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September 7, 1994

Docket No. 50-213
B14901

Re: 10CFR50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Haddam Neck Plant
Proposed Revision to Technical Specifications
Shutdown Margin

Pursuant to 10CFR50.90, Connecticut Yankee Atomic Power Company (CYAPCO) hereby proposes to amend its Operating License, DPR-61, by incorporating the attached proposed changes into the Technical Specifications of the Haddam Neck Plant.

Background

During the development of the core design for the upcoming Cycle 19, it was identified that incore neutron sources would have to be relocated during the refueling outage due to mechanical considerations concerning the new fuel design. As part of the determination of the new locations for these sources, a review of the adequacy of the existing source locations was made.

This review consisted of examining the past excore detector data from dilution to criticality following refueling. Dilution to critical is a standard practice following a refueling at the Haddam Neck Plant. This controlled dilution to critical following refueling would produce a similar excore detector response to an inadvertent boron dilution event. This review identified that the incore neutron sources were located too close to the excore detectors. As a result of the incore neutron source locations, the response of the excore detectors to a dilution event did not bound the response assumed in the safety analysis. The operators are alerted to the inadvertent boron dilution event by shutdown monitors which alarm when the increase in neutron count rate reaches a predetermined setpoint. Due to the incore neutron source locations, the time allowed for operator action to terminate an inadvertent boron dilution event was less than the required 15 minutes from the time of the alarm to criticality. The above-described findings were reported in

Licensee Event Report (LER) 94-010-00.[1] As described in the LER, CYAPCO's initial corrective action was to verify acceptable results for the boron dilution accident for the remainder of Cycle 18 operation. This determination showed acceptable results for the boron dilution accident for the remainder of Cycle 18 with credit for accumulated fuel burnup and the actual alarm setpoint of the shutdown monitors.

The changes described herein will support operation during Cycle 19 to ensure the circumstances described above and in the LER do not recur for Cycle 19.

Description of the Proposed Changes

Revisions are being proposed to the shutdown margin requirement for Modes 4 and 5 and boron dilution alarm setpoint to assure that the required margin for operator action in a boron dilution accident is met.

These changes are not necessary for Modes 1, 2, and 3, because the current shutdown margins for Modes 1, 2, and 3 are still sufficient. These changes are also not necessary for Mode 6 because the requirement that K_{eff} be less than or equal to 0.94 still provides greater than 30 minutes for operator action from the time of the alarm before criticality occurs.

The specific changes are as follows:

1. Index page IV - This page is being revised to reflect changes made to page 3/4 1-4 and new page 3/4 1-5.

2. Page 3/4 1-4 - The shutdown margin for Mode 4 is being increased from 3400 pcm[2] to 4200 pcm in order to provide additional time for operator action during a boron dilution event. The higher shutdown margin requirement, together with the change in the boron dilution alarm setpoint limit, will assure at least fifteen minutes are available for the operators from time of the alarm to the time of criticality.

3. Page 3/4 1-5 (new page) - This page is added to provide a separate requirement for Mode 5. The shutdown margin for

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(1) J. P. Stetz letter to the U.S. Nuclear Regulatory Commission, "LER 50-213/94-010-00, Neutron Source/Detector Geometry Yields Non-Conservative Analysis," dated May 18, 1994.

(2) PCM stands for "percent mille" and is a unit of reactor core reactivity. One PCM equals a reactivity change of 10^{-5} $\Delta\rho$.

Mode 5 is being increased from 3400 pcm to 4500 pcm in order to provide additional margin for operator action during a boron dilution event. The higher shutdown margin requirement together with the change in the boron dilution alarm setpoint limit will assure at least fifteen minutes are available for the operators from time of alarm to the time of criticality.

4. Pages 3/4 1-11, 3/4 1-14, and 3/4 1-16 - Since shutdown margin for Mode 4 is raised from 3400 pcm to 4200 pcm in change (2), these pages which involve Mode 4 operation are being changed for consistency. The change references the Mode 4 specification instead of the actual shutdown margin value.

5. Page 3/4 3-54 - The boron dilution alarm setpoint limit is being decreased from 2.00 to 1.80 times the steady state level. This lower alarm setpoint requirement, together with the increase in the shutdown margin, will assure that there is sufficient time for operator action to mitigate a boron dilution event.

6. Page B3/4 1-1, B3/4 1-2, and B3/4 1-3 - The bases are being revised to reflect the proposed change in shutdown margin for Modes 4 and 5.

Attachment 1 provides the marked up version of the technical specification pages. The retype of the proposed changes to the technical specifications, Attachment 2, reflects the proposed change of the currently issued version of the technical specifications. Pending technical specification changes, or technical specification changes issued subsequent to this submittal, are not reflected in the enclosed retype. The enclosed retype should be checked for continuity with the technical specifications prior to issuance.

