LICENSE CHANGE NOTICE
IMPLEMENTATION REVIEW CHECKLIST
(Typical)

USAR Revision #: 15

LCN Number: ________ LCN Revision: ___

1. LCN Form

	YES	NO	N/A	
a.	☐	☐		LCN Number appears on the form and is consistent with LCN database
b.	☐	☐		LCN **Revision** Number on the form is consistent with LCN database
c.	☐	☐		Updated Text, Tables, and Figures exactly match attached mark-up(s).
d.	☐	☐	☐	Originating department Manager/Designee approval was obtained. [N/A for new LBDC Form]
e.	☐	☐	☐	USAR Section Owner concurrence was obtained.

2. 50.59 Documentation

	YES	NO	N/A	
a.	☐	☐		The 50.59 documentation has been approved per LI-101.
b.	☐	☐	☐	The 50.59 summary is adequate and ready for submittal in the SEN Summary Report. (Only applicable for full 50.59 evaluations.)
c.	☐	☐		The changes addressed in the 50.59 documentation are consistent with the current USAR revision and License Basis Approved changes.

3. USAR Update

	YES	NO	
a.	☐	☐	Updated USAR Text, Tables, and Figures exactly reflect changes described in LCN mark-ups.
b.	☐	☐	Ensure electronic "Pending" file is consistent with review (hard) copy.
c.	☐	☐	Updated page numbers are consistent with direction provided in NSA 3.5.

4. List of Effective Pages Update (LOEP)

	YES	NO	N/A	
a.	☐	☐		Updated LOEP reflects next revision as listed on Approval Form.
b.	☐	☐	☐	If LCN change impacted page numbering, page numbers were updated correctly and reflected on LOEP.
c.	☐	☐		Updated page numbers are consistent with direction provided in NSA 3.5.

BBB-4

If any items are NO, the Licensing Reviewer shall resolve the issue with the Preparer or originating department. Resolution should bee delineated below or on attached pages.

Description of Issue:

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Resolution:

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Signature indicates all issues, if any, have been resolved and LCN package is acceptable for incorporation into the USAR.

Licensing Engineer: ______________________ Date: ________

Adobe (.pdf) Conversion / Controlled USAR Update

Identify each page revised by this LCN / LBDC. Check the accuracy of each Adobe conversion and verify that each revised page has been replaced in the Controlled Electronic USAR.

Applicable pages	**Initials / Date**	**Applicable pages**	**Initials / Date**

9.2 WATER SYSTEMS

9.2.1 Normal Service Water System

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The normal service water system provides cooling water to remove heat from turbine and reactor plant auxiliary systems and components during all modes of plant operation. It is cooled by the service water cooling system as described in Section 9.2.12. The normal service water system operates during normal plant operation, as described in this section. In emergency situations, the safety-related standby service water system operates as described in Section 9.2.7.

The service water system is shown on Fig. 9.2-1a through 9.2-1h. Table 9.2-1 lists the flow requirements for the normal service water system.

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9.2.1.1 Design Bases

The normal service water system is designed in accordance with the following criteria:

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1. A normal service water system is designed to provide cooling water to the secondary side of the reactor plant component cooling water (RPCCW) and turbine plant component cooling water (TPCCW) heat exchangers and plant chilled water systems during normal plant operation and planned unit outages.

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2. It is also designed to supply cooling water to the residual heat removal (RHR) heat exchangers to dissipate reactor decay heat when the standby service water system is not in use.

3. The normal service water system components are designed in accordance with the safety classification listed in Table 3.2-1.

4. The normal service water system is designed to remove the heat load listed in Table 9.2-1.

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5. The normal service water system cooling water is cooled in the service water system heat exchangers, which are cooled by the service water cooling system described in Section 9.2.12.

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6. The normal service water system will provide the source of cooling water for all plant systems and components required for safe shutdown of the reactor in the event of a fire in Fire Area PT-1 (E, F & G-Tunnels).

