

January 21, 1988

Docket No. 50-134

Mr. Thomas H. Newton, Jr., Director  
Nuclear Reactor Facility  
Worcester Polytechnic Institute  
Worcester, Massachusetts 01609

Dear Mr. Newton:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - WORCESTER POLYTECHNIC INSTITUTE  
(WPI)

In our review of documentation submitted in support of your reactor to use low-enriched uranium fuel dated September 17, 1987 and in a related submission to modify the WPI Technical Specifications, dated September 10, 1987, some questions have arisen for which we require answers. Please provide written responses to the enclosed questions no later than 30 days from the date of this letter. Following receipt of this information we will continue our review.

If you have any questions concerning this request, please contact me at (301) 492-8251, and after February 2, 1988, 492-1102.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P. L. 96-511.

Sincerely,

Original signed by:

Theodore S. Michaels, Project Manager  
Standardization and Non-Power  
Reactor Project Directorate  
Division of Reactor Projects III, IV,  
V and Special Projects  
Office of Nuclear Reactor Regulation

Enclosure:  
As stated

cc: See next page

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

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Sincerely,

A handwritten signature in cursive script, reading "Theodore S. Michaels", is written over the typed name.

Theodore S. Michaels, Project Manager  
Standardization and Non-Power  
Reactor Project Directorate  
Division of Reactor Projects III, IV,  
V and Special Projects  
Office of Nuclear Reactor Regulation

Enclosure:  
As stated

cc: See next page

Worcester Polytechnic Institute

Docket No. 50-134

cc: Mayor of the City of Worcester  
Worcester, Massachusetts 01601

Francis J. McGrath  
City Manager  
Worcester, Massachusetts 01608

Office of the Attorney General  
Environmental Protection Division  
19th Floor  
One Ashburton Place  
Boston, Massachusetts 02180

Department of Environmental  
Quality Engineering  
100 Cambridge Street  
Boston, Massachusetts 02180

Worcester Polytechnic Institute  
Docket No. 50-134  
License No. R-61

Reference: The Application for License Amendment dated September 10, 1987

1. Shutdown Margin

- (a) Please provide a discussion of the actual shutdown reactivity if the most reactive control blade were fully withdrawn and the other control blades were fully inserted. Also, include a discussion of reactivity conditions, relative to shutdown margin, if experiments allowed under your Technical Specifications should fail with the most reactive control blade fully withdraw.
- (b) Surveillance of the Shutdown Margin should be performed to prove compliance. Please provide proposed wording for such surveillance in Section 3.1 of your Technical Specifications.

2. Control Blade Worths

- (a) The type of change you have proposed in your technical specifications is consistent with other non-power reactor licenses. However, your Technical Specifications are not in the format of ANS 15.1. Therefore, please add to your new section 4.5.3 sufficient wording to show that not only are the control blades the same size as discussed in your Safety Analysis Report (SAR), but they are also constructed as described in Sections 2.3, 4.1.2, and 5.2.3 and in Figure 13 of your SAR.

3. Regulating Blade Worth

- (a) It is suggested that your proposed change in wording in the authorized worth of your regulating blade would also require a determination (measurement) of your effective delayed neutron fraction. If that is your intent, please provide a discussion of how you would demonstrate compliance with the proposed change to Section 2.1. Alternatively, it is suggested that you change your current Technical Specification 4.5.3 only by deleting the word "calculated," which you find ambiguous. Then your justification should discuss how you will demonstrate compliance with the 0.7% reactivity requirement, in addition to related safety considerations.
- (b) Please add a surveillance interval requirement in Section 3.1 of your Technical Specifications for assuring that the reactivity specification is met.

4. In the proposed change to Technical Specification 4.4, it would be appropriate and consistent with the conversion action to add the following sentence: "The uranium fuel shall be enriched to less than 20% <sup>235</sup>U." (This will also be consistent with 10 CFR 50.64, the revised SAR, and the ANL Report.)

Worcester Polytechnic Institute  
Docket No. 50-134  
License No. R-61

Reference: The application for authorization to convert from HEU to  
LEU Fuel, September 17, 1987

1. In the Table of Section 2.3, and other sections of the SAR, e.g. Sections 5.2.2 and 5.2.5, please correct the inconsistencies and other errors. In Table 2.3, please review carefully and make other corrections as necessary, such as adding the units to various listed quantities.
2. SAR, Section 5.1: you mention comparison of calculations for your reactor with measurements at similar reactors. However, you do not mention comparison with measurements at your own reactor. Please explain. Furthermore, you will be expected to submit a report following conversion that compares measured and projected reactor parameters with the LEU fuel.
3. SAR, Section 5.2.5, last sentence: please provide more details to support and justify this broad statement, including the assumptions of the nuclear excursion. Insufficient information is provided for us to evaluate the statement and its bases.
4. SAR, Sections 7.3 and 7.4: please explicitly show the changes in reactor parameters and compare the potential consequences of using HEU and LEU fuels.
5. SAR, Section 7.3.1: your reference No. 2 appears not to be readily available, and may be superseded by later work which is available. Please use an available reference or give details of your method and analysis, to the extent that this section has a bearing on reactor conversion from HEU to LEU.
6. Guidance given to you for preparing documentation supporting fuel conversion requested that you compare current HEU reactor parameters with projected LEU parameters. Instead, in several places in your SAR you simply made substitutions, for example in Sections 2.3, 4.1, 5.2.2, 5.2.6, and 5.2.7. Please explicitly discuss comparative values and their effects on reactor operation.
7. In Table 2.3, the void coefficient should be -0.24 not -0.25 and the table should list  $\beta_{eff} = 0.0077$ .
8. What interlocks or technical specification requirements prevent more than one control blade removal at a time?

9. The title of 5.2.5 is confusing. Please correct or clarify.
10. In Section 5.2.6, similarity to Borax 1 is claimed. Please provide discussion justifying this similarity.
11. Please review the value of 17% shutdown reactivity stated in Section 7.3.1 in light of the value stated in Table 2.3 of 12%. Also please provide the assumed rate of reactivity addition for the start-up accident.
12. Is your present fuel storage capability sufficient for safe storage of your expected inventory of LEU fuel?
13. Section 2.4 Experimental Facilities, lists 2 fuel elements with removable plates. In the ANL reports, these elements are treated as fuel. If you consider these 2 elements to be experiments, your technical specifications should be changed to provide limits and limitations on the use of in-core fueled experiments. Please discuss and propose appropriate resolution of this situation.