February 29, 2000 Template = NRR-058

Mr. Craig G. Anderson
Vice President, Operations ANO
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1448 S. R. 333
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SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - REPLACEMENT STEAM GENERATOR TECHNICAL SPECIFICATION BASES CHANGES (TAC NO. MA7759)

Dear Mr. Anderson:

By letter dated December 21, 1999, you submitted changes to the Bases for the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TS). The Bases changes relate to issues associated with the steam generator replacement, which is scheduled to occur during the 14th refueling outage for ANO-2 (2R14). The changes affect Bases Sections 2.1.2, "Reactor Coolant System Pressure," 3/4.4.12, "Low Temperature Overpressure Protection System," and 3/4.6.2.2, "Trisodium Phosphate (TSP)." In your letter dated December 21, 1999, you indicated that the TS Bases had been reviewed against the criteria of 10 CFR 50.59, and determined that the changes involved "no unreviewed safety questions."

Enclosed are the revised TS Bases pages that the NRC staff will use to update its copy of the ANO-2 TS Bases. Based on discussions with Mr. Steve Bennett of your staff, these changes will become effective following steam generator replacement, but prior to startup from refueling outage 2R14. If you have any questions, please contact me.

Sincerely,

/RA/

Thomas W. Alexion, Project Manager
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure: Bases pages

cc w/encl: See next page

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Limiting safety system settings for the Low DNBR, High Local Power Density, High Logarithmic Power Level, Low Pressurizer Pressure and High Linear Power Level trips, and limiting conditions for operation on DNBR and kw/ft margin are specified such that there is a high degree of confidence that the specified acceptable fuel design limits (i.e., DNBR and centerline fuel melt temperature) are not exceeded during normal operation and design basis anticipated operational occurrences.

2.1.2 REACTOR COOLANT SYSTEM PRESSURE

The restriction of this Safety Limit protects the integrity of the Reactor Coolant System from overpressurization and thereby prevents the release of radionuclides contained in the reactor coolant from reaching the containment atmosphere.

The Reactor Coolant System components are designed to Section III of the ASME Code for Nuclear Power Plant Components. The reactor vessel and pressurizer are designed to the 1968 Edition, Summer 1970 Addenda; piping to the 1971 Edition, original issue; and the valves to the 1968 Edition, Winter 1970 Addenda[1]. The steam generators are designed to the 1989 Edition (no Addenda). Section III of these Codes permit a maximum transient pressure of 110% (2750 psia) of design pressure. The Safety Limit of 2750 psia is therefore consistent with the design criteria and associated code requirements.

The entire Reactor Coolant System, with the original steam generators, was hydrotested at 3125 psia to demonstrate integrity prior to initial operation. The primary side of each replacement steam generator was hydrostatically tested in the manufacturing facility prior to installation. Leak testing of the Reactor Coolant System was performed in accordance with ASME Section XI Code Case N-416-1 following the installation of the replacement steam generators.

2.2.1 REACTOR TRIP SETPOINTS

The Reactor Trip Setpoints specified in Table 2.2-1 are the values at which the Reactor Trips are set for each functional unit. The Trip Setpoints have been selected to ensure that the reactor core and reactor coolant system are prevented from exceeding their Safety Limits during normal operation and design basis anticipated operational occurrences and to assist the Engineered Safety Features Actuation System in mitigating the consequences of accidents. Operation with a trip set less conservative than its Trip Setpoint but within its specified Allowable Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is equal to or less than the drift allowance assumed for each trip in the safety analyses.

The DNBR - Low and Local Power Density - High are digitally generated trip setpoints based on Limiting Safety System Settings of 1.25 and 21.0 kw/ft, respectively. Since these trips are digitally generated by the Core Protection Calculators, the trip values are not subject to drifts common to trips generated by analog type equipment. The Allowable Values for these trips are therefore the same as the Trip Setpoints.

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[1] Use of a later ASME Section III Code is acceptable, provided the Code section(s) is reconciled in accordance with Section XI.

