REACTIVITY CONTROL SYSTEMS

CHARGING PUMPS - OPERATING

LIMITING CONDITION FOR OPERATION

*3.1.2.4 At least two charging pumps shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one chargigg pump OPERABLE, restore at least two charging pumps to OPERABLE status within 72 hours or be in at least HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to at least 1% delta k/k at 200°F within the next 6 hours; restore at least two charging pumps to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.4 At least two charging pumps shall be demonstrated OPERABLE by verifying, that on recirculation flow, each pump develops a discharge pressure of greater than or equal to 2400 psig when tested pursuant to Specification 4.0.5.

NOTE: * With one centrifugal charging pump inoperable, the emergency core cooling system (ECCS) may remain operable for an additional 72 hours beyond that identified in the Action statement, but not to exceed 72 hours (2048 hours on July 14, 1984).

CHARGING PUMP - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.3 One charging pump in the boron injection flow path required by Specification 3.1.2.1 shall be OPERABLE and capable of being powered from an OPERABLE shutdown board.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no charging pump OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes.

SURVEILLANCE REQUIREMENTS

4.1.2.3 The above required charging pump shall be demonstrated OPERABLE by verifying, that on recirculation flow, the pump develops a discharge pressure of greater than or equal to 2400 psig when tested pursuant to Specification 4.0.5.

3/4.5.2 ECCS SUBSYSTEMS - T_{avg} Greater Than or Equal to 350°F

LIMITING CONDITION FOR OPERATION

* 3.5.2 Two independent emergency core cooling system (ECCS) subsystems shall be OPERABLE with each subsystem comprised of:

a. One OPERABLE centrifugal charging pump,

b. One OPERABLE safety injection pump,

c. One OPERABLE residual heat removal heat exchanger,

d. One OPERABLE residual heat removal pump, and

e. An OPERABLE flow path capable of taking suction from the refueling water storage tank on a safety injection signal and automatically transferring suction to the containment sump during the recirculation phase of operation.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one ECCS subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date. The current value of the usage factor for each affected safety injection nozzle shall be provided in this Special Report whenever its value exceeds 0.70.

SURVEILLANCE REQUIREMENTS

4.5.2 Each ECCS subsystem shall be demonstrated OPERABLE:

a. At least once per 12 hours by verifying that the following valves are in the indicated positions with power to the valve operators removed:

NOTE: * With one centrifugal charging pump inoperable, the emergency core cooling system (ECCS) may remain operable for an additional 72 hours beyond that identified in Action statement (a), but not to exceed 72 hours (2048 hours on July 14, 1984).

SURVEILLANCE REQUIREMENTS (Continued)

Valve Number	Valve Function	Valve Position
a. FCV-63-1	RHR Suction from RWST	open
b. FCV-63-22	SIS Discharge to Common Piping	open

b. At least once per 31 days by:

1. Verifying that the ECCS piping is full of water by venting the ECCS pump casings and accessible discharge piping high points, and

2. Verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. By a visual inspection which verifies that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment sump and cause restriction of the pump suctions during LOCA conditions. This visual inspection shall be performed:

1. For all accessible areas of the containment prior to establishing CONTAINMENT INTEGRITY, and

2. Of the areas affected within containment at the completion of each containment entry when CONTAINMENT INTEGRITY is established.

d. At least once per 18 months by:

1. Verifying automatic isolation and interlock action of the RHR system from the Reactor Coolant System when the Reactor Coolant System pressure is above 750 psig.

2. A visual inspection of the containment sump and verifying that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of structural distress or corrosion.

e. At least once per 18 months, during shutdown, by:

1. Verifying that each automatic valve in the flow path actuates to its correct position on a safety injection test signal and automatic switchover to containment sump test signal.

Description of Event

Investigation of a fire alarm in the 2A-A Centrifugal Pump (CCP) room revealed the inboard and outboard pump motor bearings had failed. The motor oil level was low, and the oil was discolored. At 2048 EST on 7/8/84, the 2A-A CCP was declared inoperable, and the 72-hour action statement of LCO 3.5.2 was entered.

