2.0 LIMITING CONDITIONS FOR OPERATION

2.3 Emergency Core Cooling System (Continued)

(3) Protection Against Low Temperature Overpressurization

The following limiting conditions shall be applied during scheduled heatups and cooldowns. Disabling of the HPSI pumps need not be required if the RCS is vented through at least a 0.94 square inch or larger vent.

Whenever the reactor coolant system cold leg temperature is below 385°F, at least one (1) HPSI pump shall be disabled.

Whenever the reactor coolant system cold leg temperature is below 320°F, at least two (2) HPSI pumps shall be disabled.

Whenever the reactor coolant system cold leg temperature is below 270°F, all three (3) HPSI pumps shall be disabled.

In the event that no charging pumps are operable when the reactor coolant system cold leg temperature is below 270°F, a single HPSI pump may be made operable and utilized for boric acid injection to the core, with flow rate restricted to no greater than 120 gpm.

(4) Trisodium Phosphate (TSP) Dodecahydrate

During operating Modes 1 and 2, the TSP baskets shall contain ≥ 110 ft^3 of active TSP.

a. With the above TSP requirements not within limits, the TSP shall be restored within 72 hours.

b. With Specification 2.3(4)a required action and completion time not met, the plant shall be in hot shutdown within the next 6 hours and cold shutdown within the following 36 hours.

Basis

The normal procedure for starting the reactor is to first heat the reactor coolant to near operating temperature by running the reactor coolant pumps. The reactor is then made critical by withdrawing CEA's and diluting boron in the reactor coolant. With this mode of start-up, the energy stored in the reactor coolant during the approach to criticality is substantially equal to that during power operation and therefore all engineered safety features and auxiliary cooling systems are required to be fully operable.

The SIRW tank contains a minimum of 283,000 gallons of usable water containing a boron concentration of at least the refueling boron concentration. This is sufficient boron concentration to provide a shutdown margin of 5%, including allowances for uncertainties, with all control rods withdrawn and a new core at a temperature of 60°F.[(2)]

9606040210 960531
PDR ADOCK 05000285
P PDR

The limits for the safety injection tank pressure and volume assure the required amount of water injection during an accident and are based on values used for the accident analyses. The minimum 116.2 inch level corresponds to a volume of 825 ft^3 and the maximum 128.1 inch level corresponds to a volume of 895.5 ft^3. Prior to the time the reactor is brought critical, the valving of the safety injection system must be checked for correct alignment and appropriate valves locked. Since the system is used for shutdown cooling, the valving will be changed and must be properly aligned prior to start-up of the reactor.

be available for emergency core cooling, but the contents of one of the tanks is assumed to be lost through the reactor coolant system. In addition, of the three high-pressure safety injection pumps and the two low-pressure safety injection pumps, for large break analysis it is assumed that two high pressure and one low pressure operate while only one of each type is assumed to operate in the small break analysis[5]; and also that 25% of their combined discharge rate is lost from the reactor coolant system out of the break. The transient hot spot fuel clad temperatures for the break sizes considered are shown in USAR Section 14.

The restriction on HPSI pump operability at low temperatures, in combination with the PORV setpoints ensure that the reactor vessel pressure-temperature limits would not be exceeded in the case of an inadvertent actuation of the operable HPSI and charging pumps.

Removal of the reactor vessel head, one pressurizer safety valve, or one PORV provides sufficient expansion volume to limit any of the design basis pressure transients. Thus, no additional relief capacity is required.

Technical Specification 2.2(1) specifies that, when fuel is in the reactor, at least one flow path shall be provided for boric acid injection to the core. Should boric acid injection become necessary, and no charging pumps are operable, operation of a single HPSI pump would provide the required flow path. The HPSI pump flow rate must be restricted to that of three charging pumps in order to minimize the consequences of a mass addition transient while at low temperatures.

Trisodium Phosphate (TSP) dodecahydrate is required to adjust the pH of the recirculation water to ≥ 7.0 after a loss of coolant accident (LOCA). This pH value is necessary to prevent significant amounts of iodine, released from fuel failures and dissolved in the recirculation water, from converting to a volatile form and evolving into the containment atmosphere. Higher levels of airborne iodine in containment may increase the releases of radionuclides and the consequences of the accident. A pH of ≥ 7.0 is also necessary to prevent stress corrosion cracking (SCC) of austenitic stainless steel components in containment. SCC increases the probability of failure of components.

