Progress Energy

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United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

RESPONSE TO NRC SUPPLEMENTAL REQUEST FOR ADDITIONAL INFORMATION REGARDING NRC BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

Ladies and Gentlemen:

On June 9, 2003, NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," was issued requesting that licensees provide a response within 60 days. Progress Energy Carolinas, Inc. (PEC), also known as Carolina Power and Light Company, responded to NRC Bulletin 2003-01 in a letter dated August 8, 2003, for H. B. Robinson Steam Electric Plant, Unit No. 2. Responses to subsequent Requests for Additional Information were provided by letters dated October 26, 2004, and April 1, 2005. A response to a supplemental Request for Additional Information, which was received by electronic mail transmission on June 30, 2005, is provided in Attachment II to this letter.

Attachment I provides an Affirmation in accordance with the provisions of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f).

If you have any questions concerning this matter, please contact Mr. C. T. Baucom at (843) 857-1253.

Sincerely,

Jan F. Lucas
Manager – Support Services – Nuclear

CTB/cac

Progress Energy Carolinas, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

A103

Attachments:

I. Affirmation

II. Response to NRC Supplemental Request for Additional Information Regarding NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors"

c: Dr. W. D. Travers, NRC, Region II
Mr. C. P. Patel, NRC, NRR
NRC Resident Inspector

AFFIRMATION

The information contained in letter RNP-RA/05-0076 is true and correct to the best of my information, knowledge and belief; and the sources of my information are officers, employees, contractors, and agents of Progress Energy Carolinas, Inc., also known as Carolina Power and Light Company. I declare under penalty of perjury that the foregoing is true and correct.

Executed On: 12 August 2005

J. W. Moyer
Vice President, HBRSEP, Unit No. 2

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

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NRC Supplemental Information Request

In a Bulletin 2003-01 Supplemental RAI dated March 8, 2005, it was noted that Robinson 2 plans to add new steps to procedures EPP-9 and EPP-10 to operate the SI and RHR pumps in an intermittent mode until pump distress *[from sump clogging]* is alleviated. The operating SI and RHR pumps were to be stopped and then restarted in the opposite train if both trains are available. This was to be done in six minute intervals. The NRC staff stated that to properly evaluate the Robinson plans, a technical justification for the six minute value was needed. The NRC staff asked the licensee to provide a rationale or supporting documentation that indicates that the six minute interval for starting/stopping SI and RHR pumps is acceptable to meet core cooling requirements while maintaining reliability of the pumps to operate.

In an April 1, 2005, supplemental RAI response Progress Energy provided the following information:

> "The HBRSEP, Unit No. 2 plant-specific basis documents for EPP-9 and EPP-10 provide the justification for the six-minute interval, as follows:
>
> This step is reached after the short term actions to mitigate the event have been performed. It is the last of the actions that can be completed in a short period of time and is also the most draconian action. The operating RHR pump and SI pump are stopped and restarted in the opposite train at six minute intervals until NPSH is restored to the RHR pump. Six minutes was chosen because there is an existing calculation that shows no fuel damage from a 6 minute interruption of flow to the core after the 73 minute hold point (LBLOCA). This is the longest delay supported by calculation. The actual calculation cannot be credited for these 6 minute intervals under a design basis scenario because the calculation assumes at least 7 minutes of pump run time before stopping the pump. These intermittent start/stops will not have this time frame of flow. Six minutes was used because this event is beyond design basis and using best estimate assumptions, 6 minutes should provide adequate temporary relief. The intent is to balance the need for short term relief against the need not to damage the RHR and SI pumps with excessive starting and stopping. This step is bypassed if only one train of Safeguards components are available since the repetitive start and stop of the single RHR pump will likely cause damage and loss of the pump for any future actions. Even with two pumps the pump starting duty limits will be exceeded if the screen blockage cannot be cleared."

The Progress Energy supplied information above states that the calculation from which the six minute interval is derived assumes at least seven minutes of pump run time before stopping the pump, and that "these intermittent starts/stops" will not have this time frame of flow *[given the sump clogging conditions preceding and potentially during the cycling intervals]*. Therefore, Progress Energy has not provided a technical basis for six minute start/stop intervals for the sump clogging scenario for which these actions are to be instituted.

