Duke Power®

D.M. JAMIL
Vice President

Duke Power
Catawba Nuclear Station
4800 Concord Road / CN01VP
York, SC 29745-9635

803 831 4251

803 831 3221 fax

September 13, 2005

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Duke Energy Corporation
Catawba Nuclear Station, Units 1 and 2
Docket Numbers 50-413 and 50-414
Proposed Technical Specification Amendment
Technical Specification 3.5.2, Emergency Core Cooling System; 3.6.6, Containment Spray System; 3.6.17, Containment Valve Injection Water System; 3.7.5, Auxiliary Feedwater System; 3.7.7, Component Cooling Water System; 3.7.8, Nuclear Service Water System; 3.7.10, Control Room Area Ventilation System; 3.7.12, Auxiliary Building Filtered Ventilation Exhaust System; & 3.8.1, AC Sources - Operating

Reference: 1) Letter from Dhiaa Jamil to U.S. Nuclear Regulatory Commission dated November 16, 2004.

2) Letter from Dhiaa Jamil to U.S. Nuclear Regulatory Commission dated May 3, 2005.

3) Letter from Dhiaa Jamil to U.S. Nuclear Regulatory Commission dated July 6, 2005.

Pursuant to 10 CFR 50.90, Duke Energy Corporation is submitting a response to an NRC request for additional information for an amendment request submitted on November 16, 2004 to the Catawba Nuclear Station Facility Operating License and Technical Specifications (TS). The proposed TS changes will allow the "A" and "B" Nuclear Service Water System (NSWS) headers for each unit to be taken out of service for up to 14 days each for system upgrades.

A001

This response is based on requests for additional information from the NRC after submittal of reference 3. Attachment 1 to this letter contains Catawba's response to the requests for additional information.

The conclusions reached in the original determination that the amendment contains No Significant Hazards Considerations pursuant to 10 CFR 50.92, and the basis for the categorical exclusion from performing an Environmental Assessment/Impact Statement pursuant to 10 CFR 51.22(c)(9) have not been changed based on the information in the attachment to this letter.

Pursuant to 10 CFR 50.91, a copy of this proposed amendment is being sent to the appropriate State of South Carolina official.

Inquiries on this matter should be directed to R. D. Hart at (803) 831-3622.

Very truly yours,

Dhiaa Jamil

RDH/s

Attachment: 1) - CATAWBA RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

Dhiaa Jamil affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

Dhiaa Jamil, Site Vice President

Subscribed and sworn to me: 9/13/05
Date

Notary Public

My commission expires: 7/2/2014
Date

SEAL

xc (with attachment):

W.D. Travers
U.S. Nuclear Regulatory Commission
Regional Administrator, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

E.F. Guthrie
Senior Resident Inspector (CNS)
U.S. Nuclear Regulatory Commission
Catawba Nuclear Station

S.E. Peters (addressee only)
NRC Project Manager (CNS)
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop O8-G9
11555 Rockville Pike
Rockville, MD 20852-2738

H.J. Porter
Assistant Director
Department of Health and Environmental Control
2600 Bull St.
Columbia, SC 29201

ATTACHEMENT 1

CATAWBA RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

(Throughout this attachment, the NRC request for additional information is highlighted in **bold type** and Catawba's response is shown in normal type.)

ATTACHMENT 1

PLANT SYSTEMS BRANCH

1. Temporary, one-time changes that are proposed to TS requirements are expected to demonstrate that: a) the situation is such that existing TS requirements cannot reasonably be satisfied thereby establishing a compelling need for the proposed change, and b) a permanent change to the existing TS requirements to resolve the situation would not be appropriate. Based on a review of the information that has been provided, it appears that the impact on existing TS requirements can be minimized by performing nuclear service water system (NSWS) refurbishment activities concurrent with scheduled refueling outages. While the staff recognizes that this approach can place additional demands on outage resources and may require the outage duration to be extended, this is primarily an outage management issue that does not require temporary, one-time changes to the TS requirements. Please revise the request accordingly so as to maintain compliance with the existing TS requirements to the maximum extent practical for the given situation (e.g., if adequately justified, one-time TS changes that are necessary in order to avoid a dual-unit outage may be warranted).

Catawba Response:

The NSWS at Catawba is a shared system between both units. There are two (2) main supply lines from the NSWS pump house into the plant. Main supply line 'A' provides flow to the 1A and 2A NSWS trains and main supply line 'B' provides flow to the 1B and 2B NSWS trains. The TS are written such that any time a main supply line is taken out of service both units enter a 72 hour completion time. With this configuration Catawba would be required to have a dual unit outage for any activities that would require a NSWS main supply line to be taken out of service for greater than 72 hours.

Catawba has performed NSWS pipe cleaning with one unit in a refueling outage and one unit at 100% power and performed NSWS pipe replacement with both units at 100% power. In both cases the work was completed safely and within the extended time granted by the NRC. There are different issues to manage with both schedules.

Furthermore, refueling outages are typically scheduled during the spring or fall when inclement weather is more likely to occur. This could adversely impact the NSWS system upgrades. Performing the work with both units at 100% power allows more flexibility in scheduling around inclement weather periods and allows for more focused management and site attention. Thus, the whole site can be focused on this project as opposed to several projects that are typically occurring during a refueling outage. Therefore, after careful consideration of the above discussion, Catawba has concluded that the NSWS enhancements should be performed with both units at 100% power.

2. **The proposed language of the note allowing the TS completion times to be extended does not establish a specific time limit for when the note would no longer apply, making the one-time change open-ended. Please revise the note to establish specific time limitations beyond which the note would no longer apply.**

Catawba Response:

The last sentence of the Note that will be applied to each affected TS is revised to read as follows:

> Upon completion of the system upgrades and system restoration, this footnote is no longer applicable and if not used, will expire at midnight on December 31, 2006.

