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Limiting Conditions for Operation	Surveillance Requirement
11.3.1.4 EMERGENCY CORE COOLING SYSTEM	11.4.1.4 EMERGENCY CORE COOLING SYSTEM
Applicability:	Applicability:
Applies to the operating status of the emergency core cooling system.	Applies to periodic testing requirements for the emergency core cooling systems.
Objective:	Objective:
To assure the capability of the emergency core cooling system to cool reactor fuel in the event of a Loss of Coolant Accident.	To verify operability of the emergency core cooling systems.
Specification:	Specification:
A. The two core spray systems (original and redundant) shall be operable whenever the plant is in a power operation condition except as specified in Specification B below. The original core spray system shall also be operable during refueling operations.	A. Each month the following shall be performed: Verify the operability of MO-7051, -7061, -7066, -7073 and -7074 by remote manual actuation. Leak testing of the core spray heat exchanger. Automatic actuation of both fire pumps.
B. If the redundant core spray system becomes inoperable and the valves in the other core spray system are demonstrated to be operable by manual actuation in accordance with 11.4.1.4.E, the reactor may remain in operation for a period not to exceed seven (7) days.	B. At each shutdown the following shall be performed. Verify the operability of MO-7070 and -7071 by remote manual actuation.
C. The core spray recirculation system shall be operable whenever the plant is in a power operation condition except as specified in D below.	C. At least once every six (6) months of operation other than shutdown the following shall be performed: Automatic actuation of the core spray system valves with water flow manually blocked (MO-7051, -7061, -7070 and -7071).

Limiting Conditions for Operation	Surveillance Requirement
11.3.1.4 EMERGENCY CORE COOLING SYSTEM (Contd)	11.4.1.4 EMERGENCY CORE COOLING SYSTEM (Contd)
D. One core spray recirculation pump may be inoperable for a period not to exceed seven (7) days when the reactor is in operation.	D. At each major refueling outage, the following shall be performed: Calibration of core spray system actuation and flow instrumentation. Flow testing of the two core spray system containment isolation check valves. Operability of the check valves between MO-7051 and MO-7061 and MO-7070 and MO-7071. Calibration of fire system basket strainer differential pressure switches. Operability of the core spray recirculation system.
E. The core spray recirculation heat exchanger shall not be taken out of service during power operation for periods exceeding four (4) hours. The heat exchanger shall be considered inoperable and out of service if tube bundle leakage exceeds 1.4 gpm.	
F. Both fire pumps (electric and diesel) and the piping system to the core spray system tie-ins shall be operable whenever the plant is in a power operation condition and refueling except as specified in Specification G below.	E. When a system becomes inoperable, its redundant system shall be demonstrated to be operable within four (4) hours and every 72 hours thereafter. It is not necessary to demonstrate the operability of initiation sensors or circuitry for core spray valves.
G. If a fire pump becomes inoperable and the other fire pump is operable, the reactor may remain in operation for a period not to exceed seven (7) days.	F. Instruments shall be checked, tested and calibrated at least as frequently as listed in Table 11.4.1.4(a).
H. If Specifications A, B, C, D, E, F and G are not met, a normal orderly shutdown shall be initiated within one (1) hour and the reactor shall be shut down as described in Section 1.2.5(a) within twelve (12) hours and shut down as described in Section 1.2.5(a) and (b) within the following 24 hours. No work shall be performed on the reactor or its connected systems which could result in lowering the reactor water level below elevation 607'9".	

Limiting Conditions for Operation	Surveillance Requirement

11.3.1.4 EMERGENCY CORE COOLING SYSTEM (Contd)

I. Until such time as the effectiveness of redundant core spray nozzle has been proven, the fire water makeup system to the condenser hot well shall be operable and ready for service during power operation. If the fire water makeup system becomes inoperable and not corrected, a normal orderly shutdown shall be initiated within one (1) hour and the reactor shall be shut down as described in Section 1.2.5(a) within twelve (12) hours and shut down as described in Section 1.2.5(a) and (b) within the following 24 hours.

J. Instrument set points shall be as specified in Table 11.3.1.4(a).

Bases:

The core spray system consists of two automatically actuated independent double capacity piping headers capable of cooling reactor fuel for a range of Loss of Coolant Accidents. Either system by itself is capable of providing adequate cooling for postulated large breaks in all locations. When adequate depressurization rates are achieved in the postulated small-break situation, either core spray system provides adequate cooling. For the largest possible pipe break, a flow rate of approximately 400 gpm is required after about 20 seconds.