Please provide a technical basis for why six minutes was chosen (as opposed to, say, one, three, or eight minutes, for example). In doing so, please address the following considerations: core cooling, pump motor overheating, and expected sump screen clearing phenomenology and timing given reduced flow resulting from stoppage of one RHR/SI pump pair. Also, please clarify whether "if both trains are available" means that both are running, or only one train is running, as an initial condition for this interim compensatory measure.

Response to Supplemental Information Request

The emergency operating procedure steps that direct the stopping/starting of residual heat removal (RHR) and safety injection (SI) pumps at 6 minute intervals are only reached after other near term containment sump blockage mitigation actions have been attempted. Also, these procedure steps are not entered unless both trains of SI and RHR pumps are determined to be available. This means capable of operating. The determination of availability is made regardless of the actual operating status of the pumps. Based on the procedure steps that precede the actions to cycle the pumps, it is expected that one train would be operating at this point in the procedure. After verification that both trains are available, the procedure requires that all SI, containment spray, and RHR pumps be stopped. If one or both trains are not available, the steps that are used for stopping/starting the pumps at 6 minute intervals are bypassed.

These procedure steps are only expected to be invoked if the SI system is not operating properly in containment sump recirculation cooling mode (i.e., evidence of containment sump blockage). It is not possible to quantitatively determine the core cooling status prior to and during the pump stopping/starting actions. This conclusion is based on the unpredictability of the thermal hydraulic conditions due to degradation of the emergency core cooling system (ECCS) under the postulated containment sump blockage situation.

Qualitatively, it can be judged that the use of the safety injection system intermittently at 6 minute intervals provides more core cooling than complete stoppage of the system. As stated in the letter dated April 1, 2005, the 6 minute time interval was chosen based on an existing calculation that shows no fuel damage from a 6 minute interruption of flow to the core after the 73 minute hold point. That analysis was provided to the NRC by letter dated April 23, 2001, and accepted by the NRC in a letter dated July 12, 2001 (TAC No. M98953).

Also, prior to the 6 minute stopping/starting steps, the operators are directed to check that the RHR system is aligned for "piggy back" mode. This mode of ECCS operation allows the RHR pump to supply the suction source for the high head SI pump. This mode of operation also reduces the effects of sump debris blockage because operation in the "piggy back" mode is at lower flow rates than direct RHR sump recirculation mode at the same reactor coolant system (RCS) pressures. After the 6 minute interruption of flow, it is expected that any pump cavitation

that may have been occurring will stop, and if voiding had occurred in the suction piping for the RHR pump, this voiding may be substantially reduced by gravity flow through the partially blocked sump screens. Also, with the discontinuation of flow across the containment sump screens, debris that has accumulated may float away. The 6 minute interval provides an opportunity for debris to float away and for the suction piping to refill. A delay time shorter than 6 minutes could be less effective in refilling the suction piping and allowing the movement of debris away from the sump screens. Therefore, when one train of the ECCS is restarted it is likely that the pumps could be run for at least a short period of time prior to the recurrence of cavitation. The actual run time after restart of the RHR pump and SI pump would be dependent on observed conditions.

The minimum time between stopping and restarting one train of RHR and SI pumps is approximately 12 minutes, based on the assumption that the pumps are not run for any significant period of time after restart. At the minimum time between starts, the recommended starting duties for the RHR and SI pumps would be exceeded. This would likely induce some amount of motor overheating, but it is not expected that this would cause imminent failure of these motors. Furthermore, it should be noted that the debris problem could be completely or partially resolved by the use of intermittent operation, before any starting duties are exceeded. Additionally, if any pump motor failure should occur, the intermittent operation would be discontinued. At this point, one train would remain available for accident mitigation. For example, this remaining train could be used to implement the longer-term action of injecting additional water into the RCS from the refueling water storage tank (RWST) after conditions allow this action to be taken.

The preceding information has been provided in response to the Request for Additional Information. This information does not provide a rationale or supporting documentation that indicates that the 6 minute interval for stopping/starting SI and RHR pumps is acceptable to meet core cooling requirements while maintaining reliability of the pumps to operate. This information provides the justification for these actions being placed in the H. B. Robinson Steam Electric Plant, Unit No. 2, emergency operating procedures. The justification is predominantly based on the judgment that use of the safety injection system intermittently at 6 minute intervals provides more core cooling than complete stoppage of the system. The intermittent delay period of 6 minutes is intended to be short enough to minimize the potential for core overheating, while being long enough to allow debris to float away, reduce voiding in the RHR suction, and provide a limit on pump stopping/starting.