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9.2.1.2 System Description

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The normal service water system utilizes three 50-percent capacity, motor-driven, horizontal pumps. These pumps each have a capacity of approximately 31,500 gpm. Normal service water is pumped from the service water system heat exchangers. Each normal service water system pump takes suction from the service water system heat exchanger common discharge header/pump suction header and discharges into the normal service water system pump discharge header/common system supply header.

A surge/expansion tank (1SWP-TK3) is provided on the suction side of the normal service water pumps. This tank allow for thermal expansion in service water. A pressurized N^2 blanket is provided to minimize oxygen ingression into the water and to minimize the amount of service water piping subjected to a vacuum and the degree of vacuum when no NSW pumps are running. Level in the tank is controlled by MWS-AOV53 located on the 95' el in the Turbine building. This valve auto opens on low level in the tank to inject demineralized water from the demineralized makeup water system (MWS) into the NSW return piping upstream of the CCS heat exchangers. The valve closes on high level in the tank. Manual control of the AOV is available in the main control room.

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The normal service water supply header is routed to a point outside the turbine building where the main header branches into two supply headers. One supply header branch is routed to the turbine building, while the other supply header branch is routed to the radwaste building and auxiliary building, control building, standby diesel generator building, and reactor building.

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The turbine building branch supply header supplies the three TPCCW heat exchangers, three air-conditioning water chillers, four generator hydrogen coolers, one alternator cooler, two EHC coolers, and two turbine lube oil coolers. The return from each of these components is routed to a return header which returns the service water to the service water system heat exchanger inlet header.

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The second branch supply header, supplies three radwaste/fuel building chiller condensers, three RPCCW heat exchangers, suppression pool cleanup, cooling, and alternate decay heat removal heat exchanger, auxiliary building unit coolers, four main control room air-conditioning water chillers, two RHR heat exchangers, three standby diesel generator jacket water coolers, and six drywell unit coolers. The return from each of the radwaste building, auxiliary building, drywell, and control building components is routed to a header which returns the service water to the service water system heat exchanger inlet header.

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Major component design data is listed in Table 9.2-1.

During normal operation and unit cooldown, two of the three normal service water pumps are required to dissipate the auxiliary heat loads. The third is a spare to accommodate maintenance or failure of either of the two operating pumps.

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Cooling tower makeup water and circulating water treatment is described in Sections 9.2.11.2 and 10.4.5.3. The water quality of the service water system is controlled in order to minimize scaling, corrosion and biological fouling. This is accomplished by injecting multifunctional chemicals as required.

3←• 8←• 12←• •→6 •→2 •→9

During normal plant operation, the treated normal service water flows at a nominal rate of approximately 50 GPM from the normal service water supply and return headers located in the piping tunnels up to within close proximity of the standby cooling tower and then back into the normal service water system return headers to inhibit corrosion and organic fouling within the standby service water headers which are normally on standby. The flow path of treated normal service water is accomplished by using small bore piping cross-ties between the Divisions 1 and 2 standby service water supply and return headers. The normal service water supply and return header differential pressures and orifices in the cross-ties are used to establish the flow rate of treated normal service water through the standby service water supply and return headers.

Some of the treatment chemicals may be activated when the treated water passes through the drywell unit coolers. The drywell unit coolers are exposed to neutron leakage and scatter from the core during normal operation. These neutrons interact with the chemical constituents sodium and molybdenum which are then activated to their radioactive forms. For example, natural sodium (Na) is composed of the Na-23 which can be activated by neutron capture to Na-24. The radiological impact of service water leakage on normal plant effluents is negligible.