Each core spray system has 100% cooling capacity from each spray header and each pump set. Thus, specifying both systems to be fully operational will assure to a high degree core cooling if the core spray system is required. In addition, the original core spray is required to be operable during refueling operations to provide fuel cooling in the unlikely event of an inadvertent draining of the reactor vessel.

The core spray systems receive their water supply from the plant fire system. The plant fire system supply is from Lake Michigan via two redundant 1,000 gpm fire pumps, one electric and one diesel driven. These pumps start automatically on decaying fire system pressure.

The core spray recirculation system is provided to prevent excessive water buildup in the containment sphere and to provide for long-term, post-accident cooling. The system consists of two pumps (400 gpm each) and a heat exchanger. The pumps take a suction from the lower levels of containment and discharge to the core spray headers. The system is actuated manually when the water level in the containment rises to elevation 587 feet. The 587-foot elevation will be achieved between 6 to 24 hours operation of one core spray and one containment spray system.

Bases: (Contd)

A test tank and appropriate valving is provided in the core spray recirculation system so the pump suction conditions and the flow characteristics of the system can be periodically tested.

One core spray recirculation pump has adequate capacity to provide fuel cooling at anytime following a Loss of Coolant Accident. Continuous containment spray operation is not required during the post-accident recirculation phase if only one recirculation pump is available.

The operable status of the various systems and components is to be demonstrated by periodic tests. Some of these tests will be performed while the reactor is operating in the power range. If a component is found to be inoperable, it will be possible in most cases to effect repairs and restore the system to full operability within a relatively short time. For a single component to be inoperable does not negate the ability of the system to perform its function, but it reduces the redundancy provided in the reactor design and thereby limits the ability to tolerate additional equipment failures. To provide maximum assurance that the redundant component(s) will operate if required to do so, the redundant component(s) is to be tested prior to initiating repair of the inoperable component. If it develops that (a) the inoperable component is not repaired within the specified allowable time period; or (b) a second component in the same or related system is found to be inoperable, the reactor will initially be removed from service which will provide for a reduction of the decay heat from the fuel and consequential reduction of cooling requirements after a postulated Loss of Coolant Accident. If the malfunction cannot be rapidly corrected, the reactor will be cooled to the shutdown condition using normal cooldown procedures. In this condition, release of fission products or damage of the fuel elements is not considered possible.

The plant operating procedures will require immediate action to effect repairs of an inoperable component and, therefore, in most cases, repairs will be completed in less than the specified allowable repair times. The limiting times to repair are intended to: (1) Assure that operability of the component will be restored promptly and yet, (2) allow sufficient time to effect repairs using safe and proper procedures.

The leakage rate limit for the core spray recirculation system heat exchanger was based on the consideration that the only time the heat exchanger would be used would be if a Loss of Coolant Accident were to occur. Therefore, 10 CFR Part 100 limits were used. The calculation was made as follows:

$$\text{Allowable Water Activity} = \frac{\text{Dose (Rem)}}{\text{DCF} \times \frac{f_{ing}}{f_{inh}} \times \text{DR} \times t \times 1.5}$$

Bases: (Contd)

where:

Water Activity = Drinking Water Activity at Charlevoix Resident Intake

Dose (Rem) = 10 CFR 100 Dose Limits to Thyroid Reduced by a Factor of 10 To Allow for Other Dose Vectors = 30 Rem

DCF = 1.48×10^{6} Rem/Ci Inhaled

DR = Drinking Rate = 2,200 ml/Day

1.5 = The Contribution Factor of I-33 to Inhaled Dose

f_{ing} = Ingestion Uptake Factor for Iodine = 0.30

f_{inh} = Inhalation Uptake Factor for Iodine = 0.23

t = Time = 30 Days (Assumed That Heat Exchanger Could Be Repaired Within 30 Days)

The resultant water activity = 1.57×10^{-4} µCi/ml.

Using this activity, the maximum allowable leakage rate can be calculated as follows:

$$\text{Leakage Rate} = \frac{\text{Allowable Water Activity x Dilution in Lake Mich x Dilution Flow in Heat Exchanger}}{\text{Activity of Water That Leaks}}$$

where:

Dilution in Lake Michigan = 800[8]

Dilution Flow in Heat Exchanger = 400 Gpm

I^{131} Activity of Water That Leaks = 37 µCi/ml Based on 10% Core Melt Case and 360,000 Gallons of Water in Containment at Start of Recirculation Phase

Leakage Rate = 1.36 Gallons per Minute

Bases: (Contd)

As a result of an evaluation of the effect testing frequency on emergency core cooling system reliability[a] and because of a lack of test data to prove the effectiveness of the redundant (nozzle) core spray system spray distribution[b] the surveillance requirements for the original core spray system have been increased. In addition, time periods allowed for operation with the original (ring) core spray system out of service have been reduced significantly. Further changes in surveillance and operability requirements will be requested prior the refueling outage presently scheduled for Spring 1977 based on modifications to make the core spray systems more testable and following proof of nozzle spray effectiveness.