The required amount of TSP is represented in a volume quantity converted from the Reference 7 mass quantity using the manufactured density. Verification of this amount during surveillance testing utilizes the measured volume.

2.0 LIMITING CONDITIONS FOR OPERATION

2.3 Emergency Core Cooling System (Continued)

References

(1) USAR, Section 14.15.1

(2) USAR, Section 6.2.3.1

(3) USAR, Section 14.15.3

(4) USAR, Appendix K

(5) Omaha Public Power District's Submittal, December 1, 1976

(6) Technical Specification 2.1.2, Figure 2-1B

(7) USAR, Section 4.4.3

(i) Verifying that a minimum total of 40 cubic feet of solid granular TSP is contained within the TSP storage baskets.

(ii) Verifying that when a representative sample of .6 ± .1 lbs. of TSP from a TSP storage basket is submerged, without agitation, in 89 ± 2 gallons of 77 ± 10°F borated water at refueling water concentration, the pH of the mixed solution is raised to ≥ 7 within 4 hours.

Failure to meet the above requirements will require replacement of the TSP.

(i) Verifying that the TSP baskets contain ≥ 110 ft^3 of granular trisodium phosphate dodecahydrate.

(ii) Verifying that a sample from the TSP baskets provides adequate pH upward adjustment of the recirculation water.

that the spray piping and nozzles are open will be made initially by a smoke test or other suitably sensitive method, and at appropriate intervals thereafter. A single containment spray header flow rate of 3155 gpm of atomized spray is required to provide the containment response[3] specified in Section 2.4 of the Technical Specification: To achieve the 3155 gpm flow rate, no greater than ten (10) spray nozzles may be inoperable of which no more than one may be missing. Since the material is all stainless steel, normally in a dry condition, with no plugging mechanism available, retesting at appropriate intervals is considered to be more than adequate.

Other systems that are also important to the emergency cooling function are the SI tanks, the component cooling system, the raw water system and the containment air coolers. The SI tanks are a passive safeguard. In accordance with the specifications, the water volume and pressure in the SI tanks are checked periodically. The other systems mentioned operate when the reactor is in operation and are continuously monitored for satisfactory performance.

The in-containment air treatment system is designed to filter the containment building atmosphere during accident conditions. Both in-containment air treatment systems are designed to automatically start upon accident signals. Should one system fail to start, the redundant system is designed to start automatically. Each of the two systems has 100 percent capacity.[4]

High efficiency particulate air (HEPA) filters are installed before the charcoal adsorbers to prevent clogging of the iodine adsorbers. The charcoal adsorbers are installed to reduce the potential release of radioiodine to the environment. The laboratory carbon sample test results should indicate a radioactive methyl iodide removal efficiency of at least 85 percent. If the efficiencies of the HEPA filters and charcoal adsorbers are as specified, the resulting doses will be less than the 10 CFR Part 100 guidelines for the accidents analyzed.

Pressure drop across the combined HEPA filters and charcoal adsorbers of less than 6 inches of water will indicate that the filters and adsorbers are not clogged by excessive amounts of foreign matter.

If significant painting, fire or chemical release occurs in a ventilation zone communicating with the system that could lead to the degradation of charcoal adsorbers or HEPA filters, testing will be performed to assure system integrity and performance.

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorbers system and remove excessive moisture build-up on the adsorbers.

Demonstration of the automatic initiation capability will assure system availability.

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 refueling frequency shall be utilized to visually determine that $\geq$ 110 ft^3 of TSP is contained in the TSP baskets. This requirement ensures that there is an adequate quantity of TSP to adjust the pH of the post-LOCA sump solution to a value $\geq$ 7.0.

The periodic verification is required on a refueling frequency. Operating experience has shown this surveillance frequency acceptable due to margin in the volume of TSP placed in the containment building.

