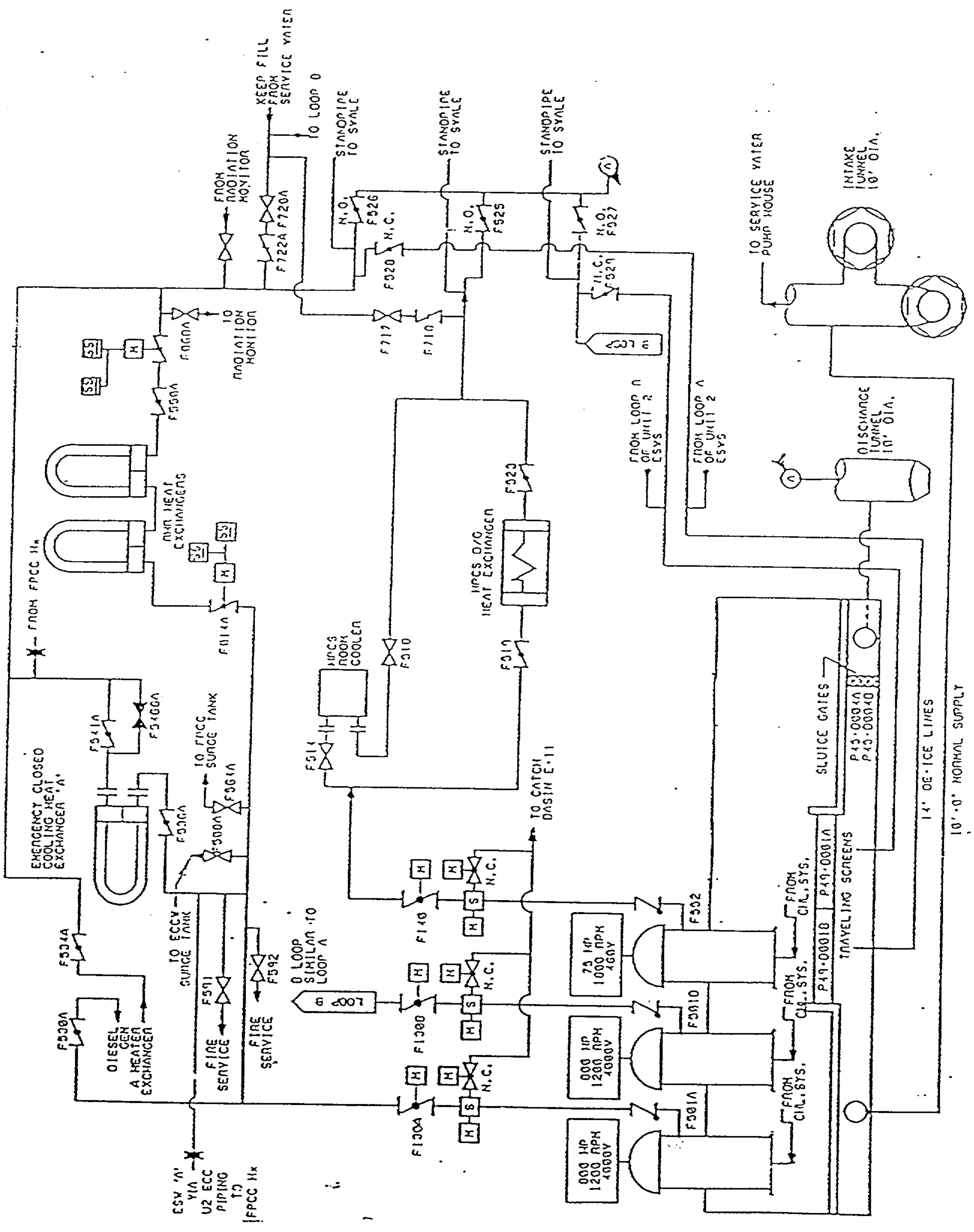
SIMPLIFIED SCHEMATIC OF INTAKE/DISCHARGE TUNNEL & SLUICE GATE ARRANGEMENT

FIGURE 1



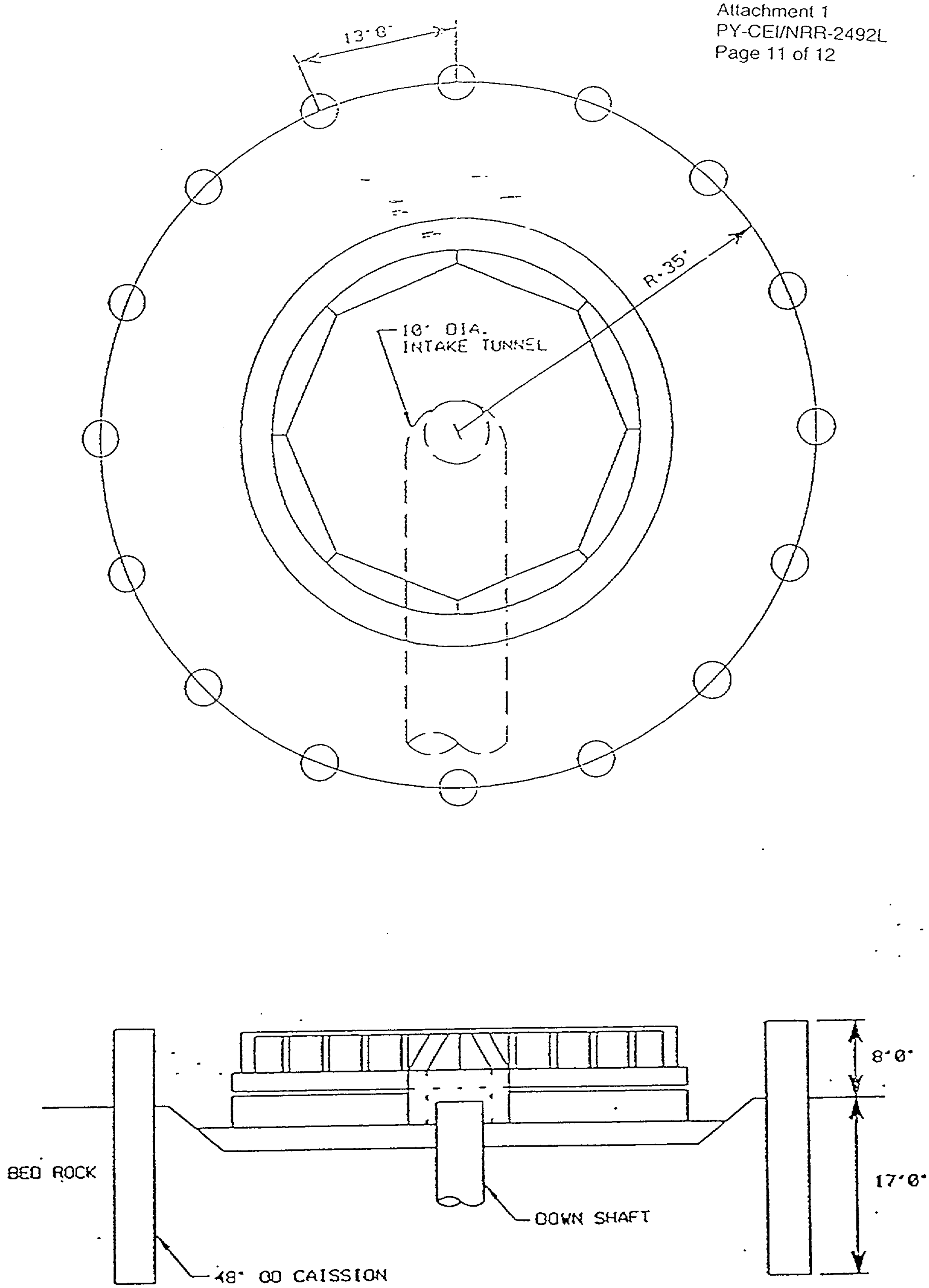
EMERGENCY SERVICE WATER PUMPHOUSE

FIGURE 2



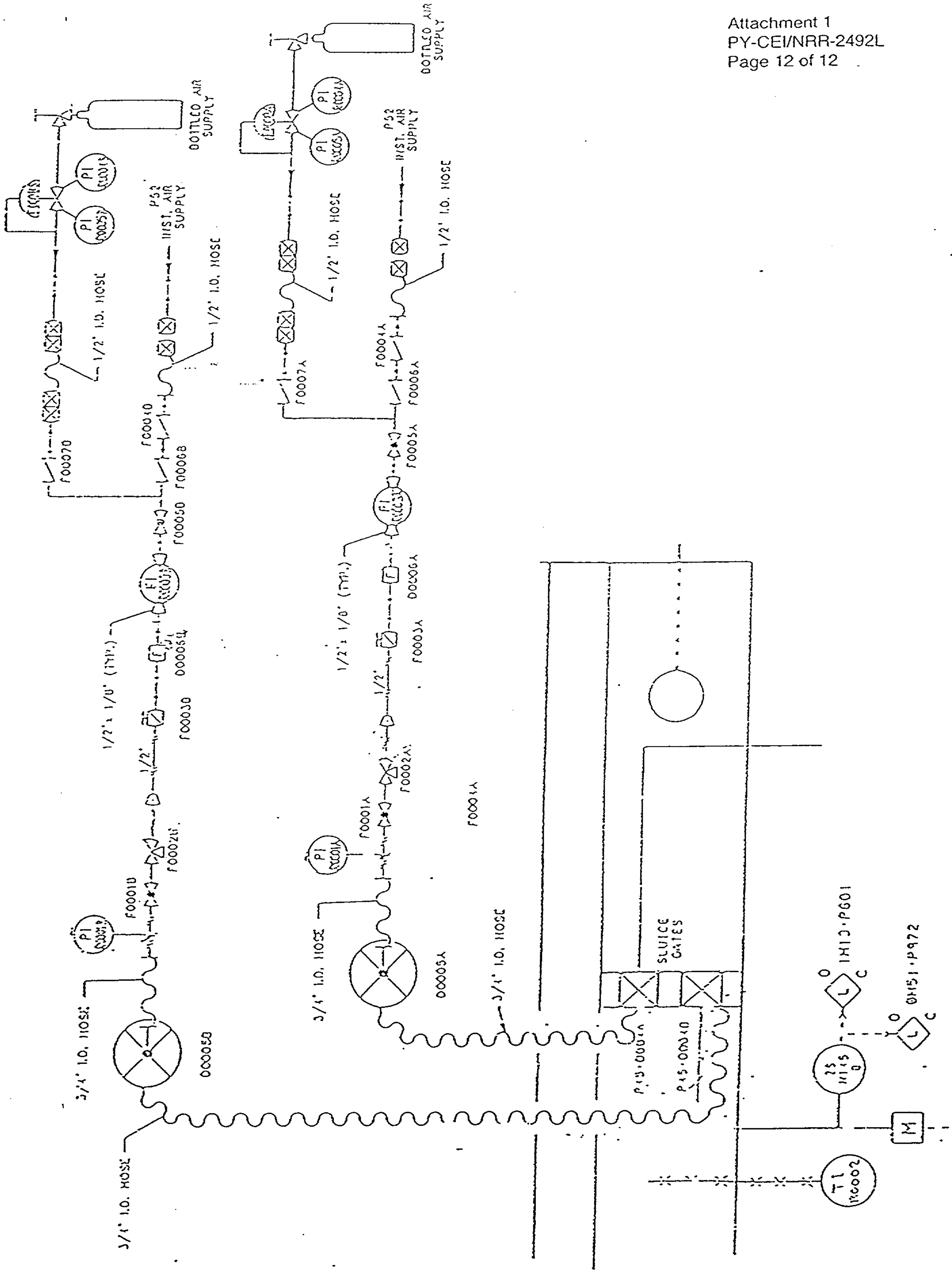
ESW SYSTEM FLOW DIAGRAM

FIGURE 3



SERVICE WATER INTAKE STRUCTURE

FIGURE 4



SLUICE GATE SEAL AIR SYSTEM

FIGURE 5

SIGNIFICANT HAZARDS CONSIDERATION

The standards used to arrive at a determination that a request for amendment involves no significant hazards considerations are included in the Nuclear Regulatory Commission's Regulation, 10 CFR 50.92, which states that the operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any previously evaluated; or (3) involve a significant reduction in a margin of safety.

The proposed amendment is requesting Nuclear Regulatory Commission review and approval of changes to the Perry Nuclear Power Plant (PNPP) Updated Safety Analysis Report (USAR) to incorporate descriptions (in the form of text, tables, and drawings) of modifications to the plant involving the installation of a switch to defeat the sluice gate opening signal and the use of a non-safety inflatable seal. The modifications are designed to increase overall reliability of the Emergency Service Water (ESW) system and to eliminate undesired operation of the ESW pumps.

