LIMITING CONDITIONS FOR OPERATION

## 3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

A. As a minimum, the reactor protection system instrumentation channels shown in Table 3.1-1 shall be OPERABLE with the PROTECTIVE INSTRUMENTATION RESPONSE TIME as shown in Table 3.1-2.

The designed system response times from the opening of the sensor contact up to and including the opening of the trip actuator contacts shall not exceed 50 milliseconds.

Applicability:

As shown in Table 3.1-1.

Action:

1. With one channel required by Table 3.1-1 inoperable in one or more Trip Functions, place the inoperable channel(s) and/or that trip system in the tripped condition* within 12 hours.

2. With two or more channels required by Table 3.1-1 inoperable in one or more Trip Functions:

a. Within one hour, verify sufficient channels remain OPERABLE or tripped* to maintain trip capability in the Trip Functions, and
b. Within 6 hours, place the inoperable channel(s) in one trip system and/or that trip system** in the tripped condition*, and
c. Within 12 hours, restore the inoperable channels in the other trip system to an OPERABLE status or tripped*.

Otherwise, take the ACTION required by Table 3.1-1 for the Trip Function.

SURVEILLANCE REQUIREMENT

## 4.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

A.1 Each reactor protection system instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION operations for the OPERATING MODES and at the frequencies shown in Table 4.1-1.

2. Response time measurements (from actuation of sensor contacts or trip point to de-energization of scram solenoid relay) are not part of the normal instrument calibration. The reactor trip system response time of each reactor trip function shall be demonstrated to be within its limit once per operating cycle. Each test shall include at least one logic train such that both logic trains are tested at least once per 36 months and one channel per function such that all channels are tested at least once every N times 18 months where N is the total number of redundant channels in a specific reactor trip function.

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* An inoperable channel or trip system need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable channel is not restored to OPERABLE status within the required time, the ACTION required by Table 3.1-1 for that Trip Function shall be taken.

** This ACTION applies to that trip system with the most inoperable channels; if both systems have the same number of inoperable channels, the ACTION can be applied to either trip system.



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reactor pressure, reactor low water level, MSIV closure, generator load rejection and turbine stop valve closure are discussed in Specifications 2.1 and 2.2.

Instrumentation (pressure switches) for the drywell are provided to detect a loss-of-coolant accident and initiate the emergency core cooling equipment. A high drywell pressure scram is provided at the same setting as the emergency core cooling systems (ECCS) initiation to minimize the energy which must be accommodated during a loss-of-coolant accident and to prevent return to criticality. This instrumentation is a backup to the reactor vessel water level instrumentation.

The reactor water level trip settings are referenced to the "top of the active fuel" which has been defined to be 344.5 inches above vessel zero. These trip settings represent the indicated water level.

High radiation levels in the main steam line tunnel above that due to the normal nitrogen and oxygen radioactivity is an indication of leaking fuel. A scram is initiated whenever such radiation level exceeds three times normal background. For the performance of a Hydrogen Water Chemistry pre-implementation test, the scram setpoint may be changed based on a calculated value of the radiation level expected during the test. Hydrogen addition will result in an approximate one- to five-fold increase in the nitrogen (N-16) activity in the steam due to increased N-16 carryover in the main steam. The purpose of this scram is to reduce the source of such radiation to the extent necessary to limit the amount of radioactivity released due to gross fuel failure. Discharge of excessive amounts of radioactivity to the environs is prevented by the air ejector offgas monitors which cause an isolation of the main condenser offgas line to the main stack.

The MSIV closure scram is set to scram when the isolation valves are 10% closed in 3 out of 4 lines. This scram anticipates the pressure and flux transient which would occur when the valves close. By scramming at this setting, the resultant transient is less severe than either the pressure or flux transient which would otherwise result.

A reactor mode switch is provided which actuates or bypasses the various scram functions appropriate to the particular plant operating status.

The manual scram function is active in all modes, thus providing for a manual means of rapidly inserting control rods during all modes of reactor operation.

The APRM (High flux in Startup or Refuel) system provides protection against excessive power levels and short reactor periods in the startup and intermediate power ranges.

