INSTRUMENTATION THAT INITIATES OR CONTROLS THE CORE AND CONTAINMENT COOLING SYSTEMS

Minimum # of Operable Instrument Channels Per Trip System (1)	Trip Function	Trip Level Setting	Remarks
2 (7)	High Drywell Pressure	≤2.22 psig	1. Initiates Core Spray; LPCI; HPCI. 2. In conjunction with Low-Low Reactor Water Level, 94.4-115.6 second time delay and LPCI or Core Spray pump running, initiates Auto Blowdown (ADS) 3. Initiates starting of Diesel Generators 4. In conjunction with Reactor Low Pressure initiates closure of HPCI vacuum breaker containment isolation valves.
1	Reactor Low Pressure	400 psig ± 5	Permissive for opening Core Spray and LPCI Admission valves.
1	Reactor Low Pressure	≤76 psig	In conjunction with PCIS signal permits closure of RHR (LPCI) injection valves.
1	Reactor Low Pressure	400 psig ± 5	In conjunction with Low-Low Reactor Water Level initiates Core Spray and LPCI.
2	Reactor Low Pressure	900 psig ± 5	Prevents actuation of LPCI break detection circuit.
2	Reactor Low Pressure	80 psig ± 5	Isolates HPCI and in conjunction with High Drywell Pressure initiates closure of HPCI vacuum breaker containment isolation valves.

NOTES FOR TABLE 3.2.B

1. Whenever any CSCS subsystem is required by Section 3.5 to be operable, there shall be two (Note 5) operable trip systems. If the first column cannot be met for one of the trip systems, that system shall be repaired or the reactor shall be placed in the Cold Shutdown Condition within 24 hours after this trip system is made or found to be inoperable.

2. Close isolation valves in RCIC subsystem.

3. Close isolation valves in HPCI subsystem.

4. Instrument set point corresponds to 79.96 inches above top of active fuel.

5. RCIC has only one trip system for these sensors.

6. Does not include static head of 17.5 psi.

7. Only required to be Operable in Run, Startup, and Hot Shutdown Modes.

LIMITING CONDITIONS FOR OPERATION

3.5 CORE AND CONTAINMENT COOLING SYSTEMS

Applicability

Applies to the operational status of the core and suppression pool cooling systems.

Objective

To assure the operability of the core and suppression pool cooling systems under all conditions for which this cooling capability is an essential response to station abnormalities.

Specification

A. Core Spray and LPCI Systems

1. Both core spray systems shall be Operable during Run, Startup, and Hot Shutdown Modes and prior to reactor startup from Cold Shutdown, except as specified in 3.5.A.2.

2. During Run, Startup, and Hot Shutdown Modes:

   a. With one of the core spray systems inoperable, restore the inoperable core spray system to Operable status within 7 days and maintain all active components of the LPCI system and the diesel generators Operable. Otherwise, be in at least Cold Shutdown within 24 hours.

   b. With both of the core spray systems inoperable be in at least Cold Shutdown within 24 hours.

3. The LPCI system shall be Operable during Run, Startup, and Hot Shutdown Modes and prior to reactor startup from Cold Shutdown, except as specified in 3.5.A.4.

SURVEILLANCE REQUIREMENTS

4.5 CORE AND CONTAINMENT COOLING SYSTEMS

Applicability

Applies to the Surveillance Requirements of the core and suppression pool cooling systems which are required when the corresponding Limiting Condition for operation is in effect.

Objective

To verify the operability of the core and suppression pool cooling systems under all conditions for which this cooling capability is an essential response to station abnormalities.

Specification

A. Core Spray and LPCI Systems

1. Core Spray System Testing.

Item	Frequency
a. Simulated Automatic Actuation Test.	Once/ Operating Cycle
b. Pump Operability.	When tested as specified in 3.13 verify that each core spray pump delivers at least 3300 GPM against a system head corresponding to a reactor vessel pressure of 104 psig.

