3.10.4 Rod Drop Time

3.10.4.1 The drop time of each control rod shall be not greater than 1.8 seconds at full flow and operating temperature from the beginning of rod motion to dashpot entry.

3.10.5 Reactor Trip Breakers

3.10.5.1 The reactor shall not be made critical unless the following conditions are met:

a. Two reactor trip breakers are operable.

b. Reactor trip bypass breakers are racked out or removed.

c. Two trains of automatic trip logic are operable.

3.10.5.2 During power operation, the requirements of 3.10.5.1 may be modified to allow the following components to be inoperable. If the system is not restored to meet the requirements of 3.10.5.1, the reactor shall be placed in the hot shutdown condition utilizing normal operating procedures within the next 8 hours.

a. One reactor trip breaker may be inoperable for up to 12 hours.

b. One train of automatic trip logic may be inoperable for up to 12 hours.

c. One reactor trip bypass breaker may be racked in and closed for up to 12 hours.

3.10.5.3 With one of the diverse trip features inoperable (shunt trip attachment/undervoltage trip attachment) on one of the reactor trip breakers, power operation may continue for up to 48 hours. If the

diverse trip feature is not restored to operable status within this time, the reactor trip breaker shall be declared inoperable and the action statement of 3.10.5.2 shall be applied.

3.10.5.4 With non-trip features of the reactor trip breakers inoperable, power operations may continue provided the requirements of Specification 3.10.5.1, 3.10.5.2, and 3.10.5.3 are satisfied.

3.10.6 Inoperable Control Rods

3.10.6.1 A control rod shall be deemed inoperable if (a) the rod is misaligned by more than 15 inches with its bank, (b) if the rod cannot be moved by its drive mechanism, or (c) if its rod drop time is not met.

for each one percent of indicated tilt is required. Physics measurements have indicated that the core radial power peaking would not exceed a two-to-one relationship with the indicated tilt from the excore nuclear detector system for the worst rod misalignment.

In the event the tilt condition of 1.09 cannot be eliminated after 24 hours, the reactor power level will be reduced to the range required for low power physics testing. To avoid reset of a large number of protection setpoints, the power range nuclear instrumentation would be reset to cause an automatic reactor trip at 55 percent of allowed power. A reactor trip at this power has been selected to prevent, with margin, exceeding core safety limits even with a nine percent tilt condition. If a tilt ratio greater than 1.09 occurs which is not due to a misaligned rod, the reactor power shall be brought to a hot shutdown condition for investigation.

However, if the tilt condition can be identified as due to rod misalignment, operation can continue at a reduced power (2 percent for each one percent the tilt ratio exceeds 1.0) for the two-hour period necessary to correct the rod misalignment.

The specified rod drop time is consistent with safety analyses that have been performed.(1)

Power to the control rod drive mechanism is supplied through duplicate series connected reactor trip circuit breakers. Operability requirements are applied to these breakers and their trip logic to assure that on proper coincidence of its trip logic the trip breakers will open initiating the required rapid reactivity insertion.

An inoperable rod imposes additional demands on the operator. The permissible number of inoperable control rods is limited to one in order to limit the magnitude of the operating burden, but such a failure would not prevent dropping of the operable rods upon reactor trip.

Normal reactor operation causes significant pellet cracking and fragmentation. Consequently, handling of irradiated fuel assemblies can result in relocation of these fragments against the cladding. Calculations show that high cladding stresses can occur if the reactor power increase is rapid during the subsequent startup.

The 72-hour period allows for stress relaxation of the clad before the ramp rate requirement is removed, thereby reducing the potential harmful effects of possible pellet or fragment relocation.

The 3 percent limit is imposed to minimize the effects of adverse cladding stresses resulting from part power operation for extended periods of time. The time period of 30 days is based upon the successful power ramp demonstrations performed on Zircaloy clad fuel in operating reactors, resulting in no cladding failures.

References

(1) FSAR Section 15.0
(2) FSAR Section 7.7
(3) FSAR Section 15.4
(4) FSAR Section 15.4
(5) FSAR Section 15