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ADDL INFO CONCERNING TECH SPECS CHANGE REQUEST NO 72, CYCLE 3 EXTENSION IN RESPONSE TO NRC LTR DTD 2/24/78.

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METROPOLITAN EDISON COMPANY

POST OFFICE BOX 542 READING, PENNSYLVANIA 19603 TELEPHONE 215 – 929-3601

March 1, 1978
GQL 0337

Director of Nuclear Reactor Operations
Attn: Mr. R. W. Reid, Chief
Operating Reactors Branch No. 4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Three Mile Island Nuclear Station Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289

This letter is in response to your request for additional information concerning Technical Specification Change Request No. 72, Cycle 3 Extension. Regarding the February 24, 1978 meeting whose representatives included members of your staff, Babcock and Wilcox, General Public Utilities and Metropolitan Edison Company, enclosed are our responses to your eight questions.

Sincerely,

J. G. Herbein
Vice President-Generation

JGH:DGM:cjg

Enclosure

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ADDITIONAL INFORMATION TMI-1

CYCLE 3 EXTENSION

1. Why is it necessary to change the APSR position limits curve for coastdown operation? Is this change safety related or is it primarily for Cycle 4 burnup considerations?

The new limits on the APSR position curve were defined using two criteria:

(1) Given an APSR position at a particular power level, the relative power peak when multiplied by the average linear heat rate at that power level must give a linear heat rate less than or equal to the axially dependent LOCA limiting kw/ft given in the TMI-1 Tech Spec (Figure 3.5-2J). The new limits on the APSR position curve assume that power operation up to full power is possible up to 315 EFPDs.

(2) Further APSR limiting position modifications were made to assure that the limits of the other LHR-dependent parameters (core imbalance and full length rod position) would not change from their current Tech Spec values. This criteria was achieved except for the slight change in positive imbalance presented in Figure 3.5-2I.

Also, modification of Figure 3.5-2N was needed in that the APSR position for a zero imbalance point with a power coastdown would shift towards the +40% withdrawal position from the current +30%. The original Tech Spec limit on APSR position was derived conservatively in that the limiting position for the 102% power level (49% withdrawn) was also imposed on all power levels through 60% full power. An analysis at 60% full power allowed the APSR's to be completely withdrawn without violating LHR limits. Plant operation never needed more APSR withdrawal between 102% and 60% full power since it was always base loaded. However, with a coastdown, analysis was performed at several intermediate power levels,

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with the lowest level allowing full withdrawal of the APSR's. This resulted in the visible change between Figures 3.5-2M and 3.5-2N in the +40% withdrawal area. If this detailed power dependent analysis was originally performed for Cycle 3, the change would not have been as dramatic.

As discussed above, the change was safety related (LOCA limiting kw/ft) and not to Cycle 4 burnup considerations.

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2. What is the most reactive position for the APSR's? Is there a reactivity gain in moving them further out?

The most reactive position in the core for the APSRs at 315 EFPD's is approximately 32% withdrawn. However, a positive imbalance would occur here. In order to maintain zero imbalance, the APSR position would be 40-to-45% withdrawn at this core burnup. There is a slight reactivity gain in moving them further up the core, but this was not the reason for modifying Figure 3.5-2M as explained in response to the first question.

3. We would like a more thorough explanation of what is being done and why.

The plant operation during the coastdown is summarized as follows. The plant will drop power in steps, controlling the reactivity effects of Doppler and xenon with full length control rods, while maintaining near-zero imbalance with APSR's, the constant boron concentration reached at 280 EFPDs, and a constant average moderator temperature. The latter is attained by increasing the coolant inlet temperature as a function of the decrease in power level. Therefore, all average coolant temperature-related set points will be maintained as prior to coastdown.

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4. What will be the effect on the accidents and transients as a result of repositioning the APSR's?

The results of previously limiting FSAR accident and transient analyses referenced in the TMI-1 Cycle 3 Reload Report (BAW-1442) remain valid for the coastdown. A comparison of key parameters is given in the attached table. The resultant relative power peaking values during the coastdown were within the design peaking factors used in the limiting safety analyses. See Question 8 for further discussion of the affected accidents and transients.

