reference type and uses differential pressure devices as its primary elements.

(d) Fuel Zone Water Level Range

This range uses the RPV taps at the elevation near the bottom of the dryer skirt and the taps below the top of the active fuel (above the pump deck). The zero of the instrument is the top of the active fuel and the instruments are calibrated to be accurate at 0 PaG and saturated condition. The water level measurement design is the condensate reference type and uses differential pressure devices as its primary element.

(e) Reactor Well Water Level Range

This range uses the RPV tap below the top of the active fuel. The zero of the instrument is the top of the active fuel. The temperature and pressure condition that is used for the calibration is 0 MPaG and 48.9°C water in the vessel. The water level measurement design is the pressure device which measures static water pressure inside the vessel and converts to a water level indication. This range is used to monitor the reactor water level when the reactor vessel head is removed and the reactor system is flooded during the refueling outage.

The condensate reference chamber for the narrow range and wide range water level range is common as discussed in Section 7.3

The concern that non-condensable gasses may build-up in the water column in the reactor vessel reference leg water level instrument lines, i.e., the reactor vessel instrument lines at the elevation near the main steam line nozzles, has been addressed by continually flushing these instrument lines with water supplied by the Control Rod Drive (CRD) System.

Reactor water level instrumentation that initiates safety systems and engineered safeguards systems is discussed in Subsections 7.2.1 and 7.3.1. Reactor water level instrumentation that is used as part of the Feedwater Control System is discussed in Subsection 7.7.1.4.

Reactor water level instrumentation that is provided in the alternate feedwater injection (AFI) Pump House is discussed in Subsection 9.5.14.

(7) Reactor Core Hydraulics

A differential pressure transmitter indicates core plate pressure drop by measuring the core inlet plenum and the space just above the core support assembly. The instrument sensing line used to determine the pressure below the core support assembly attaches to the same reactor vessel tap that is used for the injection of the liquid from the Standby Liquid Control System (SLCS). An instrument sensing line is provided for measuring

pressure above the core support assembly. The differential pressure of the core plate is indicated locally and recorded in the main control room.

Another differential pressure device indicates the reactor internal pump developed head by measuring the pressure difference between the pressure above and below the pump deck.

(8) Reactor Vessel Pressure

Pressure indicators and transmitters detect reactor vessel internal pressure from the same instrument lines used for measuring reactor vessel water level.

The following list shows the subsection in which the reactor vessel pressure measuring instruments are discussed.

(a) Pressure transmitters and trip actuators for initiating scram, and pressure transmitters and trip actuators for bypassing the MSIV closure scram, are discussed in Subsection 7.2.1.1.

(b) Pressure transmitters and trip actuators used for RCIC and LPFL are discussed in Subsection 7.3.1.1.

(c) Pressure transmitters and recorders used for feedwater control are discussed in Subsection 7.7.1.4.

(d) Pressure transmitters that are used for pressure recording are discussed in Section 7.5.

(e) The pressure transmitter that is used for providing reactor vessel pressure indication in the AFI Pump House is discussed in Subsection 9.5.14.

(9) Pressure between the inner and outer reactor vessel head seal ring is sensed by a pressure transmitter. If the inner seal fails, the pressure at the pressure transmitter is the vessel pressure, and the associated trip actuator will trip and actuate an alarm. The plant will continue to operate with the outer seal as a backup, and the inner seal can be repaired at the next outage when the head is removed. If both the inner and outer head seals fail, the leak will be detected by an increase in drywell temperature and pressure.

(10) Safety/Relief Valve Seal Leak Detection
Thermocouples are located in the discharge exhaust pipe of the safety/relief valve. The temperature signal goes to a multipoint recorder with an alarm and will be activated by any temperature in excess of a set temperature signaling that one of the SRV seats has started to leak.

(11) Other Instruments