NUCLEAR REGULATORY COMMISSION

Docket No. 50-413/414-OLA Official Exh. No. 39
In the matter of Duke Catawba
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Applicant RECEIVED 7/14/04
Intervenor REJECTED
Other
Contractor DATE
Other Witness
Reporter

RAS 8301

Duke Power. A Duke Energy Company

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OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

April 10, 2000

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-001

ATTENTION: Document Control Desk

Subject: Duke Energy Corporation
Catawba Nuclear Station, Units 1 and 2
Docket Numbers 50-413 and 50-414
McGuire Nuclear Station, Units 1 and 2
Docket Number 50-369 and 50-370
Implementation of Best-Estimate Large Break
LOCA Methodology

Reference: 1) WCAP-12945-P-A, Volume 1 (Revision 2) and Volumes 2 through 5 (Revision 1), "Code Qualification Document for Best-Estimate Loss-of-Coolant Accident Analysis," March 1998.

Duke Power Corporation plans to implement the Westinghouse best-estimate large break LOCA methodology for McGuire and Catawba Nuclear Stations (Reference 1). This change in LOCA methodology will gain margin in the calculated large break LOCA peak cladding temperature, thus allowing more operational and core design margin. The first cycle to utilize Westinghouse fuel is Catawba Unit 2 Cycle 11. This cycle is scheduled to begin operation in early April 2000. Two more reload cycles, McGuire Unit 2 Cycle 14 and Catawba Unit 1 Cycle 13, are scheduled to begin operation in 2000. The Appendix K large break LOCA analyses for these cycles resulted in limited LOCA margins. Therefore, an expedited NRC review of the application of the best-estimate large break LOCA method is desirable. To help facilitate the review process three separate submittals are planned that will allow for the review process to get started while the plant specific analysis is being completed. This three

NRC Staff Exhibit 2

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step submittal process was discussed by phone with the NRC staff on March 9, 2000.

This is the first submittal, which provides the process of how the best-estimate LOCA model will be applied. The details of the modeling approach to be used for McGuire/Catawba are provided in the attachment to this letter. The second submittal, scheduled for early May 2000, will contain the Technical Specification changes required to implement the Westinghouse best-estimate LOCA method. The third submittal, scheduled for July 2000, will provide a summary of the McGuire/Catawba plant specific analysis.

Given the reload schedule for McGuire Unit 2 Cycle 14 and Catawba Unit 1 Cycle 13, approval of the implementation of the Westinghouse best-estimate large break LOCA method is requested by September 1, 2000.

Please address any comments or questions regarding this matter to J. S. Warren at (704) 382-4986.

Very truly yours,

M. S. Tuckman

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Attachment

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Attachment

McGuire/Catawba Nuclear Stations
Best-Estimate Large Break LOCA Model Development

The best estimate large break LOCA (BE LBLOCA) analysis for the McGuire and Catawba Units, incorporating a 1% higher power level, will be performed using a bounding unit approach, similar to what has been done for Farley and Diablo Canyon. In this approach, a WCOBRA/TRAC model is developed choosing bounding inputs for the plant configuration. Where the bounding direction is not known, sensitivity studies are performed to determine the limiting direction.

The differences between the four units will be divided into vessel and loop, as detailed below.

Vessel

Two vessel models will be built to capture the differences in the upper internals.

- McGuire Unit 1, with (14) 15x15 guide tubes

- Other three units, with (6) 15x15 guide tubes

Other minor differences will be bounded in the two vessel models as follows:

1. Barrel/baffle: All units are upflow, but the baffle plates and bypass flow fraction are different between them. A conservative composite approach will be used to model this area, including use of:

   - Thickest of the baffle plates (increases boiling rate, which decreases core flooding rate)

   - Maximum barrel/baffle volume (corresponding to thinnest plates, which decreases water available for core reflood)

   - Higher bypass flow (decreases water available for core reflood)

2. Cold leg nozzle loss coefficient (forward flow): Maximum value among the four units will be used which reduces the safety injection flow rate (higher injection pressure).

3. Balance of vessel: A bounding approach is used for other minor differences, similar to discussion of barrel/baffle region above. This approach will:

   - Maximize vessel volume where liquid is not available for core cooling, such as the lower plenum

   - Minimize vessel volume where liquid is available for core cooling, such as the upper head

   - Maximize metal mass

Based on these two vessel models, a limiting vessel will be chosen based on analysis results and determination of the phenomenological differences, which led to those results. Studies will then continue with the determination of limiting loop configuration.

Loops

The major differences between the loops for the four units are the accumulators and steam generators. For the limiting vessel model determined above, the following studies will be performed to determine the limiting configuration.

1. Accumulator line friction (L/D): The highest and lowest values will be analyzed to determine the limiting direction.

2. Accumulator pressure: Base transient will use a nominal pressure. The range of pressures to encompass all units will be included in the initial condition uncertainty calculations, so it will not be considered here.

3. Accumulator water volume: Base transient will use the minimum nominal water volume. The high nominal value will be analyzed to determine the limiting direction.

Attachment

4. Steam Generators: The two types of steam generators (W and BWC) will be analyzed with the limiting vessel to determine the bounding type.

Limiting Composite Plant

At the completion of the loop sensitivity studies, a limiting composite plant configuration, which includes the limiting vessel model along with the limiting loop configuration, will be determined. The choice of limiting configuration will again be based on results, combined with an understanding of the phenomena that led to the results. This composite model will be used to perform a final composite initial transient. This model will form the basis for the remainder of the BE LBLOCA analysis. Other minor differences in plant initial conditions will be addressed in the initial conditions run matrix by ranging the parameters to bound all four units.

Transition Core Effects

The transition from Framatome to Westinghouse fuel will be addressed with a separate evaluation, similar to that performed for Point Beach. Two additional calculations will be performed to determine the effects of the transition core. One calculation will use a fresh Westinghouse assembly surrounded by once-burned (or more) Framatome assemblies. The second calculation will use a once burned Framatome assembly surrounded by Westinghouse assemblies.