3. **The discussion of consequence mitigation capability under the first bullet in Enclosure 1, Section 4.3, of the May 3, 2005, submittal indicates that consequence mitigation remains unaffected. However, this is not correct in that the proposed increase in TS completion times extends the period during which the affected systems are vulnerable to single active failures, and compensatory measures are typically credited as a way to offset this increased vulnerability. Please discuss compensatory measures that will be credited in this regard.**

Catawba Response:

In the July 6, 2005 submittal, two additional operator actions have been identified that will be incorporated into existing plant procedures. These actions were identified to mitigate the dominant accident sequences in the current probabilistic risk assessment (PRA) model. These actions involve operation of the auxiliary feedwater (AFW) system and component cooling water (CCW) system. These actions are discussed in more detail in the response to question 6.c and 6.d in the PRA Branch questions at the end of this submittal. These consequence mitigation strategies helped reduce the change in core damage frequency (CDF) for the extended completion times being requested in this license amendment request (LAR). These actions along with the other compensatory actions previously identified in section 4.3 assure consequence mitigation is preserved.

4. **The compensatory measures discussed in Enclosure 1, Section 4.3, of the May 5, 2005, submittal are not sufficiently restrictive. For example, Section 4.3 indicates that "no major maintenance or testing will be planned" and that the operable train "will be protected to the extent practical by minimizing any maintenance." These statements do not establish much of a prohibition to performing maintenance on the operable train of equipment and leaves much to interpretation. This is also true of the compensatory actions that apply to the offsite power sources, switchyard activities, and the standby shutdown facility. Additionally, the compensatory measures should include confirmation that the operable equipment that is being relied upon is fully operable and not degraded prior to commencing each NSWS train outage. Finally, because a substantial portion of the accident sequences involve a loss of 4160 volt ac power, measures should be established to assure that inadvertent or unauthorized entry into the switchyard area is prevented. Please revise the license amendment request accordingly to address these observations.**

Catawba Response:

The intent of utilizing the phrase "no major maintenance or testing will be planned" was that no discretionary maintenance under CNS control would be planned or commenced on the operable train equipment. The only items that would occur on the operable train were equipment checks (i.e., routine operator rounds, non intrusive equipment checks required by TS, thermography, etc.). At no time would work commence on an operable system that would render it incapable of performing its intended function.

During each NSWS train outage, the current TS are restrictive in that if any activities (testing or maintenance) are commenced that render the operable train inoperable, both CNS units would be in a shutdown action statement that would require both units to be in hot standby within 6 hours. CNS would apply these TS as required and commence activities to correct any issue that may arise. Some systems may require routine non-intrusive surveillances (i.e., weekly battery checks) that will be allowed to occur.

During each NSWS train outage, Operations will employ the following items in regard to protection of the operable trains:

- To prevent unauthorized entry into the switchyard, Operations will place their own lock on the switchyard entry gate. This will require that anyone that wants to enter the switchyard will have to gain Operations approval before entry.
- Operations will place equipment protection signs/tape/barriers on the opposite train equipment. This will provide a visual deterrent to entry into those areas.
- Operations will develop and implement one focused increased surveillance round each shift that will focus on the protected equipment and the protection tools employed.

Prior to commencing each NSWS train outage, Operations will employ the following process as part of the configuration risk management program:

- The status of the opposite train equipment will be evaluated to ensure that no issues are outstanding that would question the operability of the equipment.
- Compensatory Actions will be reviewed for NSWS work impact.
- Operations will evaluate the condition of the switchyard, offsite power supply, and the grid prior to entering each extended NSWS train outage for voluntary maintenance. An extended NSWS train outage will not be entered to perform elective maintenance when grid stress conditions are high.
- Operations will evaluate the local area weather conditions prior to entering each extended NSWS train

outage for voluntary planned maintenance. Each extended NSWS train outage will not be entered for voluntary planned maintenance purposes if weather forecasts for the local area are predicting severe weather conditions that could affect the switchyard or offsite power supply during the AOT.

- The results of the above items will be presented to the on duty Operations Shift Manager (OSM) and the OSM will make the final decision to proceed.
- Operations will review any emergent equipment issues that may arise, to ensure that they do not invalidate the actions taken for the NSWS train outages.

5. **Similar to the observations discussed in Question 4, the severe weather restrictions established that are established as a commitment in Attachment 2 of Enclosure 1 to the May 5, 2005, submittal is not sufficiently definitive. First, prior to commencing each NSWS train outage, measures should be taken to confirm that no potential outbreaks of severe weather are forecast for the duration of the NSWS train outage. Second, if severe weather should be forecast after the NSWS train outage has commenced, the specific actions to be taken should be better defined. Finally, severe weather restrictions are important considerations relative to consequence mitigation and should be credited in Enclosure 1, Section 4.3, of the May 5, 2005 submittal along with the other compensatory measures that bear on this area of review.**

The issue for evaluating weather conditions prior to entry into each NSWS train outage is addressed in the response to question 4 above.

If severe weather were to be forecast after commencement of either NSWS train outage the following actions would be taken.

- Operations would review the Severe Weather Preparations procedure for actions to be taken in preparation of severe weather.

- To resolve questions as to the NSWS Projects contingency plans for NSWS restoration in the event of an emergency requiring all trains functional/operable during either NSWS train outage, the following will be included in the critical maintenance plan as discussed in section 3.2.2 of the May 3, 2005 submittal.

The planning, scheduling and critical maintenance plan will be developed to support system restoration in an expeditious manner. In order to restore the system as quickly as possible after notification, all materials required for system restoration (prefabricated assemblies with bolting and gaskets) will be staged at each work site on the project. Sealing surfaces will also be cleaned and ready for reassembly. This plan will also include tagging restoration, fill and vent of the NSWS train, and resources necessary to implement these activities.

