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February 8, 1978

Mr. Edson G. Case, Deputy Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Station Units 2 and 3
Quad-Cities Station Units 1 and 2
Proposed Amendment to Facility
Operating License Nos. DPR-19,
DPR-25, DPR-29, and DPR-30
NRC Docket Nos. 50-237/249/254/265

Reference (a): D. K. Davis letter to R. L. Bolger dated August 3, 1977

(b): R. L. Bolger letter to E. G. Case dated October 25, 1977

(c): D. K. Davis letter to R. L. Bolger dated December 12, 1977

Dear Mr. Case:

Pursuant to 10 CFR 50.59, Commonwealth Edison proposes to make amendments to Dresden Units 2 and 3 and Quad-Cities Units 1 and 2 Technical Specifications concerning surveillance testing of relief valves as requested in Reference (c). Reference (b) transmitted our original Technical Specification change as requested by Reference (a). However, as the Staff stated in Reference (c), additional clarification to its initial request was needed and that a new submittal would be required. This submittal completely replaces Reference (b).

The proposed change to Dresden Units 2 and 3 will require amending pages 78, 79, 84, 86, and adding pages 78A and 81H to both DPR-19 and DPR-25. During our review of this change a typographical error was noted on page 79 Section 3.5.E.1. The reference to Section 3.5.F.2 should be changed to 3.5.E.2.

The proposed change to Quad-Cities Units 1 and 2 will require amending pages 3.5/4.5-5, 3.5/4.5-12, 3.5/4.5-16 (DPR-29), 3.5/4.5-16A (DPR-29), 3.5/4.5-15 (DPR-30), 3.5/4.5-15A (DPR-30), and adding pages 3.5/4.5-5A, 3.5/4.5-19 (DPR-30), and 3.5/4.5-20 (DPR-29). Pages 3.5/4.5-16A and 3.5/4.5-15A are included in this submittal because a portion of the previous page had to be displaced onto it. There are no "changes" made to the subject matter on this page.

Attachment I contains Dresden Station Units 2 and 3 changes, Attachment II contains Quad-Cities Station Unit 1 changes, and Attachment III contains Quad-Cities Station Unit 2 changes.

These Technical Specification changes have received on-site and off-site review and approval. Please direct any additional questions on this matter to this office.

Three (3) signed originals and fifty-seven (57) copies are provided for your use.

Very truly yours,

C. Reed

Cordell Reed
Assistant Vice President

attachments

SUBSCRIBED and SWORN to
before me this 10th day
of February, 1978

Notary Public

Attachment I

Dresden Station Units 2 and 3

DPR-19 and DPR-25

3.5 LIMITING CONDITION FOR OPERATION

D. Automatic Pressure Relief Subsystems

1. Except as specified in 3.5.D.2 and 3 below, the Automatic Pressure Relief Subsystem shall be operable whenever the reactor pressure is greater than 90 psig and irradiated fuel is in the reactor vessel.

4.5 SURVEILLANCE REQUIREMENT

D. Surveillance of the Automatic Pressure Relief Subsystem shall be performed as follows:

1. Perform the indicated surveillances as required.

   a. During each operating cycle the following shall be preformed:

      (1) A simulated automatic initiation which opens all pilot valves.

      (2) A logic system functional test shall be preformed each refueling outage.

      (3) A visual inspection of the target rock and relief valve line restraints in the torus to verify structural integrity for continued operation.

   b. Until March 1, 1979, at least once each 18 months the following shall be performed:

      (1) With the reactor at $\geq$ 100 psig in the steam dome each valve shall be manually opened. Relief valve opening shall be verified by a compensating turbine bypass valve or control valve closure.

   c. After March 1, 1979, the following test program shall be performed in accordance with the test schedule of Table 4.5.1.

