DUKE POWER COMPANY

OCONEE NUCLEAR STATION

ATTACHMENT 1

TECHNICAL SPECIFICATIONS

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Bases

The high pressure injection system and chemical addition system provide control of the reactor coolant system boron concentration.(1) This is normally accomplished by using any of the three high pressure injection pumps in series with a boric acid pump associated with either the boric acid mix tank or the concentrated boric acid storage tank. An alternate method of boration will be the use of the high pressure injection pumps taking suction directly from the borated water storage tank.(2)

The quantity of boric acid in storage in the concentrated boric acid storage tank or the borated water storage tank is sufficient to borate the reactor coolant system to a 1% $\Delta k/k$ subcritical margin at cold conditions (70°F) with the maximum worth stuck rod and no credit for xenon at the worst time in core life. The current cycles for each unit are analyzed with the limits presented in the Core Operating Limits Report. The cycle specific analyses determine the volume and boron concentration requirements for the BWST and CBAST necessary to borate to cold shutdown. The volume requirements include a 10% margin and, in addition, allow for a deviation of 10 EFPD in the cycle length. The specification assures that two supplies are available whenever the reactor is critical so that a single failure will not prevent boration to a cold condition.

The concentration of boron in the concentrated boric acid storage tank may be higher than the concentration which would crystallize at ambient conditions. For this reason, and to assure a flow of boric acid is available when needed, these tanks and their associated piping will be kept at least 10°F above the crystallization temperature for the concentration present. Once in the high pressure injection system, the concentrate is sufficiently well mixed and diluted so that normal system temperatures assure boric acid solubility.

REFERENCES

(1) FSAR, Sections 9.3.1, and 9.3.2

(2) FSAR, Figure 6.0.2

(3) Technical Specification 3.3

Bases

Specification 3.3 assures that, for whatever condition the reactor coolant system is in, adequate engineered safety feature equipment is operable.

For operation up to 60% FP, two high pressure injection pumps are specified. Also, two low pressure injection pumps and both core flood tanks are required.

In the event that the need for emergency core cooling should occur, functioning of one high pressure injection pump, one low pressure injection pump, and both core flood tanks will protect the core, and in the event of a main coolant loop severance, limit the peak clad temperature to less than 2,200°F and the metal-water reaction to that representing less than 1 percent of the clad. (1) Both core flooding tanks are required as a single core flood tank has insufficient inventory to reflood the core.

The requirement to have three HPI pumps and two HPI flowpaths operable during power operation above 60% FP is based on considerations of potential small breaks at the reactor coolant pump discharge piping for which two HPI trains (two pumps and two flow paths) are required to assure adequate core cooling. (2) The analysis of these breaks indicates that for operation at or below 60% FP only a single train of the HPI system is needed to provide the necessary core cooling.

The requirement for a flowpath from LPI discharge to HPI pump suction is provided to assure availability of long term core cooling following a small break LOCA in which the BWST is depleted and RCS pressure remains above the shutoff head of the LPI pumps.

The borated water storage tanks are used for two purposes:

(a) As a supply of borated water for accident conditions.

(b) As a supply of borated water for flooding the fuel transfer canal during refueling operation. (3)

Three-hundred and fifty thousand (350,000) gallons of borated water (a level of 46 feet in the BWST) are required to supply emergency core cooling and reactor building spray in the event of a loss-of-core cooling accident. This amount fulfills requirements for emergency core cooling. The borated water storage tank capacity of 388,000 gallons is based on refueling volume requirements. Heaters maintain the borated water supply at a temperature above 50°F to lessen the potential for thermal shock of the reactor vessel during high pressure injection system operation. The boron concentration is set at the amount of boron required to maintain the core 1 percent $\Delta k/k$ subcritical at 70°F without any control rods in the core. The minimum boron concentration is specified in the Core Operating Limits Report.

It has been shown for the worst design basis loss-of-coolant accident (a 14.1 ft^2 hot leg break) that the Reactor Building design pressure will not be exceeded with one spray and two coolers operable. (4) Therefore, a maintenance period of seven days is acceptable for one Reactor Building cooling fan

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ATTACHMENT 2

ANALYTICAL METHODS USED TO DETERMINE COLR LIMITS

ATTACHMENT 2

Identified below are the limits listed in Technical Specification 6.9.1 and the analytical methods used in determining each of these.