LIMITING CONDITIONS FOR OPERATION

3.5 CORE AND CONTAINMENT COOLING SYSTEMS

A. Core Spray and LPCI Systems (Cont)

4. During Run, Startup, and Hot Shutdown Modes with the LPCI system inoperable, restore the LPCI system to Operable status within 7 days and maintain both core spray systems and the diesel generators Operable. Otherwise, be in at least Cold Shutdown within 24 hours.

5. Two low pressure injection/spray subsystems shall be Operable during Cold Shutdown and Refuel Modes unless the rector head is removed, the spent fuel pool gates are removed, and water level is at greater than or equal to elevation 114 foot, except as specified in 3.5.A.6.

6. During Cold Shutdown and Refuel Modes unless the reactor head is removed, the spent fuel pool gates are removed, and water level is at greater than or equal to elevation 114 foot:

   a. With one of the required low pressure injection/spray subsystems inoperable, restore the inoperable required low pressure injection/spray subsystem to Operable status within 4 hours. Otherwise, take immediate action to suspend activities with potential for draining the reactor vessel.

   b. With both of the required low pressure injection/spray subsystems inoperable, take immediate action to suspend activities with potential for draining the reactor vessel and restore 1 low pressure injection/spray subsystem to Operable status within 4 hours. Otherwise, take immediate action to restore secondary containment and one standby gas treatment system to Operable status and to restore isolation capability in each required secondary containment penetration flow path not isolated.

SURVEILLANCE REQUIREMENTS

4.5 CORE AND CONTAINMENT COOLING SYSTEMS

A. Core Spray and LPCI Systems (Cont)

1. c. Motor Operated Valve Operability — As Specified in 3.13

   d. Core Spray Header Δp Instrumentation

Check	Once/day
Calibrate	Once/3 months
Test Step	Once/3 months

2. This section intentionally left blank

3. LPCI system testing shall be as follows:

a. Simulated Automatic Actuation Test	Once/ Operating Cycle
b. Pump Operability.	When tested as specified in 3.13, verify that each LPCI pump delivers 4800 GPM at a head across the pump of at least 380 ft.
c. Motor Operated Valve Operability	As Specified in 3.13

LIMITING CONDITION FOR OPERATION

3.5 CORE AND CONTAINMENT COOLING SYSTEMS (Cont)

F. Minimum Low Pressure Cooling and Diesel Generator Availability

1. During any period when one emergency diesel generator (EDG) is inoperable, continued reactor operation is permissible only during the succeeding 72 hours unless such EDG is sooner made operable, provided that all of the low pressure core and containment cooling systems shall be operable, and the remaining EDG shall be operable in accordance with 4.5.F.1. If this requirement cannot be met, an orderly shutdown shall be initiated and the reactor shall be placed in the Cold Shutdown Condition within 24 hours.

   The 72 hours LCO can be extended to 14 days provided, in addition to the above requirements, the Station Black Out Diesel Generator is verified operable in accordance with 4.5.F.2.

2. Deleted

3. Deleted

4. Deleted

SURVEILLANCE REQUIREMENT

4.5 CORE AND CONTAINMENT COOLING SYSTEMS (Cont)

F. Minimum Low Pressure Cooling and Diesel Generator Availability

1. When it is determined that one EDG is inoperable, within 24 hours, determine that the operable EDG is not inoperable due to a common cause failure,

   OR

   perform surveillance 4.9.A.1.a for the operable EDG,

   AND

   within 1 hour and once every 8 hours thereafter, verify correct breaker alignment and indicated power availability for each offsite circuit.

2. Confirm the Station Black Out Diesel Generator (SBO-DG) has been demonstrated operable within the preceding 7 days

   OR

   within 72 hours of declaring an EDG inoperable, perform a surveillance to demonstrate that the SBO-DG is operable,

   AND

   within 1 hour of demonstrating the SBO-DG operability as specified above and once every 8 hours thereafter, verify normal breaker configuration.

