Limiting Conditions for Operation	Surveillance Requirement

3.1.5 REACTOR DEPRESSURIZATION SYSTEM

Applicability:

Applies to the operating status of the Reactor Depressurization System (RDS).

Objective:

To assure the operability of the RDS and when working in conjunction with the emergency core cooling system to allow cooling of the reactor fuel in the event of a Loss of Coolant Accident.

Specification:

A. The RDS shall be operable at all power levels (ie, whenever the reactor is critical with the head on) except as specified in 3.1.5.B, D, E, F and G below.

B. Should one depressurizing valve or isolation valve become inoperable in the closed position, the reactor may remain in operation for a period not to exceed seven (7) days provided the remaining depressurizing valves and isolation valves are determined to be operable and they are test-operated as described in Specification 4.1.5.C.

   If the inoperable valve cannot be returned to service within seven (7) days, the reactor shall be shut down.

4.1.5 REACTOR DEPRESSURIZATION SYSTEM

Applicability:

Applies to periodic testing requirements for the RDS.

Objective:

To verify operability of the RDS.

Specification:

A. The isolation valves shall be test-operated at least once every three months per Section IWV-3410 Summer 1973 Addenda of the ASME B&PV Code Section XI.

B. The depressurizing valves shall be test-operated during each cold shutdown; however, in the case of frequent cold shutdowns, these valves need not be exercised more often than once every three months per Section IWV-3410 Summer 1973 Addenda of the ASME B&PV Code Section XI.

C. When it is determined that one of the RDS valves (depressurization or isolation valves) is inoperable in the closed position, the remaining valves shall be demonstrated to be operable immediately.

Limiting Conditions for Operation	Surveillance Requirement
3.1.5 REACTOR DEPRESSURIZATION SYSTEM (Contd)	4.1.5 REACTOR DEPRESSURIZATION SYSTEM (Contd)
Should one isolation valve or depressurizing valve become inoperable in the open position, during power operation, the plant will be brought to the cold shutdown condition within 12 hours.	
C. The limiting conditions for operation of the instrumentation which initiates and controls the RDS are given in Table 3.5.2.h.	D. The instrumentation shall be functionally tested, calibrated and checked as indicated in Table 4.5.2.h. System Logic shall also be functionally tested as indicated in Table 4.5.2.h.
D. Should one input channel fail, the reactor may remain in operation for a period not to exceed seven (7) days provided the remaining input channels are determined to be operable as described in Specification 4.1.5.E. If the failed channel cannot be returned to service within seven (7) days, the reactor shall be shut down.	E. Should one input channel fail, the remaining three channels shall be tested immediately.
	F. Should one output channel fail, the remaining channels shall be tested immediately.
E. Should one output channel fail, the reactor may remain in operation for a period not to exceed seven (7) days provided the remaining output channels are determined to be operable as described in Specification 4.1.5.F. If the failed channel cannot be returned to service within seven (7) days, the reactor shall be shut down.	G. The cell voltage and specific gravity of each cell of the UPS will be determined on a monthly basis.
	H. The RDS containment penetration assemblies seal pressure shall be examined at six-month intervals.
F. The four uninterruptible power supplies (UPS) shall be operable at all power	

Limiting Conditions for Operation	Surveillance Requirement
3.1.5 REACTOR DEPRESSURIZATION SYSTEM (Contd)	4.1.5 REACTOR DEPRESSURIZATION SYSTEM (Contd)

levels (ie, whenever the reactor is critical with the head on). Should one of four divisions of the UPS become inoperable, the reactor may remain in operation for a period not to exceed seven (7) days provided the associated equipment of the three remaining UPS is determined to be operable and it is test-operated periodically as described in Specifications 4.1.5.C, E and F.

G. Should the RDS containment penetration seal pressure be lost and it is determined that the electrical conductor seal(s) are leaking in excess of the leakage allowable as described in Specifications 3.3.1 and 4.3.1 and the seal pressure cannot be restored within a 24-hour period, the reactor shall be shut down.

Bases:

The RDS provides for both manual and automatic depressurization of the primary system to allow injection of the core spray following a small-to-intermediate size break in the primary system. This will allow core cooling with the objective of preventing excessive fuel clad temperatures. The design of this system is based on the specified initiation set points described in Table 3.5.2.h. Transient analyses reported in Section 6 of the RDS Description, Operation and Performance Analysis submitted August 15, 1974 to the Directorate of Licensing USAEC, to demonstrate that these conditions result in adequate safety margins for both the fuel and the system pressure. Performance analysis of the RDS is considered only with respect to its depressurizing effect in conjunction with core spray. Therefore, no credit is taken for steam cooling of the core which provides further conservatism to the emergency core cooling system.