3.5 LIMITING CONDITION FOR OPERATION	4.5 SURVEILLANCE REQUIREMENT
	(1) With the reactor at ≥ 100 psig in the steam dome each relief valve shall be manually opened. Relief valve opening shall be verified by a compensating turbine bypass valve or control valve closure. (2) The initial required test interval of Table 4.5.1 shall be determined by the number of remotely operated relief valves found inoperable from March 1, 1978 to March 1, 1979. (3) The initial valve tests of Table 4.5.1 shall be completed by the earlier of the completion of the next refueling outage occurring after March 1, 1979 or the time period defined by March 1, 1979 plus the initial test interval determined above.
2. From and after the date that one of the five relief valves of the automatic pressure relief subsystem is made or found to be inoperable when the reactor is pressurized above 90 psig with irradiated fuel in the reactor vessel, reactor operation is permissible only during the succeeding 14 days unless repairs are made and provided that during such time the HPCI Subsystem is demonstrated operable, and the core spray and LPCI systems are operable.	2. When it is determined that one relief valve of the automatic pressure relief subsystem is inoperable, the HPCI shall be demonstrated to be operable immediately and weekly thereafter. Core spray and LPCI must have been demonstrated operable within the last 30 days.
3. From and after the date that more than one of five relief valves of the automatic pressure relief subsystem is made or found to be inoperable when the reactor is pressurized above 90 psig with irradiated fuel in the reactor vessel, reactor operation at greater than 90 psig	3. When it is determined that more than one relief valve of the automatic pressure relief subsystem is inoperable, the HPCI subsystem shall be demonstrated to be operable immediately.

is permissible only during the succeeding 24 hours unless repairs are made and provided that during such time the HPCI Subsystem is operable.

4. If the requirements of 3.5.D cannot be met, an orderly shutdown shall be initiated and the reactor pressure shall be reduced to 90 psig within 24 hours.

5. A failure of any combination safety relief valve to open under a manual actuation signal does not constitute a failure of the safety function of that valve as described in Sections 3.6.E and 4.6.E.

E. Isolation Condenser System

1. Whenever the reactor pressure is greater than 90 psig and irradiated fuel is in the reactor vessel, the isolation condenser shall be operable except as specified in 3.5.E.2.

2. From and after the date that the isolation condenser system is made or found to be inoperable for any reason, reactor operation is permissible only during the succeeding seven days unless such system is sooner made operable, provided that during such seven days all active components of the HPCI subsystem are operable.

3. If the requirements of 3.5.E cannot be met an orderly shutdown shall be

E. Surveillance of the Isolation Condenser System shall be performed as follows:

1. Isolation Condenser System Testing:

   a. The shell side water level and temperature shall be checked daily.

   b. Simulated automatic actuation and functional system testing shall be performed during each refueling outage or whenever major repairs are completed on the system.

   c. The system heat removal capability shall be determined once every five years.

   d. Calibrate vent line radiation monitors quarterly.

2. When it is determined that the isolation condenser system is inoperable, the HPCI subsystem shall be demonstrated to be operable immediately and daily thereafter.

TABLE 4.5.1

REMOTELY OPERATED RELIEF AND SAFETY-RELIEF VALVE TEST SCHEDULE#

NUMBER OF REMOTELY OPERATED RELIEF AND SAFETY-RELIEF VALVES FOUND INOPERABLE DURING TESTING OR TEST INTERVAL**	NEXT REQUIRED TEST INTERVAL*
0	18 months ± 25%
1	184 days ± 25%
2	92 days ± 25%
≥ 3	31 days ± 25%

* The required test interval shall not be lengthened more than one step at a time. Early tests may be performed prior to entering the "next required test interval" (i.e., in advance of the nominal time less the negative 25% tolerance band). Early tests may be used as a new reference point for tests of the same interval, however, they are not acceptable for lengthening the test interval.

**Setpoint drift is not considered to be a valve failure for the purposes of this test schedule.

#Each affected remotely operated relief and safety-relief valve shall be demonstrated OPERABLE pursuant to Specifications 4.5.D.1.b.(1) and 4.5.D.1.c.(1) as applicable, within 36 hours after exceeding 100 psig, whenever maintenance, repair or replacement work is performed on a valve or its associated actuator. Successful tests performed under this provision may be used to satisfy the test requirements for a "required test interval" provided such tests are performed within the current "required test interval" and its associated tolerance band. Valve failures detected during testing under this provision shall not be considered inoperable valves for the purpose of this table.