LIMITING CONDITIONS FOR OPERATION

SURVEILLANCE REQUIREMENTS

3.7 CONTAINMENT SYSTEMS (CONT)

4.7 CONTAINMENT SYSTEMS (Cont)

A. Primary Containment (Cont)

k. The differential pressure may be reduced to less than 1.17 psid for a maximum of four (4) hours for maintenance activities on the differential pressure control system and during required operability testing of the HPCI system, the relief valves, the RCIC system and the drywell-suppression chamber vacuum breakers.

l. If the specifications of Item i, above, cannot be met, and the differential pressure cannot be restored within the subsequent (6) hour period, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition in twenty-four (24) hours.

m. Suppression chamber water level shall be between -6 to -1 inches on torus level instrument which corresponds to a downcomer submergence of 3 feet to 3 feet 5 inches.

n. The suppression chamber can be drained if the conditions as specified in Section 3.5.F.5 of this Technical Specification are adhered to.

BACKGROUND

Each Core Spray system consists of one pump and associated piping and valves with all active components required to be operable. The LPCI system consists of four LPCI pumps and associated piping and valves with all active components required to be operable.

Each low pressure injection/spray subsystem during the Cold Shutdown or Refuel Mode consists of any one pump and the required associated piping and valves with all active components required to be operable of the LPCI or Core Spray Systems.

The LPCI system is not considered inoperable when the RHR System is operating in the shutdown cooling mode.

APPLICABLE SAFETY ANALYSES

Based on the loss of coolant analysis performed by General Electric in accordance with Section 50.46 and Appendix K of 10CFR50, the Pilgrim I Emergency Core Cooling Systems are adequate to provide sufficient cooling to the core to dissipate the energy associated with the loss of coolant accident, to limit calculated fuel clad temperature to less than 2200°F, to limit calculated local metal water reaction to less than or equal to 17%, and to limit calculated core wide metal water reaction to less than or equal to 1%. The detailed bases is described in NEDC-31852P and summarized in Section 6.5 of the PNPS FSAR.

The analyses discussed in NEDC-31852P calculated a peak clad fuel temperature of less than 2200°F with a Core Spray pump flow of 3200 gallons per minute (gpm). A flow rate of 3300 gpm ensures adequate flow for events involving degraded voltage.

Core spray distribution has been shown, in full-scale tests of systems similar in design to that of Pilgrim, to exceed the minimum requirements by at least 25%. In addition, cooling effectiveness has been demonstrated at less than half the rated flow in simulated fuel assemblies with heater rods to duplicate the decay heat characteristics of irradiated fuel. The accident analysis takes credit for core spray flow into the core at vessel pressure below 205 psig. However, the analysis is conservative in that no credit is taken for spray cooling heat transfer in the hottest fuel bundle until the pressure at rated flow for the core spray (104 psig vessel pressure) is reached.

The LPCI system is designed to provide emergency cooling to the core by flooding in the event of a loss-of-coolant accident. This system functions in combination with the core spray system to prevent excessive fuel clad temperature. The LPCI system and the core spray system provide adequate cooling for break areas of approximately 0.2 square feet up to and including the double-ended recirculation line break without assistance from the high pressure emergency core cooling systems. The analyses in NEDC-31852P calculated a peak clad fuel temperature of less than 2200°F with LPCI pump flows of 4550 gpm, 4033 gpm, and 3450 gpm for two, three, and four pump combinations feeding into a single loop. A single pump flow rate at 4800 gpm ensures sufficient flow to meet or exceed the analyses' assumptions.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The analyses of LOCA for PNPS demonstrated the combination of LPCS/LPCI systems are sufficient to provide core cooling even with a single failure of either an active or passive safety-related component. The analyses determined there were four significant single failures that challenge the Emergency Core Coolant Systems' capability to prevent fuel damage during the postulated LOCA. They are:

1) Battery Failure - Loss of a single battery train could leave only one LPCS pump, two LPCI pumps, and ADS to mitigate the LOCA. This is the most limiting single failure for all but the largest postulated recirculation line breaks and for all postulated non-recirculation line breaks.

