B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.14 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

10 CFR 50, Appendix A, GDC 30, (Ref. 1) requires means be provided for detecting and, to the extent practical, identifying the location of the source of RCS LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting leakage detection systems.

Leakage detection systems must have the capability to detect reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE.

The containment sump collects unidentified LEAKAGE and is instrumented to alarm on increasing level and has the capability to detect a leakage rate of 1 gpm in less than 1 hour. This sensitivity is acceptable for detecting increases in unidentified LEAKAGE.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by radiation monitoring instrumentation. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. Instrument sensitivities of 10^{-9} μCi/cc radioactivity for particulate monitoring and of 10^{-6} μCi/cc radioactivity for gaseous monitoring are adequate for these leakage detection systems. The particulate monitoring channel ~~detector~~ is capable of detecting a change in RCS leak rate of 1 gpm within one hour ~~on both the particulate and gaseous radioactivity monitoring systems~~, based on ~~Rb 88 and~~ activity levels assumed in the environmental report (0.1% failed fuel). The predominant nuclide of detection for the particulate channel is Rb-88. The gaseous channel requires significantly more time to detect the same change in RCS leak rate (approximately 14 hours). This is due to the relatively long half-life of its predominant nuclide of detection, Xe-133.

Other installed instrumentation such as RB pressure and Containment Cooling Fan condensate flow also indicate leakage into containment. These are potentially valuable

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4.2.3.6.3 Water Quality

Industry experience and test programs have periodically shown the need for revising reactor coolant quality specifications. Reactor coolant specifications are revised to further minimize corrosion product activation and to promote long-term structural integrity of steam generator tubing and other components. Plant specific chemistry specifications are revised as needed based on site specific and industry experience and test programs. Plant chemistry specifications conform to the ITS and are described in plant procedures. Chemistry specifications will continue to be improved as more is learned from industry experience and testing. Reactor coolant quality specifications are listed in Table 4-10. The solids content of the reactor coolant is maintained below the design level by minimizing corrosion through chemistry control and by continuous purification of the letdown stream of reactor coolant using the letdown filter and purification demineralizer of the MU system. A hydrogen overpressure is maintained in the makeup tank to ensure that a predetermined amount of dissolved hydrogen remains in the reactor coolant to chemically combine with the oxygen produced by radiolysis of the water.

4.2.3.7 Flow Measurement

Reactor coolant flow rate is measured for each heat transport loop by a flow tube welded into the reactor outlet pipe. The power/flow monitor of the Reactor Protection system (RPS) utilizes this flow measurement to prevent reactor power from exceeding a permissible level for the measured flow. This is discussed in further detail in Section 7.3.2.

4.2.3.8 Leak Detection

The entire RC system is located within the secondary shielding and is inaccessible during reactor operation. All RC system leakage drains to the RB sump. All RC system leakage to the RB atmosphere will be in the form of fluid and vapor. The fluid will drain to the RB sump while the vapor will be condensed in the RB coolers and drain to the RB sump via a drain line from the RB cooler.

The RB air sample line radiation monitor (RM-A6) consists of a particulate measuring channel with a range of 1×10^{-11} to 1×10^{-7} µCi/cc (Cs-137) and a gaseous measuring channel with a range of 1×10^{-6} to 1×10^{-2} µCi/cc (Kr-85). RM-A6 contains two parallel connected particulate/iodine prefilters, an isokinetic sampler and two pump assemblies. The two pumps are powered from alternate power sources such that a loss-of-power to the running pump will automatically start the standby pump. The filter activity is counted and displayed in the control room on the radiation monitor panel module. A high radiation count rate initiates an indicating light on the radiation monitoring panel module and sounds an alarm in the control room. ~~The response of RM-A6 is such that with RC system activity levels assumed in the environmental report (0.1% failed fuel), a change in RC system leak rate of 1 gpm will be detected within one hour.~~ **The particulate monitoring channel is capable of detecting a change in RCS leak rate of one gpm within one hour, based on activity levels assumed in the Environmental Report (0.1% failed fuel). The predominant nuclide of detection for the particulate channel is Rb-88. The gaseous channel requires significantly more time to detect the same change in RCS leak rate (approximately 14 hours). This is due to the relatively long half-life of its predominant nuclide of detection, Xe-133.**

The sample point for RM-A6 is located within duct work for air handling fan AHF-3B near the 190 ft elevation of the RB. An additional sample point is installed within the existing sample line and is located near the 160 ft elevation of the RB. The additional sample point affords flexibility in plant operation if fan AHF-3B were to fail during normal operation. Repairs to AHF-3B could then be performed during the next available outage rather than during power operation. The additional sample point was analyzed to assure that adequate air flow is available to

FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3
DOCKET NO. 50-302/LICENSE NO. DPR-72

ATTACHMENT C

LICENSE AMENDMENT REQUEST #238, REVISION 0

Revision to Licensing Basis for Reactor Coolant System Leakage Detection Instrumentation

Proposed Revisions to Improved Technical Specification Bases and Final Safety Analysis Report in Revision Bar Format

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