D. Automatic Pressure Relief Subsystem

Upon failure of the HPCI subsystem to function properly following a small break loss-of-coolant accident, the automatic pressure relief subsystem automatically causes the relief valves to open, depressurizing the reactor so that flow from the low pressure cooling systems can enter the core in time to limit fuel cladding temperature to 2200°F. The APR subsystem is conservatively required to be operable whether the reactor vessel pressure exceeds 90 psig, even though the low pressure core cooling systems can respond properly up to 350 psig.

E. Isolation Cooling System - The turbine main condenser is normally available. The isolation condenser is provided for core decay heat removal following reactor isolation and scram. The isolation condenser has a heat removal capacity sufficent to handle the decay heat production at 300 seconds following a scram. Water will be lost from the reactor vessel through the relief valves in the 300 seconds following isolation and scram. This represents a minor loss relative to the vessel inventory.

The system may be manually initiated at any time. The system is automatically initiated on high reactor pressure in excess of 1060 psig sustained for 15 seconds. The time delay is provided to prevent unnecessary actuation of the system during anticipated turbine trips. Automatic initiation is provided to minimize the coolant loss following isolation from the main condenser. To be considered operable the shell side of the isolation condenser must contain at least 11,300 gallons of water. Make-up water to the shell side of the isolation condenser is provided by the condensate transfer pumps from the condensate storage tank. The condensate transfer pumps are operable from on-site power. The fire protection system is also available as make-up water. An alternate method of cooling the core upon isolation from the main condenser is by using the relief valves and HPCI subsystem in a feed and bleed manner. Therefore, the high pressure relief function and the HPCI must be available together to cope with an anticipated transient so the LCO for HPCI and relief valves is set upon this function rather than their function as depressurization means for a small pipe break.

F. Emergency Cooling Availability - The purpose of Specification D is to assure a minimum of 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 LPCI pumps would be available. Likewise, if 2 LPCI pumps were out of service and 2 containment service water pumps on the opposite side were also out of service no containment cooling would be available. It is during refueling outages that major maintenance is performed and during such time that all low pressure core cooling systems may be out of service. This specification provides that should this occur, no work will be performed on the primary system which could lead to draining the vessel. This work would include work on certain control rod drive components and recirculation system. Thus, the specification precludes the events which could require core cooling. Specification 3.9 must also be consulted to determine other requirements for the diesel generators.

The testing frequency applicable to APR valves is provided to ensure operability and demonstrate reliability of the valves. The required testing interval varies with observed valve failures. The number of inoperable valves found during both operation and testing of these valves determines the time interval for the next required test of these valves. Early tests may be performed prior to entering the next required test **interval**(i.e., in advance of the nominal time less the negative 25% tolerance band). Early tests may be used as a new reference point for tests of the same time interval. However, they are not acceptable for lengthening the test interval since they were not performed within the ± 25% tolerance band as required by Table 4.5.1.

H. <u>Maintenance of Filled Discharge Pipe</u>

The surveillance requirements to assure that the discharge piping of the core spray, LPCI, and HPCI systems are filled provides for a visual observation that water flows from a high point vent. This ensures that the line is in a full conditon. Between the monthly intervals at which the lines are vented, instrumentation has been provided to monitor the presence of water in the discharge piping. This instrumentation will be calibrated on the same frequency as the safety system instrumentation. This period of periodic testing ensures that during the intervals between the monthly checks the status of the discharge piping is monitored on a continuous basis.

Attachment II

Quad-Cities Station Unit 1

DPR-29

provided that during such 7 days all active components of the automatic pressure relief subsystems, the core spray subsystems, LPCI mode of the RHR system, and the RCIC system are operable.

3. If the requirements of Specification 3.5.C cannot be met, an orderly shutdown shall be initiated, and the reactor pressure shall be reduced to 90 psig within 24 hours.

D. Automatic Pressure Relief Subsystems

1. The automatic pressure relief subsystem shall be operable whenever the reactor pressure is greater than 90 psig, irradiated fuel is in the reactor vessel and prior to reactor startup from a cold condition.

2. From and after the date that one of the five relief valves of the automatic pressure relief subsystem is made or found to be inoperable when the reactor is pressurized above 90 psig with irradiated fuel in the reactor vessel, reactor operation is permissible only during the succeeding 14 days unless repairs are made and provided that during such time the HPCI subsystem is demonstrated operable and the core spray and LPCI subsystems are operable.

