U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
June 14, 1990

Attachment

Duke Power Company
McGuire Nuclear Station

Technical Specification Bases With Changes Identified
and
Additional Information (FSAR and Bases Pages)

LIMITING SAFETY SYSTEM SETTINGS

BASES

Reactor Trip System Interlocks

The Reactor Trip System Interlocks perform the following functions:

P-6 On increasing power P-6 allows the manual block of the Source Range Reactor trip and de-energizing of the high voltage to the detectors. On decreasing power, Source Range Level trips are automatically reactivated and high voltage restored.

P-7 On increasing power P-7 automatically enables Reactor trips on low flow in more than one reactor coolant loop, reactor coolant pump bus undervoltage and underfrequency, ~~Turbine trip~~, pressurizer low pressure and pressurizer high level. On decreasing power the above listed trips are automatically blocked.

P-8 On increasing power P-8 automatically enables Reactor trips on low flow in one or more reactor coolant loops and on Turbine Trip. On decreasing power the P-8 automatically blocks the above listed trips.

P-10 On increasing power P-10 allows the manual block of the Intermediate Range Reactor trip and the Flow Setpoint Power Range Reactor trip; and automatically blocks the Source Range Reactor trip and de-energizes the Source Range high voltage power. On decreasing power the Intermediate Range Reactor trip and the Low Setpoint Power Range Reactor trip are automatically reactivated. Provides input to P-7.

P-13 Provides input to P-7.

For information only.

LIMITING SAFETY SYSTEM SETTINGS

BASES

Steam Generator Water Level

The Steam Generator Water Level Low-Low trip protects the reactor from loss of heat sink in the event of a sustained steam/feedwater flow mismatch resulting from loss of normal feedwater. The specified Setpoint provides allowances for starting delays of the Auxiliary Feedwater System.

Undervoltage and Underfrequency - Reactor Coolant Pump Busses

The Undervoltage and Underfrequency Reactor Coolant Pump Bus trips provide core protection against DNB as a result of complete loss of forced coolant flow. The specified Setpoints assure a Reactor trip signal is generated before the Low Flow Trip Setpoint is reached. Time delays are incorporated in the Underfrequency and Undervoltage trips to prevent spurious Reactor trips from momentary electrical power transients. For undervoltage, the delay is set so that the time required for a signal to reach the Reactor trip breakers following the simultaneous trip of two or more reactor coolant pump bus circuit breakers shall not exceed 1.5 seconds. For underfrequency, the delay is set so that the time required for a signal to reach the Reactor trip breakers after the Underfrequency Trip Setpoint is reached shall not exceed 0.6 second. On decreasing power the Undervoltage and Underfrequency Reactor Coolant Pump Bus trips are automatically blocked by P-7 (a power level of approximately 10% of RATED THERMAL POWER with a turbine impulse chamber pressure at approximately 10% of full power equivalent); and on increasing power, reinstated automatically by P-7.

Turbine Trip

A Turbine trip initiates a Reactor trip. On decreasing power the Turbine trip is automatically blocked by P-8 (a power level of approximately 48% of RATED THERMAL POWER with a turbine impulse chamber at approximately 48% of full power equivalent); and on increasing power, reinstated automatically by P-8.

Safety Injection Input from ESF

If a Reactor trip has not already been generated by the Reactor Trip System Instrumentation, the ESF automatic actuation logic channels will initiate a Reactor trip upon any signal which initiates a Safety Injection. The ESF Instrumentation channels which initiate a Safety Injection signal are shown in Table 3.3-3.

McGuire FSAR
Volume 7
For Information Only.

This trip protects the reactor from loss of heat sink in the event of a sustained steam/feedwater flow mismatch. This trip is actuated on two-out-of-four low-low water level signals occurring in any steam generator.