The IRM system provides protection against short reactor periods in these ranges.

A source range monitor (SRM) system is also provided to supply additional neutron level information during startup but has no scram functions (reference paragraph 7.6.1.4 of the Updated FSAR). Thus, the IRM and APRM are required in the "Refuel" and "Startup/Hot Standby" modes. In the power range the APRM system provides required protection (reference paragraph 7.6.1.7 of the Updated FSAR). Thus the IRM System is not required in the "Run" mode. The APRM's cover only the power range. The IRM's and APRM's provide adequate coverage in the startup and intermediate range.

The control rod drive scram system is designed so that all of the water which is discharged from the reactor by a scram can be accommodated in the discharge piping. The scram discharge volume accommodates in excess of 60 gallons of water and is the low point in the piping. No credit was taken for this volume in the design of the discharge piping as concerns the amount of water which must be accommodated during a scram.

During normal operation the discharge volume is empty; however, should it fill with water, the water discharged to the piping from the reactor could not be accommodated which would result in slow scram times or partial control rod insertion. To preclude this occurrence, level switches have been provided in the instrument volume

## 3.2 BASES

In addition to reactor protection instrumentation which initiates a reactor scram, protective instrumentation has been provided which initiates action to mitigate the consequences of accidents which are beyond the operator's ability to control, or terminates operator errors before they result in serious consequences. The objectives of the Specifications are:

1. To ensure the effectiveness of the protective instrumentation when required including periods when portions of such systems are out of service for maintenance. When necessary, one channel may be made inoperable for brief intervals to conduct required functional tests and calibrations.

2. To prescribe the trip settings required to assure adequate performance.

Some of the settings on the instrumentation that initiate or control core and containment cooling have tolerances explicitly stated where the high and low values are both critical and may have a substantial effect on safety. The setpoints of other instrumentation, where only the high or low end of the setting has a direct bearing on safety, are chosen at a level away from the normal operating range to prevent inadvertent actuation of the safety system involved and exposure to abnormal situations.

The instrumentation which initiates primary system isolation is connected in a dual bus arrangement.

The trip level settings given for reactor water level represent the indicated water level. The reactor water level trip settings are defined or described in "inches" above the top of active fuel. The term top of active fuel, however, no longer has a precise physical meaning since the length of the fuel pellet columns has changed over time from that of the initial core load. Since the basis of all safety analyses is the absolute level (inches above vessel zero) of the trip settings, the "top of the active fuel" has been arbitrarily defined to be 344.5 inches above vessel zero. This definition is the same as that given by Figure 5.1-1 of the Updated FSAR for the initial core and maintains the consistency between the various level definitions given in the FSAR and the technical specifications.

The low water level instrumentation set to trip at 170" above the top of the active fuel closes all isolation valves except those in Groups 1, 6, 7 and 9 (see notes to Table 3.7-3 for isolation valve groups). Details of valve grouping and required closing times are given in Specification 3.7. For valves which isolate at this level this trip setting is adequate to prevent uncovering the core in the case of a break in the largest line assuming a 60 second valve closing time. Required closing times are less than this.

The low-low reactor water level instrumentation is set to trip when reactor water level is 119.5" above top of the active fuel. This trip initiates the HPCI and RCIC and trips the recirculation pumps. The low-low-low reactor water level instrumentation is set to trip when the water level is 18.5" above the top of the active fuel. This trip activates the remainder of the ECCS subsystems, closes Group 7 valves, closes Main Steam Line Isolation Valves, Main Steam Drain Valves, Recirc Sample Valves (Group 1) and starts the emergency diesel generators. There trip level settings were chosen to be high enough to prevent spurious actuation but low enough to initiate ECCS operation and primary system isolation so that post accident cooling can be accomplished and the guidelines of 10 CFR 100 will not be exceeded. For large breaks up to the complete circumferential break of a 22-inch recirculation line and with the trip setting given above, ECCS initiation and primary system isolation are initiated in time to meet the above criteria. Reference Sections 6.3 and 7.3 of the Updated FSAR.