2) LPCI Injection Valve Failure - Loss of the injection valve selected by LPCI Loop Selection Logic for the pathway for all LPCI pumps' flow leaves two core spray pumps, HPCI, and ADS for LOCA mitigation. This becomes the limiting single failure for the largest postulated recirculation line breaks.

3) Loss of one emergency diesel generator - This leaves one LPCS pump, two LPCI pumps, and ADS for LOCA mitigation.

4) HPCI Failure - This leaves all other ECCS resources available. It is a significant failure primarily for small line breaks.

In all cases above, the remaining ECCS resources are sufficient to prevent PCT from exceeding 2200° F and other criteria provided in Section 50.46 and Appendix K of 10CFR50.

During unit operation the ECCS performance is evaluated for the entire spectrum of break sizes for a postulated loss of coolant accident (LOCA). The long term cooling analysis following a design basis LOCA demonstrates that only one low pressure ECCS injection/spray subsystem is required, post LOCA, to maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown. Therefore, it is reasonable to assume, based on engineering judgment, that while in Cold Shutdown or Refuel Mode, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level. During the Cold Shutdown and Refuel Modes when the reactor head is removed, the spent fuel pool gates are removed, and water level is at greater than or equal to elevation 114 foot in excess of 300,000 gallons of water is available to provide core cooling in the event of leakage from the reactor vessel without ECCS operation. These conditions provide sufficient coolant inventory to allow operator action to terminate the inventory loss prior to fuel uncovery in case of an inadvertent draindown; therefore, no ECCS is required to be operable.

BASES

ACTIONS

3.5.A.2

During the Run, Startup and Hot Shutdown Modes should one Core Spray system become inoperable, the remaining Core Spray and the LPCI system are available should the need for core cooling arise. Based on judgment of the reliability of the remaining systems a seven-day repair period is justified. If the inoperable Core Spray system is not restored to Operable status within the 7 days or one of the remaining systems becomes inoperable the unit must be in at least Cold Shutdown within the next 24 hours.

3.5.A.4

During the Run, Startup, and Hot Shutdown Modes should the LPCI system become inoperable, the remaining Core Spray systems are available should the need for core cooling arise. Based on judgment of the reliability of the remaining systems a seven-day repair period is justified. If the inoperable Core Spray system is not restored to Operable status within the 7 days or one of the remaining systems becomes inoperable the unit must be in at least Cold Shutdown within the next 24 hours.

3.5.A.6.a

During Cold Shutdown and Refuel Modes unless the reactor head is removed, the spent fuel pool gates are removed, and water level is at greater than or equal to elevation 114 foot if any one required low pressure injection/spray subsystem is inoperable, the inoperable subsystem must be restored to Operable status in 4 hours. In this condition, the remaining Operable subsystem can provide sufficient vessel flooding capability to recover from an inadvertent vessel draindown. However, overall system reliability is reduced because a single failure in the remaining Operable subsystem concurrent with a vessel draindown could result in the ECCS not being able to perform its intended function. The 4 hour completion time for restoring the required low pressure injection/spray subsystem to Operable status is based on engineering judgment that considered the remaining available subsystem and the low probability of a vessel draindown event.

With the inoperable subsystem not restored to Operable status in the required completion time, action must be immediately initiated to suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.

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BASES

ACTIONS

3.5.A.6.b

During Cold Shutdown and Refuel Modes unless the reactor head is removed, the spent fuel pool gates are removed, and water level is at greater than or equal to elevation 114 foot with both of the required ECCS injection/spray subsystems inoperable, all coolant inventory makeup capability may be unavailable. Therefore, actions must immediately be initiated to suspend OPDRVs to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended. One ECCS injection/spray subsystem must also be restored to Operable status within 4 hours.