A communications plan for this critical path work will be developed and will include written pre-job briefs for each work location. These plans will be updated as the job progresses and discussed at the start of each shift so the crews will understand the criticality of what is needed to restore the system in a timely manner should the notification be given.

6. **Because a substantial portion of the accident sequences involve a loss of 4160 volt ac power, compensatory measures similar to those discussed in Question 5 should be established for grid instability.**

Catawba Response:

Catawba will utilize the following process to evaluate ongoing work activities with respect to the status of the offsite power system (i.e., grid).

Nuclear System Directive (NSD) 415, "Operational Risk Management (Modes 1-3), section 415.6.7 has the following requirement. "Prior to the release of work for execution, Operations personnel must consider the effects of severe weather and grid instabilities on plant operations. This qualitative evaluation is inherent of the duties of the Operations Senior Reactor Operator (SRO) assigned to the Work Control Center (WCC). Response to actual plant risk due to severe weather or grid instabilities are programmatically incorporated into applicable plant emergency or response procedures."

In addition, the reliability of the grid is included in the risk assessment and risk management actions through the use of coding for the switchyard in ORAM-Sentinel. NSD 415.6.2 *(Conducting Risk Assessment)* provides the administrative guidance for the use of ORAM-Sentinel in performance of risk assessments, and NSD 415.7 *(Evaluation of Risk Assessment Results)* provides the administrative guidance for managing the results of the assessment. Response to emergent conditions are addressed in NSD 415.6.4.1 *(Emergent Conditions)*, and grid conditions are specifically addressed in NSD 415.6.7 *(Severe Weather and Other External Conditions)*.

The programmatic controls in place to ensure that the plant staff is aware of current gird system status are:

- Transmission network reliability and economic factors are calculated daily. This process is detailed in NSD 417.9 *(Nuclear System Generation Risk Management Process)*. The nuclear power plant sites are notified of the conditions in advance as part of the normal day-to-day operational practice. If the system indicates a significant risk or challenge, activities related to AC Power Availability are postponed until the network reliability issues are resolved.

This process will be used by Operations as discussed in question 4 above to evaluate grid status prior to and during each NSWS train outage.

7. **Enclosure 1, Section 4.3, of the May 5, 2005, submittal establishes a compensatory action to cross-tie selected CCW system loads during the time period that a component cooling water (CCW) heat exchanger will be out of service during the NSWS outages. Please be more specific as to what loads in particular will be cross-tied. Also, please describe the capability of the operable CCW train to accommodate these additional system loads, how this determination was made, and how the appropriate flow balance will be assured for accident mitigation considerations.**

Catawba Response:

Whenever a CCW heat exchanger is taken out of service for maintenance or testing, the affected CCW train is declared inoperable and rendered unavailable. Furthermore, the associated ESF trains are declared inoperable and rendered unavailable.

During power operations however, the CNS operating procedures are written to maintain availability of essential heat loads associated with the CCW train made unavailable in the manner described above except for the heat exchangers associated with the residual heat removal (RHR) and CCW trains. This is accomplished by aligning to the operating CCW train selected loads of the inoperable CCW train. The following is a list of some of the more important loads:

1. Auxiliary Feedwater Pump Motor Cooler
2. Containment Spray Pump Motor Cooler
3. Safety Injection Pump Motor Cooler
4. Safety Injection Pump Bearing Oil Cooler
5. Centrifugal Charging Pump Motor Cooler
6. Centrifugal Charging Pump Bearing Oil Cooler
7. Centrifugal Charging Pump Speed Reducer Oil Cooler
8. Component Cooling Pump Motor Coolers

The RHR Heat Exchanger associated with the inoperable CCW train would not be aligned to the operating CCW train.

The following alignments and changes are made to the CCW System and interfacing components:

1. The pumps associated with the inoperable CCW train are racked out.
2. The CCW surge tank train isolation signal remains functional in order to provide protection of the operable CCW train from pipe breaks in the non-essential header and inoperable train.
3. The RHR Heat Exchanger isolation valve associated with the inoperable train will be secured by closing the valve and opening its breaker.
4. One spent fuel cooling heat exchanger is taken out of service. Both spent fuel pool cooling pumps remain available for purification and recirculation of the Spent Fuel Pool. Spent fuel pool cooling system temperature and Spent Fuel Pool level is monitored and makeup provided as needed.

The acceptability of this alignment to meet design requirements is documented in an engineering calculation, CNC-1223.23-00-0042, "Evaluation of Flow Balance for a CCW Train in a Cross Train Alignment."

8. **Enclosure 1, Section 4.3, of the May 5, 2005, submittal indicates that a procedure change will be made to ensure that an operator is stationed at the correct time to control the Unit 1 and Unit 2 auxiliary feedwater flow control valves in the event that flow control is lost following a loss of 4160 volt ac power on Unit 1 or Unit 2, as applicable. Please explain what the "appropriate time" is for taking this action, potential challenges and hazards that could prevent the operators from completing the necessary actions and how they will be overcome, and to what extent flow control could be lost on both units at the same time and if this is a possibility, what specific actions will be required and how this capability will be assured.**

Catawba Response:

Several accident sequences analyzed in the PRA model require operator action to throttle AFW flow outside the control room following a loss of instrument air or DC power to prevent overfilling of the steam generators (SG). Following a loss 4160 volt AC power event, throttling of AFW can only be maintained in the control room until the safety related batteries are depleted. The safety-related batteries are sized to provide the required voltage for at least two (2) hours. Once this depletion occurs, only manual throttling is possible. If the manual throttling is not performed in a timely manner, SG overfill can occur which would result in loss of the turbine driven AFW pump.