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Piping wall thicknesses are increased over standard design requirements by corrosion allowance of 0.125, to ensure against degradation of system performance due to the effects of long-term corrosion, is provided for all piping but the 48-in header between the normal service water pumps and the turbine building. For this piping, a program of corrosion monitoring is provided to detect corrosion problems before the minimum pipe wall thickness is compromised (see Section 9.2.1.4). Additionally, the water in the normal cooling water system is chemically treated and protective coatings are applied to the internals of certain components to control corrosion.
2←• 6←•

9.2.1.3 Safety Evaluation

The normal service water system is a non-nuclear safety system. Upon complete loss of normal service water, the plant is shut down. Cooling water for safe shutdown and maintenance of the safe shutdown condition is provided by the standby service water system (Section 9.2.7).
•→12
The normal service water headers in the turbine building and radwaste building can be isolated from the safety-related lines in the auxiliary, diesel generator, control, and containment buildings by automatic block valves and check valves in the normal service water supply header, and automatic block valves in the normal service water return header. These valves are Safety Class 3, except the containment isolation valves which are Safety Class 2. Piping within the auxiliary building, diesel generator room, control building, and reactor containment is common to the normal service water and standby service water systems. This piping is Safety Class 3, Seismic Category I.
12←•
Automatic isolation of the normal service water supply and return headers serving the auxiliary, control, and diesel generator buildings allows standby service water to cool essential components within these buildings under all accident conditions.

Analysis of postulated cracks in moderate-energy piping systems is covered in Section 3.6.

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A fire in Area PT-1 (E, F & G-Tunnels) could potentially render the standby service water system inoperable. Normal service water and its required support systems (including the necessary portions of the Off-Site Power Distribution System) has been analyzed to remain free from fire damage during a fire in Fire Area PT-1. In this are only, normal service water is credited for cooling the required safe shutdown systems and components.
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A manual control switch is provided in the main control room for operation of the condensate makeup containment isolation valve. The valve closes automatically on a LOCA signal.

A control switch is provided in the auxiliary control room for either manual or automatic operation of the condensate storage tank makeup valve. In the automatic mode, level control opens the valve when the condensate storage tank level is low and closes the valve when the level is high.

Pushbutton controls are provided in the auxiliary control room for either manual or automatic control of the condensate transfer pumps. When operating in the automatic mode, pump startup occurs on either low pump discharge pressure or high pump discharge flow. Pump discharge flow is monitored in the auxiliary control room. A low discharge flow condition when both pumps are running activates a condensate demand low alarm in the auxiliary control room. Alarms are activated in the auxiliary control room when a pump that is running automatically trips and when a pump automatically starts. A manual control switch is provided in the auxiliary control room for opening and closing of the condensate makeup to radwaste system isolation valve.

9.2.7 Standby Service Water System

The standby service water (SSW) system operates under emergency conditions, in conjunction with the ultimate heat sink, to remove heat from those plant components required for the safe shutdown and cooldown of the unit.

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A flow diagram for the standby service water system is included in Fig. 9.2-1b through 9.2-1f. Table 9.2-14 lists the essential components served by the standby service water system. Table 9.2-15 lists the major components in the standby service water system and the design cooling water flows for each. Table 9.2-16 presents a single passive failure analysis of the standby service water system. Quantities of heat rejected to standby service water are detailed in Section 9.2.5.

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9.2.7.1 Design Bases

The standby service water system is designed in accordance with the following requirements:

1. The system provides all the necessary cooling water to the reactor plant components required to safely bring the reactor to a cold shutdown condition and to maintain it in cold shutdown for a 30-day postaccident period.

2. The system automatically performs its emergency cooling function assuming any single active or passive failure coincident with a loss of offsite power.

3. The system is designed to Safety Class 3 requirements, as defined in Section 3.2.3.3 for pumps, piping, and valving.

4. The system is designed to Seismic Category I requirements, as defined in Section 3.7.

5. Protection is provided from extreme natural phenomena such as earthquakes, tornadoes, and floods, as described in Sections 3.2, 3.3, 3.5, and 3.8.

6. Protection is provided from the effects of externally and internally generated missiles, as described in Section 3.5.

7. Protection is provided from the effects of pipe whip and jet impingement from high- and moderate-energy line breaks, as described in Section 3.6.

