3.2 LIMITING CONDITIONS FOR OPERATION

3.2 PROTECTIVE INSTRUMENT SYSTEMS

Specification (cont'd)

I. Recirculation Pump Trip Instrumentation

During reactor power operation, the Recirculation Pump Trip Instrumentation shall be operative in accordance with Table 3.2.1.

J. Control Room Toxic Gas Monitoring

Whenever the Control Room is required to be manned, the Toxic Gas Monitoring System shall be operable in accordance with Table 3.2.7.

4.2 SURVEILLANCE REQUIREMENTS

4.2 PROTECTIVE INSTRUMENT SYSTEMS

Specification (cont'd)

I. Recirculation Pump Trip Instrumentation

The Recirculation Pump Trip Instrumentation shall be functionally tested and calibrated in accordance with Table 4.2.1.

J. Control Room Toxic Gas Monitoring

The Toxic Gas Monitoring System Instrumentation shall be calibrated in accordance with Table 4.2.7.



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TABLE 3.2.6

POST-ACCIDENT INSTRUMENTATION

| Minimum Number of Operable Instrument Channels | Parameter | Type of Indication | Instrument Range |
|---|---|---|---|
| 2 | Drywell Atmospheric Temperature (Note 1) | Recorder #16-19-45<br>Recorder #TR-1-149 | 0-300°F<br>0-300°F |
| 2 | Containment Pressure (Note 1) | Meter 16-19-29A<br>Meter 16-19-29B | 0-275 psia<br>0-275 psia |
| 1 | Torus Pressure (Note 1) | Recorder #16-19-44 | 0-80 psia |
| 2 | Torus Water Level (Note 3) | Meter #16-19-10A<br>Meter #16-19-10B | 0-20 ft.<br>0-20 ft. |
| 2 | Torus Water Temperature (Note 1) | Meter #16-19-48 | 60-180°F |
| 2 | Reactor Pressure (Note 1) | Meter #PI-2-3-56A<br>Meter #PI-2-3-56B | 0-1500 psig<br>0-1500 psig |
| 2 | Reactor Vessel Water Level (Note 1) | Meter #2-3-91A<br>Meter #2-3-91B | (-150)-0-(+150)"$H_2O$<br>(-150)-0-(+150)"$H_2O$ |
| 1 | Control Rod Position (Notes 1,2) | Meter | 0-48" RPIS |
| 1 | Neutron Monitor (Notes 1,2) | Meter | 0-125% Rated flux |
| 1 | Torus Air Temperature (Note 1) | Recorder #TR-16-19-45 | 0-300°F |
| 2/valve | Safety/Relief Valve Position From Pressure Switches (Note 4) | Lights (SRV 2-71-A thru D) | Closed - Open |

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TABLE 3.2.6

POST-ACCIDENT INSTRUMENTATION
(continued)

| Minimum Number of Operable Instrument Channels | Parameter | Type of Indication | Instrument Range |
|---|---|---|---|
| 1/valve | Safety Valve Position From Acoustic Monitor (Note 5) | Meter Z1-2-1A/B | Closed - Open |
| 2 | Containment Hydrogen/Oxygen Monitor (Note 1) | Meter SR-VG-6A<br>Meter SR-VG-6B | 0-30% hydrogen<br>0-25% oxygen |
| 2 | Containment High-Range Radiation Monitor (Note 6) | Meter RM-16-19-1A/B | 1 R/hr-$10^7$ R/hr |

TABLE 3.2.6

POST-ACCIDENT INSTRUMENTATION
(continued)

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TABLE 3.2.6 NOTES

Note 1 - From and after the date that a parameter is not indicated in the Control Room, continued reactor operation is permissible during the next seven days. If reduced to one indication of a parameter operation is permissible for 30 days.

Note 2 - Control rod position and neutron monitor instruments are considered to be redundant to each other.

Note 3 - From and after the date that this parameter is reduced to one indication in the Control Room, continued reactor operation is permissible during the next 30 days. If both channels are inoperable and indication cannot be restored in six hours, an orderly shutdown shall be initiated and the reactor shall be in a hot shutdown condition in six hours and a cold shutdown condition in the following 18 hours.

