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April 26, 2006

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke), Oconee Nuclear Station
Docket Numbers 50-269, 270, and 287
Response to Request for Additional Information (RAI) Pertaining to Defense-in-Depth and Diversity (D3)Assessment Associated with the Digital Upgrade of Oconee's Reactor Protective System (RPS) and Engineered Safeguards Protective System (ESPS)

On March 16, 2006, Nuclear Reactor Commission (NRC) Staff electronically transmitted an RAI associated with earlier Duke RAI responses (October 26, and December 15, 2005) related to the D3 assessment for the Oconee RPS/ESPS digital upgrade submitted by Duke on March 20, 2003. The March 16, 2006, RAI requests Duke to verify that simulator performance for the small break loss of coolant accident (SBLOCA) scenario accurately reflects actual plant performance. The Attachment provides Duke's response to the additional question.

Duke's earlier responses to the August 26, 2005, RAI included the results of three simulator validation runs requested by NRC staff to validate manual operator actions credited in the D3 assessment.

If there are any additional questions, please contact Boyd Shingleton at (864) 885-4716.

Very truly yours,

Bruce Hamilton

B. H. Hamilton, Vice President
Oconee Nuclear Site

A001

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B. H. Hamilton, being duly sworn, states that he is Vice President, Oconee Nuclear Site, Duke Energy Carolinas, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this revision to the Renewed Facility Operating License Nos. DPR-38, DPR-47, DPR-55; and that all the statements and matters set forth herein are true and correct to the best of his knowledge.

Bruce Hamilton

B. H. Hamilton, Vice President
Oconee Nuclear Site

Subscribed and sworn to before me this 26 day of April, 2006

Sheila A Smith

Notary Public

My Commission Expires:

6/12/2013

Attachment

NRC Request for Additional Information (RAI) Associated with the Digital Upgrade of Oconee's Reactor Protective System and Engineered Safeguards Protective System

NRC Question

In support of your proposed license amendment request to install a new digital RPS/ESPS platform at Oconee, and based on a request by the NRC, you previously performed a small break LOCA simulator scenario with 3 crews of licensed operators, and provided the NRC with event and operator response times.

Please verify that simulator performance for the small break LOCA scenario with the three crews, including the operator actions (inserting a manual reactor trip, tripping RCPs, and manually initiating HPI, reactor building cooling, and reactor building sprays), accurately reflects actual plant performance. In particular, please verify the direction, rate of change, magnitude, and timing of the following parameters on the simulator versus best available plant data or plant engineering analysis:

Pressurizer level
Reactor pressure
Subcooling margin
Reactor building pressure

Duke Response

Summary

Duke provided a preliminary response to portions of the question above during a telephone conference call on March 14, 2006, between NRC staff (Dave Trimble, Dave Muller, and John Monroe) and Duke (Boyd Shingleton and Tommy Loflin). In that call NRC Staff had asked whether Duke had performed benchmarking at Oconee to show that the simulator responds similar to the plant for the small break LOCA (SBLOCA). NRC staff explained that typically simulators model the

direction the plant is heading and the time it takes to get there in general but don't necessarily match actual plant conditions. The NRC wanted to know if benchmarking shows that the simulator and plant response are similar for the SBLOCA.

During the call, Duke responded that benchmarking is performed annually at Oconee versus a set of engineering data for numerous events including the SBLOCA. Benchmarking is done for an SBLOCA (0.01 ft^2) break in which RPS and ESPS function versus the 0.0123 ft^2 that corresponds to the transient simulated for Duke's response to RAI 6 in which RPS and ESPS are assumed to completely fail. Duke confirmed that the simulator data and the engineering data for reactor coolant system (RCS) pressure closely agree. Regarding reactor building (RB) pressure, Duke agreed to follow-up with a response at a later date.

