Krohn RIII

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Subject: PB AFW Acc Design Basis

RIII

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A/-35

The AF system also performs the following functions related to regulatory commitments:

In the event of a station blackout (prolonged loss of offsite and onsite AC power) affecting both units, the AF system shall be capable of automatically supplying sufficient feedwater to remove decay heat from both units without any reliance on AC power for one hour (Reference 1).

In the event of plant fires, including those requiring evacuation of the control room, the AF system shall be capable of manual initiation to provide feedwater to a minimum of one steam generator per unit at sufficient flow and pressure to remove decay and sensible heat from the reactor coolant system over the range from hot shutdown to cold shutdown conditions. The AF system shall support achieving cold shutdown within 72 hours (Reference 2).

In the event of an Anticipated Transient Without Scram (ATWS), the AF system shall be capable of automatic actuation by use of equipment that is diverse from the reactor trip system. This is accomplished by the AMSAC system described in FSAR Section 7.4. An AFW pump start delay time of less than or equal to 90 seconds is assumed in the ATWS analysis. This delay time consists of a 30 second AMSAC time delay plus a 60 second AF system pump start response time. (Reference 4)

10.2.2 SYSTEM DESIGN AND OPERATION

The auxiliary feedwater system consists of two electric motor-driven pumps, two steam turbine-driven pumps, pump suction and discharge piping, and the controls and instrumentation necessary for operation of the system. Redundancy is provided by utilizing two pumping systems, two different sources of power for the pumps, and two sources of water supply to the pumps. The system is categorized as seismic Class I and is designed to ensure that a single fault will not obstruct the system function.

One system utilizes a steam turbine-driven pump for each unit (1/2P-29) with the steam capable of being supplied from either or both steam generators. This system is capable of supplying 400 gpm of feedwater to a unit, or 200 gpm to each steam generator through normally throttled MOVs AF-4000 and AF-4001. The feedwater flowrate from the turbine-driven auxiliary feedwater pump depends on the throttle position of these MOVs. Check valves are provided to help prevent backflow when the pumps are not in service. Each pump has an AOV (AF-4002) which has a safety-related function to open to ensure minimum recirculation flow to dissipate pump heat. An air accumulator tank is provided in the instrument air line as a backup pneumatic source to the AF-4002 recirculation line valve in the event of loss of instrument air. This backup supply is sized to provide adequate time for operators to either maintain minimum flow through the running pump(s), to secure the unneeded pump(s) if necessary, to restore instrument air, or to use the manual gag on each valve to provide minimum recirculation flow. The pump drive is a single-stage turbine, capable of quick starts from cold standby and is directly connected to the pump. The turbine is started by opening either one or both of the isolation valves (MS-2019 and MS-2020) between the turbine supply steam header and the main steam lines upstream of the main steam isolation valves. The turbine and pump are normally cooled by service water with an alternate source of cooling water from the firewater system.

BASES

LCO

This LCO provides assurance that the AFW System will perform its design safety function to mitigate the consequences of Design Basis Accidents and transients. Three AFW pump systems, consisting of two shared motor driven pump systems and one dedicated turbine driven pump system are required to be OPERABLE to ensure the availability of RHR capability for all events accompanied by a loss of offsite power and a single failure. This is accomplished by powering two of the pumps from independent emergency buses. The third AFW pump is powered by a different means, a steam driven turbine supplied with steam from a source that is not isolated by closure of the MSIVs.

The AFW System is configured into three pump systems. The AFW System is considered OPERABLE when the components and flow paths required to provide redundant AFW flow to the steam generators are OPERABLE, and the components required to manually transfer AFW pump suction supply to the service water system are OPERABLE. This requires that the two motor driven AFW pumps be OPERABLE, each capable of supplying AFW to a separate steam generator. The turbine driven AFW pump is required to be OPERABLE with redundant steam supplies from each main steam line upstream of the MSIVs, and shall be capable of supplying AFW to both of the steam generators. The piping, valves, instrumentation, and controls in the required flow paths also are required to be OPERABLE. For an AFW pump system to be considered OPERABLE, a minimum recirculation flow path must be available, and the backup pneumatic supply for the minimum recirculation air-operated valve must be OPERABLE.

The LCO is modified by a Note indicating that only the motor driven AFW pumps which are associated with steam generators required to be operable for heat removal (per LCO 3.4.6) are required to be OPERABLE in MODE 4. This is because of the reduced heat removal requirements and short period of time in MODE 4 during which the AFW is required and the insufficient steam available in MODE 4 to power the turbine driven AFW pump.

APPLICABILITY

In MODES 1, 2, and 3, the AFW System is required to be OPERABLE in the event that it is called upon to function when the MFW is lost. In addition, the AFW System is required to supply enough makeup water to replace the steam generator secondary inventory, lost as the unit cools to MODE 4 conditions.

In MODE 4 the AFW System may be used for heat removal via the steam generators.

In MODE 5 or 6, the steam generators are not normally used for heat removal, and the AFW System is not required.