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9. Redundancy is provided to permit isolation of inoperable components, subsystems, or piping without compromising their intended safety functions, as described in Section 9.2.7.3.

10. Provision is provided to permit operational functional testing of safety-related equipment during shutdown, as described in Section 9.2.7.4.

11. Nonseismic pipe, ductwork, or components are analyzed to ensure that their failure or collapse during an SSE does not compromise the system's safety function.

9.2.7.2 System Description

The standby service water system is composed of the following:

1. Two equally sized, redundant piping systems, each supplying the components listed in Table 9.2-15. During normal plant operation, the normal service water pumps use standby service water piping to supply safety-related components.

2. Four 50 percent capacity, 7,690 gpm, motor-driven, wet pit, vertical centrifugal standby service water pumps. Two pumps are provided on each redundant supply header. Operating characteristics of the SSW pumps are given in Fig. 9.2-22. A wall in the SSW pumphouse physically separates each set of two pumps. All four pumps take suction from a common pump well in the ultimate heat sink water storage basin..

3. One ultimate heat sink cooling tower and associated storage basin, as described in Section 9.2.5. Each redundant header may be remotely aligned to the two redundant cells on the ultimate heat sink cooling tower

The standby service water system is capable of accommodating any single component failure or loss of any single emergency power supply, i.e., Division I, II, or III power without affecting the overall system capability of effecting safe shutdown and cooldown or postaccident heat dissipation, as detailed in Table 9.2-16 and the FMEA. Operator actions may be required to isolate a failed component from the remainder of the standby service water system, or to transfer cooling to the redundant portion of the system, if the redundant portion was in a shutdown state.

A failure of Division I power will result in the unavailability of 1SWP*P2A and all associated motor-operated isolation valves. Pump 1SWP*P2C will start automatically on Division III power but is not required since the 100 percent redundant B subsystem will be fully operable on Division II power.

Operator action to close the NSW return valve will be required after 20 min to limit water loss from the unisolated A subsystem to the nonsafety-related normal service water subsystem.

A failure of Division II power will result in a loss of the B subsystem. Division I pump 1SWP*P2A and Division III pump 1SWP*P2C in the A subsystem will operate to provide all required cooling.

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A failure of Division III power will result in the unavailability of 1SWP*P2C. The three operable pumps will provide for all short-term cooling requirements. With the HPCS pump unavailability due to the loss of Division III power, operator action may be required after 20 min to ensure the availability of LPCS for long-term cooling. The fully operable B subsystem can handle RHR heat exchanger cooling with two pumps. Operator action may be required to limit water demands on the remaining A subsystem pump 1SWP*P2A. Equipment can be operated on Division I as long as the following essential equipment remains operable:

Auxiliary building unit coolers required to support LPCS operation

Standby diesel generator A

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A transient analysis was performed based on the following initial conditions:

1. A main steam line (or recirculation suction line) double-ended-rupture (DER) long-term response

2. The redundant portion of the system is in a shutdown state

3. Suppression pool temperature has not yet peaked.

A single passive or active failure (e.g., fan trip, flow, level, pressure, or temperature condition) in the standby service water system initiates an alarm in the main control room. Upon annunciation, the operator responds by initiating the necessary valve action to isolate standby service water to the independent redundant portion of the system or to isolate a failed component or portion of the system initiating the alarm condition from the remainder of the standby service water system. The conservative assumption is made that standby service water to the residual heat removal heat exchanger in the suppression pool cooling mode is lost for 10 min while the operator is establishing shell-side flow to the residual heat removal heat exchanger in the redundant portion of the system. A transient analysis indicates that the suppression pool temperature increase is less than 1°F, and the containment pressure increase is less than 0.1 psi. This transient analysis shows that the design objectives of the system can be met following the failure of a single component.

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A fire in Fire Area PT-1 (E, F & G-Tunnels) could potentially render the standby service water system inoperable. Normal service water and its required support system (including the necessary portions of the Off-Site Power Distribution System) has been analyzed to remain free from fire damage during a fire in Fire Area PT-1. IN this area only, normal service water is credited for cooling the required safe shutdown systems and components.