Amendment No. ~~24.66.79,138~~
~~Revised by NRC Letter dated May 17, 1999~~
Revised by NRC Letter dated February 29, 2000

3/4.4.12 LOW TEMPERATURE OVERPRESSURE PROTECTION SYSTEM

Low temperature overpressure protection (LTOP) of the RCS, including the reactor vessel, is provided by redundant relief valves on the pressurizer which discharge from a single discharge header. Each relief valve is isolated from the RCS by two motor operated block valves. Each LTOP relief valve is a direct action, spring-loaded relief valve, with orifice area of 6.38 in^2 and a lift setting of $\leq$ 430 psig, and is capable of protecting the RCS from overpressurization when the transient is either (1) the start of an idle reactor coolant pump, under water-solid conditions, with the secondary water temperature of the steam generator less than or equal to 100°F above the RCS cold leg temperature (energy addition event), or (2) simultaneous injection of two HPSI pumps and all three charging pumps to the water-solid RCS (mass addition event). The limiting LTOP design basis event is the energy addition event. The analyses assume that the safety injection tanks (SITs) are either isolated or depressurized such that they are unable to challenge the LTOP relief setpoints.

Since neither the LTOP reliefs nor the RCS vent is analyzed for the pressure transient produced from SIT injection, the LCO requires each SIT that is pressurized to $\geq$ 300 psig to be isolated. The isolated SITs must have their discharge valves closed and the associated MOV power supply breaker in the open position. The individual SITs may be unisolated when pressurized to < 300 psig. The associated instrumentation uncertainty is not included in the 300 psig value and therefore, the procedural value for unisolating the SITs with the LTOPs in service will be reduced.

The LTOP system, in combination with the RCS heatup and cooldown limitations of LCO 3.4.9.1 and administrative restrictions on RCP operation, provides assurance that the reactor vessel non-ductile fracture limits are not exceeded during the design basis event at low RCS temperatures. These non-ductile fracture limits are identified as LTOP pressure-temperature (P-T) limits, which were specifically developed to provide a basis for the LTOP system. These LTOP P-T limits, along with the LTOP enable temperature, were developed using guidance provided in ASME Code Section XI, Division 1, Code Case N-514 that mandates that "LTOP systems shall limit the maximum pressure in the vessel to 110% of the pressure determined to satisfy Appendix G, paragraph G-2215 of Section XI, Division 1".

The enable temperature of the LTOP isolation valves is based on any RCS cold leg temperature reaching 220°F (including a 20°F uncertainty). Although each relief valve is capable of mitigating the design basis LTOP event, both LTOP relief valves are required to be OPERABLE below the enable temperature to meet the single failure criterion of NRC Branch Technical Position RSB 5-2, unless any RCS vent path of 6.38 in^2 (equivalent relief valve orifice area) or larger is maintained.

A hydrated form of TSP is used because of the high humidity in the containment building during normal operation. Since the TSP is hydrated, it is less likely to absorb large amounts of water from the humid atmosphere and will undergo less physical and chemical change than the anhydrous form of TSP.

The LOCA radiological consequences analysis takes credit for iodine retention in the sump solution based on the recirculation water pH being ≥ 7.0. The radionuclide releases from the containment atmosphere and the consequences of a LOCA would be increased if the pH of the recirculation water were not adjusted to 7.0 or above.

The required amount of TSP is based upon the extreme cases of water volume and pH possible in the containment sump after a large break LOCA. The minimum required volume is the volume of TSP that will achieve a sump solution pH of ≥ 7.0 when taking into consideration the calculated sump water volume and boron concentration resulting in the minimum possible pH. The amount of TSP needed in the containment building is based on the mass of TSP required to achieve the desired pH. However, a required volume is specified, rather than mass, since it is not feasible to weigh the entire amount of TSP in containment. The minimum required volume is based on the manufactured density of TSP dodecahydrate. Since TSP can have a tendency to agglomerate from high humidity in the containment building, the density may increase and the volume decrease during normal plant operation. Due to possible agglomeration and increase in density, estimating the minimum volume of TSP in containment is conservative with respect to achieving a minimum required pH.