The fire water makeup system to the condenser hot well was provided as a temporary means of reducing peak fuel clad temperature under postulated small and intermediate sized pipe breaks until the Reactor Depressurization System could be completed. It is still required until nozzle spray distribution patterns are demonstrated.

References:

1. Consumers Power Company letter to Directorate of Licensing, USAEC, dated May 18, 1972.
2. Technical Specifications Change No 26 dated July 27, 1971.
3. FHSR, Section 12.
4. FHSR, Section 3.
5. FHSR, Section 5.
6. Consumers Power Company letter to Directorate of Licensing, USAEC, dated September 22, 1972.
7. FHSR, Section 13.
8. "Big Rock Point Plant Hydrological Survey," Great Lakes Research Division, Special Report No 9, Ayer, J. C., et al, Nov 1961.
9. Consumers Power Company letter to the Secretary of the Commission, USNRC dated March 26, 1976.
10. Comments by the Director, Nuclear Reactor Regulation Relating to the Request for Exemption of the Big Rock Point Nuclear Power Plant From the Requirements of 10 CFR 50.46 dated April 19, 1976.

TABLES 11.3.1.4a AND 11.4.1.4a

Instrumentation That Initiates Cores Spray

Parameter	11.3.1.4a Limiting Conditions for Operation			11.4.1.4a Surveillance Requirement	
	Trip System Logic	Limiting Set Point	Conditions for Operability	Instrument Trip Test Including Valve Initiation	Instrument Calibration
Open Core Spray Valves					
Low Reactor Water Level (b)	One of Two for Each of Two Valves in Series	≥610'5" Elev (≥2'8" Above Core)	Power Operation and Refueling Operations (a)	Once Every Six Months of Operation Other Than Cold Shut-down	Each Major Refueling
Steam Drum Pressure Low (b)	One of Two for Each of Two Valves in Series	≥200 Psig	Power Operation and Refueling Operations (a)	Once Every Six Months of Operation Other Than Cold Shut-down	Each Major Refueling

Notes for Tables 11.3.1.4a and 11.4.1.4a

(a) Initiation of valve operation requires both low reactor water level coincident with low steam drum pressure.

(b) The primary core spray system shall be available for use during refueling operations and the backup system shall be closed and operation of the backup core spray valves shall be blocked or otherwise defeated while the piping section from the valves to the reactor head is dismantled.

P. Add a new Section 11.3.3.4 as follows:

Limiting Conditions for Operation

11.3.3.4 CONTAINMENT SPRAY SYSTEM

Applicability:

Applies to the operating status of the containment spray system.

Objective:

To assure the capability of the containment spray system to reduce containment pressure in the event of a Loss of Coolant Accident.

Specification:

A. During power operation each of the two containment spray systems shall be operable.

B. If the condition specified in A above is not met, a normal orderly shutdown shall be initiated within one hour and the reactor shall be shut down as described in Section 1.2.5(a) within 12 hours and shutdown as described in Section 1.2.5(a) & (b) within the following 24 hours.

C. Operability of the fire water supply and recirculation systems is governed by Specification 11.3.1.4.

Surveillance Requirement

11.4.3.4 CONTAINMENT SPRAY SYSTEM

Applicability:

Applies to the testing of the containment spray system.

Objective:

To verify the operability of the containment spray system.

Specification:

A. Once each operating cycle, the following shall be performed:

1. Automatic actuation of the containment spray valve MO-7064 (with water flow manually blocked).

2. Calibration of flow instrumentation.

3. The operability of power-operated valves required for proper system actuation shall be checked.

B. Surveillance of fire water supply and recirculation systems is governed by Specification 4.1.4.

C. Instrument channels shall be tested and calibrated as listed in Table 11.4.3.4(a).

Bases:

The containment spray systems are provided to reduce pressure in the containment following a Loss of Coolant Accident. They are initially supplied from the fire water system and later by the core spray recirculation system. They are not required to be in service at reactor coolant temperatures of 212°F or below because the resultant Loss of Coolant Accident pressure is not sufficient to pressurize the containment.

Operation of only one system is sufficient to provide the required containment spray flow. The specified flow of approximately 400 gpm is sufficient to remove post-accident core energy releases including a substantial chemical reaction involving hydrogen generation to below design values.