3. If the requirements of Specification 3.5.D cannot be met, an orderly shutdown shall be initiated and the reactor pressure shall be reduced to 90 psig within 24 hours.

operable immediately. The automatic pressure relief and RCIC systems shall be demonstrated to be operable daily thereafter.

D. Automatic Pressure Relief Subsystems

Surveillance of the automatic pressure relief subsystems shall be performed as follows:

1. A simulated automatic initiation test which opens all pilot valves shall be performed each refueling outage.

2. At least once per 18 months, until March 1, 1979, with the reactor at pressure, each relief valve shall be manually opened. Relief valve opening shall be verified by a compensating turbine bypass valve or control valve closure.

3. After March 1, 1979, each relief valve shall be manually opened in accordance with the test schedule given in Table 4.5-1. Relief valve opening shall be verified by a compensating turbine bypass valve or control valve closure.

4. The Initial Next Required Test Interval of Table 4.5-1 shall be determined by the number of relief valves found inoperable from March 1, 1978 through March 1, 1979

5. The initial valve tests of Table 4.5-1 shall be completed by, the earlier of:

   a. The completion of the next refueling outage occurring after March 1, 1979, or

   b. The time period defined by March 1, 1979 plus the initial test interval, determined above.

6. At least once per refueling outage a visual inspection of the relief valve line restraints in the suppression chamber shall be conducted to verify structural integrity for continued operation.

7. A logic system functional test shall be performed each refueling outage.

8. When it is determined that one relief valve of the automatic pressure relief subsystem is inoperable, the HPCI shall be demonstrated to be operable immediately and weekly thereafter.

Should the loss of one RHR pump occur, a nearly full complement of core and containment cooling equipment is available. Three RHR pumps in conjunction with the core spray subsystem will perform the core cooling function. Because of the availability of the majority of the core cooling equipment, which will be demonstrated to be operable, a 30-day repair period is justified. If the LPCI mode of the RHR system is not available, at least two RHR pumps must be available to fulfill the containment cooling function. The 7-day repair period is set on this basis.

B. RHR Service Water

The containment cooling mode of the RHR system is provided to remove heat energy from the containment in the event of a loss-of-coolant accident. For the flow specified, the containment long-term pressure is limited to less than 8 psig and is therefore more than ample to provide the required heat-removal capability (reference SAR Section 5.2.3.2).

The containment cooling mode of the RHR system consists of two loops, each containing two RHR service water pumps, one heat exchanger, two RHR pumps, and the associated valves, piping, electrical equipment, and instrumentation. Either set of equipment is capable of performing the containment cooling function. Loss of one RHR service water pump does not seriously jeopardize the containment cooling capability, as any one of the remaining three pumps can satisfy the cooling requirements. Since there is some redundancy left, a 30-day repair period is adequate. Loss of one loop of the containment cooling mode of the RHR system leaves one remaining system to perform the containment cooling function. The operable system is demonstrated to be operable each day when the above condition occurs. Based on the fact that when one loop of the containment cooling mode of the RHR system becomes inoperable, only one system remains, which is tested daily, a 7-day repair period was specified.

C. High-Pressure Coolant Injection

The high-pressure coolant injection subsystem is provided to adequately cool the core for all pipe breaks smaller than those for which the LPCI mode of the RHR system or core spray subsystems can protect the core.

The HPCI meets this requirement without the use of offsite electrical power. For the pipe breaks for which the HPCI is intended to function, the core never uncovers and is continuously cooled, thus no cladding damage occurs (reference SAR Section 6.2.5.3). The repair times for the limiting conditions of operation were set considering the use of the HPCI as part of the isolation cooling system.

D. Automatic Pressure Relief

Upon failure of the HPCI to function properly after a small break loss-of-coolant accident, the ADS automatically causes the safety-relief valves to open, depressurizing the reactor so that flow from the low pressure cooling systems can enter the core in time to limit fuel cladding temperature to less than 2200^{o}F. ADS is conservatively required to be operable whenever reactor vessel pressure exceeds 90 psig even though low pressure cooling systems provide adequate core cooling up to 350 psig.