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Large-scale leakage from the standby service water system due to major piping or component failures can be detected by the following methods:

1. Standby service water flows in each redundant header are monitored in the pump discharge and service water flow recorder. A mismatch in these flows indicate large-scale leakage.

2. Pump discharge header pressure transmitters alarm required header pressure.

Small-scale leakage from standby service water piping or components can be detected by the following methods:

1. Routine maintenance and inservice inspection

2. Monitoring building and tunnel sump levels

3. Monitoring the operation of components cooled by the standby service water system.

9.2.7.4 Testing and Inspection Requirements

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The standby service water system will be tested periodically in accordance with Regulatory Position 2.b of Regulatory Guide 1.22 and the requirements of the ASME Code, Section XI.

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The reactor plant component cooling water system and the plant chilled water system (that supply the containment unit coolers during normal plant operations) are both demineralized water systems. Since the service water system is chlorinated, the above valves are not operated during normal plant operation to prevent the introduction of chlorinated water into these demineralized water systems. These valves can be tested when the reactor is shut down. All of these valves are accessible during

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9.2 WATER SYSTEMS

9.2.1 Normal Service Water System

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The normal service water system provides cooling water to remove heat from turbine and reactor plant auxiliary systems and components during all modes of plant operation. It is cooled by the service water cooling system as described in Section 9.2.12. The normal service water system operates during normal plant operation, as described in this section. In emergency situations, the safety-related standby service water system operates as described in Section 9.2.7.

The service water system is shown on Fig. 9.2-1a through 9.2-1h. Table 9.2-1 lists the flow requirements for the normal service water system.

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9.2.1.1 Design Bases

The normal service water system is designed in accordance with the following criteria:

•→6

1. A normal service water system is designed to provide cooling water to the secondary side of the reactor plant component cooling water (RPCCW) and turbine plant component cooling water (TPCCW) heat exchangers and plant chilled water systems during normal plant operation and planned unit outages.

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2. It is also designed to supply cooling water to the residual heat removal (RHR) heat exchangers to dissipate reactor decay heat when the standby service water system is not in use.

3. The normal service water system components are designed in accordance with the safety classification listed in Table 3.2-1.

4. The normal service water system is designed to remove the heat load listed in Table 9.2-1.

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5. The normal service water system cooling water is cooled in the service water system heat exchangers, which are cooled by the service water cooling system described in Section 9.2.12.

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6. The normal service water system will provide the source of cooling water for all plant systems and components required for safe shutdown of the reactor in the event of a fire in Fire Area PT-1 (E, F & G-Tunnels).

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9.2.1.2 System Description

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The normal service water system utilizes three 50-percent capacity, motor-driven, horizontal pumps. These pumps each have a capacity of approximately 31,500 gpm. Normal service water is pumped from the service water system heat exchangers. Each normal service water system pump takes suction from the service water system heat exchanger common discharge header/pump suction header and discharges into the normal service water system pump discharge header/common system supply header.

A surge/expansion tank (1SWP-TK3) is provided on the suction side of the normal service water pumps. This tank allow for thermal expansion in service water. A pressurized N^2 blanket is provided to minimize oxygen ingression into the water and to minimize the amount of service water piping subjected to a vacuum and the degree of vacuum when no NSW pumps are running. Level in the tank is controlled by MWS-AOV53 located on the 95' el in the Turbine building. This valve auto opens on low level in the tank to inject demineralized water from the demineralized makeup water system (MWS) into the NSW return piping upstream of the CCS heat exchangers. The valve closes on high level in the tank. Manual control of the AOV is available in the main control room.

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The normal service water supply header is routed to a point outside the turbine building where the main header branches into two supply headers. One supply header branch is routed to the turbine building, while the other supply header branch is routed to the radwaste building and auxiliary building, control building, standby diesel generator building, and reactor building.