The operable status of these systems and components is demonstrated by periodic tests. If a component is found to be inoperable, it will be possible in most cases to effect repairs and restore the system to full operability within a relatively short time. If a single system becomes inoperable, a redundant system has been provided with the ability to perform the spray function, but it reduces the redundancy provided by plant design and limits the ability to tolerate additional equipment failures.

12

Initiation of the containment spray system assures that containment design pressure will not be exceeded due to hydrogen generation assuming the core spray systems do not function. It has been conservatively calculated that the energy release following a complete core meltdown (assuming no containment spray systems or core spray systems operate) would bring the containment pressure to approximately the design value (27 psig) about 15 minutes after the postulated accident had occurred. Subsequent LOCA analysis system modifications and regulations have limited H_2 generation such that it is no longer significant and calculations show that containment sprays are not required to prevent containment design pressures from being exceeded. Thus, the automatic actuation time of the primary containment spray system has been established at 15 minutes so as to allow the operator adequate time to evaluate and block actuation, if system operation is not required.

References:

1. FHSR, Section 3.

2. Additional information in support of Proposed Technical Specification Change No 8 dated March 17, 1966.

3. Safety Evaluation by the Research and Power Reactor Safety Branch, Division of Reactor Licensing, Consumers Power Company, Proposed Change No 8 dated April 14, 1966.

TABLE 11.4.3.4

Instrumentation That Initiates Enclosure Spray

	11.3.3.4 Limiting Conditions for Operation			11.4.3.4 Surveillance Requirement	
Parameter	Trip System Logic	Set Point	Conditions for Operability	Instrument Trip Test Including Valve Actuation	Instrument Calibration
Enclosure High Pressure	1 of 2	≤2.2 Psig (a)	Power Operation and Refueling Operation	Once Every Six Months of Operations Other Than Shutdown	Each Major Refueling
Time Delay (b)	1 of 1	≥13 Min, ≤15 Min (a)	Power Operation and Refueling Operation	Once Every Six Months of Operations Other Than Shutdown	Each Major Refueling

(a) Primary enclosure spray setting.

(b) The time delay device requires power to perform the tripping function. This supply is provided by the valve control circuit.

Q. Add a new Section 11.4.5.3 as follows:

Limiting Conditions for Operation

11.3.5.3 EMERGENCY POWER SOURCES

Applicability:

Applies to the operational status of the emergency power sources.

Objective:

To assure the capability of the emergency power sources to provide power required for emergency equipment in the event of a Loss of Coolant Accident.

Specification:

A. For all reactor operating conditions except cold shutdown, there shall normally be available one 138 kV line, one 46 kV line, one diesel generation system and one station battery system, except as further specified in 1, 2 and 3 below.

   1. Refueling operations and related testing may be conducted with the 138 kV line de-energized.

   2. The 46 kV line or the diesel generator may be out of service for repair for periods up to seven days during reactor operation and for extended periods during refueling or shutdown operations.

Surveillance Requirement

11.4.5.3 EMERGENCY POWER SOURCES

Applicability:

Applies to the periodic testing requirements for the emergency power sources.

Objective:

To assure the operability of the emergency power sources to provide emergency power in the event of a Loss of Coolant Accident.

Specification:

A. The emergency power system surveillance will be performed as indicated below. In addition, components on which maintenance has been performed will be tested.

   1. During each operating cycle -

      (a) Test of automatic initiation sensors and load test the emergency diesel to 180-200 kW generator output.

      (b) Test and calibrate the following instruments and controls associated with diesel generator:

         (1) Fuel oil level.

         (2) Oil pressure tripping.

         (3) Water temperature tripping.

Limiting Conditions for Operation	Surveillance Requirement
11.3.5.3 EMERGENCY POWER SOURCES (Contd)	**11.**4.5.3 EMERGENCY POWER SOURCES (Contd)
3. The diesel generator fuel supply shall be adequate for one-day operation.	(4) Overspeed tripping. (5) Battery undervoltage alarm.
4. If the conditions specified in 2 or 3 above are not met, a normal orderly shutdown shall be initiated within one (1) hour and the reactor shall be shut down as described in Section 1.2.5(a) within twelve (12) hours and shut down as described in Section 1.2.5(a) and (b) within the following 24 hours.	(c) Test the automatic transfer of station power from the 138 kV line to the 46 kV line. (d) Test the automatic transfer of power sources for the 1Y and 2Y instrument and control panels.
5. The station battery system shall be operable under all conditions except for uniquely authorized periods during cold shutdown. If the station battery is inoperable, no actions shall be taken which result in a reactivity addition except cooldown or might result in the primary coolant system being drained.	2. Monthly - (a) Test start diesel generator and supply load to 480 V Bus 2B for 20 minutes' duration. (b) Determine the cell voltage and specific gravity of each cell of the station battery and the diesel generator start-up battery. (c) Test operate the rod position motor generator set.
6. An orderly hot shutdown of the reactor shall be initiated within 54 minutes and the reactor shall be shut down as described in Section 1.2.5(a) within twelve (12) hours and shut down as described in Section 1.2.5(a) and (b) within the following 24 hours if the conditions of operation as specified in 5 above are exceeded.	3. Weekly - Test start the diesel generator and run for warm-up period.