Testing must be performed to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. A representative sample of 1.80 - 1.83 grams of TSP from one of the baskets in containment is submerged in 0.99 - 1.01 liters of water at a boron concentration of 2445 - 2465 ppm. At a standard temperature of 115 - 125°F, without agitation, the solution should be left to stand for 4 hours. The liquid is then decanted and mixed, the temperature adjusted to 75 - 79°F and the pH measured. At this point the pH must be $\geq$ 7.0. The representative sample weight is based on the minimum required TSP weight of 5,788 lbs_m which at a manufactured density of at least 53.0 lb_m/ft^3 corresponds to the minimum volume of 110 ft^3, and maximum possible post-LOCA sump volume of 375,143 gallons, 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 maximum possible post-LOCA sump volume. The post-LOCA sump volume originates from the Reactor Coolant System (RCS), the Safety Injection Refueling Water Tank (SIRWT), the Safety Injection Tanks (SITs) and the Boric Acid Storage Tanks (BASTs). The maximum post-LOCA sump boron concentration is based on a cumulative boron concentration in the RCS, SIRWT, SITs and BASTs of 2445 ppm. 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 achieving a pH $\geq$ 7.0 by the onset of recirculation after a LOCA.

References

(1) USAR, Section 6.2
(2) USAR, Section 6.3
(3) USAR, Section 14.16
(4) USAR, Section 6.4

ATTACHMENT B

DISCUSSION, JUSTIFICATION AND NO SIGNIFICANT HAZARDS CONSIDERATIONS

DISCUSSION AND JUSTIFICATION

The Omaha Public Power District (OPPD) proposes to revise the Fort Calhoun Station Unit (FCS) No. 1 Technical Specifications for Trisodium Phosphate (TSP) Dodecahydrate requirements by adding a Limiting Condition for Operation (LCO) to Specification 2.3, "Emergency Core Cooling System," and revising the surveillance requirements as contained in Section 3.6, "Safety Injection and Containment Cooling Systems Tests." These changes are based on a recent calculation performed by Combustion Engineering (ABB/CE) of the quantity of TSP needed to attain a neutral pH (i.e., ≥ 7.0) in the containment sump water following a Loss of Coolant Accident (LOCA). These changes are also intended to attain consistency with the CE Standard Technical Specifications (STS) as presented in NUREG-1432, Revision 1 dated April 7, 1995. The amount of TSP required increases from the present value and will be achieved through a modification to be installed during the 1996 Refueling Outage which is scheduled to commence on September 21, 1996. Baltimore Gas and Electric (BG&E) recently made a similar submittal in Reference 3 which was approved by the NRC in Reference 4.

Specification 2.3(4)

This proposed change represents a new LCO which is added to establish overall consistency with the CE STS for TSP requirements. The proposed change establishes a minimum TSP volume that must be maintained during operating Modes 1 and 2, as well as establishing the time limits for accomplishing corrective actions should the LCO not be met. Using operating Modes 1 and 2 is consistent with the FCS Emergency Core Cooling System (ECCS) Technical Specifications (TS). The time to shutdown (36 hours) is consistent with the FCS TS 2.0.1 requirements.

The minimum TSP volume utilized in this LCO was the result of a recent calculation performed by ABB/CE and represents an increase from that previously contained in Specification 3.6(2)d(i).

Specification 3.6(2)d

The proposed changes to this specification include both revising the required surveillance inventory of the TSP baskets in Specification 3.6(2)d(i) to be consistent with the aforementioned calculation and revising/reformatting the TSP sample testing requirements of Specification 3.6(2)d(ii) to be consistent with the CE STS (NUREG-1432).

Trisodium Phosphate Dodecahydrate is stored in open containers in the containment to neutralize the acidic containment spray and sump water following a LOCA. The neutral solution is better able to maintain radioactive iodine in solution and reduces the probability of stress corrosion cracking (SCC) and subsequent failure of austenitic stainless steel components in the containment. The TSP located in the containment sump is stored in baskets designed to allow the chemical to flow out when dissolved by water. Mixing will be achieved as the solution is continuously recirculated and the final pH of the sump and spray will be ≥ 7.0.

DISCUSSION AND JUSTIFICATION (continued)

The minimum quantity of TSP required to raise the pH to 7.0 has been calculated based on the maximum boron concentration of the containment sump water which is a mixture of water from the Reactor Coolant System (RCS), the Safety Injection Refueling Water Tank (SIRWT), the Safety Injection Tanks (SITs) and the Boric Acid Storage Tanks (BASTs) following a LOCA.

