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TABLE 3.2.1 (Continued)

EMERGENCY CORE COOLING SYSTEM ACTUATION INSTRUMENTATION

<u>Automatic Depressurization</u>			
<u>Minimum Number of Operable Instrument Channels per Trip System (Note 4)</u>	<u>Trip Function</u>	<u>Trip Level Setting</u>	<u>Required Action When Minimum Conditions for Operation are Not Satisfied</u>
2	Low-Low Reactor Vessel Water Level	Same as Core Spray	Note 6
2	High Drywell Pressure	≤ 2.5 psig	Note 6
1	Time Delay (2E-K5A and B)	≤ 120 seconds	Note 6
1	Bus Power Monitor	--	Note 6
1	Trip System Logic	--	Note 6
2	Time Delay (2E-K16A and B, 2E-K17A and B)	≤ 8 minutes	Note 6

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TABLE 4.2.1 (Continued)

<u>Automatic Depressurization System</u>			
<u>Trip Function</u>	<u>Functional Test</u> ⁽⁸⁾	<u>Calibration</u> ⁽⁸⁾	<u>Instrument Check</u>
Low-Low Reactor Vessel Water Level	(Note 1)	Once/Operating Cycle	Once Each Day
High Drywall Pressure	(Note 1)	Once/Operating Cycle	Once Each Day
Bus Power Monitor	(Note 1)	None	Once Each Day
Trip System Logic (Except Solenoids of Valves)	Every 6 Months (Notes 2 and 11)	Every 6 Months (Note 3)	----

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TABLE 4.2 NOTES

1. Initially once per month; thereafter, a longer interval as determined by test results on this type of instrumentation.
2. During each refueling outage, simulated automatic actuation which opens all pilot valves shall be performed such that each trip system logic can be verified independent of its redundant counterpart.
3. Trip system logic calibration shall include only time delay relays and timers necessary for proper functioning of the trip system.
4. This instrumentation is excepted from functional test definition. The functional test will consist of injecting a simulated electrical signal into the measurement channel.
5. Check control rod position indication while performing the surveillance requirement of Section 3.3.
6. Functional tests, calibrations, and instrument checks are not required when these instruments are not required to be operable or are tripped. Functional tests shall be performed before each startup with a required frequency not to exceed once per week. Calibration shall be performed prior to or during each startup or controlled shutdown with a required frequency not to exceed once per week. Instrument checks shall be performed at least once per day during those periods when instruments are required to be operable.
7. This instrumentation is excepted from the functional test definitions and shall be calibrated using simulated electrical signals once every three months.
8. Functional tests and calibrations are not required when systems are not required to be operable.
9. The thermocouples associated with safety/relief valves and safety valve position, that may be used for back-up position indication, shall be verified to be operable every operating cycle.
10. Separate functional tests are not required for this instrumentation. The calibration and integrated ECCS tests which are performed once per operating cycle will adequately demonstrate proper equipment operation.
11. Trip system logic functional tests will include verification of operation of all automatic initiation inhibit switches by monitoring relay contact movement. Verification that the manual inhibit switches prevent opening all relief valves will be accomplished in conjunction with Section 4.5.F.1.

3.2 (Continued)

The APRM rod block trip is flow referenced and prevents a significant reduction in MCPR especially during operation at reduced flow. The APRM provides gross core protection; i.e., limits the gross core power increase from withdrawal of control rods in the normal withdrawal sequence. The trips are set so that MCPR is maintained greater than the fuel cladding integrity safety limit. For single recirculation loop operation, the APRM rod block trip setting is reduced in accordance with the analysis presented in NEDE-30060, February 1983. This adjustment accounts for the difference between the single loop and two-loop drive flow at the same core flow, and ensures that the margin of safety is not reduced during single loop operation.

The IRM rod block function provides local as well as gross core protection. The scaling arrangement is such that trip setting is less than a factor of 10 above the indicated level. Analysis of the worst-case accident results in rod block action before MCPR approaches the fuel cladding integrity safety limit.

A downscale indication on an APRM or IRM is an indication the instrument has failed or the instrument is not sensitive enough. In either case, the instrument will not respond to changes in control rod motion and thus control rod motion is prevented.

To prevent excessive clad temperatures for the small pipe break, the HPCI or Automatic Depressurization System must function since, for these breaks, reactor pressure does not decrease rapidly enough to allow either core spray or LPCI to operate in time. For a break or other event occurring outside the drywell, the Automatic Depressurization System is initiated on low-low reactor water level only after a time delay. The arrangement of the tripping contacts is such as to provide this function when necessary and minimize spurious operation. The trip settings given in the Specification are adequate to ensure the above criteria are met. The Specification preserves the effectiveness of the system during periods of maintenance, testing, or calibration, and also minimizes the risk of inadvertent operation; i.e., only one instrument channel out of service.

The ADS is provided with inhibit switches to manually prevent automatic initiation during events where actuation would be undesirable, such as certain ATWS events. The system is also provided with an Appendix R inhibit switch to prevent inadvertent actuation of ADS during a fire which requires evacuation of the Control Room.

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.

With the dual-channel arrangement of these subsystems, the single failure of a relay 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 ensure 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. Testing of the automatic initiation inhibit switches verifies the proper operability of the switches and 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.