Early on 7/9/84, a decision was made to pull the motor and have a motor shipped from Watts Bar Nuclear Plant (WBNP). Due to the differences in shaft sizes of the WBNP CCP and the SQN CCP, the coupling between the pump and motor required machining to obtain a proper alignment. The fitting required several machining and fitting operations to obtain a proper fit. The machined coupling was installed early on 7/11/84, and alingment of the motor to the pump has begun. The time required to properly align the 5300 lb. motor to within .002 inches cannot be accurately estimated, but following the proper alignment approximately four hours (best estimate) would be needed to return the CCP to operable status. This four-hour period will consist of clearing the hold order which was initiated to replace motor and performance of the required surveillance test (SI-40) on the CCP.

JUSTIFICATIONS FOR CHANGE

Centrifugal charging pumps are required for small break loss of coolant accidents (LOCA). Probabilistic risk assessment (PRA) techniques indicate that the probability of losing the operable centrifugal charging pump (CCP 2B-B) coincident with a small break LOCA is 3×10^{-5} per reactor year; therefore, for an additional 72 hour (3 days) period the probability is $3 \times 10^{-5} \times 3/365 = 2.5 \times -^{7}$. This probability is sufficient low to justify this one extension of the action time for an additional 72 hours. The positive displacement charging pump (powered from train 2B) is operable and can supply charging/seal flow in the event CCP 2B-B fails (locked rotor, etc).

Further, Westinghouse Nuclear Safety has performed an analysis to indicate there is no problem with the requested technical specification change. This analysis is similar to that done for Zion and DC Cook Nuclear Stations and for which NRC allowed seven-day extension times on the limiting condition for operation. This analysis and further justification will be provided later today (7/11/84).

CONTINGENCY ACTIONNS

The following measures will be taken to ensure a charging pump will be capable of providing flow to the RCS.

1. A special operating notice will be issued to appropriate operating personnel to outline possible steps to take in the event CCP 2B-B (which is now in continuous operation) fails conincident with a LOCA. This notice will include guidelines for providing electrical power from the redundant power train should diesel generator 2B-B fail or startup of the positive displacement charging pump should CCP 2B-B itself fail.

2. Dedicated operations personnel will be provided to perform manual actions should they be required (start a CCP o. operate valves).

JUSTIFICATION OF EMERGENCY TECHNICAL SPECIFICATION CHANGE STATUS

The power system dispatcher has been contacted, and today (7/11/84) is expected to be the hottest day of the summer to date. The expected electrical demand and availability just match with both Sequoyah units on-line. As explained in the 'Description of Event,' TVA has acted diligently in attempting to restore CCP 2A-A to operable status, has informed NRC of the situation in a timely manner, and has not created an emergency situation in order to take advantage of the emergency provision of 10 CFR 50.91. Consequently, an emergency technical specification change is requested as outlined below, and NRC is requested to use 10 CFR 50.91 subparagraph 5 to issue the requested change on an emergency basis.

SIGNIFICANT HAZARDS CONSIDERATION

1. Is the probability of an occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report significantly increased?

   No. Centrifigual charging pumps (high-head safety injection pumps) are required for small break loss of coolant accidents. Probability risk assessment (PRA) techniques indicate that the probability of losing the operable centrifugal charging pump 2B-B CCP coincident with a small break LOCA is 3×10^{-5} per reactor year; therefore, for an additional 72-hour (3 day) period, the probabability is 2.5×10^{-7}. This probability is sufficiently low to justify this one time extension of the action time for an additional 72 hours.

2. Is the probability for an accident or malfunction of a different type than evaluated previously in the safety analysis report created?

   No. Requsting an extension of the action time for an additional 72 hours for the CCP does not create any different type of accident or malfunction than was previously analyzed in the FSAR. The analyses in the FSAR assumes one CCP available. This one time extension will still maintain one CCP (2B-B).

3. Is the margin of safety as defined in the basis of any technical specification significantly reduced?

   No. Requesting an extension of the action time for an additional 72 hours does not significantly reduce any margin of saety as defined in the basis of any technical specifications. The probability of losing the operable CCP coincident with a small break (LOCA) is 2.5×10^{-7} for this additional 72-hour (3 day) period.

