METROPOLITAN EDISON COMPANY SUBSIDIARY OF GENERAL PUBLIC UTILITIES CORPORATION

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

January 24, 1974

Mr. J. C. Delaney
Fuel Fabrication & Reprocessing Branch
Directorate of Licensing
Office of Regulation
U.S. Atomic Energy Commission
Washington, DC 20545

SUBJECT: SPECIAL NUCLEAR MATERIALS
LICENSE SNM-1313

Dear Mr. Delaney:

We wish to amend the subject Special Nuclear Materials License and present the following information in support of this request:

1. Change the boron concentration listed in paragraph 6.0 of the application on page three from "2270 PPM" to "A minimum of 1800 PPM". Information presented in Technical Specification 3.8 Fuel Loading and Refueling indicates that this boron concentration is more than adequate to prevent criticality.

2. We wish to eliminate the use of the "new fuel inspection stand" as set forth in paragraph 6.1 of the application. It is our intent to remove the fuel assemblies one at a time from the shipping containers and perform the required inspections as the fuel is placed into the "new fuel elevator". This revision will eliminate a step from the handling procedure thus speeding up the process.

3. Our final request deals with paragraph 6.0 of the application. Met-Ed wishes to store the 177 Mark B fuel assemblies in a dry condition in the spent fuel pool at the Three Mile Island Site. At a later date the spent fuel pool will be flooded with borated water at a concentration of 1800 PPM. Fuel assemblies will be stored within the spent fuel pool without dust wrappers but with control fixtures and with burnable

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poison rods in place. The dry spent fuel pool will be protected from low-density moderation (steam, fog fire fighting application, etc.). Flooding will be performed in such a way to prevent splashing of the water onto the stored fuel assemblies.

The fuel pool loaded with 177 fuel assemblies is safe under all conditions - (a) dry, (b) partially flooded, and (c) fully flooded - as discussed below:

(a) Dry - Low-enriched fuel (enriched to less than 5 wt %) cannot be made critical in the absence of a moderator; this is well documented as for example in Figure 17 of TID-7028. The presence of concrete reflection around the finite array of elements will not lead to a condition even approaching critical. Numerous KENO calculations have been made for arrays of fuel assemblies on 21-inch center-to-center pitch assuming maximum enrichment (4 wt %), no burnable poison or control rods, and dry conditions. Both infinite arrays and arrays bounded by concrete have been evaluated; maximum k_{eff} calculated are below 0.6.

(b) Partial flooding has been shown safe both by calculation and by experiment. B&W's Lynchburg Research Center has performed numerous critical experiments over the last 10 years on low-enriched fuel pins set in configurations simulating our Mark B fuel assembly. Experiments have universally shown a smooth ever-increasing reactivity versus water height with no evidence on partial water height curves that reactivity would decrease if water height were increased beyond the critical height. One study of reactivity versus water height demonstrates direct proportionality of $(\Delta p/\Delta H)$ 1/3 vs. H where p is reactivity and H is moderator height, (BAW-3647-3/March 1967). Several KENO calculations have been made for k_{eff} versus water height of an infinitely long by 14 assembly wide array (concrete reflected) of 4 wt % Mark B fuel assemblies on a 21-inch center-to-center pitch. Non-borated and no poison fixtures were assumed. K_{eff} was calculated for a half, three-quarters, and full water height; maximum reactivity occurred at full water height.

(c) Fully flooded, each assembly is separated by slightly greater than 12 inches of borated water. Twelve inches of unborated water is nearly perfect neutronic isolation. This has been verified by well-validated PDQ and KENO calculations. K_{eff} for this array in unborated water at the maximum enrichment (3.5 wt) is about 0.87. The canal is being flooded with water borated to 1800 PPM, which should be worth another 15 to 20% in negative reactivity.

The above information demonstrates the nuclear criticality safety of the fuel storage at Three Mile Island, Unit 1.

Very truly yours,

J. G. Miller
Vice President

asb

BCC: Messrs. R. C. Arnold
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