Bases:

Normal station power can be provided by the station turbine generator, the 138 kV transmission line or the 46 kV line. These sources are adequate to provide emergency a-c power. When none of these sources is available, a single emergency diesel generator rated at 200 kW starts automatically to provide emergency a-c power

Bases: (Contd)

to 480 V Bus 2B. The weekly starting test is based on Manufacturer's Bulletin 33743-1 for relubrication protection of moving parts. Diesel generator initiation and output circuit breaker closure is accomplished by two voltage sensors, one to detect loss of normal power on Bus 1A and the other to provide assurance of generator output prior to automatic closure of the generator output breaker. Additional breaker interlocks are provided to assure that the normal Buses 1A and 2A are isolated prior to closing the generator output breaker. This prevents overloading of the generator at the switching period.

The diesel fuel oil tank is sized for two-day full load operation. One-day supply is considered adequate to provide fuel makeup.

A single station battery supplies power for normal station services and is sized for emergency uses including valves and controls for Loss of Coolant Accidents. The battery can be charged from the emergency diesel generator output if normal station power sources are not available.

The primary core spray valves and the primary containment spray valve are operated and controlled by power from the station battery. The backup core spray valves and backup containment spray valves are operated by power from normal station power sources or the emergency diesel generator.

The station battery will be considered operable if it is essentially fully charged and the battery charger is in service. The station battery has adequate capacity to carry normal loads for 54 minutes without the battery charger and still provide sufficient power for equipment required to operate during a LOCA. If steps are taken to reduce nonessential loads during a loss of off-site power (such as part of the emergency lights) additional time (up to five hours) can be gained from the time of the loss of the charger until the battery would no longer have sufficient power for equipment required to operate during a LOCA.

II. DISCUSSIONS

These proposed changes are submitted to maximize the reliability of emergency core cooling performance at the Big Rock Point Plant. They are based upon the results of the reviews performed by Consumers Power Company and the NRC staff. These reviews are documented in the "Report on Evaluation of Adequacy of Emergency Core Cooling System" dated February 27, 1976, the additional information submitted by Consumers Power Company March 26, 1976 and the "Comments by the Director, Nuclear Reactor Regulation Relating to the Request for Exemption of the Big Rock Point Nuclear Power Plant from the Requirements of 10 CFR 50.46" dated April 1976.

The primary purpose of the changes with respect to core spray system operability surveillance is to increase the surveillance to the maximum extent practical, consistent with the reviews performed.

The deletion of the interlock between MO-7064 and MO-7068 and thus automatic actuation of MO-7068 is based primarily on three considerations. The first is that this interlock has some potential for tying together vital redundant power supplies. The second is, as described in the proposed Technical Specifications Change submitted February 27, 1976, that containment sprays are not required during the short term to preclude containment design pressure being exceeded during a Loss of Coolant Accident and adequate time is available for operator action. The third is that far greater separation can be achieved by elimination of the interlock rather than installation of more complex electrical circuitry. Thus, it is proposed that the interlock be removed and that the backup containment spray valve (MO-7068) be remote manually actuated in the unlikely event that the automatic containment spray valve (MO-7064) does not open as designed.

The third area of change involves reduction of the nominal steady state operating pressure from 1485 psig to 1335 psig. This reduction is proposed based on a request of the staff because the analysis performed pursuant to 10 CFR 50.46 assumed a nominal operating pressure of 1335 psig. Further analysis will be required if it is desired to increase the nominal operating pressure above 1335 psig.

III. CONCLUSIONS

The Plant Review Committee has concluded that these proposed changes do not involve an unreviewed safety question. The Safety and Audit Review Board has not had an opportunity to review these changes. This review will be completed in the near future and the NRC staff will be informed of the results if they differ from those of the Plant Review Committee.

CONSUMERS POWER COMPANY

By C R Bilby
C. R. Bilby, Vice President

Sworn and subscribed to before me this 10th day of May 1976.

Sylvia B Ball
Sylvia B. Ball, Notary Public
Jackson County, Michigan
My commission expires May 18, 1976.