E. RCIC

The RCIC system is provided to supply continuous makeup water to the reactor core when the reactor is isolated from the turbine and when the feedwater system is not available. Under these conditions the pumping capacity of the RCIC system is sufficient to maintain the water level above the core without any other water system in operation. If the water level in the reactor vessel decreases to the RCIC initiation level, the system automatically starts. The system may also be manually initiated at any time.

4.5 SURVEILLANCE REQUIREMENTS BASES

The testing interval for the core and containment cooling systems is based on a quantitative reliability analysis, judgment, and practicality. The core cooling systems have not been designed to be fully testable during operation. For example, the core spray final admission valves do not open until reactor pressure has fallen to 350 psig. Thus, during operation, even if high drywell pressure were simulated, the final valves would not open. In the case of the HPCI, automatic initiation during power operation would result in pumping cold water into the reactor vessel which is not desirable.

The systems can be automatically actuated during a refueling outage and this will be done. To increase the availability of the individual components of the core and containment cooling systems, the components which make up the system, i.e., instrumentation, pumps, valve operators, etc., are tested more frequently. The instrumentation is functionally tested each month. Likewise the pumps and motor-operated valves are also tested each month to assure their operability. The combination of a yearly simulated automatic actuation test and monthly tests of the pumps and valve operators is deemed to be adequate testing of these systems.

With components or subsystems out of service, overall core and containment cooling reliability is maintained by demonstrating the operability of the remaining cooling equipment. The degree of operability to be demonstrated depends on the nature of the reason for the out-of-service equipment. For routine out-of-service periods caused by preventative maintenance, etc., the pump and valve operability checks will be performed to demonstrate operability of the remaining components. However, if a failure, design deficiency, etc., causes the out-of-service period, then the demonstration of operability should be thorough enough to assure that a similar problem does not exist on the remaining components. For example, if an out-of-service period caused by failure of a pump to deliver rated capacity due to a design deficiency, the other pumps of this type might be subjected to a flow rate test in addition to the operability checks.

The verification of the main steam relief valve operability during manual actuation surveillance testing must be made independent of temperatures indicated by thermocouples downstream of the relief valves. It has been found that a temperature increase may result with the valve still closed. This is due to steam being vented through the pilot valves during the surveillance test. By first opening a turbine bypass valve, and then observing its closure response during relief valve actuation, positive verification can be made for the relief valve opening and passing steam flow. Closure response of the turbine control valves during relief valve manual actuation would likewise serve as an adequate verification for the relief valve opening. This test method may be performed over a wide range of reactor pressures greater than 150 psig. Valve operation below 150 psig is limited by the spring tension exhibited by the relief valves.

The testing frequency applicable to the relief valves is provided to ensure operability and demonstrate reliability of the valves. The required testing interval varies with observed valve failures. The number of inoperable valves found during both operation and testing of these valves determines the time interval for the next required test. Early tests may be performed prior to entering the next required test interval (in advance of the nominal time less the negative 25% tolerance band). Early tests may be used as a new reference point for tests of the same time interval; however, they are not acceptable for lengthening the test interval since they were not performed within the ± 25% tolerance band required by Table 4.5-1.

The surveillance requirements to ensure that the discharge piping of the core spray, LPCI mode of the RHR, HPCI, and RCIC systems is filled provides for a visual observation that water flows from a high point vent. This ensures that the line is in a full condition. Instrumentation has been provided to monitor the presence of water in the discharge piping between the monthly intervals at which the lines are vented and alarm the control room if it is not. This instrumentation will be calibrated on the same frequency as the safety system instrumentation and the alarm system tested monthly. This testing ensures that, during the interval between the monthly venting checks, the status of the discharge piping is monitored on a continuous basis.

An alarm point of ≥ 40 psig for the low pressure of the fill system has been chosen because, due to elevations of piping within the plant, 39 psig is required to keep the lines full. The shutoff head of the fill system pumps is 74 psig and therefore will not defeat the low-pressure cooling pump discharge press interlock of ≥ 75 psig as shown in Table 3.2-2.

The watertight bulkhead door and the penetration seals for pipes and cables penetrating the vault walls and ceilings have been designed to withstand the maximum flood conditions. To assure that their installation is adequate for maximum flood conditions, a method of testing each seal has been devised.

