3/4.5 EMERGENCY CORE COOLING SYSTEMS

3/4.5.1 ACCUMULATORS

COLD LEG INJECTION

LIMITING CONDITION FOR OPERATION

3.5.1.1 Each cold leg injection accumulator shall be OPERABLE with:

a. The discharge isolation valve open,

b. A contained borated water volume of between 7853 and 8171 gallons,

c. A boron concentration of between 1900 and 2100 ppm,

d. A nitrogen cover-pressure of between 385 and 481 psig, and

e. A water level and pressure channel OPERABLE.

APPLICABILITY: MODES 1, 2, and 3*.

ACTION:

or boron concentration less than 1900 ppm

a. With one cold leg injection accumulator inoperable, except as a result of a closed isolation valve, restore the inoperable accumulator to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. With one cold leg injection accumulator inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

Insert (A)

SURVEILLANCE REQUIREMENTS

4.5.1.1.1 Each cold leg injection accumulator shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1) Verifying, by the absence of alarms, the contained borated water volume and nitrogen cover-pressure in the tanks, and

2) Verifying that each cold leg injection accumulator isolation valve is open.

*Pressurizer pressure above 1000 psig.

Insert A: (To be inserted into Technical Specification page 3/4 5-1)

c. With one accumulator inoperable due to boron concentration less than 1900 ppm and:

1) The volume weighted average boron concentration of the three limiting accumulators 1900 ppm or greater, restore the inoperable accumulator to OPERABLE status within 24 hours of the low boron determination or be in at least HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1000 psig within the following 6 hours.

2) The volume weighted average boron concentration of the three limiting accumulators less than 1900 ppm but greater than 1500 ppm, restore the inoperable accumulator to OPERABLE status or return the volume weighted average boron concentration of the three limiting accumulators to greater than 1900 ppm and enter ACTION c.1 within 6 hours of the low boron determination or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1000 psig within the following 6 hours.

3) The volume weighted average boron concentration of the three limiting accumulators 1500 ppm or less, return the volume weighted average boron concentration of the three limiting accumulators to greater than 1500 ppm and enter ACTION c.2 within 1 hour of the low boron determination or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1000 psig within the following 6 hours.

BASES

3/4.5.1 ACCUMULATORS

The OPERABILITY of each Reactor Coolant System accumulator ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs from the cold leg injection accumulators and directly into the reactor vessel from the upper head injection accumulators in the event the Reactor Coolant System pressure falls below the pressure of the accumulators. This initial surge of water into the core provides the initial cooling mechanism during large pipe ruptures.

The limits on accumulator volume, boron concentration and pressure ensure that the assumptions used for accumulator injection in the safety analysis are met.

Insert (B)

The accumulator power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these accumulator isolation valves fail to meet single failure criteria, removal of power to the valves is required.

The limits for operation with an accumulator inoperable for any reason except an isolation valve closed minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional accumulator which may result in unacceptable peak cladding temperatures. If a closed isolation valve cannot be immediately opened, the full capability of one accumulator is not available and prompt action is required to place the reactor in a mode where this capability is not required.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two independent ECCS subsystems ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the accumulators is capable of supplying sufficient core cooling to limit the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double ended break of the largest cold leg pipe downward. In addition, each ECCS subsystem provides long-term core cooling capability in the recirculation mode during the accident recovery period.

With the coolant temperature below 350°F, one OPERABLE ECCS subsystem is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the limited core cooling requirements.

Insert B: (To be inserted into Technical Specification page B 3/45-1)

The allowed down time for the accumulators are variable based upon boron concentration to ensure that the reactor is shutdown following a LOCA and that any problems are corrected in a timely manner. Subcriticality is assured when boron concentration is above 1500 ppm, so additional down time is allowed when concentration is above 1500 ppm. A concentration of less than 1900 ppm in any single accumulator or as a volume weighted average may be indicative of a problem, such as valve leakage, but since reactor shutdown is assured, additional time is allowed to restore boron concentration in the accumulators.

TECHNICAL JUSTIFICATION AND SAFETY ANALYSIS

The specifications associated with Cold Leg Injection Accumulators are intended to ensure that a sufficient volume of borated water will be immediately forced into the core through each of the cold legs in the event the reactor coolant system (RCS) pressure falls below the pressure of the accumulators. This surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures. The limits placed upon accumulator volumes, and pressures ensure the assumptions used in the safety analyses are satisfied. Boron concentration limits help to provide reasonable assurance that the reactor will remain subcritical following the LOCA event.

The existing specification requires each Cold Leg Injection Accumulator to maintain conditions consistent with safety analyses assumptions including boron concentrations within the range of 1900-2100 ppm. The proposed revision to the required action statement maintains the overall volume and boron delivery requirements but allows for a more flexible schedule to restore a single accumulator to operable status. The assurance of satisfying volume and boron delivery requirements is provided by calculating the average volume and volume weighted averaged boron concentration of the three limiting accumulators. The limiting accumulators are defined as the combination of three accumulators which delivers the minimum volume weighted average boron concentration. The accumulator which would provide the maximum boron delivery is not accounted for due to the assumption that the volume from that accumulator passes directly out of the break in the RCS piping.