These specifications ensure the operability of the RDS under all conditions for which the automatic or manual depressurization of the system is an essential response to the transient described above.

Bases: (Contd)

One RDS valve can remain out of service in the closed position for seven days because of redundancy, provided the remaining RDS valves are test-operated immediately as described in Specification 4.1.5.C. When conditions for the actuation on the depressurizing system are reacned, all the valves in the four blowdown paths are opened. Each blowdown path is designed to pass 144 lb/second of steam at 1350 psig which is a third of the required total flow rate. Therefore, failure of one flow path to open upon actuation does not preclude achieving the required rate of depressurization.

In addition to reactor protection instrumentation, which initiates a reactor scram, protective instrumentation has been provided for the RDS which initiates action to mitigate the consequences of the Loss of Coolant Accident. This set of specifications provides the limiting conditions of operation for the RDS. The objectives of the specifications are (i) to assure the effectiveness of the protective instrumentation when required even during periods when portions of such systems are out of service for maintenance and (ii) to prescribe the trip settings required to assure adequate performance. To conduct the required input channel maintenance or functional tests and calibrations, any one channel may be bypassed. If the input channel is not bypassed when functional tests and calibrations are performed, actual trip signals supersede test and calibration conditions.

The minimum functional testing frequency used in this specification is based on a frequency that has proven acceptable and conforms to that of the existing reactor protection system.

Four plant variables are monitored and used as inputs to the actuation system. These are (1) steam drum water level, (2) reactor water level, (3) motor-driven fire pump discharge pressure and (4) diesel engine driven fire pump discharge pressure. These variables are jointly processed by the four independent actuation system input channels which are physically and electrically isolated from one another. A failure in one channel cannot propagate into another channel. Each of the four plant variables is monitored by four separate sensors. One sensor in each of the four variables is associated with each of the four input channels. The actuation of the RDS is enabled when two of the four input channels are in a tripped state.

The input channel is in a tripped state upon coincidence and subsequent processing of the following inputs: (1) Low steam drum level (delayed for two minutes), (2) high fire pump discharge pressure (either diesel- or motor-driven) and (3) low reactor water level. A low steam drum level signal is generated when the steam drum level sensor associated with the input channel indicates a level of 25" below steam drum center line.

This low steam drum level signal initiates a two-minute delay which allows a containment evacuation interval prior to system blowdown and also permits the incorporation of operator input to the system initiation logic specified in the design basis (Reference Section 3.3.D of the August 15, 1974 RDS Description, Operation and

Bases: (Contd)

Performance Analysis). For the latter, the operator is provided with manual timer reset capability for each of the four input channels at the control panel. The low steam drum level signal is also used to generate a fire pump start signal. Verification of a fire pump start and thus verification that a source of core spray water is available at the core spray valves is obtained when the pressure switch associated with the input channel at either fire pump discharge has tripped, corresponding to a pressure equal to or exceeding 100 psig. This variable is used as an enabling input to the actuation system to prevent depressurizing the reactor coolant system when the source of coolant required to cool the core is not available. A low reactor water level signal is generated when the input channel reactor water level sensor indicates a level $\geq$ 2'8" above the top of active fuel. Low reactor water level is confirmation of the LOCA and with the other two inputs present (time delayed low drum level and core spray water availability) causes the automatic trip of the input channel. These trip level settings were chosen to be low enough to prevent spurious actuation but high enough to initiate RDS operation so that post-accident cooling can be accomplished.

Upon failure of an uninterruptible power supply (UPS) or a channel power supply, the affected channel fault condition is alarmed as "channel 'X' unavailable." Power failures associated with input channels cause the coincidence trip conditions for the input channels to change from 2-out-of-4 to 2-out-of-3. The output channel actuation coincidence reverts to 3-of-3 upon failure of an output channel power supply.

Input channel bypass capability is provided to permit bypassing any one input channel at a time. The bypass feature is used to bypass a channel when the channel has failed to the "trip" state and/or when channel maintenance is required. Bypassing of an input channel in the "trip" state or for maintenance causes the coincidence trip condition of the input channel to be changed from 1-out-of-3 or 2-out-of-4, respectively, to 2-out-of-3. The input channel bypassed condition is alarmed as "channel 'X' unavailable" and "bypassed."