LOCA EVALUATION FOR SEQUOYAH #2
WITH ONE CHARGING PUMP OUT OF SERVICE

The purpose of this evaluation is to assess the effect of one charging pump out of service for the Sequoyah unit #2 Nuclear Plant on Loss of Coolant Accident (LOCA) consequences. The result of this evaluation justify a tech spec extension for a charging pump out of service,

DESCRIPTION OF SEQUOYAH UNIT 2
SI SYSTEM AND FSAR ANALYSIS ASSUMPTIONS

The Sequoyah Unit #2 safety injection system consists of two electrical trains each having one IHSI pump, one RHR pump and one charging pump.

Large Break LOCA

Safety injection pump flow provides an insignificant proportion of the total ECCS flow during a large break accident, where RCS pressure rapidly drops to near atmospheric. Accumulator and low head safety injection (RHR) flow are important for this accident. Therefore, the loss of a charging pump has a negligible effect on large break LOCA calculated peak clad temperature.

Small Break LOCA

Protection against small break LOCAs comes from the two train safety injection system. Small break LOCA FSAR licensing analyses assume the worst single failure to be loss of one train. The small break LOCA analysis of record yields peak clad temperatures well below 10 CFR 50.46 limits. Therefore, the FSAR analysis assumption bounds the present plant configuration with one charging pump out of service and no single failure.

If the worst single failure assumption is considered in addition to the loss of charging pump and the train lost has the operational charging pump, ECCS flow is delivered from the intermediate head pump and the RHR pump. The following evaluation is applicable to this case.

One differentiation in the ECCS flow characteristics with no charging pump is the absence of flow at pressures greater than the shutoff head of the intermediate head pump, or approximately 1500 psia. The Westinghouse Topical Report, WCAP-8600, 'Report on Small Break LOCAs in W NSSS Systems,' demonstrated that the RCS depressurizes to a pressure where ECCS flow equilibrates to the break flow for design basis small LOCAs with auxiliary feedwater available. Therefore, for small break sizes that relied only on charging flow for inventory makeup, additional depressurization will naturally occur resulting in makeup from the intermediate head pump. ECCS flow above 1500 psia is not required for core cooling of any size design basis LOCAs. Further, the absence of ECCS flow at RCS pressures above 1500 psia have no effect on the peak clad temperatures for the worst small break, as analyzed in the FSAR.

Reduction of ECCS flow in the range of 600 to 1200 psia has an adverse effect on calculated clad temperature for small break LOCAs. The loss of a

charging pump has the effect of reducing delivered ECCS in that important pressure range. The safety injection flow will be degraded by approximately 44%. Established sensitivity studies have indicated that such a degradation results in as much as a 440°F small break LOCA PCT increase.

The current small break LOCA analysis for Sequoyah Unit #2 predicts a maximum peak clad temperature of 1485°F. Therefore, considering a 440°F PCT increase due to loss of a charging pump, there remains margin to the 10 CFR 50.46 peak clad temperature limit of 2200°F.

Additionally, credit for conservative assumptions in the small break LOCA FSAR analysis can mitigate the PCT penalty. Two prominent assumptions are listed below.

1.	ANS Decay Heat + 20%	- A best estimate decay heat function would reduce PCT by 200°F.
2.	Analysis assumed loss of steam dump	- Steam dump availability would reduct PCT by 100°F or more.

In conclusion, operation of Sequoyah Unit #2 with a charging pump out of service for a brief period of time reduced the small break LOCA PCT margin in the unlikely event of a LOCA coincident with the worst single failure. However, the present FSAR analysis has sufficient margin to 10 CFR 50.46 PCT limits. Additionally, when consideration of better estimate assumptions in the FSAR analysis are included, the PCT penalty is mitigated. Therefore, these factors indicate that a further extension for one week of operation with a charging pump out of service is not an unacceptable safety risk.

One-time tech spec extensions of 7 to 10 days for a charging pump out of service has been granted by the NRC for Zion Unit I and D. C. Cook Unit I based on similar safety evaluations.