The proposed amendment has been reviewed with respect to these three factors and it has been determined that the proposed change does not involve a significant hazard because:

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

   The new selector switch is procured as safety-related Class 1E, is fully qualified environmentally and seismically, and is also qualified in regard to mechanical and electrical operational cycles. Based on these characteristics, the switch is deemed to be highly reliable and will not introduce any new failure modes to the gate control circuit. In addition, the key operated feature of the selector switch ensures that inadvertent positioning of the switch, i.e., a operator error, is not possible. Re-positioning of the switch will be procedurally controlled and will require conscious operator action along with use of a key. Therefore, it is concluded that addition of the new selector switch will not introduce any new failure modes and it will not cause or create any malfunctions of equipment.

   The new inflatable seal and supporting mechanical equipment was procured as non-safety. The frequent verification of sluice gate seal integrity assures that the seals will be functional during accident and transient mitigation. This is supported by the probabilistic analysis that determined that the inflatable seal use results in a negligible increase in the Core Damage Frequency (7.4 E-8). Therefore, it is concluded that the new inflatable seals will not introduce any new failure modes and it will not cause or create any malfunctions of equipment.

   The effect of disabling the automatic opening of the sluice gates with the proposed selector switch was evaluated and determined that the requirements of Regulatory Guide (RG) 1.27, Ultimate Heat Sink For Nuclear Power Plants, are met which ensures compliance with General Design Criteria (GDC) 44, Cooling Water.

   Analyzed events are initiated by the failure of plant structures, systems or components. The ESW system is an accident mitigating system that provides a reliable source of cooling water during accident conditions and is not an accident initiator. The proposed change does not have a detrimental impact on the integrity of any plant structure, system or component that initiates an analyzed event. The proposed change will not alter the operation of, or otherwise increase the failure probability of any plant equipment that initiates an analyzed accident. As a result, the probability of any accident previously evaluated is not significantly increased.

Sufficient water is available to the ESW pumps to satisfy requirements for all modes of operation, accounting for minimum lake levels. The alternate intake tunnel that branches from the main discharge tunnel is isolated from the ESW pumphouse by the normally closed sluice gates. The alternate intake tunnel and sluice gates are not relied upon for mitigation of a Loss of Coolant Accident (LOCA) or other accidents with radiological consequences analyzed in the Updated Safety Analysis Report (USAR). The probabilistic analysis demonstrates that the unavailability of the alternate intake tunnel is acceptable during the time period that the sluice gate manual open/close circuit and the automatic opening signal is defeated, due to the extremely low probability of normal intake failure. The modifications do not result in changes to initial conditions of an accident nor alter assumptions used in any consequence determinations. This activity cannot increase the dose to the public nor on-site radiation doses such that actions to mitigate the radiological consequences of an accident would be impeded; nor does this modification directly or indirectly affect the ability of any other plant system to mitigate the radiological consequences of an accident. The proposed change will not alter the operation of any plant equipment assumed to function in response to the aforementioned analyzed events. Therefore, the probability of occurrence or the consequences of an accident previously evaluated remains unchanged.