(1) Axial Power Imbalance Protective Limits and Variable Low RCS Pressure Protective Limits for Specification 2.1.

The Axial Power Imbalance Protection limits define the values of reactor power as a function of axial imbalance such that minimum DNBR and/or a LHR $\leq$ centerline fuel melt limit is predicted when RCS parameters are at their design limits. The methodology described in NFS-1001A, Section 7.2.2 is used to determine these limits. New uncertainty factors, discussed in DPC-NE-1002A, Section 7.2.2.1 and 7.2.2.2 replace those described in NFS-1001A.

The variable low RCS pressure protective limits define the core outlet pressure/vessel outlet temperature combinations for which minimum DNBR occurs when RCS parameters are at their design limits. The methodology described in Section 6.4 of DPC-NE-2003A is used in developing these limits for both 3 and 4 pump operation.

(2) Reactor Protective System Trip Setting Limits for the Flux/Flow/Imbalance and Variable Low Reactor Coolant System Pressure trip functions in Specification 2.3.

The methodology used in determining the RPS Trip Setting Limits for the Flux/Flow/Imbalance and Variable Low RCS Pressure trip functions is described in Section 7.3 of NFS-1001A.

(3) Power Dependent Rod Insertion Limits for Specifications 3.1.3.5, 3.1.11, 3.5.2.1.b, 3.5.2.2.d.2.c, 3.5.2.3, and 3.5.2.5.c.

These Rod Insertion Limits are determined for each cycle using the methodology of Section 7.4 of NFS-1001A.

(4) Concentrated Boric Acid Storage Tank volume and boron concentration for Specification 3.2.2.

The Concentrated Boric Acid Storage Tank (CBAST) boron concentration requirements are based on those that will provide a 1% $\Delta k/k$ shutdown margin from full power to cold shutdown at all times during a given cycle. The required shutdown boron concentration requirements are determined using the methodology described in Section 3.2.2.2 of NFS-1001A. These values are calculated with the worst stuck rod out and take no credit for xenon. For the various times during the cycle that these values are calculated, a conservative calculation is performed to determine the volume/mass of boric acid required in the CBAST to borate to a 1% $\Delta k/k$ shutdown margin. The calculation assumes perfect mixing between the RCS inventory and makeup/letdown in the boron concentration calculations. The limiting volume/mass is then compared to the Tech Spec limit. An equivalent 10% volumetric margin is added to the homogeneous makeup/letdown calculation for conservatism.

(5) Core Flood Tank boron concentration for Specification 3.3.3.

The Core Flood Tank (CFT) boron concentration is used in the shutdown calculation during recirculation from the Reactor Building sump following a LOCA. This calculation assumes that perfect mixing occurs between the RCS inventory, BWST inventory, and the CFT inventory. A boron concrete absorption conservatism is accounted for in this calculation. The shutdown boron concentration requirements are determined in the same manner as discussed above (NFS-1001A, Section 3.2.2.2).

(6) Borated Water Storage Tank boron concentration for Specification 3.3.4.

The Borated Water Storage Tank (BWST) boron concentration is evaluated each cycle to assure a 1% Δk/k shutdown margin during refueling conditions (per Tech Spec 3.8.4) assuming all rods out and no xenon. In addition, the BWST boron concentration is also evaluated to assure a 1% Δk/k margin exists at all times for a normal shutdown from full power to cold shut down conditions (including a 10% volumetric conservatism) as well as during recirculation from the Reactor Building (RB) sump following a LOCA. These calculations are performed in the same manner as discussed in (4) and (5), with shutdown boron concentration requirements based on the methodology discussed in Section 3.2.2.2 of NFS-1001A.

(7) Quadrant Power Tilt Limits for Specification 3.5.2.4.a, 3.5.2.4.b, 3.5.2.4.d, 3.5.2.4.e, and 3.5.2.4.f.

The Quadrant Power Tilt Limits are developed in the manner discussed in Section 7.4 of NFS-1001A.

(8) Power Imbalance Limits for Specification 3.5.2.6.

The methodology used to determine the acceptable operating limits is discussed in Section 7.4 of NFS-1001A.