The loss of normal power abnormal procedure for both units has been revised so that an operator will be dispatched to locally control AFW flow when the station is on batteries for more than one (1) hour. This provides the operators at least one hour to establish local control prior to the station batteries output voltage decreasing to the point where control of AFW flow is affected. This time frame provides the operator sufficient time to reach the required valves and perform the manipulations well in advance of any SG level concerns. Operations has reviewed the procedure changes and verified that the valves to be manipulated are accessible, the valve locations are such that the operator has the ability to perform the actions within the time frames required, lighting is sufficient, and communication with the control room is available to control SG level. The normal procedure for the CCW system (OP/1(2)/A/6400/005) has been revised to require the assignment of the operator who will perform this function.

The dominant sequences which credit this action include those in which a CCW heat exchanger is out of service for cleaning (commensurate with the corresponding NSWS train out of service for the train outages) with a failure of the 4160 volt AC bus on the opposite train. The vital dc batteries deplete and, as mentioned above, the control room loses the ability to remotely throttle flow to the steam generators via the Turbine-Driven AFW Pump.

ELECTRICAL BRANCH

1. **In Items 4, 6, and 7 of Section 4.10 you have stated that "No major maintenance or testing ". Please explain what is meant by major maintenance. The staff has previously accepted "No discretionary maintenance" to mean those activities under the control of the licensee.**

Catawba Response:

The response to this item was addressed in the response to question 4 in the Plant Systems section above.

2. **In Item 8 of Section 4.10, you have stated that operations will increase their routine monitoring of these trains to help ensure their operability. Provide details about increase monitoring.**

Catawba Response:

The response to this item was addressed in the response to question 4 in the Plant Systems section above.

3. **From Item 7 of Section 4.10, it is not clear to the staff whether any maintenance will be performed on electrical distribution systems during each 14-day period of NSWS project. If so, provide a justification.**

Catawba Response:

CNS does not plan to perform any discretionary maintenance on the following electrical systems for the protected train and the equipment that will receive CCW cooling when the CCW system is in cross train alignment:

- 4160 volt safety-related electrical buses
- 600 volt safety-related load centers
- 600 volt safety-related motor control centers
- 125 volt vital DC busses, batteries, and battery chargers
- 120 vital instrument busses and associated vital inverters

These systems will be added to the list of compensatory measures documented in section 4.3 of the May 3, 2005 submittal.

4. Section 4.10, "Contingency Measures" does not seem comprehensive in nature. The following regulatory commitments have been typically provided for the past emergency diesel generator (EDG) allowed outage time (AOT) extension requests. Please explain why your contingency measures are adequate.

A. The local area weather conditions will be evaluated prior to entering the extended EDG AOT for voluntary planned maintenance. An extended EDG AOT will not be entered for voluntary planned maintenance purposes if weather forecasts for the local area are predicting severe weather conditions that could affect the switchyard or offsite power supply during the AOT.

B. The condition of the switchyard, offsite power supply, and the grid will be evaluated prior to entering the extended AOT for elective maintenance. An extended EDG AOT will not be entered to perform elective maintenance when grid stress conditions are high such as during extreme summer temperatures and/or high demand.

Catawba Response:

The response to this item was addressed in the response to question 4 in the Plant Systems section above.

ATTACHMENT 1

RISK ASSESSMENT BRANCH

1. **The amendment request identified the December 2004 date of the probabilistic risk assessment (PRA) model used for the risk evaluations in support of this request, and identified that the model covers internal and external initiating events (except seismic).**

   a. **Identify and discuss the risk impact of any plant modifications, procedure revisions, or other plant changes that could impact the PRA model, which have not been incorporated into the December 2004 model. If plant changes are scheduled for implementation prior to the planned nuclear service water system (NSWS) outages, such changes should also be identified and discussed.**

   b. **Describe the scope and methods used to develop the fire risk and external events risk portions of the PRA model, specifically identifying any screening criteria applied to eliminate fire initiating events. If such screening criteria were used, discuss why screened initiators are not potentially significant contributors to risk during each NSWS outage when the plant is relying upon a single train of equipment.**

Catawba Response:

a. Duke has identified one item that could impact the December 2004 model, but was not incorporated. This is identified from Duke's database that tracks potential PRA changes for future incorporation. The item is given below:

Description of Plant Modification	**Impact on Analysis**
Install three new flood walls in Unit 1 and three new flood walls in Unit 2 in the turbine building basement to protect 4160 volt AC transformers and eliminate two unit loss of power event.	Sensitivity studies indicate that the flood wall addition has a negligible impact on the results. The turbine building flood is a small (< 3%) contributor to the CDF for the condition considered in the LAR.

In addition, one item involving human reliability was created during the preparation of the July 2005 submittal. This was included in the analysis and is described below:

Description of Procedure Change	Impact on Analysis
This permanent procedure change addresses the condition beginning 1 hour after losing charger power due to 1 CCW train in maintenance and a loss of the 4160 volt AC bus on the other train. When battery power fails, AFW throttle valves will fail open leading to SG overfill and loss of the turbine driven AFW pump. This change affects the HRA event in which the operator fails to manually throttle the AFW flow locally.	This procedure change has been included in the analysis submitted in support of the July 2005 submittal.

b. The general methodology for examining external events is consistent with the methods presented in NUREG/CR-2300. The general approach used to develop the external event PRA is as follows:

- Natural and man-made external events of interest were identified using other PRAs, NSAC/60, ANSI/ANS-2.12 and the aforementioned NUREG/CR-2300.

- The resulting events were screened in order to select significant events requiring further review.

- A scoping analysis was performed on the remaining events. Four were identified that warranted a detailed quantification: earthquakes, floods, tornadoes, and fires.

The fire initiating events included in the analysis were identified by a review of the various areas of the plant for the possibility of a fire that could result in one or more of a predetermined set of initiating events. When an initiating event was identified the area was reviewed for other events which would impact the ability to mitigate the initiating event. These areas were then examined using event tree methodology to estimate the fire damage frequency. For areas such as the control room and cable room, the loss of CCW is assumed as the initiating event because of its severity.