Should an output channel require maintenance or should a single fault cause an output channel subchannel trip (two independent subchannels operate in 2 of 2 coincidence), the output channel actuation capability can be disabled by removing the associated 125 V DC supply. The 125 V DC supply to an output channel is disabled via a circuit breaker in its respective UPS. The disabling of an output channel is alarmed as "channel 'X' unavailable."

Since 3-out-of-4 output channels are required to assure design requirements are met (one output channel operates one depressurizing valve and one isolation valve), the failure of one output channel will not preclude achieving the required rate of depressuri[illegible] This redundancy also enables maintenance to be performed on one output channel while the plant is in o[illegible].

Bases: (Contd)

Once the RDS actuation system output channels are enabled (at least two input channels are in a tripped state or a manual trip is initiated) and tripped, they remain in that condition until they are manually reset. This reset can be accomplished only after the initiating signals (ie, input channel trips or manual trip) have been restored to levels at which RDS operation is not required.

Separate, independent and one-hour sources of electrical power are provided, through four divisions, to accomplish the detection of the LOCA and the completion of the depressurization. Each of the divisions (1, 2, 3 and 4) is supplied with electrical power from one of four independent uninterruptible power supplies (UPS) consisting of a battery charger, a battery and an inverter.

Each UPS has output of 120 V AC, 60 Hz and 125 V DC. Divisions 1 and 2 normally receive power from the existing 480 V AC Bus 1A. Divisions 3 and 4 are supplied by 480 V AC Bus 2A. Normal station power to Busses 1A and 2A can be provided by one of three sources: (1) The station turbine generator, (2) the 138 kV transmission line or (3) the 46 kV transmission line. Should none of these sources be available, provision is included for supplying input power from the 480 V AC Bus 2B which is tied to the emergency diesel. If all 480 V AC power is lost, the UPS is capable of sustaining its output for one hour.

Since only 3-out-of-4 blowdown paths are required to assure adequate depressurization, the single system failure of one UPS division will not preclude achieving the required rate of depressurization. This redundancy also enables maintenance to be performed on the UPS while the plant is in operation.

Four new containment penetration assemblies are used in transmitting electrical power, control and instrumentation signals between equipment located inside the containment building and facilities located external to the containment building. These electrical penetrations are welded into spare containment penetration sleeves. The penetration assemblies are designed in accordance with IEEE 317 and are seismically and environmentally qualified to the RDS design conditions.

The pressure retaining portion of the assemblies is designed and fabricated to the requirements of Subsection NE, Class MC vessels, of Section III of the ASME Code. The penetration assemblies include a single aperture seal and a double electrical conductor seal and are designed to operate with the internal cavity pressurized with nitrogen at approximately 27 psig. The relatively maintenance-free seal assemblies dictate a minimum inspection frequency of twice annually.

Tables 3.5.2.h and 4.5.2.h

Instrumentation That Initiates RDS Operation

3.5.2.H - Limiting Conditions for Operation				4.5.2.H - Surveillance Requirement		
Parameter	Minimum Operable Channels	Limiting Set Point	Conditions for Operability	Instrument Trip Test	Instrument Calibration	Protective Channel Trip
Low Steam Drum Level	3	Above or Equal to 25" Below Center Line	At Power Levels Whenever the Reactor Is Critical With the Head On	Monthly	Each Major Refueling	-
Fire Pump(s) Discharge Pressure	3	$\geq$ 100 Psig	Ditto	Monthly	Ditto	-
Low Reactor Water Level	3	$\geq$ 2'8" Above Top of Active Fuel	"	Monthly	"	-
120-Second Time Delay	3	$\leq$ 120 Seconds Following Low Steam Drum Level Signal	"	Monthly	"	-
Input Channels A Through D	3	-	"	Monthly	-	-
Output Channels I Through IV	3	-	"	-	-	Monthly
*Fire Pump Start	1	-	"	Monthly	-	Monthly

*Reference Specifications 3.1.4 and 4.1.4 for Bases.

Rev B, 2/24/75

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Amdt to OL/Change to Tech Specs: Consisting of incorporation of their Reactor Depressurization System Description, Operation & Performance Analysis reporting program.....

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