2. The proposed change would not create the possibility of a new or different kind of accident from any previously evaluated.

The proposed modification of the opening circuit has been designed, and will be procured and installed in accordance with the original ESW system design codes and standards. ESW system functions as required by GDC 44 and RG 1.27, have not been impacted by the change. Systems supporting the operation of the ESW system have not been affected. Failure of the modification to perform its design function due to electrical or mechanical failure would be identical to the current ESW system performance.

Inflating the seals and defeating the automatic gate-opening signal results in the availability of only one intake path from the ultimate heat sink. Availability of only one intake during the time that the automatic opening function is disabled has been demonstrated to be acceptable because a water supply from the normal intake to the ESW pumps will be available. Cooling water supply from only one intake path cannot initiate an accident of a different type than previously evaluated because the cooling water supply paths cannot create or initiate an accident

The ESW system is an accident mitigating system and is not an accident initiator. Consequently, the alternate intake tunnel, the sluice gates, the sluice gate seals, and the sealing system are all components contained in the ESW system and are therefore not accident initiators. The operational change to the sluice gates, i.e., inflation of the seals and disabling of the sluice gate automatic opening feature, does not result in any interactions or interfaces with other plant systems, structures, or components that could create the possibility of an accident of a different type. The operational change prevents leakage past the sluice gates. Similarly, the sluice gates in the closed position does not result in any interactions or interfaces with other plant systems, structures, or components that could create the possibility of an accident of a different type. Performance of these isolation functions cannot initiate an accident.

This change will not affect any known accident initiators or contributors; therefore, it will not increase the probability of an accident previously thought to be incredible. The proposed modifications do not affect any system or component that could initiate an accident. Therefore, this change will not create any different type of accident than previously evaluated in the USAR. Therefore, the probability of occurrence or the consequences of an accident previously evaluated remains unchanged.

3. The proposed change will not involve a significant reduction in the margin of safety.

   The design of the ESW system includes suitable redundancy and reliability to assure that an adequate supply of cooling water is provided and that no single failure will prevent safe shutdown of the unit. The normal cooling water supply to the ESW pump house is provided by a branch tunnel from the main intake tunnel, while a backup supply is available by means of a branch tunnel (alternate intake) from the main discharge tunnel. Currently, the sluice gates automatically open upon receipt of a signal from low water level switches in the ESW pump house forebay. Opening of a sluice gate ensures the necessary cooling water is available to the ESW pumps from the alternate intake tunnel. The licensing basis assumes that two supply paths are available and that automatic initiation would restore the cooling supply from the alternate path if the normal cooling supply were lost. The proposed modification will disable the manual/automatic-opening feature of the sluice gates during the summer months and will thus isolate the alternate supply path. A probabilistic study has demonstrated compliance with the requirements of RG 1.27. The study determined that an alternate source is not required due to having demonstrated that there is extremely low probability that a single aqueduct can functionally fail as the result of natural or site-related phenomena. Therefore, the proposed modification does not involve a significant reduction in the margin of safety.