Areas were screened from the analysis when the consequences of a fire in the area were similar to one of the internal initiating events but the fire frequency was much smaller than the corresponding internal event initiator. The screened initiators have been determined to be less severe than the corresponding internal events and therefore should have a negligible impact on the results of the analysis for the NSWS completion time extension.

2. **Two unresolved peer review items regarding the NSWS were identified in the submittal (Attachment 3), and further information is requested regarding their potential impact on the risk calculations supporting this amendment request.**

    a. **Qualitatively describe how loss of one or both trains of NSWS is modeled as an initiating event(s) in the PRA, and the supporting calculations used to determine the annual frequency of these events; identify the final calculated frequencies.**

    b. **If point estimates of the loss of NSWS initiating event are used in lieu of a Boolean equation generated by appropriate fault tree logic, identify how the impact of the NSWS header outage is quantitatively accounted for in the loss of NSWS initiating event frequency in the PRA model used to support the risk calculations for this amendment request.**

    c. **For use in the configuration risk management program to assure Regulatory Guide 1.177 Tier 3 requirements are met to avoid high risk configurations, describe how the impact of the NSWS header outage will be accounted for with regards to the frequency of loss of NSWS initiating events.**

Catawba Response:

a. The loss of NSWS initiating event is modeled in the PRA as a loss of both trains of NSWS. The NSWS system fault tree is used to calculate this frequency. The design of the NSWS is such that only 1 pump train is required to be in service. The 1A pump is assumed to be in service with Pumps 1B, 2A and 2B in standby. The mission time for the operating pump (1A) is one year times a nominal capacity factor of 0.9 (i.e., 7884 hrs). Thus, components in the normal flow path receive a mission time of 7884 hrs. The exposure times for the components in the standby pump trains are unchanged from the values they have with NSWS performing its function as a support system.

   The frequency of the loss of NSWS initiator was calculated to be 5.8E-05.

b. The loss of NSWS initiator is calculated by means of a fault tree solution; however, the resulting frequency is put into the plant fault tree as a point estimate. When calculating the risk impact from taking a train of NSWS out of service, the loss of NSWS initiator is adjusted accordingly to reflect that only one train of NSWS is available.

c. As stated in the May 2005 submittal, a robust configuration risk management program is in place to provide controls and assessments to preclude the possibility of simultaneous outages of redundant trains and to ensure system reliability. The risk configuration management software contains a database which houses several component / system combinations evaluated using the PRA model. Evaluations involving the NSWS system incorporate adjustments to the loss of NSWS initiating event frequency and its status as a support system, as appropriate, to reflect the portion of NSWS that is available.

3. **The amendment request states in Section 3.2.1 that no additional compensatory actions beyond avoidance of risk significant equipment outage configurations are being proposed. However, the submittal specifically identifies compensatory measures to be taken, in Section 4.3, and in Section 4.6, while Attachment 2 of the submittal refers only to contingency items in Section 4.3. Further, in the revised Section 4.6 submitted by letter dated July 6, 2005, a new assumption regarding discretionary maintenance on the**

condenser circulating water system was identified. The submittal uses different wording to identify the commitments and the resulting assumption in the risk calculations; specifically, Section 4.3 commits to no planned major maintenance or testing, while Section 4.6 refers to no planned discretionary maintenance. It is expected that any assumption made in support of the risk calculations would be a commitment, whether or not it is explicitly identified in Attachment 2. The licensee is requested to review and verify specific commitments being made in support of this license amendment request.

Further, the staff is unable to ascertain which of these actions may already be credited in the risk analyses supporting this proposed change. Regulatory Guide 1.177, Section 2.3.6 states that such compensatory measures identified should be those for which no credit is being taken. Please identify whether the risk analyses credits each compensatory measure identified in the submittal.

Catawba Response:

Duke's risk analysis to support the LAR specifically includes the following assumptions regarding maintenance and support system availability as outlined in Section 4.6 of the revised submittal:

- No maintenance will be performed on the Condenser Circulating Water System during the requested AOT extension. In addition, maintenance will not be performed on other key safety significant systems such as AFW, RHR, charging, CCW, 4160 volt AC power, DGs, and the SSF.

- The DGs for the NSWS train that is not undergoing maintenance will be fully operable on both units and the DGs for the NSWS train that is undergoing maintenance will be available on both units. Temporary modifications will be installed to provide cooling water to the DG jacket water coolers and DG starting air aftercoolers. Specifically, when the Train 'A' supply header is out of service, the '1A' and '2A' jacket water coolers will get temporary cooling water from the fire protection system and the 1A2 and 2A2 starting air aftercoolers will get cooling water from the drinking water system. Similarly, both 'B' train jacket water coolers and the 1B2 and 2B2 starting air aftercoolers will get cooling water as described above when the 'B' Train NSWS supply header is out of service.

Furthermore, the ensuing paragraph of this submittal describes operator actions should a loss of normal power to the operable 4160 volt AC bus occur. These include dispatching operators to throttle key AFW valves to supply flow to the steam generators as well as instructing operators to align the available CCW pumps in the maintenance train to provide flow through the available CCW heat exchanger (corresponding to the train that has lost the 4160 volt AC bus). These operator actions are credited in the risk analysis.

Finally, the submittal lists several items in Section 4.6 which are referred to as "non-quantifiable risk reduction factors". The risk analysis quantification does not reflect these actions which include the following:

- Operator review of the loss of power, loss of NSWS and loss of CCW procedures
- No maintenance performed in the switchyard
- Consideration of performing the NSWS AOTs during times of the year when severe weather is less likely.
- Performing the NSWS AOTs while remaining at power

Catawba will revise section 4.3 of Enclosure 1 and Attachment 2 of the May 3, 2005 submittal to reflect the above discussion.

