15.5 Increase in Reactor Coolant Inventory

15.5.1 Inadvertent HPCF Startup

15.5.1.1 Identification of Causes and Frequency Classification

15.5.1.1.1 Identification of Causes

Manual startup of the HPCF (High Pressure Core Flooder System) is postulated for this analysis (i.e., operator error).

15.5.1.1.2 Frequency Classification

This transient disturbance is categorized as an incident of moderate frequency.

15.5.1.2 Sequence of Events and System Operation

15.5.1.2.1 Sequence of Events

Table 15.5-1 lists the sequence of events for Figure 15.5-1.

15.5.1.2.1.1 Identification of Operator Actions

Small changes in plant conditions are experienced. The operator should, after hearing the alarm that the HPCF has commenced operation, check reactor water level and drywell pressure. If conditions are normal, the operator shuts down the system.

15.5.1.2.2 System Operation

To properly simulate the expected sequence of events, the analysis of this event assumes normal functioning of plant instrumentation and controls—specifically, the pressure regulation and the vessel level control which respond directly to this event.

Required operation of engineered safeguards other than what is described is not expected for this transient event.

The system is assumed to be in the manual flow control mode of operation.

15.5.1.3 Core and System Performance

15.5.1.3.1 Input Parameter and Initial Conditions

The water temperature of the HPCF System is conservatively assumed to be 4.4°C with an enthalpy of 25.6 J/g.

Inadvertent startup of the HPCF System is chosen to be analyzed, because it provides the greatest auxiliary source of cold water into the vessel.

15.5.1.3.2 Results

Figure 15.5-1 shows a typical system response for the simulated transient event for the manual flow control mode. It begins with the introduction of cold water into the upper core plenum. Within 1 s, the full HPCF flow is established at approximately 3.2% of rated feedwater flow rate. This flow is nearly 138% of the HPCF flow at rated pressure. No delays are considered because they are not relevant to the analysis.

Addition of cooler water to the upper plenum causes a reduction in steam flow, which results in some depressurization as the pressure regulator responds to the event. The flux level settles out slightly below operating level. Pressure and thermal variations are relatively small and no significant consequences are experienced. MCPR (Minimal Critical Power Ratio) remains above the safety limit and, therefore, fuel thermal margins are maintained. Therefore, this event does not have to be reanalyzed for specific core configurations This event is a mild transient. Analysis results for GE12 fuel design will be provided in the FSAR.

15.5.1.3.3 Consideration of Uncertainties

Important analytical factors, including reactivity coefficient and feedwater temperature change, are assumed to be at the worst conditions so that any deviations in the actual plant parameters will produce a less severe transient.

15.5.1.4 Barrier Performance

Figure 15.5-1 shows a slight pressure reduction from initial conditions; therefore, no further evaluation is required, as RCPB (Reactor Cooler Pressure Boundary) pressure margins are maintained.

15.5.1.5 Radiological Consequences

Because no activity is released during this event, a detailed evaluation is not required.

15.5.2 Chemical Volume Control System Malfunction (or Operator Error)

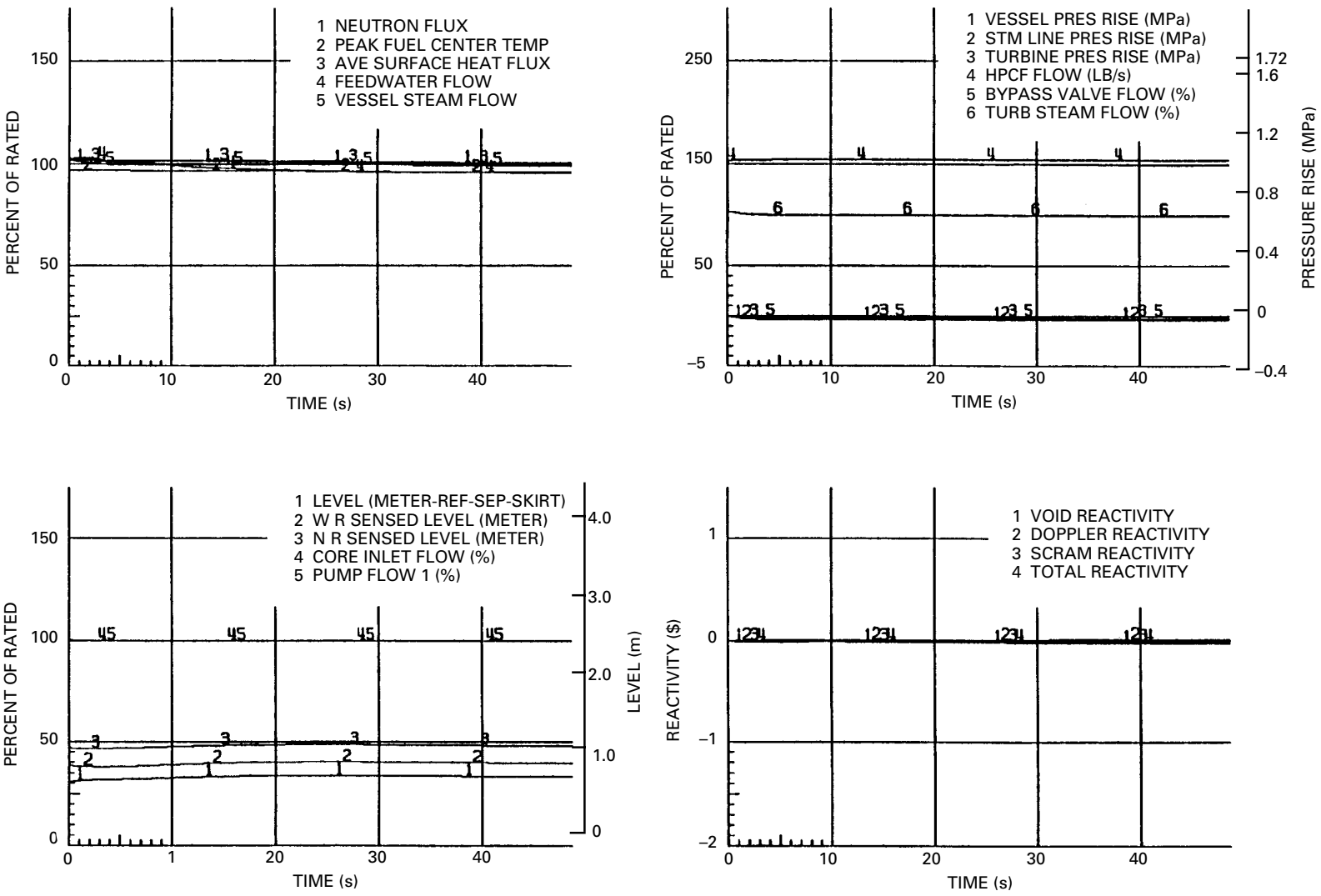
This section is not applicable to the BWR (Boiling Water Reactor).

15.5.3 BWR Transients Which Increase Reactor Coolant Inventory

These events are presented and considered in Sections 15.1 and 15.2.

Table 15.5-1 Sequence of Events for Figure 15.5-1 (Inadvertent Startup of HPCF)

Time (s)	Event
0	Simulate HPCF cold water injection
1	Full flow established for HPCF.
2	Depressurize effect stabilized.



TYPICAL ABWR

Figure 15.5-1 Inadvertant Startup of HPCF