Note 4 - From and after the date that safety/relief valve posit[illegible] from pressure switches is unavailable, reactor operation may continue provided safety/relief valve po[illegible]ion can be determined from recorder 2-166 (thermocouple, 0-600°F) and meter 16-19-48 (torus wa[illegible] temperature, 60-180°F). If both indications are not available, the reactor shall be in a hot shutdown condition in six hours and a cold shutdown condition in the following 18 hours.

Note 5 - From and after the date that safety valve position from the acoustic monitor is unavailable, reactor operation may continue provided safety valve position can be determined from recorder 2-166 (thermocouple, 0-600°F and Meter 16-19-29A or B (containment pressure 0-275 psia). If both indications are not available, the reactor shall be in a hot shutdown condition in six hours and in a cold shutdown condition in the following 18 hours.

Note 6 - Within 30 days following the loss of one indication, or 7 days following the loss of both indications, restore the inoperable channel(s) to an operable status or a special report to the Commission pursuant to Specification 6.7 must be prepared and submitted within the subsequent 14 days, outlining the action taken, the cause of the inoperability, and the plans and schedule for restoring the system to operable status.

TABLE 3.2.7

TOXIC GAS MONITORING SYSTEM

| Minimum Number of Operable Instrument Channels | Function | Trip Setting | | Required Action When Minimum Conditions of Operations Are Not Satisfied |
|---|---|---|---|---|
| 2 | Initiate emergency Control Room breathing air | Chlorine | ≤ 5 ppm | Note 1 |
| | | Ammonia | ≤ 75 ppm | |
| | | Vinyl Chloride | ≤ 800 ppm | |
| | | Carbon Dioxide | ≤ 800 ppm | |
| | | Methanol | ≤ 300 ppm | |

Note 1 - Within 30 days following the loss of one indication, or 7 days following the loss of both indications, restore the inoperable channel(s) to an operable status or a special report to the Commission pursuant to Specification 6.7 must be prepared and submitted within the subsequent 14 days, outlining the action taken, the cause of the inoperability, and the plans and schedule for restoring the system to operable status.

TABLE 4.2.6

CALIBRATION REQUIREMENTS

POST-ACCIDENT INSTRUMENTATION

| Parameter | Calibration | Instrument Check |
|---|---|---|
| Drywell Atmosphere Temperature | Every 6 months | Once each day |
| Containment Pressure | Once/Operating Cycle | Once each day |
| Torus Pressure | Every 6 months | Once each day |
| Torus Water Level | Once/Operating Cycle | Once each day |
| Torus Water Temperature | Every 6 months | Once each day |
| Reactor Pressure | Once/Operating Cycle | Once each day |
| Reactor Vessel Water Level | Once/Operating Cycle | Once each day |
| Control Rod Position | (Note 5) | Once each day |
| Neutron Monitor | Same as Reactor Protection Systems | Once each day |
| Torus Air Temperature | Every 6 months | Once each day |
| Safety/Relief Valve Position | Every refueling outage (Note 9) (a Functional Test to be performed quarterly) | Once each day |
| Safety Valve Position | Every refueling outage (Note 9) (a Functional Test to be performed quarterly) | Once each day |

TABLE 4.2.6

CALIBRATION REQUIREMENTS

POST-ACCIDENT INSTRUMENTATION (Cont)

| Parameter | Calibration | Instrument Check |
|---|---|---|
| Containment Hydrogen/Oxygen Monitor | Once/Operating Cycle | Once each day |
| Containment High-Range Radiation Monitor | Once/Operating Cycle | Once each day |

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TABLE 4.2.7

TOXIC GAS MONITORING SYSTEM - CALIBRATION REQUIREMENTS

| Parameter | Calibration | Instrument Check |
| --- | --- | --- |
| Toxic Gas Monitoring System | Once/Operating Cycle | Once each day |

3.2 (Continued)

standby gas treatment system operation so that none of the activity released during the refueling accident leave the Reactor Building via the normal ventilation stack but that all activity is processed by the standby gas treatment system. Trip settings for the monitors in the ventilation duct are based upon initiation of the normal ventilation isolation and standby gas treatment system operation at a radiation level equivalent to the maximum release rate of 0.08/E Ci/sec given in Specification 3.8.C.1.a. The monitoring system in the plant stack represents a backup to this system to limit gross radioactivity releases to the environs.