In the course of verifying the basis of the surveillance test requirements for TSP, OPPD calculated the amount of TSP required to bring the water in the sump to a pH of 7.0. The surveillance procedure requires measurement of the depth of the TSP in the baskets and calculation of the volume actually present.

The new calculation showed the minimum quantity of TSP required to raise the pH to 7.0 is 110 ft^3 based on the boron concentration of the containment sump water following a LOCA.

Hydrogen generation from corrosion of galvanized and aluminum materials in containment has been conservatively calculated based on an initial pH of 4.5. A pH ≥ 7.0 reduces the generation rate. A very high aluminum corrosion rate would occur for pH values of approximately 9 to 10; however, a resultant containment sump pH this high is not considered possible.

The proposed change to Technical Specification 3.6(2)d(ii) moves the surveillance test amounts of chemical and water used from the Specification to the Basis section. This relocation is consistent with the CE STS and does not alter the test method or acceptance criteria. The amount of TSP used in the test is changed to reflect the ratio of TSP to water in the containment sump necessary to achieve a pH ≥ 7.0 following a LOCA. The specified concentration of boron reflects the highest concentration that could be found in the containment sump following a LOCA. The test temperature is changed to 115 - 125°F which is well below the temperature expected to be found in the containment sump following a LOCA. The decanting of solution does not change the intent of the test method since the dissolving period will still be conducted without agitation.

Administrative Changes

A header, "Surveillance Requirements, Safety Injection and Containment Cooling Systems Tests (Continued)," is being added to page 3-54a as this was omitted in Amendment No. 44 to the FCS TS dated March 22, 1979. Also, the Surveillance Requirements specification number on the top of page 3-57 is being corrected from 13.0 to 3.0. This typographical error appeared in Amendment No. 171 to the FCS TS dated September 7, 1995. These changes are strictly administrative in nature.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION:

The proposed changes do not involve significant hazards considerations because operation of Fort Calhoun Station Unit No. 1 in accordance with these changes would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated.

Trisodium Phosphate Dodecahydrate (TSP) is stored in the containment sump to raise the pH of the sump and spray water following a loss of coolant accident (LOCA). As the pH of the water increases, more radioactive iodine is kept in solution and the possibility of airborne radioactivity leakage is decreased. An additional advantage of a higher pH is the beneficial reduction in chloride stress corrosion cracking (SCC) of austenitic stainless steel components in the containment following a LOCA.

This chemical is an accident mitigator, not an accident initiator in that it is not used until after an accident (i.e., a LOCA) has occurred. At the time it begins to go into solution, the accident has occurred, containment spray has been activated and water is collecting in the containment sump. Therefore, increasing the Technical Specification (TS) minimum amount of TSP verified to be in containment will not involve a significant increase of the probability of an accident previously evaluated.

The Updated Safety Analysis Report (USAR), Section 14.15, "Loss of Coolant Accident," does not take credit for a post-LOCA minimum containment sump pH adjustment to 7.0 for the iodine removal and retention calculation until ten hours after initiation of the event. Increasing the amount of TSP (based on recent re-analysis) in the containment sump ensures that a pH $\geq$ 7.0 is achieved and therefore does not increase the consequences of any accident previously evaluated.

The proposed change to TS 2.3(4) represents a new Limiting Condition for Operation (LCO) which is added to establish overall consistency with the CE STS for TSP requirements. The proposed change establishes a minimum TSP volume that must be maintained during operating Modes 1 and 2 to ensure that a pH $\geq$ 7.0 is achieved within four hours following a LOCA; as well as, establishing times for accomplishing corrective actions should the LCO not be met. Therefore, this change does not significantly increase the probability or consequences of any accident previously evaluated.

The proposed change to TS 3.6(2)d(i) revises the required surveillance inventory of the TSP baskets consistent with the aforementioned calculation to ensure that a pH $\geq$ 7.0 is achieved. Therefore, this change does not increase the consequences of any accident previously evaluated.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION: (continued)

The proposed change to TS 3.6(2)d(ii) moves the surveillance test amounts of chemical and water used from the Specification to the Basis section. This relocation will not alter the test method or acceptance criteria.

