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August 22, 1984

Mr. H. R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

Attention: Mr. J. R. Miller, Chief
Operating Reactors, Branch 3

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
TECHNICAL SPECIFICATION CHANGE REQUEST NO. 99
CONTROL ROD INSERTION LIMITS
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

During the review of our Technical Specification Change Request No. 99, "Control Rod Insertion Limits", additional information relative to the methodology and results of the analysis performed to determine the impact of parking the Rod Cluster Control Assemblies (RCCAs) at the 225 steps withdrawn position was requested by our NRC project manager, Mr. T. Colburn.

The methodology and results of the analysis performed by Westinghouse Electric Corporation were discussed during a telephone conference on July 23, 1984. Additionally, we are attaching the requested information to this letter to aid in your review of our amendment request.

Please contact us if you have additional questions.

Very truly yours,

C. W. Fay

Vice President-Nuclear Power

C. W. Fay

Enclosure

Copies to NRC Resident Inspector
C. F. Riederer, PSCW

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REVISED RCCA PARKING POSITION FOR POINT BEACH

ANALYSIS DESCRIPTION

Introduction

Analysis was performed to determine the impact of parking the Rod Cluster Control Assemblies (RCCA's) at the 225 steps withdrawn position, 3 steps inserted from nominal all-rods-out. The analysis was performed to support a Rod Insertion Limits Technical Specification change submitted by Wisconsin Electric Power Company for the Point Beach Units. The results of this analysis are briefly summarized below.

Methodology

One- and three-dimensional neutronic calculations were performed to quantify the axial and radial power distribution impact of the three step insertion. Fine mesh PANDA models (1-D axial, diffusion theory) were used for the axial power distribution evaluation, while 3D-nodal (PALADON) calculations were used to quantify radial power distribution changes.

Beginning-of-life (BOL) core models were developed which placed the RCCA's (all 33) at the 225 steps withdrawn position. These models were then depleted to end-of-life. The resulting power distributions at BOL and EOL were then compared with the nominal models, i.e., the models developed and depleted with all-rods-out.

The impact on EOL shutdown margin was also assessed. Only EOL was considered since BOL shutdown margin is never limiting. The impact on EOL shutdown margin can be quantified by calculating the amount of rod worth inherent in the 3 step insertion. This worth is unavailable for reactor trip and represents the decrease in excess shutdown margin resulting from the 3 step insertion strategy. The worth was determined by calculating the change in core reactivity at EOL when the RCCA's are moved from 225 steps withdrawn to 228 steps withdrawn.

Results

Intuitively, one would expect that inserting the RCCA's three steps would result in a negligible impact on core power distributions and peaking factors. This is obvious from two facts: (1) there is very little power at the very top of the core, and (2) when the rods are positioned at 225 steps, they are inserted into the active fuel only approximately 1 step (the 228 steps withdrawn position is above the active fuel height). The calculations performed show that positioning the RCCA's at 225 steps is acceptable from a nuclear design viewpoint.

Table 1 shows the calculated increase in the core average axial peaking factor, Fz, at BOL and EOL when the rods are inserted 3 steps. The change in axial offset is also indicated. The increase in axial peaking results in a corresponding increase in the total core peaking factor, Fq(T). This 0.4% increase is insignificant and can easily be accommodated in the Point Beach cores.

The impact on the F-delta-H radial peaking factor is also insignificant. 3-D calculations indicate an F-delta-H increase of about 0.2% when the rods are inserted 3 steps. This is not surprising since F-delta-H is an integral quantity and only the top few inches of the core "see" the presence of the RCCA's. This, together with the fact that the relative power at the top of the core is very small, results in negligible impact.

The excess shutdown margin at EOL for Units 1 and 2 is 0.75% delta-rho and 0.88% delta-rho, respectively. These conservatively calculated values represent the shutdown margin in excess of the required 2.77% delta-rho. These values are typical of the Pt. Beach cores which, by virtue of having four more RCCA's than typical Westinghouse 2-loop cores, always have an abundance of excess margin. The three step insert worth of the RCCA's is predicted to be about 0.02% delta-rho, negligible in comparison with the excess margin available.

Conclusion

The power distribution and shutdown margin impact of the 3 step insertion strategy is extremely small. The minor perturbations predicted can easily be accommodated within the existing Pt. Beach core design limits.

TABLE 1

AXIAL IMPACT OF THREE STEP INSERTION IN PT. BEACH*

	BOL	EOL
Nominal Fz	1.221	1.107
New Fz	1.224	1.111
% Increase in Fz	0.33	0.36
Nominal A.O. (%)	-4.6	-3.2
New A.O. (%)	-4.8	-3.4
Delta A.O. (%)	-0.2	-0.2

*Typical Values