4. The amendment request identified that the emergency diesel generator (EDG) remains functional during the NSWS outage on the affected header due to a modification to allow the fire protection system to provide cooling water to the jacket water heat exchanger. Please clarify certain aspects as to the beneficial risk impacts of this modification:

a. Describe how the potential interaction between a fire initiating event which credits fire suppression water, and failures which rely upon that same fire suppression water cooling of the EDG, are addressed in the PRA model.

b. **Discuss if the configuration-specific risk during each NSWS header outage is more sensitive to the EDG recovery compared to the baseline model, and if appropriate provide the results of any applicable sensitivity and uncertainty analyses.**

c. **Please clarify the benefit provided for the diesel generators by aligning drinking water to cool the starting air system aftercoolers, since these provide a non safety-related function.**

Catawba Response:

a. The fire initiating events contribute less than 1% to the CDF for the condition evaluated for this LAR. The fires included in the Catawba PRA are predominantly fires associated with the loss of the CCW System. None of the fires are assumed to have a consequential loss of offsite power. The DGs are not required to mitigate the accidents initiated by a fire unless there is a subsequent random loss of off site power. The frequency of a fire with subsequent loss of off site power is very low.

   The minimum flow requirements for the DG jacket water coolers are 700 gpm each based on current fouling data. Evaluation of the proposed temporary configuration predicts a flow of approximately 895 GPM which will exceed the minimum required as stated above. Flow from the Fire Protection system will need to be available to two DGs during each AOT. The Fire Protection System water supply is provided by three (3) full capacity electric motor driven fire pumps supplied with water from Lake Wylie. Each main fire pump has a rated capacity of 2500 gpm at 144 psig. Each pump is sized to supply the largest fixed water fire suppression system demand plus 1000 gpm for fire hose stations water flow with the shortest leg out of service. During each NSWS train outage no discretionary maintenance will occur on the fire protection system pumps, their respective power supplies or the main fire headers. Engineering has reviewed this information and determined that this configuration will not adversely impact the plants ability to respond to a fire.

b. The CDF and LERF results while in the NSWS header outage are less sensitive to the diesel generator availability than are the base case results. This is apparent from a review of the dominant initiating event contributors. While in the NSWS outage, the risk results are dominated by the Loss of CCW, Loss of NSWS, and Loss of 4160 volt AC Bus initiating events. These sequences are not sensitive to the DG availability. The base case results are more influenced by the turbine building flood, tornado, and LOOP sequences which are affected by the DG availability.

c. Providing drinking water to cool the starting air system aftercoolers is necessary to assure that starting air is maintained available for the DGs. This is the expected initial condition and is the assumed condition in the DG fault tree logic construction. The benefit is thus that the plant is assured to be in an initial state that is consistent with the fault tree analysis.

5. **The licensee identified that the PRA model credits refill of the refueling water storage tank (RWST) for certain small loss-of-coolant accidents (LOCAs), in the event that recirculation flow could not be established. Please provide a discussion of:**

   a. **The specific conditions for which RWST refill is assumed to be sufficient to mitigate a small LOCA.**

   b. **The mission time for continued injection, and the capacities of the available water sources being credited relative to this mission time.**

   c. **The system modeling, including any support functions, developed for the water supplies being credited, including provisions for adding boric acid to the RWST for refill.**

   d. **The mechanisms assumed for decay heat transport to the ultimate heat sink or to the environment for these scenarios, including the plant-specific or other calculations used to support the success criterion.**

   e. **The actions required to align RWST refill, the plant emergency procedures, which would be in effect prior to the onset of core damage, which direct these actions, and the human error probability development for this action.**

Catawba Response:

a. Refilling the RWST is credited for small LOCAs with failure of sump recirculation and success of secondary side heat removal. With secondary side heat removal available, the reactor coolant system can be depressurized allowing the cold leg accumulators to inject and to dramatically reduce the break flow. These cut sets involve sump recirculation failures due to RHR train failures or unavailability, and valve failures in the RHR and safety injection systems.

b. The mission time for continued injection is 24 hours. With the low injection rates required to remove decay heat after just a few hours, the water sources are sufficient to provide injection for this length of time.

c. No system modeling is included for the RWST refill. The only failure mode included is the human error at 2.3E-03. The small LOCA cut sets to which this recovery is applied include primarily hardware failures in the safety injection and RHR systems. The only support system which shows up in the cut sets is a train of CCW. This has no impact on the ability to refill the RWST.

d. For the great majority of sequences to which this recovery applies, the Containment Spray System is operating to remove decay heat from the sump. The NSWS is available in these sequences to function as the ultimate heat sink. For the specific case where the recirculation failure is the sump isolation valves, the decay heat is deposited into the containment. Following ice melt, long term containment overpressurization is possible. However, this has no impact on the analysis being considered here because this sequence does not contribute to the quantitative results even if the recovery is assumed to fail.

e. In the event of a small LOCA, the ECCS pumps would provide makeup flow to the RCS until low level (37%) in the RWST is reached. If sump recirculation is unavailable, the emergency procedure directs the operators to reduce ECCS flow (and containment spray, if operating) from the RWST until the RWST is considered depleted at 5% level. The same emergency procedure instructs the operators to establish makeup to the RWST to delay or prevent depletion, using an operating procedure for guidance.

The emergency procedure in effect is EP/1(2)/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirculation). Makeup to the RWST is directed by reference to operating procedure OP/1(2)/A/6200/014 (Refueling Water System). Makeup to the RWST is a combination of control room and local actions. The local actions are in the auxiliary building, to which access is available during this event. The valves operated from the control room are air operated, each of which fails to the position required for this makeup. The pumps related to this makeup are the Boric Acid pumps, which have essential power, and the Reactor Makeup water pumps, which have Blackout power available. The Blackout bus is normally powered from offsite power, and can be manually realigned via control room pushbuttons to the Essential bus if required to support an ECCS recovery event.