To test a pipe seal, another test seal is installed in the opposite side of the penetration creating a space between the two seals that can be pressurized. Compressed air is then supplied to a fitting on the test seal and the space inside the sleeve is pressurized to approximately 15 psi. The outer face of the permanent seal is then tested for leaks using a soap bubble solution.

On completion of the test, the test seal is removed for use on other pipes and penetrations of the same size.

In order to test an electrical penetration, compressed air is supplied to a test connection and the space between the fittings is pressurized to approximately 15 psig. The outer faces are then tested for leaks using a soap bubble solution.

TABLE 4.5-1

Relief Valve Test Schedule #

Number of Relief Valves Found Inoperable During Testing or Test Interval*	Next Required Test Interval**
0	18 months ± 25%
1	184 Days ± 25%
2	92 Days ± 25%
≥ 3	31 Days ± 25%

*The required test interval shall not be lengthened more than one step at a time. Early tests may be performed prior to entering the "next required test interval" (in advance of the nominal time less the negative 25% tolerance band). Early tests may be used as a new reference point for tests of the same interval; however, they are not acceptable for lengthening the test interval.

**Setpoint drift is not considered to be a valve failure for the purposes of this test schedule.

#Each affected remotely operated relief and safety-relief valve shall be demonstrated OPERABLE pursuant to Specifications 4.5.D.2 & 4.5.D.3 as applicable, within 36 hours after exceeding 100 psig, whenever maintenance, repair or replacement work is performed on a valve or its associated actuator. Successful tests performed under this provision may be used to satisfy the test requirements for a "required test interval" provided such tests are performed within the current "required test interval" and its associated tolerance band. Valve failures detected during testing under this provision shall not be considered inoperable valves for the purpose of this table.

Attachment III

Quad-Cities Station Unit 2

DPR-30

provided that during such 7 days all active components of the automatic pressure relief subsystems, the core spray subsystems, LPCI mode of the RHR system, and the RCIC system are operable.

3. If the requirements of Specification 3.5.C cannot be met, an orderly shutdown shall be initiated, and the reactor pressure shall be reduced to 90 psig within 24 hours.

operable immediately. The automatic pressure relief and RCIC systems shall be demonstrated to be operable daily thereafter.

D. Automatic Pressure Relief Subsystems

1. The automatic pressure relief subsystem shall be operable whenever the reactor pressure is greater than 90 psig, irradiated fuel is in the reactor vessel and prior to reactor startup from a cold condition.

2. From and after the date that one of the five relief valves of the automatic pressure relief subsystem is made or found to be inoperable when the reactor is pressurized above 90 psig with irradiated fuel in the reactor vessel, reactor operation is permissible only during the succeeding 14 days unless repairs are made and provided that during such time the HPCI subsystem is demonstrated operable and the core spray and LPCI subsystems are operable.

3. If the requirements of Specification 3.5.D cannot be met, an orderly shutdown shall be initiated and the reactor pressure shall be reduced to 90 psig within 24 hours.

D. Automatic Pressure Relief Subsystems

Surveillance of the automatic pressure relief subsystems shall be performed as follows:

1. A simulated automatic initiation test which opens all pilot valves shall be performed each refueling outage.

2. At least once per 18 months, until March 1, 1979, with the reactor at pressure, each relief valve shall be manually opened. Relief valve opening shall be verified by a compensating turbine bypass valve or control valve closure.

3. After March 1, 1979, each relief valve shall be manually opened in accordance with the test schedule given in Table 4.5-1. Relief valve opening shall be verified by a compensating turbine bypass valve or control valve closure.

4. The Initial Next Required Test Interval of Table 4.5-1 shall be determined by the number of relief valves found inoperable from March 1, 1978 through March 1, 1979.

5. The initial valve tests of Table 4.5-1 shall be completed by, the earlier of:

   a. The completion of the next refueling outage occurring after March 1, 1979, or

   b. The time period defined by March 1, 1979 plus the initial test interval, determined above.

6. At least once per refueling outage a visual inspection of the relief valve line restraints in the suppression chamber shall be conducted to verify structural integrity for continued operation.