In general, the simulator data and the engineering data for direction, rate of change, and magnitude closely agree for three parameters (pressurizer level, RCS pressure, and subcooling margin). For RB pressure, the direction and the rate of change are in agreement, however, the magnitude and timing are not. The simulator response is considered conservative for the purpose of demonstrating operator response times since in all cases, the actuation setpoints are reached earlier than the analysis predicts. Thus, the operator in the simulator is required to recognize the need for manual operator action sooner than would be required.

A comparison of simulator and engineering data is provided below. The results closely agree in most cases but not in all cases. Benchmarking was performed for a slightly different break size in a different location and assumes RPS and ES continue to function. The relevance of this is described in more detail in the discussion section below. The simulator was used to provide a representative plant response for the rod ejection and SBLOCA events to initiate a procedural response. The simulator validation runs demonstrated that operators could respond well within the time assumed in the D3 assessment.

Comparison of Simulator and Engineering Data

The engineering data for the direction, rate of change, magnitude, and timing of the pressurizer level, reactor pressure, subcooling margin parameters compared to the simulator validation results are provided in the table below. As indicated above, the results are not directly comparable. As indicated in the discussion section below, the primary objective of the simulator validations was to demonstrate operator response times once an indication is received as driven by plant procedures.

Parameter	Direction		Rate of change		Magnitude		Timing	
	S	E	S	E	S	E	S	E
Pressurizer level	down	down	rapid	rapid	220"	220"	< 100s	<100s
RCS pressure </= 1600 psig	down	down	rapid	rapid	600 psi	600 psi	Ave 62s	88s
Subcooling margin	generally down	generally down	rapid	rapid	30ºF	30ºF	Ave 85s	180s
RB pressure ≥ 3psig	up	up	slow	slow	3 psig	3 psig	172s	414s
RB pressure ≥ 10psig	up	up	slow	slow	10 psig	*	520s	*

S simulator data
E engineering data
* for the leak size modeled (.01 ft^2) the reactor building does not reach 10 psig

Discussion

The simulator validation cases utilized a composite scenario designed to encompass the limiting aspects of both the rod ejection and SBLOCA events. The basis for the composite scenario was discussed in the response to RAI 6. The primary objective of the simulator validations was to demonstrate that the procedural response to a SBLOCA was consistent with the assumptions made in the D3 assessment. The simulator was required to provide a representative plant response to initiate the procedural response. The break size selected for the composite scenario was significantly smaller than the limiting SBLOCA (0.44 ft^2) described in the D3 assessment.

The simulator response to an SBLOCA has been validated versus a set of engineering data. This data was developed by Duke using the RELAP5/MOD2-B&W computer code and consists of a variety of transient simulations. This reference transient data is historical in nature and provides a basis for evaluating the simulator response.

The SBLOCA reference transient data was developed for a 0.01 ft^2 break on the loop B1 cold leg pump discharge. The transient response for the composite scenario discussed in the response to RAI 6 is slightly different since its break was located on the top of the reactor vessel head and was slightly larger (0.0123 ft^2). Thus, no directly applicable reference transient data exists to compare the simulator transient response for the composite scenario discussed in the response to RAI 6

For the reference transient case, a 0.01 ft^2 break on the loop B1 cold leg pump discharge without a failure of either RPS or ES functions, the simulator response is comparable for RCS pressure and pressurizer level. Some differences exist between the reference transient data and the simulators subcooled margin response primarily due to the method for determining the individual values. The simulator provides the operator with an error adjusted subcooled margin value as determined using the ICCM equations, whereas the RELAP5 value uses an approximation of the ICCM equations. For this parameter it is important to remember that the limiting SBLOCA presented in the D3 assessment is a 0.44 ft^2 core flood line break. For the core flood line break, subcooled margin would be lost considerably faster than the scenario utilized in Duke's response to RAI 6.

The RB pressure response obtained during the simulator validation cases is more conservative than the RB pressure response in the engineering data (i.e., increases at a greater rate and therefore provides less time for the operator to recognize and respond to). The relative importance of the timing of operator action to actuate the engineered safeguards was examined in detail in the December 14, 2005, response to RAI 7.