Revision bars are provided in the right-hand margin to indicate a revision to the text. No revision bars are utilized when the page is changed solely to accommodate the shifting of text due to additions or deletions.

In addition to these changes, CYAPCO requests the NRC Staff issue two additional pages. Amendment No. 167[3] revised Technical Specification page 3/4 5-2 by deleting item "b" of surveillance section 4.5.1 and relettering the remaining statements.

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(3) A. B. Wang letter to J. F. Opeka, "Issuance of Amendment (TAC No. M87136)," dated October 4, 1993.

CYAPCO recently discovered that two technical specification pages need to be revised to reflect the changes made in amendment No. 167. These changes are only editorial in nature.

Included in Attachment 3 are the marked up and revised Technical Specification pages 3/4 1-13 and 3/4 1-14. We respectfully request that these pages be issued in conjunction with the pages revised herein.

Safety Assessment

The boron dilution analysis is performed using a feed-and-bleed model to determine the change in boron concentration during a boron dilution event. For the limiting cases, a maximum dilution rate of 180 gpm is assumed. Even though there are several nonsafety-grade alarms that will immediately alert the operator of the initiation of a boron dilution event, the boron dilution analysis only credits the boron dilution alarm. The boron dilution alarm is initiated from the two shutdown monitors that measure neutron flux. The alarm is set based upon an increase in neutron flux above normal background. In modeling the alarm, it is assumed that the neutron flux increase is inversely proportional to the change in shutdown margin. For example, the neutron flux is assumed to double when the shutdown margin is reduced by a factor of two.

A review of the past cycle's startup testing has shown that, due to the placement of the neutron sources, the assumed detector response was nonconservative. This was discussed in LER 94-010-00. The nonconservatism can be characterized by an alarm penalty factor. For example, for a penalty factor of 1.3, a shutdown margin reduction factor of 2.6 would be required for the neutron flux increase to give a doubling alarm. For a penalty factor of 1.0 (no penalty), a shutdown margin reduction factor of 2.0 would be required for the neutron flux increase to give a doubling alarm. During the upcoming refueling, the neutron sources will be relocated to assure that the assumed detector response is conservative. This will be verified during startup testing. The increase in shutdown margin to 4200 pcm for Mode 4 and 4500 pcm for Mode 5 and the reduction in the boron dilution alarm setpoint limit to 1.80 times normal level will assure that even with an alarm penalty factor of 1.3, the criteria for operator action still will be met. This is shown in Table 1. With the new boron dilution alarm setpoint limit, only changes to the shutdown margin for Modes 4 and 5 are needed.

An alarm penalty factor of 1.3 was chosen based on a review of past startup data and the selection of new source locations for Cycle 19. Past startups (all with the neutron sources in the current locations) have shown a penalty factor ranging from 1.3

to 1.5. However, since the neutron sources will be moved further away from the excore detectors for the Cycle 19 startup, the need for any penalty factor is expected to be significantly reduced or completely eliminated. Therefore, an alarm penalty factor of 1.3 in combination with moving the neutron sources will provide for a conservative Cycle 19 boron dilution analysis.

The proposed changes are conservative in that they will require more shutdown margin and will provide an earlier credited alarm to the operator. It should be noted that while the proposed LCO setpoint limit is being reduced from 2.0 to 1.8 for the shutdown monitors, the actual setpoint is not planned to be changed since it is significantly below the proposed LCO limit of 1.8. Other than the boron dilution event, no other design basis accidents are affected. Thus, the proposed changes are safe and will provide additional margin for operator action to mitigate a boron dilution event.

Significant Hazards Consideration

In accordance with 10CFR50.92, CYAPCO has reviewed the attached proposed changes and has concluded that they do not involve a significant hazards consideration (SHC). The basis for this conclusion is that the three criteria of 10CFR50.92(c) are not compromised. The proposed changes do not involve an SHC because the changes would not:

1. Involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed changes will provide additional time for operator action in a boron dilution event to assure that there is at least fifteen minutes between the time to alarm and the time to criticality for Modes 1 through 5 and thirty minutes for Mode 6 for operator action. The changes assure that these criteria will be met. Since the required criteria for operator action is met, there is no increase in the consequences of the boron dilution accident. No other accidents are affected by the change.

   There are no hardware modifications associated with the proposed changes. Thus, there is no increase in the probability of any accident previously evaluated.

2. Create the possibility of a new or different kind of accident from any accident previously evaluated.

   This is a change to the technical specifications only. There are no hardware modifications associated with this proposed change which could introduce new or unique

operational modes or accident precursors. Therefore, there is no potential for a new unanalyzed accident.