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The turbine building branch supply header supplies the three TPCCW heat exchangers, three air-conditioning water chillers, four generator hydrogen coolers, one alternator cooler, two EHC coolers, and two turbine lube oil coolers. The return from each of these components is routed to a return header which returns the service water to the service water system heat exchanger inlet header.

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The second branch supply header, supplies three radwaste/fuel building chiller condensers, three RPCCW heat exchangers, suppression pool cleanup, cooling, and alternate decay heat removal heat exchanger, auxiliary building unit coolers, four main control room air-conditioning water chillers, two RHR heat exchangers, three standby diesel generator jacket water coolers, and six drywell unit coolers. The return from each of the radwaste building, auxiliary building, drywell, and control building components is routed to a header which returns the service water to the service water system heat exchanger inlet header.

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Major component design data is listed in Table 9.2-1.

During normal operation and unit cooldown, two of the three normal service water pumps are required to dissipate the auxiliary heat loads. The third is a spare to accommodate maintenance or failure of either of the two operating pumps.

•→12 •→8 •→3

Cooling tower makeup water and circulating water treatment is described in Sections 9.2.11.2 and 10.4.5.3. The water quality of the service water system is controlled in order to minimize scaling, corrosion and biological fouling. This is accomplished by injecting multifunctional chemicals as required.

3←• 8←• 12←• •→6 •→2 •→9

During normal plant operation, the treated normal service water flows at a nominal rate of approximately 50 GPM from the normal service water supply and return headers located in the piping tunnels up to within close proximity of the standby cooling tower and then back into the normal service water system return headers to inhibit corrosion and organic fouling within the standby service water headers which are normally on standby. The flow path of treated normal service water is accomplished by using small bore piping cross-ties between the Divisions 1 and 2 standby service water supply and return headers. The normal service water supply and return header differential pressures and orifices in the cross-ties are used to establish the flow rate of treated normal service water through the standby service water supply and return headers.

Some of the treatment chemicals may be activated when the treated water passes through the drywell unit coolers. The drywell unit coolers are exposed to neutron leakage and scatter from the core during normal operation. These neutrons interact with the chemical constituents sodium and molybdenum which are then activated to their radioactive forms. For example, natural sodium (Na) is composed of the Na-23 which can be activated by neutron capture to Na-24. The radiological impact of service water leakage on normal plant effluents is negligible.

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Piping wall thicknesses are increased over standard design requirements by corrosion allowance of 0.125, to ensure against degradation of system performance due to the effects of long-term corrosion, is provided for all piping but the 48-in header between the normal service water pumps and the turbine building. For this piping, a program of corrosion monitoring is provided to detect corrosion problems before the minimum pipe wall thickness is compromised (see Section 9.2.1.4). Additionally, the water in the normal cooling water system is chemically treated and protective coatings are applied to the internals of certain components to control corrosion.
2←• 6←•

9.2.1.3 Safety Evaluation

The normal service water system is a non-nuclear safety system. Upon complete loss of normal service water, the plant is shut down. Cooling water for safe shutdown and maintenance of the safe shutdown condition is provided by the standby service water system (Section 9.2.7).
•→12
The normal service water headers in the turbine building and radwaste building can be isolated from the safety-related lines in the auxiliary, diesel generator, control, and containment buildings by automatic block valves and check valves in the normal service water supply header, and automatic block valves in the normal service water return header. These valves are Safety Class 3, except the containment isolation valves which are Safety Class 2. Piping within the auxiliary building, diesel generator room, control building, and reactor containment is common to the normal service water and standby service water systems. This piping is Safety Class 3, Seismic Category I.
12←•
Automatic isolation of the normal service water supply and return headers serving the auxiliary, control, and diesel generator buildings allows standby service water to cool essential components within these buildings under all accident conditions.

Analysis of postulated cracks in moderate-energy piping systems is covered in Section 3.6.