Sufficient TSP is required to be available in MODES 1, 2, and 3, because the RCS is at elevated temperature and pressure, providing an energy potential for a LOCA. The potential for a LOCA results in a need for the ability to control the pH of the recirculated coolant.

If it is discovered that the TSP in the containment building is not within limits, action must be taken to restore the TSP to within limits. During plant operation the containment sump is not accessible and corrections may not be possible. 72 hours is allowed for restoring the TSP within limits, where possible, because 72 hours is the same time allowed for restoration of other ECCS components. If the TSP cannot be restored within limits within 72 hours, the plant must be brought to a MODE in which the LCO does not apply. The specified Allowed Outage Times for reaching HOT STANDBY and HOT SHUTDOWN were chosen to allow reaching the specified conditions from full power in an orderly manner and without challenging plant systems.

The SR 4.6.2.2.a periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation. A Frequency of 18 months is required to determine visually that combined a minimum of 278 cubic feet is contained in the TSP baskets. This requirement ensures that there is an adequate volume of TSP to adjust the pH of the post LOCA sump solution to a value ≥ 7.0.

The periodic verification is required every 18 months, since access to the TSP baskets is only feasible during outages, and normal fuel cycles are scheduled for 18 months. Operating experience has shown this Surveillance Frequency acceptable due to the margin in the volume of TSP placed in the containment building.

The SR 4.6.2.2.b requirement to dissolve a representative sample of TSP in a sample of borated water provides assurance that the stored TSP will dissolve in borated water at the postulated post-LOCA temperatures. Testing must be performed to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. A representative sample of 3.09 ± 0.05 grams of TSP from one of the baskets in containment is submerged in 1.0 ± 0.01 liter of water at a boron concentration of 3130 ± 30 ppm and at a temperature of 120 ± 5°F. The solution is allowed to stand for 4 hours without agitation. The liquid is then decanted from the solution and mixed, the temperature adjusted to 77 ± 2°F and the pH measured. At this point, the pH must be ≥ 7.0. The representative sample weight is based on the minimum required TSP weight of 6804 kilograms, which at manufactured density corresponds to the minimum volume of 278 cubic ft, and assumed post LOCA borated water mass in the sump of approximately 4885000 lbm normalized to buffer a 1.0 liter sample. The boron concentration of the test water is representative of the maximum possible boron concentration corresponding to the calculated post LOCA sump volume producing the lowest pH. Agitation of the test solution is prohibited, since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved TSP to naturally diffuse through the sample solution. In the post LOCA containment sump, rapid mixing would occur, significantly decreasing the actual amount of time before the required pH is achieved. This would ensure compliance with the Standard Review Plan requirement of a pH ≥ 7.0 by the onset of recirculation after a LOCA.

3/4.6.2.3 CONTAINMENT COOLING SYSTEM

The OPERABILITY of the containment cooling system ensures that 1) the containment air temperature will be maintained within limits during normal operation, and 2) adequate heat removal capacity is available when operated in conjunction with the containment spray systems during post-LOCA conditions.

The containment cooling system and the containment spray system are redundant to each other in providing post accident cooling of the containment atmosphere. As a result of this redundancy in cooling capability, the allowable out-of-service time requirements for the containment cooling system have been appropriately adjusted. However, the allowable out of service time requirements for the containment spray system have been maintained consistent with that assigned other inoperable ESF equipment since the containment spray system also provides a mechanism for removing Iodine from the containment atmosphere.

The addition of a biocide to the service water system is performed during containment cooler surveillance to prevent buildup of Asian clams in the coolers when service water is pumped through the cooling coils. This is performed when service water temperature is between 60°F and 80°F since in this water temperature range Asian clams can spawn and produce larva which could pass through service water system strainers.