As for the human error performance probability development, the need to secure the pumps is taken to be the most critical with respect to timing of the actions. The analysis considers both the procedures to stop the ECCS pumps and to initiate refill of the RWST. With several options available to refill the RWST, the contribution of hardware failures is expected to be negligible compared to the human action.

6. **The risk calculations presented in Sections 4.6 and 4.7 of the submittal require clarification:**

   a. **With regards to the impact on the PRA model for internal flooding due to modifications to the turbine building, it is stated that new events "may be created," then identifies that the impacts have been included; please clarify if the modifications have been fully credited in these calculations.**

   b. **The information provided by letter dated May 3, 2005, provided the non-seismic baseline core damage frequency and large early release frequency as 3.68E-5/yr and 2.70E-6/yr, respectively. It is not stated in the July 6, 2005, submittal if these baseline values are now revised. Further, the May 3 submittal identified that the core damage probability (CDP) and large early release probability (LERP) were calculated assuming a 0.9 capacity factor, but it is not stated in the July 6 submittal whether the revised increase in CDP** and LERP, assumed to be the incremental conditional core damage probability and incremental conditional large early release probability, are also based on a 0.9 capacity factor. The staff requests clarification of the bases for the numbers provided.

c. A revision to the PRA model and calculations in support of this amendment request was identified in the July 6 submittal identifying a significant risk reduction from crediting the throttling of auxiliary feedwater flow prior to battery depletion to preserve the turbine-driven pump steam supply which would otherwise be lost due to overfill of a steam generator. The staff requests additional details regarding this action, the sequences for which this action is credited, and how steam generator level is controlled following battery depletion when level instrumentation may be unavailable. The staff also requests confirmation that the risk calculations include appropriate consideration of dependencies of this new operator action with existing actions already in the model.

d. A revision to the PRA model and calculations in support of this amendment request was identified in the July 6 submittal identifying a significant risk reduction from crediting the alignment of component cooling water pumps in a "maintenance train" through the heat exchanger for the train "without power," stating that this provides essential header cooling. The staff requests clarification as to the specific conditions which exist and how this manual realignment restores essential header cooling. The staff also requests confirmation that the risk calculations include appropriate consideration of dependencies of this new operator action with existing actions already in the model.

Catawba Response:

a. To clarify this statement, flood walls have recently been installed in the Turbine Building to protect the station transformers that feed the 4160 volt AC busses.

The turbine building flood initiator as currently defined by the PRA model would essentially be eliminated if the new wall were included. However, given that some piping is routed in the vicinity of the new enclosures housing the transformers, it is conceivable that some new, yet less severe, flooding events may be created. As a result, the impact of Turbine Building flooding was included in the assessment used to support the July 2005 submittal.

A sensitivity calculation was performed to gauge the maximum impact of the turbine building flood wall installation. The turbine building flood initiating frequency was set to 0 in the fault tree model used to support the July 2005 submittal. As a result, the ICDP remained at 5.8E-06 and the ILERP increased slightly from 1.9E-07 to 2.0E-07. Thus, installation of the turbine building flood walls has no appreciable impact on the submittal results.

b. As stated in the May 2005 submittal, the non-seismic CDF based upon the December 2004 model is 3.68E-05/yr. and the LERF is 2.70E-06 / yr. However, these values do not use an updated value for a recovery event in which the operators fail to trip the Reactor Coolant Pumps (RCPs) in time to prevent RCP seal failure. Our review identified that there is additional time in which the charging pumps can run without cooling water that was not considered in the original quantification. Accounting for this additional time to trip the RCPs results in a reduction of the HEP by about an order of magnitude. In addition, previously evaluated combinations of human error events were revised to include the revised HEP. Using the new values results in a new nominal non-seismic CDF of 3.5E-05/ yr. and the LERF is 2.6E-06 / yr.

The base case core damage and large early release frequencies (on a per year basis) are based on a plant capacity factor of 0.9. However, when calculating the ICCDP and ICLERP for the specific conditions requested in the LAR this capacity factor is not included as it is assumed that the units will be at power for the duration of the requested completion time extension.

c. Several accident sequences analyzed in the PRA model require operator action to throttle AFW flow outside of the control room following a loss of instrument air or DC power to prevent overfilling of the SGs. For sequences involving a loss of 4160 volt AC event, throttling of AFW flow can only be maintained in the control room until the batteries are depleted. Once this depletion occurs, only local manual throttling is possible. The loss of normal power procedure has been revised so that an operator will be dispatched to locally control AFW flow when the station is on batteries for more than 1 hour. Local control is established immediately; thus, operators do not wait for the batteries to deplete, thereby significantly reducing the HEP for this action. Each steam generator has 4 level indications in the control room with the indicators supplied from the 4 battery sets. Only 2 of the indications are lost as the batteries supplied from that train's 4160 volt AC bus deplete leaving 2 available for level control. Additionally, the SSF could also be used to provide level indication if needed. Some sequences require local throttling following loss of instrument air. Level indication is not affected in these sequences.

AFW flow is controlled locally using the guidance of AP/1(2)/A/5500/007, Enclosure 16. The first line of control is the motor operated valves from the control room, with local operation of any one of three local valves provided as a backup to the control room option for EACH flow path. One of the local options is local operation of the motor operated valve which was first attempted from the control room.