The purpose of isolating the mechanical vacuum pump line is to limit release of radioactivity from the main condenser. During an accident, fission products would be transported from the reactor through the main steam line to the main condenser. The fission product radioactivity would be sensed by the main steam line radiation monitors which initiate isolation.

Post-accident instrumentation parameters for Containment Pressure, Torus Water Level, Containment Hydrogen/Oxygen Monitor, and Containment High-Range Radiation Monitor, are redundant, environmentally and seismically qualified instruments provided to enhance the operators' ability to follow the course of an event. The purpose of each of these instruments is to provide detection and measurement capability during and following an accident as required by NUREG-0737 by ensuring continuous on-scale indication of the following: containment pressure in the 0 to 275 psia range; torus water level in the 0 to 20 foot range (i.e., the bottom to 5 feet above the normal water level of the torus pool); containment hydrogen/oxygen concentrations (0 to 30% hydrogen and 0 to 25% oxygen); and containment radiation in the 1 R/hr to $10^7$ R/hr gamma. The Control Room Toxic Gas Monitor assures that the Control Room operators, wherever required to be in the Control Room, will be adequately protected against the effects of an accidental release of toxic gases and that the plant can be safely operated or shut down under design basis accident conditions.

## 4.2 PROTECTIVE INSTRUMENTATION

The protective instrumentation systems covered by this Specification are listed in Table 4.2. Most of these protective systems are composed of two or more independent and redundant subsystems which are combined in a dual-channel arrangement. Each of these subsystems contains an arrangement of electrical relays which operate to initiate the required system protective action.

The relays in a subsystem are actuated by a number of means, including manually-operated switches, process-operated switches (sensors), bistable devices operated by analog sensor signals, timers, limit switches, and other relays. In most cases, final subsystem relay actuation is obtained by satisfying the logic conditions established by a number of these relay contacts in a logic array. When a subsystem is actuated, the final subsystem relay(s) can operate protective equipment, such as valves and pumps, and can perform other protective actions, such as tripping the main turbine generator unit.

4.2 (Continued)

With the dual-channel arrangement of these subsystems, the single failure of a ready circuit can be tolerated because the redundant subsystem or system (in the case of high pressure coolant injection) will then initiate the necessary protective action. If a failure in one of these circuits occurs in such a way that an action is taken, the operator is immediately alerted to the failure. If the failure occurs and causes no action, it could then remain undetected, causing a loss of the redundancy in the dual-channel arrangement. Losses in redundancy of this nature are found by periodically testing the relay circuits in the subsystems to assure that they are operating properly.

It has been the practice in boiling water reactor plants to functionally test protective instrumentation sensors and sensor relays on-line on a monthly frequency. Since logic circuit tests result in the actuation of plant equipment, testing of this nature was done while the plant was shutdown for refueling. In this way, the testing of equipment would not jeopardize plant operation. However, a refueling interval could be as long as eighteen months, which is too long a period to allow an undetected failure to exist.

This specification is a periodic testing program which is based upon the overall on-line testing of protective instrumentation systems, including logic circuits as well as sensor circuits. Table 4.2 outlined the test, calibration, and logic system functional test schedule for the protective instrumentation systems. The testing of a subsystem includes a functional test of each relay wherever practicable. The testing of each relay includes all circuitry necessary to make the relay operate, and also the proper functioning of the relay contacts. Functional testing of the inaccessible temperature switches associated with the isolation systems is accomplished remotely by application of a heat source to individual switches.

All subsystems are functionally tested, calibrated, and operated in their entirety if practicable. Certain exceptions are necessary because the actuation of certain relays would jeopardize plant operation or present an operational hardship.

For example, certain relays trip recirculation system discharge valves, and the actuation of these relays would cause a severe plant transient. In cases of this nature, the devices in the relay circuit will be tested, but the relay will only be actuated during a refueling outage. The number of relays in this category is very small compared to the total number of identical relays being tested on-line.