If at least one low pressure ECCS injection/spray subsystem is not restored to Operable status within the 4 hour Completion Time, additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is Operable; one standby gas treatment subsystem is Operable; and secondary containment isolation capability (i.e., one isolation valve and associated instrumentation are Operable or other acceptable administrative controls to assure isolation capability) in each associated penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases. Operability may be verified by an administrative check, or by examining logs or other information, to determine whether the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the Operability of the components. If, however, any required component is inoperable, then it must be restored to Operability status. In this case, Surveillance may need to be performed to restore the component to Operable status. Actions must continue until all required components are Operable.

The 4 hour completion time to restore at least one low pressure injection/spray subsystem to Operable status ensures that prompt action will be taken to provide the required cooling capacity or to initiate actions to place the plant in a condition that minimizes any potential fission product release to the environment.

SURVEILLANCE REQUIREMENTS

The testing interval for the core and containment cooling systems is based on industry practice, quantitative reliability analysis, judgment and practicality. The core cooling systems have not been designed to be fully testable during operation. To increase the availability of the core and containment cooling systems, the components which make up the system; i.e., instrumentation, pumps, valves, etc., are tested frequently. The pumps and motor operated valves are tested in accordance with ASME B&PV Code, Section XI (IWP and IWV, except where specific relief is granted) to assure their operability. The frequency and methods of testing are described in the PNPS IST

(continued)

B 3/4.5 CORE AND CONTAINMENT COOLING SYSTEMS

3/4.5.F. BASES: Minimum Low Pressure Cooling and Diesel Generator Availability

BACKGROUND

The purpose of Specification 3/4.5.F is to assure that adequate core cooling equipment is available at all times. If, for example, one core spray were out of service and the diesel which powered the opposite core spray were out of service, only 2 LCPI pumps would be available.

Specification 3.4.F.5 allows removal of one CRD mechanism while the torus is in a drained condition without compromising core cooling capability. The available core cooling capability for a potential draining of the reactor vessel while this work is performed is based on an estimated drain rate of 300 gpm if the control rod blade seal is unseated. Flooding the refuel cavity and dryer/separator pool to elevation 114'-0" corresponds to approximately 305,000 gallons of water and will provide core cooling capability in the event leakage from the control rod drive does occur. A potential draining of the reactor vessel (via control rod blade leakage) would allow this water to enter into the torus and after approximately 243,000 gallons have accumulated (needed to meet minimum NPSH requirements for the LPCI and/or core spray pumps), the torus would be able to serve as a common suction header. This would allow a closed loop operation of the LPCI system and the core spray system (once re-aligned) to the torus. In addition, the other core spray system is lined up to the condensate storage tanks which can supplement the refuel cavity and dryer/separator pool water to provide core flooding, if required.

ACTION

The maximum allowed out-of service (OOS) time for one EDG is 14 days, provided that one EDG and the SBO-DG are operable, in addition to all of the low pressure core and containment cooling systems as specified in 3.5.F.1. If the SBO-DG is determined to be inoperable, the maximum allowed OOS time for one EDG is 72 hours. A 24-hour LCO will control the plant for cold shutdown if the SBO-DG becomes inoperable anytime after 72 hours during a 14-day EDG LCO.

SURVEILLANCE

The SBO-DB shall be determined to e operable as defined below for extending the 3 days OOS time to 14 days for an EDG. The SBO-DG is operable if a surveillance was completed within the last seven days before extending to a 14 day OOS; otherwise , a surveillance must be completed to demonstrate that the SBO-DG is operable. The 72 hours period allows the operators to complete the required SBO-DG surveillance using the 23Kv offsite power source and to notify Commonwealth Electric of the needed use of the 23 Kv line in the testing configuration. The SBO-DG is operable if it is capable of