•→15
A fire in Area PT-1 (E, F & G-Tunnels) could potentially render the standby service water system inoperable. Normal service water and its required support systems (including the necessary portions of the Off-Site Power Distribution System) has been analyzed to remain free from fire damage during a fire in Fire Area PT-1. In this are only, normal service water is credited for cooling the required safe shutdown systems and components.
15←•

A manual control switch is provided in the main control room for operation of the condensate makeup containment isolation valve. The valve closes automatically on a LOCA signal.

A control switch is provided in the auxiliary control room for either manual or automatic operation of the condensate storage tank makeup valve. In the automatic mode, level control opens the valve when the condensate storage tank level is low and closes the valve when the level is high.

Pushbutton controls are provided in the auxiliary control room for either manual or automatic control of the condensate transfer pumps. When operating in the automatic mode, pump startup occurs on either low pump discharge pressure or high pump discharge flow. Pump discharge flow is monitored in the auxiliary control room. A low discharge flow condition when both pumps are running activates a condensate demand low alarm in the auxiliary control room. Alarms are activated in the auxiliary control room when a pump that is running automatically trips and when a pump automatically starts. A manual control switch is provided in the auxiliary control room for opening and closing of the condensate makeup to radwaste system isolation valve.

9.2.7 Standby Service Water System

The standby service water (SSW) system operates under emergency conditions, in conjunction with the ultimate heat sink, to remove heat from those plant components required for the safe shutdown and cooldown of the unit.

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A flow diagram for the standby service water system is included in Fig. 9.2-1b through 9.2-1f. Table 9.2-14 lists the essential components served by the standby service water system. Table 9.2-15 lists the major components in the standby service water system and the design cooling water flows for each. Table 9.2-16 presents a single passive failure analysis of the standby service water system. Quantities of heat rejected to standby service water are detailed in Section 9.2.5.

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9.2.7.1 Design Bases

The standby service water system is designed in accordance with the following requirements:

1. The system provides all the necessary cooling water to the reactor plant components required to safely bring the reactor to a cold shutdown condition and to maintain it in cold shutdown for a 30-day postaccident period.

2. The system automatically performs its emergency cooling function assuming any single active or passive failure coincident with a loss of offsite power.

3. The system is designed to Safety Class 3 requirements, as defined in Section 3.2.3.3 for pumps, piping, and valving.

4. The system is designed to Seismic Category I requirements, as defined in Section 3.7.

5. Protection is provided from extreme natural phenomena such as earthquakes, tornadoes, and floods, as described in Sections 3.2, 3.3, 3.5, and 3.8.

6. Protection is provided from the effects of externally and internally generated missiles, as described in Section 3.5.

7. Protection is provided from the effects of pipe whip and jet impingement from high- and moderate-energy line breaks, as described in Section 3.6.

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8. Deleted

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9. Redundancy is provided to permit isolation of inoperable components, subsystems, or piping without compromising their intended safety functions, as described in Section 9.2.7.3.

10. Provision is provided to permit operational functional testing of safety-related equipment during shutdown, as described in Section 9.2.7.4.

11. Nonseismic pipe, ductwork, or components are analyzed to ensure that their failure or collapse during an SSE does not compromise the system's safety function.

9.2.7.2 System Description

The standby service water system is composed of the following:

1. Two equally sized, redundant piping systems, each supplying the components listed in Table 9.2-15. During normal plant operation, the normal service water pumps use standby service water piping to supply safety-related components.

2. Four 50 percent capacity, 7,690 gpm, motor-driven, wet pit, vertical centrifugal standby service water pumps. Two pumps are provided on each redundant supply header. Operating characteristics of the SSW pumps are given in Fig. 9.2-22. A wall in the SSW pumphouse physically separates each set of two pumps. All four pumps take suction from a common pump well in the ultimate heat sink water storage basin.