3. Involve a significant reduction in a margin of safety.

As shown in the attached tables, for boron dilution transients, the combination of the shutdown margin increase and the lower credited boron dilution alarm setpoint will provide assurance that the criteria for operator action will be met. Specifically, at least fifteen minutes from the time of alarm to the time of criticality in Modes 1 through 5 and thirty minutes in Mode 6 are available for operator action to mitigate a boron dilution event. The proposed changes provide margin to compensate for nonconservatism in the shutdown monitor response up to a penalty factor of 1.3. During the upcoming refueling outage, the neutron sources will be repositioned to eliminate or significantly reduce any nonconservatism in the shutdown monitor response. This will be confirmed by startup testing.

The increase in shutdown margin can be accomplished with the available boric acid sources without any hardware changes required. The available sources of boric acid are those stored in the boric acid storage tank and the refueling water storage tank.

It is, therefore, concluded that these proposed changes have no impact on the margin of safety.

Moreover, the Commission has provided guidance concerning the application of the standards of 10CFR50.92 by providing certain examples (March 6, 1986, 51FR7751) of amendments that are considered not likely to involve an SHC. The proposed changes described herein are not enveloped by a specific example, but do not constitute an SHC since the changes are conservative. The proposed changes require more shutdown margin and will provide an earlier alarm to the operator in order to mitigate a boron dilution event.

Environmental Consideration

CYAPCO has reviewed the proposed license amendment against the criteria of 10CFR51.22 for environmental considerations. The proposed changes do not increase the types or amounts of effluents that may be released off site, nor do they involve any significant increase to individual or cumulative occupational radiation exposures. Based on the foregoing, CYAPCO concluded that the proposed changes meet the criteria delineated in 10CFR51.22(c)(9) for a categorical exclusion from the requirements for an environmental impact statement.

The Haddam Neck Plant Nuclear Review Board has reviewed and approved these proposed changes and concurs with the above determination.

In accordance with 10CFR50.91(b), we are providing the State of Connecticut with a copy of this proposed amendment to ensure their awareness of this request.

Regarding our proposed schedule for issuance, this amendment is required prior to core reload during the upcoming Cycle 18 refueling outage. Therefore, we request issuance no later than January 31, 1995, with the amendment effective as of the date of issuance to be implemented within 30 days of issuance.

Should the Staff require any additional information to process this request, contact Mr. E. P. Perkins, Jr. at (203) 665-3110.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

J. F. Opeka
Executive Vice President

cc: T. T. Martin, Region I Administrator
A. B. Wang, NRC Project Manager, Haddam Neck Plant
W. J. Raymond, Senior Resident Inspector, Haddam Neck Plant

Mr. Kevin T.A. McCarthy, Director
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Subscribed and sworn to before me
this 7th day of September, 1994
Lorraine J. D'Amico

Date Commission Expires: 3/31/98

Table 1

Haddam Neck Plant

Boron Dilution Event
Operator Action Time

September 1994

BORON DILUTION EVENT

OPERATOR ACTION TIME

1.8 ALARM SETPOINT

1.3 ALARM PENALTY

MODE	LOOPS ISOLATED	SHUTDOWN MARGIN (%ΔK/K)	TIME TO ALARM (MIN)	TIME TO CRITICAL-ITY (MIN)	TIME FOR OPERATOR ACTION (MIN)
1[1]	0	2.0	21.63	38.05	16.42
2[1]	0	2.0	19.55	34.70	15.15
3	0	2.0	22.62	39.85	17.23
3	2	2.8	21.95	39.11	17.16
4	4	4.2	19.35	34.94	15.59
5	4	4.5	19.61	35.43	15.82
6	4	(2)	37.62	72.34	34.72
6	4	(2)(3)	37.54	68.74	31.20

(1) Full power alarms/reactor trip conservatively bounded using shutdown alarm methodology.

(2) Initial shutdown determined by the boron concentration needed to achieve 6% with all rods out and 11% with all rods in.

(3) During Fuel Movement

BORON DILUTION EVENT

OPERATOR ACTION TIME

1.8 ALARM SETPOINT

NO ALARM PENALTY

MODE	LOOPS ISOLATED	SHUTDOWN MARGIN (%ΔK/K)	TIME TO ALARM (MIN)	TIME TO CRITICAL-ITY (MIN)	TIME FOR OPERATOR ACTION (MIN)
1[1]	0	2.0	16.48	38.05	21.56
2[1]	0	2.0	15.08	34.70	19.61
3	0	2.0	17.24	39.85	22.62
3	2	2.8	16.67	39.11	22.44
4	4	4.2	14.64	34.94	20.30
5	4	4.5	14.83	35.43	20.60
6	4	(2)	27.99	72.34	44.35
6	4	(2)(3)	28.29	68.74	40.46

(1) Full power alarms/reactor trip conservatively bounded using shutdown alarm methodology.

(2) Initial shutdown determined by the boron concentration needed to achieve 6% with all rods out and 11% with all rods in.

(3) During Fuel Movement