   The closed sluice gates and the non-safety sluice gate seals prevent recirculation of plant discharge water to the ESW forebay and therefore maintain the forebay at or below its design temperature limit. The ESW system must be capable of providing cooling water at a temperature such that the heat exchangers serviced by ESW can remove their design heat loads for safe plant shutdown and for accident and transient mitigation. In order to prevent a reduction in the margin of safety associated with the ESW inlet temperature, the ESW forebay must not exceed 85°F. With the seals inflated, the closed sluice gates will prevent recirculation and subsequent increase of the forebay temperature above 85°F and therefore the closed sluice gates do not reduce the margin of safety associated with the ESW inlet temperature. The back-up air supply for the sluice gate seals, the frequent verification of the integrity of the sluice gate seals provided via administrative controls, and the functional and leak testing of the air system isolation check valves provides assurance that the inflated non-safety sluice gate seals can be credited during accident and transient mitigation and normal plant operation. Therefore, the margin of safety associated with ESW inlet temperature will not be reduced since the seals will be available to prevent leakage and subsequent increase of the forebay temperature above 85°F. Further, a probabilistic study supports this conclusion by demonstrating that seal failure, when needed, is highly improbable and would result in a negligible increase to core damage frequency. Therefore, it is concluded that inflation of the non-safety seals and reliance on them to prevent sluice gate leakage during all modes of operation does not represent a reduction to the margin of safety.

Reliability of the cooling water supply to the ESW intake structure is maintained, even though the physical redundancy of the ESW cooling water supplies may not be available during periods of elevated lake temperature when the sluice gate seals are inflated and the automatic opening feature is disabled. In compliance with Regulatory Guide 1.27, it has been demonstrated that there is an extremely low probability of normal intake failure during the time that the automatic opening feature of the sluice gates is disabled and the alternate intake tunnel is unavailable.

Redundancy, isolation capability and separation is provided such that no single failure will prevent safe shutdown of the units. The lake itself is a reliable heat sink with an extremely low probability of not being available at all times.

The design of these systems thus meets the requirements of Criterion 44.

For further discussion, see the following sections:

a. General Plant Description 1.2

b. Design of Category I Structures 3.8

c. Water Systems 9.2

3.1.2.4.16 Criterion 45 - Inspection of Cooling Water System

The cooling water system shall be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to assure the integrity and capability of the system.

3.1.2.4.16.1 Evaluation Against Criterion 45

Important components are located in accessible locations to facilitate periodic inspection during normal plant operation. Suitable manholes, handholes, inspection ports, or other design and layout features are provided for this purpose.

These features meet the requirements of Criterion 45.

For further discussion, see the following sections:

a. General Plant Description 1.2

When elevated lake temperatures may cause the ESW forebay temperature to approach its maximum allowable design limit of 85°F, the sluice gate seals are inflated and the automatic opening feature is disabled.

The motor operated isolation valves from the RHR heat exchangers are operated remote-manually by a selector switch in the control room (loop A valves can also be controlled at the remote reactor shutdown panel) and open automatically upon receipt of a signal from ECCS or ESW pump start. The pump discharge isolation valves operate from the same remote-manual signal or the automatic signal used to initiate pump operation. Motor operated sluice gates are automatically opened upon receipt of a signal from level switches in the emergency service water pumphouse forebay. Differential pressure switches across the emergency service water strainers start the strainer backwash operation on high differential pressure. Pressure switches downstream of the emergency service water strainers initiate the hypochlorite injection to the emergency service water pumps after the pumps start.

The flow, temperature and pressure transmitters are used to provide flow, temperature and pressure indication in the control room. Flow, temperature and pressure switches are provided to give alarms in the control room. Radiation monitors provide alarm signals in the event there is a leak of radioactive water into the emergency service water system (loop A and loop B) from the RHR heat exchangers.

c. ECC System Operation

The ECC system provides the required cooling water for the emergency core cooling support components, i.e., RHR pump and room coolers, LPCS pump and room coolers, and RCIC room coolers. The system is designed to provide the required cooling without compromising the independence of the redundant core cooling systems.

When elevated lake temperatures may cause the ESW forebay temperature to approach its maximum allowable design limit of 85°F, the sluice gate seals are inflated and the automatic opening feature is disabled.

discharge minimize the entrance of foreign particles 0.0625 in. and larger into the system. The available NPSH is calculated based upon the conditions of low water level, emergency service water temperature and pressure of 85°F and 14.7 psia, respectively, and maximum system flow requirements.