The logic is shown on Figure 7.2.1-1, Sheet 7. A detailed functional description of the process equipment associated with this trip is provided in Reference 1.

f. Safety Injection Signal Actuation Trip

A reactor trip occurs when the Safety Injection System is actuated. The means of actuating the Safety Injection System are described in Section 7.3. This trip protects the core against a loss of reactor coolant or steam.

Figure 7.2.1-1, Sheet 8, shows the logic for this trip. A detailed functional description of the process equipment associated with this trip function is provided in Reference 1.

g. Manual Trip

The manual trip consists of two switches with one output on each switch. One switch is used to actuate the train A trip breaker; the other switch actuates the train B trip breaker. Operating either manual trip switch removes the voltage from the under-voltage trip coil, energizes the shunt trip coil, and trips the reactor.

There are no interlocks which can block this trip. Figure 7.2.1-1, Sheet 3, shows the manual trip logic.

h. Turbine Trips

A direct reactor trip on turbine trip provides additional protection against PORV challenges initiated by a narrow range of events, that is, turbine trips not initiated by a reactor trip or a safety injection and occurring at or near full power.

The reactor trip on turbine trip will be generated by either of the following signals, provided reactor power is greater than the P-8 setpoint:

1) Four-out-of-four turbine stop valves closed.

2) Two-out-of-three turbine auto-stop oil pressure low, which indicates loss of turbine control oil.

The trip logic is shown on Figure 7.2.1-1, Sheet 16.

McGuire FSAR
Volume 7
for information only.

7.2.1.1.3 Reactor Protection System Interlocks

a. Power Escalation Permissives

The overpower protection provided by the out-of-core nuclear instrumentation consists of three discrete, but overlapping, ranges. Continuation of startup operation or power increase requires a permissive signal from the higher range instrumentation channels before the lower range level trips can be manually blocked by the operator.

A one-of-two intermediate-range permissive signal (P-6) is required prior to source range level trip blocking. A source-range manual block is provided for each logic train and the blocks must be in effect on both trains in order to proceed in the intermediate range. Source range level trips are automatically reactivated and high voltage restored when both intermediate range channels are below the permissive (P-6) level. There is a manual reset switch for administratively reactivating the source range level trip and detector high voltage when between the permissive P-6 and P-10 level, if required. Source range level trip block and high voltage cutoff are always maintained when power is above the permissive P-10 level in order to prevent detector damage.

The intermediate-range level trip and power-range (low setpoint) trip can only be blocked after satisfactory operation and permissive information are obtained from two-of-four power-range channels. Individual blocking switches are provided so that the low setpoint power range trip and intermediate-range trip can be independently blocked. These trips are automatically reactivated when any three of the four power range channels are below the permissive (P-10) level, thus ensuring automatic activation to more restrictive trip protection.

The development of permissives P-6 and P-10 is shown on Figure 7.2.1-1, Sheet 4. All of the permissives are digital; they are derived from analog signals in the nuclear power range and intermediate-range channels.

See Table 7.2.1-2 for the list of protective system interlocks.

b. Blocks of Reactor Trips at Low Power

Interlock P-7 blocks a reactor trip at low power (below approximately 10 percent of full power) from low reactor coolant flow, reactor coolant pump under voltage, reactor coolant pump underfrequency, pressurizer low pressure, or, pressurizer high water level. See Figure 7.2.1-1, Sheets 5, 6 and 16, for permissive applications. The low power signal is derived from three-out-of-four power range neutron flux signals below the setpoint in coincidence with two-out-of-two turbine impulse chamber pressure signals below the setpoint (low unit load)

The P-8 interlock blocks a reactor trip from a turbine trip or low reactor coolant flow reactor trip when the unit is below approximately 47 percent of full power. The block action (absence of the P-8 interlock signal) occurs when three-out-of-four neutron flux power range signals are below the setpoint. Thus, below the P-8 setpoint, the reactor is allowed to operate with one inactive loop and trip does not occur until two loops are indicating low flow.