The allowance of 24 hours to restore the inoperable accumulator if the volume weighted average of the three limiting accumulators is greater than 1900 ppm is deemed appropriate since safety analyses assumptions remain satisfied but the low concentration in a single accumulator is indicative of a possible problem and therefore investigation and corrective action is the prudent response. The 24 hour allowance maintains the existing requirement to restore the inoperable accumulator but does not unnecessarily initiate operator actions in the attempt to avoid more severe action statement procedures. The benefit of the revision is thus a less hurried atmosphere for operator actions allowing for a well planned response to the inoperable accumulator and a reduction in the number of unnecessary plant mode changes while maintaining plant conditions which satisfy safety analyses assumptions.

The action statement related to conditions in which the volume weighted average boron concentration of the three limiting accumulators is less than 1900 ppm but greater than 1500 ppm allows 6 hours to either restore the inoperable accumulator to operable status or return the volume weighted average boron concentration of the three limiting accumulators to greater than 1900 ppm and continue appropriate actions per the previously discussed action statement. The 6 hour allowance reflects the fact that a slight deficiency in boron concentration in a single accumulator is a less severe condition that deviations in the volume or cover pressure parameters since the cold leg accumulators serve primarily as a core cooling mechanism. The 6 hour allowance sufficiently minimizes the probability of a LOCA event concurrently with the volume weighted average boron concentration of the three limiting accumulators being less than 1900 ppm and also provides a reduction in the number of plant mode changes associated with the severe action statements of the existing specification. Reactivity control via normal control systems, the operable cold leg accumulators, and the refueling water storage tank also help to minimize concerns related to increasing the allowable time an accumulator may be inoperable due to low boron concentration from 1 hour to 6 hours prior to initiating a plant operating mode reduction.

The action for a boron concentration of less than 1500 ppm would be to restore concentration to greater than 1500 ppm within one hour and enter the action for volume weighted average boron concentration in the 1500-1900 ppm range or proceed to Hot Shutdown. The 1500 ppm concentration would maintain shutdown of the reactor at zero power, T 0, all control rod assemblies out, including a 1% uncertainty (FSAR Table 4.3.2-2). The existing Specification would allow this excursion for one hour, and once concentration is restored, shutdown is assured. The probability of a LOCA during accumulator down time is small, thus the one hour window without assured shutdown is acceptable. When boron concentration is above 1500 ppm, shutdown is assured and the boron has served its purpose. Additional boron adds to the margin.

Considering the frequency of slight deviations in single accumulator boron concentrations at Catawba and the associated increase in forced mode changes, revision of the accumulator specification was deemed appropriate. The development of the volume weighted average boron concentration of the three limiting accumulators aspect of the proposed specification adequately ensures the validity of the safety analyses and provides a reasonable time period to address the minor deviations in boron concentration of the inoperable accumulator. The increased time period (6 hours) for operation with a single accumulator inoperable and the volume weighted average boron concentration of the three limiting accumulators less than 1900 ppm is reasonable considering the probability of a LOCA concurrent with this condition and the availability of other means of reactivity control.

The proposed changes to the bases are to clarify the use of the "three limiting accumulators" and provide the reasoning behind the specification's Action statements with regards to the variable allowed times based upon the boron concentration.

ANALYSIS OF SIGNIFICANT HAZARDS CONSIDERATION

Pursuant to 10CFR 50.91, this analyses provides a determination that the proposed amendment to the Technical Specifications does not involve any significant hazards consideration, as defined by 10CFR 50.92.

The proposed amendment would not:

1) Involve a significant increase in the probability or consequences of an accident previously evaluated. The proposed change would allow increased time with the boron concentration in the cold leg accumulators below 1900 ppm but greater than 1500 ppm. The change would not affect any accident mechanisms regarding probability of an accident since no hardware changes are made, and the consequences are unaffected since the same volume of water is injected for cooling purposes and the boron assures reactor shutdown following a LOCA.

2) Create the possibility of a new or different kind of accident from any accident previously evaluated. No hardware changes are made to create any new failure or accident sequences. The boron concentration in the water will assure reactor shutdown thus preventing a return to criticality after a LOCA.

3) Involve a significant reduction in a margin of safety. While the shutdown margin following a LOCA may be reduced if a LOCA were to occur with the boron concentration lower than 1900 ppm but greater than 1500 ppm, the increase in allowed time does not significantly affect the margin of safety. Existing Specifications allow a one hour window with a boron concentration of less than 1500 ppm. The proposed Specification maintains this action statement. When boron concentration is above 1500 ppm, shutdown is assured and the boron has served its purpose.

Based upon the preceding analyses, Duke Power Company concludes that the proposed amendments do not involve a significant hazards consideration.