7. A logic system functional test shall be performed each refueling outage.

8. When it is determined that one relief valve of the automatic pressure relief subsystem is inoperable, the HPCI shall be demonstrated to be operable immediately and weekly thereafter.

Based on the fact that when one-loop of the containment cooling mode of the RHR system becomes inoperable, only one system remains, which is tested daily, a 7-day repair period was specified.

C. **High-Pressure Coolant Injection**

The high-pressure coolant injection subsystem is provided to adequately cool the core for all pipe breaks smaller than those for which the LPCI mode of the RHR system or core spray subsystems can protect the core.

The HPCI meets this requirement without the use of offsite electrical power. For the pipe breaks for which the HPCI is intended to function, the core never uncovers and is continuously cooled, thus no cladding damage occurs (reference SAR Section 6.2.5.3). The repair times for the limiting conditions of operation were set considering the use of the HPCI as part of the isolation cooling system.

D. **Automatic Pressure Relief**

Upon failure of the HPCI to function properly after a small break loss-of-coolant accident, the ADS automatically causes the safety-relief valves to open, depressurizing the reactor so that flow from the low pressure cooling systems can enter the core in time to limit fuel cladding temperature to less than 2200°F. ADS is conservatively required to be operable whenever reactor vessel pressure exceeds 90 psig even though low pressure cooling systems provide adequate core cooling up to 350 psig.

E. **RCIC**

The RCIC system is provided to supply continuous makeup water to the reactor core when the reactor is isolated from the turbine and when the feedwater system is not available. Under these conditions the pumping capacity of the RCIC system is sufficient to maintain the water level above the core without any other water system in operation. If the water level in the reactor vessel decreases to the RCIC initiation level, the system automatically starts. The system may also be manually initiated at any time.

The HPCI system provides an alternate method of supplying makeup water to the reactor should the normal feedwater become unavailable. Therefore, the specification calls for an operability check of the HPCI system should the RCIC system be found to be inoperable.

F. **Emergency Cooling Availability**

The purpose of Specification 3.5.F is to assure a minimum of 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 two RHR pumps would be available. Likewise, if two RHR pumps were out of service and two RHR service water pumps on the opposite side were also out of service no containment cooling would be available. It is during refueling outages that major maintenance is performed and during such time that all low-pressure core cooling systems may be out of service. This specification provides that should this occur, no work will be performed on the primary system which could lead to draining the vessel. This work would include work on certain control rod drive components and recirculation system. Thus, the specification precludes the events which could require core cooling. Specification 3.9 must also be consulted to determine other requirements for the diesel generators.

Quad-Cities Units 1 and 2 share certain process systems such as the makeup demineralizers and the radwaste system and also some safety systems such as the standby gas treatment system, batteries, and

4.5 SURVEILLANCE REQUIREMENTS BASES

The testing interval for the core and containment cooling systems is based on a quantitative reliability analysis, judgment, and practicality. The core cooling systems have not been designed to be fully testable during operation. For example, the core spray final admission valves do not open until reactor pressure has fallen to 350 psig. Thus, during operation, even if high drywell pressure were simulated, the final valves would not open. In the case of the HPCI, automatic initiation during power operation would result in pumping cold water into the reactor vessel which is not desirable.

The systems can be automatically actuated during a refueling outage and this will be done. To increase the availability of the individual components of the core and containment cooling systems, the components which make up the system, i.e., instrumentation, pumps, valve operators, etc., are tested more frequently. The instrumentation is functionally tested each month. Likewise the pumps and motor-operated valves are also tested each month to assure their operability. The combination of a yearly simulated automatic actuation test and monthly tests of the pumps and valve operators is deemed to be adequate testing of these systems.

With components or subsystems out of service, overall core and containment cooling reliability is maintained by demonstrating the operability of the remaining cooling equipment. The degree of operability to be demonstrated depends on the nature of the reason for the out-of-service equipment. For routine out-of-service periods caused by preventative maintenance, etc., the pump and valve operability checks will be performed to demonstrate operability of the remaining components. However, if a failure, design deficiency, etc., causes the out-of-service period, then the demonstration of operability should be thorough enough to assure that a similar problem does not exist on the remaining components. For example, if an out-of-service period caused by failure of a pump to deliver rated capacity due to a design deficiency, the other pumps of this type might be subjected to a flow rate test in addition to the operability checks.