Should normal emergency service water (ESW) supply from the intake tunnel be interrupted, sluice gates open automatically upon receiving a low water level signal from the ESW pump house forebay, allowing water from the discharge tunnel to flow into the forebay and supply the ESW system. Upon indication on a control room panel that the sluice gates are open, manual valves may be administratively closed to prevent warm ESW from dumping to the discharge tunnel, thus forming a closed loop system. With the manual valves closed, the ESW system discharges to the swale. Upon restoration of normal supply from the intake tunnel, the sluice gates are administratively closed and the valves are administratively opened to restore normal system operation.

INSERT PARAGRAPH HERE, SEE NEXT PAGE

Tables 9.2-1 through 9.2-8 indicate the estimated heat loads dissipated to the emergency service water system for the various operating modes. The major heat load to the system is derived from the RHR heat exchangers. Approximate RHR heat exchanger outlet temperatures, based on the maximum expected emergency service water temperature of 85°F, are listed in Table 9.2-9.

Performance of the RHR heat exchangers is determined by monitoring the inlet flow in the control room. A low flow alarm indicates insufficient flow. Temperature elements on the heat exchanger outlets are also provided. The parameters of cooling water flow and temperature observed during normal shutdown give the operator sufficient tube side data to determine RHR heat exchanger performance. Additionally, the heat exchanger performance is periodically assessed per the requirements of Generic Letter 89-13.

PARAGRAPH TO INSERT ON PAGE 9.2-5:

The sluice gates provide a barrier between the discharge tunnel and the ESW pump house forebay to prevent recirculation of plant discharge water thereby maintaining the ESW forebay at or below its maximum allowable temperature of 85°F during all modes of plant operation including accident and transient mitigation. The non-safety sluice gate seals also form part of this barrier when elevated lake temperature may cause the ESW forebay to approach its design temperature limit and the seals are inflated.

When elevated lake temperatures may cause the ESW forebay temperature to approach its maximum allowable design limit of 85°F, the sluice gate seals are inflated and the automatic opening feature is disabled.

Level switches are located in the ESW pumphouse forebay. These level switches provide a low level signal which automatically opens sluice gates between the discharge tunnel and the forebay to ensure a cooling water supply.

Additional details for instrumentation and controls is provided in Section 7.3.1.

9.2.2 EMERGENCY CLOSED COOLING SYSTEM

9.2.2.1 Design Bases

A separate emergency closed cooling (ECC) system serves each unit. Each system is designed to provide a reliable source of cooling water to safety-related components required for certain modes of normal reactor operation, as well as for accident conditions and loss of normal auxiliary power.

Tables 9.2-14 through 9.2-17 summarize the cooling water requirements to those components serviced by the emergency closed cooling system for the various modes of plant operation. The system is divided into two separate loops. For this discussion the loops are denoted by the letters "A" and "B."

The emergency closed cooling system is a closed system that has its heat exchangers cooled by the emergency service water system. It is designed to yield maximum expected equipment cooling water temperature of 95°F on the closed side.

The system is designed such that the occurrence of any single active or passive failure would not contribute to the inability of the emergency closed cooling system to perform its intended function. The system is classified as Safety Class 3 and Seismic Category I. The chemical addition tank and piping up to the last valve prior to the connection

9.2.4.5 Instrumentation Requirements

Hot water storage tank temperature is maintained at a predetermined temperature by a temperature controller which activates the tank heater, as required.

9.2.5 ULTIMATE HEAT SINK

9.2.5.1 Design Bases

Heat rejected from the turbine cycle during normal operation will be discharged to the atmosphere by two natural draft cooling towers, each 516 feet high. During startup, shutdown and emergency operation, heat will be rejected to Lake Erie through the emergency service water system. This system draws water from the lake, cools the plant and returns the water to the lake. The lake has been shown to have a sufficiently high level to assure that it is always available to qualify as a single source of cooling water (refer to Sections 2.3.1 and 2.4.11). All features necessary to provide cooling water for emergency purposes have been designed to Quality Group C, Safety Class 3 and Seismic Category I (see Section 3.2), and have been provided with redundant features to assure availability. INSERT TEXT HERE, SEE NEXT PAGE

The structures and components used to take water from and return water to the lake are sized for the service water system (turbine plant and nonsafety nuclear requirements) flow rate of 70,500 gpm, and the emergency service water system (RHR and nuclear safety requirements) flow rate of 45,400 gpm.