In the Basis, the amount of TSP used in the test is changed to reflect the ratio of TSP to water that would be found in the containment sump following a LOCA. The specified concentration of boron in the test reflects the highest concentration that could be found in the containment sump following a LOCA. The test temperature is changed to 115 - 125°F, which is well below the temperature expected to be found in the containment sump following a LOCA. The decanting of the solution does not change the intent of the test method since the dissolving period will still be conducted without agitation. Therefore, these changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Create the possibility of a new or different kind of accident from any previously analyzed.

TSP is currently present in the containment sump. The addition of TSP ensures that a pH ≥ 7.0 is achieved following a LOCA. The increase in TSP inventory will be accomplished via a modification to be installed during the 1996 Refueling Outage.

The proposed change to TS 2.3(4) represents a new LCO which is added to establish overall consistency with the CE STS for TSP requirements. The proposed change establishes a minimum TSP volume that must be maintained during operating Modes 1 and 2 to ensure that a pH ≥ 7.0 is achieved following a LOCA; as well as, establishing corrective action term limits should the LCO not be met. This proposed change does not create a possibility of a new or different kind of accident from any previously analyzed.

The proposed change to TS 3.6(2)d(ii) moves the surveillance test amounts of chemical and water used from the Specification to the Basis section to be consistent with the CE STS. This relocation will not alter the test method or acceptance criteria. In the Basis section, the amount of TSP used in the test is changed to reflect the ratio of TSP to water that would be found in the containment following a LOCA. The specified concentration of boron in the test reflects the highest concentration that could be found in the containment sump following a LOCA. The test temperature is changed to a range of 115 - 125°F which is well below the temperature expected to be found in the containment sump following a LOCA. The decanting of the solution does not change the intent of the test method since the dissolving period will still be conducted without agitation. Therefore, these changes will not create the possibility of a new or different type of accident from any accident previously evaluated.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION: (continued)

(3) Involve a significant reduction in a margin of safety.

TSP is stored in the containment lower level to raise the pH of the containment sump and recirculated spray water following a LOCA. As the pH of the water increases, more radioactive iodine is kept in solution and the possibility of airborne radioactivity leakage is decreased. Additionally, a higher pH has the beneficial effect of reducing the possibility of chloride stress corrosion cracking of austenitic stainless steel components in the containment.

The proposed change to TS 2.3(4) represents addition of a new LCO for TSP requirements during power operations and hot standby consistent with CE STS. This change does not involve a significant reduction in a margin of safety.

TS 3.6(2)d(i) requires verification that a minimum volume of TSP is contained in the storage baskets in containment. This change proposes to increase that volume consistent with the latest ABB/CE calculation. The increased volume will ensure that the containment sump, when filled with water from the Reactor Coolant System, Safety Injection Refueling Water Tank, Safety Injection Tanks and Boric Acid Storage Tanks, will have a pH ≥ 7.0 within four hours following a LOCA. Therefore, this change does not involve a reduction in a margin of safety.

The proposed change to TS 3.6(2)d(ii) would move the surveillance test amounts of chemical and water used from the Specification to the Basis section. This relocation is consistent with the CE STS and will not alter the test method or acceptance criteria. In the Basis, the amount of TSP used in the test is changed to reflect the ratio of TSP to water that would be found in the containment following a LOCA. The specified concentration of boron in the test reflects the highest post-LOCA concentration that could be found in the containment. The test temperature is changed to a range of 115 - 125°F which is well below the temperature expected to be found in the containment sump following a LOCA. The decanting of the solution does not change the intent of the test method since the dissolving period will still be conducted without agitation. Therefore, these changes do not involve a significant reduction in a margin of safety.

Therefore based on the above considerations, it is OPPD's position that this proposed amendment does not involve significant hazards considerations as defined by 10 CFR 50.92 and the proposed changes will not result in a condition which significantly alters the impact of the Station on the environment. Thus, the proposed changes meet the eligibility criteria for categorical exclusion set forth in current revisions of 10 CFR 51.22(c)(9) and pursuant to 10 CFR 51.22(b) no environmental assessment need be prepared.