5. In BAW-1442 on page 4-2, the statement is made that the maximum expected three-cycle local pellet burnup is less than 55,000 MWD/MTU. What will the value be for an extension of Cycle 3? How will this affect the ability to meet the design criterion on cladding strain of 1%?

The highest pellet burnup expected at 315 EFPD's is 44,218 MWD/MTU, well below the limiting 55,000 MWD/MTU derived from the 1% clad strain criterion.

6. How does extension of Cycle 3 affect the ability to provide the required shutdown margin as shown in Table 5-2 of BAW-1442?

The shutdown margin in Table 5-2 of BAW-1442 is derived from the worst core condition for this parameter, i.e., prior to Group 7 rod withdrawal near the end of cycle (246 EFPD's). Once the control rods are removed, the maximum allowable inserted rod worth decreased, increasing the shutdown margin. It may also be stated that after analyzing those key parameters involved in this calculation that the extended 35 EFPDs of operation will not bring the shutdown margin below the minimum value for Cycle 3 of 1.4% $\Delta k/k$. Hence, the shutdown margin criterion of 1% $\Delta k/k$ will not be violated by extending Cycle 3's operation.

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7. How will extension of Cycle 3 affect the minimum DNBR?

All steady state margins to the limiting DNBR are positive throughout Cycle 3 and, in fact, increase with cycle burnup. Therefore, the extension of Cycle 3 will not affect the existing DNBR margins.

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8. What is the effect of the Cycle 3 extension on the accidents considered in Sections 7.4, 7.6, 7.8 and 7.14 of BAW-1442?

The four accidents questioned will be discussed separately:

a. Cold Water (Pump Start-up) Accident Of the key parameters for this accident, the only one in need of discussion based on the extended Cycle 3 operation is the moderator temperature coefficient. As seen from the attached table, the value reached is -2.6×10^{-4} Δ k/k°F which is 13% less negative than the value used in the FSAR analysis. Note also that this accident is analyzed under conditions that cannot exist at TMI-1, i.e., two pump operation at 50% full power. Hence, it may be stated that the transient results would be less severe than those reported in the FSAR.

b. Stuck-Out, Stuck-In, or Dropped Control Rod The extended cycle burnup will affect the moderator temperature coefficient, the worth of the dropped rod, and local peaking factors. The more negative Doppler is a second order affect.

Since the moderator coefficient is less negative than that used in the analysis, the worth of the dropped rod is much smaller than the limiting rod worth used, and the resultant peaking factors are well within the design values chosen, the results of this analysis at 315 EFPD's even from 100% full power, if that were possible, would be much less severe than those from the analysis presented in FSAR.

c. Steam Line Failure The key parameters to be investigated as a result of extending Cycle 3 are the moderator temperature coefficient, the worst stuck rod worth, the core's shutdown margin, and the local power peaking factors. As discussed previously, and shown in the attached table, the FSAR analysis

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used values for these parameters that bound those at 315 EFPD's in Cycle 3. Therefore, based on the above, the consequences at the steam line break in Cycle 3 would be bounded by those results presented in the FSAR.

d. LOCA Analysis

All of the related Tech Spec figures have been modified so that the LOCA linear heat rate limits would not be violated during this extended burnup. The fission gas pressure is also within the NRC guidelines limits since the pin burnup reached during the cycle stretch will not exceed the analyzed burnup value wherein pin pressure equals system pressure.

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COMPARISON OF

KEY ACCIDENT AND TRANSIENT

PARAMETERS

AFFECTED BY CYCLE 3 EXTENSION

PARAMETER	SAFETY STUDY FOR CYCLE 3 RELOAD REPORT	CYCLE 3 @ 315 EFPD's
Doppler coeff, 10^{-5} $\Delta k/k^{o}F$ (EOL)	-1.33	-.152
Moderator coeff, 10^{-4} $\Delta k/k^{o}F$ (EOL)	-3.0	-2.60
All rod group worth, %Δk/k, HZP	10.0	8.72
Maximum ejected rod worth, HZP, Δk/k	1.00	0.68
Maximum dropped rod worth, HFP, %Δk/k	0.46	less than 0.20
Maximum stuck rod worth, HZP, EOC, Δk/k	2.1	2.07
Minimum shutdown margin, HZP, %Δk/k	1.0	greater than 1.4

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