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2.4.0 Transient Scenarios

Learning Objectives:

1. Given a plant transient scenario, explain the behavior of selected plant parameters, control systems, and equipment for the time designated in the statement of the scenario.

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2.4.1 Turbine Impulse Pressure Channel Failure

A Westinghouse plant is operating at 100% power with all control systems in automatic. Turbine impulse pressure channel PT-505 fails low. Using Figure 2.3-1 (section 2.3), describe the responses of the following parameters:

1. T_{avg},
2. Pressurizer pressure,
3. Pressurizer level,
4. Main steam header pressure,
5. Main steam flow rate,
6. Power-range power,
7. Control bank D rod position, and
8. Charging flow rate.

State the reactor trip signal(s) that can be expected during this transient.

2.4.2 Emergency Boration

A Westinghouse plant is operating at 100% power with the rod control system in manual and all other control systems in automatic. Explain the responses of reactor power and T_{avg} after two minutes of emergency boration.

If the plant were at 10^{-8} amps in the intermediate range and no-load T_{avg}, what would be the responses of reactor power and T_{avg} after a two-minute emergency boration?

2.4.3 Steam Generator Safety Valve Failure

A Westinghouse plant is operating at 80% power with control bank D at 220 steps. A code safety valve on the B steam generator fails open.

1. Describe the effect on the steam flow input to the steam generator level control system.
2. Describe the effect on the steam flows from the other steam generators.
3. Explain how plant parameters other than steam flows can aid the operator in diagnosing the problem.

2.4.4 Steam Flow Increase with - MTC

A Westinghouse plant is in the process of starting up with reactor power and steam flow matched at five percent. The steam flow is increased to seven percent. With a negative moderator coefficient and no operator action:

1. Describe the plant response.
2. State what plant condition will terminate the transient (reactor trip, engineered safety features actuation, steady-state operation, etc.).

2.4.5 Steam Flow Increase with + MTC

A Westinghouse plant is in the process of starting up with reactor power and steam flow matched at five percent. The steam flow is increased to seven percent. With a positive moderator coefficient and no operator action:

1. Describe the plant response.

2. State what plant condition will terminate the transient (reactor trip, engineered safety features actuation, steady-state operation, etc.).