DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

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

Subject: McGuire Nuclear Station
Docket Nos. 50-369 and 50-370
Catawba Nuclear Station
Docket Nos. 50-413 and 50-414
Startup Physics Test Program

Gentlemen:

By letter dated February 2, 1988, Duke Power Company submitted a proposed Startup Physics Test Program for McGuire and Catawba Nuclear Stations. This program was found unacceptable (Reference: Letter, D.S. Hood to H.B. Tucker, March 11, 1988). A telecon on March 24, 1988 identified means of resolving the concerns of the March 11, 1988 letter; therefore, this proposed program has been revised to reflect those resolutions and is hereby resubmitted. The following changes have been included:

1. Rod Swap. The Rod Swap test now includes both review and acceptance criteria. These criteria are identical to those in the NRC Safety Evaluation Report for the Duke Power Company Rod Swap Methodology. Also, a minor wording change was made to further clarify the rod banks that are to be measured.

2. Isothermal Temperature Coefficient. The proposed acceptance criterion is now ±2 pcm/degrees-F.

3. Flux Symmetry Check. The discussion of this test in the attached Technical Basis was expanded to clarify which core locations would be used to verify flux symmetry.

Changes to the February 2, 1988 submittal are identified by a vertical line in the right margin.

Duke Power currently anticipates first application of this program on McGuire 2 Cycle 5 which is scheduled to start up in July 1988. NRC review and approval is desired by June 30, 1988.

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Because this is a revision to a previously docketed application, no additional fees are required.

Very truly yours,

Hal B. Tucker

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SAG/116/jgc

Attachment

xc: Dr. J. Nelson Grace
Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW - Suite 2900
Atlanta, GA 30323

Mr. Darl Hood, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. K.N. Jabbour, Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. W.T. Orders
NRC Resident Inspector
McGuire Nuclear Station

Mr. P.K. Van Doorn
NRC Resident Inspector
Catawba Nuclear Station

Technical Basis for the Proposed Startup Physics Test Program

The proposed test program is modeled predominantly after standard ANSI/ANS-19.6.1-1985 ("Reload Startup Physics Tests for Pressurized Water Reactors"). The tests required by the ANS standard are listed below with some discussion on compliance by the proposed test program. It is believed that, in all cases, the intent of the standard has been met.

1. Critical Boron Concentration Measurement--All Rods Out

   The standard's reference to an initial rod insertion of less than 20 inches has been rephrased to: "near fully withdrawn." This effectively limits the inserted reactivity to the verified measurement range of the reactivity computer (typically, for positive insertions, <+55 pcm) and not to an arbitrary rod position. The intent to minimize the boron adjustment due to rod position is still maintained.

2. Critical Boron Concentration Measurement--Rods Inserted

   This test is not explicitly included. According to the standard, the purpose of this test is to compare measured to predicted values for differential boron worth. This comparison is done as part of the proposed Rod Swap Test (with an agreement of ≤15% requiring no further action).

   The standard also specifically requires the use of a rod bank (or banks) with a total predicted worth of at least 1000 pcm. To facilitate testing, the proposed method uses the reference bank, which is typically worth between 800 and 900 pcm. The resulting total NC boron change of about 80 to 90 ppm, versus approximately 100 ppm, should not significantly affect the measurement accuracy of either the NC boron concentration or the reference bank integral worth. The intent to minimize the measurement errors has not been compromised.

3. Control Bank Worth Measurement

   No significant deviation from the standard.

4. Isothermal Temperature Coefficient Measurement

   No significant deviation from the standard.

5. Flux Symmetry Check

   The upper power level limit of 30% RTP has been extended to 40% RTP in the proposed test, to allow testing off critical path. Peaking factors are not expected to change significantly during the additional 10% RTP power increase. In addition, none of the FSAR analyzed accidents has a limiting condition within the 30-40% RTP power range. Consequently, considering the relatively low power densities, the 40% RTP limit should not involve a safety concern.

   The purpose of this test, as stated in the standard, is: "to determine if the measured azimuthal flux symmetry is consistent with the expected

symmetry." The proposed test accomplishes this by comparing measured-to-predicted values for relative power densities (fuel assembly $F_{\Delta H}$ or normalized reaction rates) at all operable instrumented core locations. Any expected flux asymmetry is, by definition, incorporated in the predicted data. The alternate method of comparing symmetric core locations only was not used for two reasons:

1. a full core flux map provides a more accurate core power distribution measurement (McGuire and Catawba have a limited number of quarter core symmetric instrumented locations) and,

2. simply comparing measured relative power densities for symmetric locations should reveal any flux asymmetries, but it does not account for expected asymmetries (i.e., test acceptance criteria may be challenged when, in actuality, the measured flux distribution verified the predicted flux distribution).

The standard recognizes either method, and the intent, to verify the core flux symmetry at a reasonably low power level, is met.

6. Core Power Distribution Check--Intermediate Power

The standard's power range of 40-75% RTP has been changed to 50-80% RTP, again, to allow testing off critical path. With the Flux Symmetry check completed by 40% RTP, raising the lower limit for this test from 40% to 50% RTP is inconsequential. Raising the upper limit to 80% RTP should not be a problem since peaking factors are not expected to change significantly in the 75-80% RTP range. Neither power limit change involves a limiting condition associated with the FSAR analyzed accidents. Based on the above, these changes should not involve a safety concern, and the intent of the standard is satisfied.

7. Core Power Distribution Check--High Power

No significant deviation from the standard.

8. Critical Boron Concentration Measurement--High Power

No significant deviation from the standard.

In general, the proposed testing program does not deviate significantly from what is currently done at McGuire and Catawba. The basic test methods/conditions and the acceptance criteria are either comparable or conservative compared to the existing program.