9.2.5.2 System Description

The ultimate heat sink for Perry is shown schematically by Figure 9.2-10. Water is taken from Lake Erie by means of intake structures located approximately 2,650 feet off shore and 13.3 feet

TEXT TO INSERT ON PAGE 9.2-37:

Cooling water supply to the ESW intake structure is available at all times even though the physical redundancy of the ESW cooling water supplies may not be available during periods of elevated lake temperature when the sluice gate seals are inflated and the automatic opening feature is disabled. In compliance with Regulatory Guide 1.27, it has been demonstrated that there is an extremely low probability of normal intake failure during the time that the automatic opening feature of the sluice gates is disabled and the alternate intake tunnel is unavailable.

When elevated lake temperatures may cause the ESW forebay temperature to approach its maximum allowable design limit of 85°F, the sluice gate seals are inflated and the automatic opening feature is disabled.

opening of either one of two motor operated gates which are normally closed, but will open automatically upon detection of low water level in the pump house forebay. A weir in front of the normal water supply tunnel entrance to the forebay will ensure that a minimum water level is maintained in the forebay if the normal water supply is lost and the water tries to drain out through the normal supply tunnel (Figure 3.8-65).

The effects of natural phenomena on the heat sink water level or water volume are presented in Sections 2.3.1 and 2.4.11, including an evaluation of Lake Erie Canal lock failures. Figures 1.2-18 and 3.8-65 present the intake and discharge structure orientation and location.

9.2.6 CONDENSATE STORAGE FACILITIES

9.2.6.1 Design Bases

The condensate storage system is designed to store and provide adequate deaerated, demineralized water to accommodate main cycle makeup and to provide a minimum of 150,000 gallons for the RCIC and HPCS Systems at all times. The tank is designed to AWWA D100.

9.2.6.2 System Description

The condensate transfer and storage system is shown in Figure 9.2-13. It consists of one 500,000 gallon capacity storage tank per unit with associated makeup and distribution systems. The tank is located outdoors adjacent to the turbine building.

Makeup to each condensate storage tank will come from the 400,000 gallon capacity mixed bed water storage tank, serving both units. Makeup is cyclical in nature, i.e., the makeup control valve opens on low level (which is still above the 150,000 gallon reserve) and closes on high level. The normal makeup from the mixed bed water storage tank is

15.0.1 ANALYTICAL OBJECTIVE

The spectrum of postulated initiating events is divided into categories based upon the type of disturbance and the expected frequency of the initiating occurrence; the limiting events in each combination of category and frequency are quantitatively analyzed. The plant safety analysis evaluates the ability of the plant to operate within regulatory guidelines, without undue risk to the public health and safety.

This chapter addresses two types of operating conditions addressed by the Code of Federal Regulations. It compares the radiation releases from anticipated operational transients to the 10 CFR 20 limits on the "anticipated average radiation levels." The consequences of very unlikely events (faulted events) are compared to the 10 CFR 100 limits (for the design-basis RAST LOCA analysis, the licensing basis offsite dose limit is 25 rem TEDE). The analyses described in this chapter show that the consequences for these two types of events are less severe than the corresponding 10 CFR limits.

Unless otherwise identified, it is assumed that all equipment (safety grade or nonsafety grade) is available to mitigate the transients described and analyzed in this chapter. ~~However~~ Only safety grade equipment is assumed to be used to mitigate accidents and safely shut down the reactor. However, credit is taken for the non-safety sluice gate seals, while inflated, to maintain the ESW forebay temperature at or below its maximum allowable value such that the ESW pumps can perform their safety function. (Refer to section 9.2.1.2 for a discussion regarding the function of the non-safety sluice gate seals.)