3. One ultimate heat sink cooling tower and associated storage basin, as described in Section 9.2.5. Each redundant header may be remotely aligned to the two redundant cells on the ultimate heat sink cooling tower

The standby service water system is capable of accommodating any single component failure or loss of any single emergency power supply, i.e., Division I, II, or III power without affecting the overall system capability of effecting safe shutdown and cooldown or postaccident heat dissipation, as detailed in Table 9.2-16 and the FMEA. Operator actions may be required to isolate a failed component from the remainder of the standby service water system, or to transfer cooling to the redundant portion of the system, if the redundant portion was in a shutdown state.

A failure of Division I power will result in the unavailability of 1SWP*P2A and all associated motor-operated isolation valves. Pump 1SWP*P2C will start automatically on Division III power but is not required since the 100 percent redundant B subsystem will be fully operable on Division II power.

Operator action to close the NSW return valve will be required after 20 min to limit water loss from the unisolated A subsystem to the nonsafety-related normal service water subsystem.

A failure of Division II power will result in a loss of the B subsystem. Division I pump 1SWP*P2A and Division III pump 1SWP*P2C in the A subsystem will operate to provide all required cooling.

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A failure of Division III power will result in the unavailability of 1SWP*P2C. The three operable pumps will provide for all short-term cooling requirements. With the HPCS pump unavailability due to the loss of Division III power, operator action may be required after 20 min to ensure the availability of LPCS for long-term cooling. The fully operable B subsystem can handle RHR heat exchanger cooling with two pumps. Operator action may be required to limit water demands on the remaining A subsystem pump 1SWP*P2A. Equipment can be operated on Division I as long as the following essential equipment remains operable:

Auxiliary building unit coolers required to support LPCS operation

Standby diesel generator A

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A transient analysis was performed based on the following initial conditions:

1. A main steam line (or recirculation suction line) double-ended-rupture (DER) long-term response

2. The redundant portion of the system is in a shutdown state

3. Suppression pool temperature has not yet peaked.

A single passive or active failure (e.g., fan trip, flow, level, pressure, or temperature condition) in the standby service water system initiates an alarm in the main control room. Upon annunciation, the operator responds by initiating the necessary valve action to isolate standby service water to the independent redundant portion of the system or to isolate a failed component or portion of the system initiating the alarm condition from the remainder of the standby service water system. The conservative assumption is made that standby service water to the residual heat removal heat exchanger in the suppression pool cooling mode is lost for 10 min while the operator is establishing shell-side flow to the residual heat removal heat exchanger in the redundant portion of the system. A transient analysis indicates that the suppression pool temperature increase is less than 1°F, and the containment pressure increase is less than 0.1 psi. This transient analysis shows that the design objectives of the system can be met following the failure of a single component.

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A fire in Fire Area PT-1 (E, F & G-Tunnels) could potentially render the standby service water system inoperable. Normal service water and its required support system (including the necessary portions of the Off-Site Power Distribution System) has been analyzed to remain free from fire damage during a fire in Fire Area PT-1. IN this area only, normal service water is credited for cooling the required safe shutdown systems and components.

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Large-scale leakage from the standby service water system due to major piping or component failures can be detected by the following methods:

1. Standby service water flows in each redundant header are monitored in the pump discharge and service water flow recorder. A mismatch in these flows indicate large-scale leakage.

2. Pump discharge header pressure transmitters alarm required header pressure.

Small-scale leakage from standby service water piping or components can be detected by the following methods:

1. Routine maintenance and inservice inspection

2. Monitoring building and tunnel sump levels

3. Monitoring the operation of components cooled by the standby service water system.

9.2.7.4 Testing and Inspection Requirements

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The standby service water system will be tested periodically in accordance with Regulatory Position 2.b of Regulatory Guide 1.22 and the requirements of the ASME Code, Section XI.

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The reactor plant component cooling water system and the plant chilled water system (that supply the containment unit coolers during normal plant operations) are both demineralized water systems. Since the service water system is chlorinated, the above valves are not operated during normal plant operation to prevent the introduction of chlorinated water into these demineralized water systems. These valves can be tested when the reactor is shut down. All of these valves are accessible during

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