The dependency analysis for human actions was updated to capture the impact of the re-quantified value for local throttling of AFW flow. All significant cut sets with combinations of human actions were re-quantified using the new human error probability value.

d. One of the dominant sequences in the analysis for the extended completion time is a loss of the essential 4160V ac switchgear on the train opposite of the one where NSWS and CCW are out of service. A revision will be made to the loss of normal power procedure to allow for the recovery of CCW following a loss of the operating train's essential 4160 volt AC bus by starting the CCW pumps from the 'out of service train' and routing flow through the CCW heat exchanger on the operable train which has lost power from the bus. In this configuration the CCW pumps on the 'out of service train' will provide flow to the components that are being cooled by the 'inservice train' that is in a cross train alignment (as described in the answer to question 7 in the Plant Systems Branch). This will allow the operators to utilize the emergency core cooling pumps and motor driven AFW pump on the 'out of service train'.

The dependency analysis for human actions was updated to capture the impact of the new value for alignment of a CCW pump through another train's heat exchanger. All significant cut sets with combinations of human actions were re-quantified using the new human error probability value.

Configuration Risk Management

7. **Please provide a description of the capability of the station's current configuration risk management program, including the contemporaneous risk assessment capabilities and tools which are or will be in use during extended NSWS outages, which ensure that risk-significant plant configurations will not be entered, and that appropriate actions will be taken when unforeseen events put the plant in a risk-significant configuration. The discussion should address the four key components identified in paragraph 2.3.7 of Regulatory Guide 1.177. The licensee should also discuss how this program will administratively control emergent, high risk configurations during the extended NSWS outages, and specifically the conditions for which the program would require a plant shutdown.**

Catawba Response:

The configuration risk management program utilized at Catawba was described in Section 3.2 of the May 3, 2005 submittal. The response to question 4 in the Plant Systems Branch section of this attachment provides additional insight on how this program will be utilized prior to and during each NSWS train outage.

This program uses a blended approach of quantitative and qualitative evaluation of each configuration assessed. The Catawba on-line computerized risk tool, ORAM-Sentinel, considers both internal and external initiating events with the exception of seismic events. Thus, the overall change in plant risk during maintenance activities is expected to be addressed adequately considering the proposed LAR.

Emergent items will be evaluated and screened for Risk Management by the on-duty work control center (WCC) SRO.

The WCC SRO will identify "Emergent Issues" which warrant inclusion into the Risk Management Process. For those issues that affect TS equipment, the appropriate TS would be followed. During the NSWS train outages, if a protected train would be rendered inoperable, the appropriate unit(s) would be shutdown as required by TS. Plant personnel would be called out as necessary to support plant activities necessary to address the emergent issue and restore the equipment to operability and exit any TS required shutdown. NSD 415 provides guidance on handling emergent conditions. As discussed in the May 3, 2005 submittal in section 3.2.2, the NSWS train outages will be treated as a "Critical Maintenance Plan." As a part of this plan it is a requirement to include contingency plans for problems that have a reasonable chance to occur.

As discussed in this response and in previous responses in this Attachment, Catawba has a program that will provide the required oversight during the planning and implementation phase of the NSWS outages. This program ensures that the status of the equipment to be protected during the NSWS train outages is monitored frequently and any emergent issues will be addressed in an expeditious manner.

8. **The risk calculations and contingency measures specifically identify the use of the fire protection and drinking water systems as backups to the unavailable NSWS train for the EDG and charging pumps. Please discuss any assumptions as to the availability of these systems, and administrative controls which will be used to avoid unnecessary maintenance or testing on these systems, during the NSWS extended outages.**

Catawba Response:

The drinking water system is credited for providing cooling (if needed) to the "A" train CCP for each unit during the 24 hour mission. This function is assumed to be available (no maintenance) in this analysis. This backup cooling is conservatively assumed to be unavailable during LOOP and tornado initiated events. With regards to the drinking water system providing cooling to the DG starting air aftercoolers; the starting air is assumed to be available in the analysis as an initial condition and therefore the drinking water system is assumed to be available as needed to support this function prior to an event. The starting air is not required to be maintained for the duration of the mission and therefore neither is cooling to the aftercoolers.

The fire protection system and drinking water system that are utilized as backups for the EDGs and charging pumps will be treated as the other protected systems discussed in section 4.3 of the May 3, 2005 submittal. The discussion in question 4 of the Plant Systems section above provides some additional clarification of how these systems will be treated. Due to the nature and design of the fire protection and drinking water systems, some portions may become inoperable or unavailable; however, the portions of the systems necessary to support the compensatory measures will remain unaffected. Section 4.3 of the May 5, 2006 submittal will be revised to reflect this discussion.

9. **The amendment request identified that prior extended NSWS outages had been accomplished safely, with no licensee event reports submitted. Please confirm that during the prior NSWS extended outages, there were no configuration control issues, unplanned equipment outages which had a risk impact requiring unplanned compensatory measures, or other issues relevant to the conduct of the NSWS outages which had impact on the configuration risk. If any issues do exist, please describe the corrective actions which have been and/or will be taken during the proposed extended NSWS outages to guard against similar conditions arising.**

Catawba Response:

Duke documented the results of the initial NSWS pipe cleaning project during the fall of 2000 (during a Unit 1 refueling outage) in a letter to the NRC dated April 4, 2001. During this project, there were no configuration control issues, or unplanned equipment outages that resulted in Unit 2 (operating unit) entering any required shutdown TS. No issues arose that required any additional compensatory actions. The same was true during the NSWS header pipe replacement in January 2003. The pipe replacement was accomplished while both units were at 100% power and no unplanned equipment issues or configuration control issues occurred that affected plant operation or the NSWS header replacement work.

10. **The submittal identifies contingency planning for severe weather, and a commitment to monitor the National Weather Service reports during the outage. It is not clear what benefit is gained by ongoing monitoring of weather during the time when the NSWS header is out of service, unless it is possible to restore it to functional condition. Please discuss any contingency planning applicable to the NSWS outages for a prompt return to service of the header during each phase of the planned outage.**

Catawba Response:

The response to this item was addressed in the response to question 5 in the Plant Systems section above.