The verification of the main steam relief valve operability during manual actuation surveillance testing must be made independent of temperatures indicated by thermocouples downstream of the relief valves. It has been found that a temperature increase may result with the valve still closed. This is due to steam being vented through the pilot valves during the surveillance test. By first opening a turbine bypass valve, and then observing its closure response during relief valve actuation, positive verification can be made for the relief valve opening and passing steam flow. Closure response of the turbine control valves during relief valve manual actuation would likewise serve as an adequate verification for the relief valve opening. This test method may be performed over a wide range of reactor pressures greater than 150 psig. Valve operation below 150 psig is limited by the spring tension exhibited by the relief valves.

The testing frequency applicable to the relief valves is provided to ensure operability and demonstrate reliability of the valves. The required testing interval varies with observed valve failures. The number of inoperable valves found during both operation and testing of these valves determines the time interval for the next required test. Early tests may be performed prior to entering the next required test interval (in advance of the nominal time less the negative 25% tolerance band). Early tests may be used as a new reference point for tests of the same time interval; however, they are not acceptable for lengthening the test interval since they were not performed within the ± 25% tolerance band required by Table 4.5-1.

The surveillance requirements to ensure that the discharge piping of the core spray, LPCI mode of the RHR, HPCI, and RCIC systems is filled provides for a visual observation that water flows from a high point vent. This ensures that the line is in a full condition. Instrumentation has been provided to monitor the presence of water in the discharge piping between the monthly intervals at which the lines are vented and alarm the control room if it is not. This instrumentation will be calibrated on the same frequency as the safety system instrumentation and the alarm system tested monthly. This testing ensures that, during the interval between the monthly venting checks, the status of the discharge piping is monitored on a continuous basis.

An alarm point of ≥ 40 psig for the low pressure of the fill system has been chosen because, due to elevations of piping within the plant, 39 psig is required to keep the lines full. The shutoff head of the fill system pumps is 74 psig and therefore will not defeat the low-pressure cooling pump discharge press interlock of ≥ 75 psig as shown in Table 3.2-2.

The watertight bulkhead door and the penetration seals for pipes and cables penetrating the vault walls and ceilings have been designed to withstand the maximum flood conditions. To assure that their installation is adequate for maximum flood conditions, a method of testing each seal has been devised.

To test a pipe seal, another test seal is installed in the opposite side of the penetration creating a space between the two seals that can be pressurized. Compressed air is then supplied to a fitting on the test seal and the space inside the sleeve is pressurized to approximately 15 psi. The outer face of the permanent seal is then tested for leaks using a soap bubble solution.

On completion of the test, the test seal is removed for use on other pipes and penetrations of the same size.

In order to test an electrical penetration, compressed air is supplied to a test connection and the space between the fittings is pressurized to approximately 15 psig. The outer faces are then tested for leaks using a soap bubble solution.

TABLE 4.5-1

Relief Valve Test Schedule#

Number of Relief Valves Found Inoperable During Testing or Test Interval*	Next Required Test Interval**
0	18 months ± 25%
1	184 Days ± 25%
2	92 Days ± 25%
≥ 3	31 Days ± 25%

* The required test interval shall not be lengthened more than one step at a time. Early tests may be performed prior to entering the "next required test interval" (in advance of the nominal time less the negative 25% tolerance band). Early tests may be used as a new reference point for tests of the same interval; however, they are not acceptable for lengthening the test interval.

**Setpoint drift is not considered to be a valve failure for the purposes of this test schedule.

#Each affected remotely operated relief and safety-relief valve shall be demonstrated OPERABLE pursuant to Specifications 4.5.D.2 & 4.5.D.3 as applicable, within 36 hours after exceeding 100 psig, whenever maintenance, repair or replacement work is performed on a valve or its associated actuator. Successful tests performed under this provision may be used to satisfy the test requirements for a "required test interval" provided such tests are performed within the current "required test interval" and its associated tolerance band. Valve failures detected during testing under this provision shall not be considered inoperable valves for the purpose of this table.