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The Pennsylvania State University  
304 Old Main  
University Park, PA 16802-1504

Document Control Desk  
United States Nuclear Regulatory Commission  
Washington, DC 20555

Re: Request for Additional Information (TAC NO. MA8019)

Dear Sir or Madam:

On January 18, 2000 we submitted three proposed changes to the Technical Specifications (TS) for the Penn State Breazeale Reactor (PSBR). Two of those proposed changes (changes 1 and 3) were subsequently approved and issued by the NRC. On November 2, 2000 you sent us a Request for Additional Information (TAC NO. MA8019) related to proposed change 2. Your request indicated that our response should be sent within 60 days. Due to the press of other matters we requested delays in our submittal; our NRC Project Manager agreed to our requests to extend the response time to 180 days.

Change 2 in our letter of January 18, 2000 proposed changes to TSs 3.1.2, 3.1.4, and 3.7.1 a and b to allow initial confirmatory physics tests following a changes in core/experimental configurations to be performed without violation of those specifications.

Your request for additional information asked for information in three areas. These areas were: administrative controls on conduct of testing, assurance that the exemption would not be used to usurp the intent of the annual confirmatory measurement of excess reactivity, and information relating to confirmation that the exemption would not result in violation of fuel design criteria during anticipated operational occurrences (AOOs).

This letter along with its attachments provide our response to your request. In preparing our response we concluded that the proposed change to TS 3.1.4 was not required as it only applied to pulse mode operation and we are only requesting exemptions related to initial physics measurements. We therefore withdraw the portion of the proposed change related to TS 3.1.4.

Answers to your questions are provided as attachments.

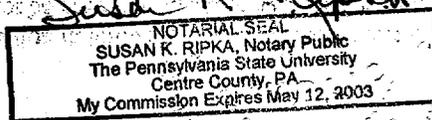
If you have further questions regarding our proposed changes to TSs 3.1.2 and 3.7.1.a and b please contact Dr. Fred Sears, the PSBR Director, at 814-865-6351.

Sincerely,

Dr. Eva J. Pell  
Vice President for Research and  
Dean of the Graduate School

Attachment

cc: M. Mendonca, NRC Project Manager  
T. Dragoun, NRC Inspector  
L. Burton  
J. Brenizer  
T. Flinchbaugh  
D. Sathianathan  
F. Sears



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## REQUEST FOR ADDITIONAL INFORMATION (TAC NO. MA8019) RESPONSE

The response will treat and answer the questions in a different order than given in the request in order to clarify matters.

**NRC Question 3:** *The TS 4.1.2 Surveillance for excess reactivity states that "The excess reactivity of the core shall be measured annually, not to exceed 15 months, and following core or control rod changes equal to or greater than 0.7%dk/k (~\$1.00)." The annual measurement should not be exempt from the TS 3.1.2 reactivity limit as its purpose is to verify that operation has been acceptable. Provide proposed technical specification to clarify this point.*

**PSBR Response:** We agree that the exemption should not apply to the annual verification measurement. We propose the following wording for TS 3.1.2 to clarify this point.

### Specification

- a. The maximum excess reactivity above cold, clean, critical plus samarium poison of the core configuration with experiments and experimental facilities in place shall be 4.9% dk/k (~\$7.00).
- b. During initial measurements of maximum excess reactivity for a new core/experimental configuration this specification is suspended provided the reactor is operated at power levels no greater than 1 kw. If the power level exceeds 1 kw, power shall be reduced to less than 1 kw within one minute. This exemption does not apply for the annual confirmatory measurement of excess reactivity required by TS 4.1.2.

We propose adding the following sentence to the Basis for TS 3.1.2

The exemption allows the initial physics measurement of maximum excess reactivity for a new core/experimental configuration to be measured without creating a reportable occurrence. Maintaining the power level less than 1 kw during this exemption assures there is no challenge to the safety limit on fuel temperature.

**NRC Question 2:** *Provide description of administrative controls on conduct of testing. For example, (1) responsibility for sign-offs to do test, (2) verification, reviews and responsibilities for estimation of reactivity worths before conduct of a test, (3) verification, reviews and responsibilities for calculation of the worths after tests, (4) procedures and controls to maintain operation at or below 1 kilowatt, etc.*

**PSBR Response:** The administrative controls for all operations of the PSBR including testing are provided by written procedures. Specifically SOP-5, Experiment Evaluation and Authorization provides the administrative controls for all operations of the PSBR. Additional/supplemental controls relating to these proposed TS changes are provided by SOP-3, Core Loading and Fuel Handling; CCP-15, Control Rod Reactivity Worth; and CCP-11, Core Reactivity Evaluation. Each of these procedures contain appropriate specific instructions relating to procedural review and approval, data collection, evaluation, review and approval of results, and verification against TSs. Changes to new core loadings require the specific approval of the Director. Review of results require a 2nd level review and in most cases the review of the Director or the Manager, Operations and Training.

Sign-offs to perform related testing requires the approval of the Director or the Manager, Operations & Training (SOP-5). Estimations of reactivity worths are required by the core loading governing procedure (SOP-3). Measurements of rod worths are controlled by CCP-15. Evaluations of rod worths are controlled by CCP-15 and CCP-11. Normal administrative procedures are used to maintain operation below 1 kw.

Upon going to a new core/experimental configuration confirmation of acceptable reactivity values must be accomplished in accordance with CCP-11, Core Reactivity Evaluation prior to returning to routine operation.

For the purposes of the proposed changes to TS 3.1.2 and 3.7.1.a and b, we consider these changes applicable only for the initial tests to determine rod worths, shutdown margin, and excess reactivity after a change in core loading, control rods, or experimental configuration. The exemptions requested do not apply to annual confirmation measurements of these parameters even though the same procedures and techniques may be used.

**NRC Question 1:** *The Penn State staff has said that exemptions to Limiting Conditions of Operation (LCOs) during physics testing are allowed at power reactors. These exemptions are allowed given that fuel design criteria are not exceeded during anticipated operational occurrences (AOOs). However, these exemptions also require certain provisions on other LCOs (e.g., Shutdown Margin) being consistent with the analyses of the AOOs. Provide or reference analyses for analogous conditions on the Penn State TRIGA reactor during the proposed physics testing exemption conditions. For any assumed conditions required to maintain the validity of the analyses provide associated technical specifications and surveillance requirements to meet these requirements before and during physics testing. Also, provide action statements that reinstate conditions to within the LCO conditions within an appropriate period.*

*Alternatively to the proposed exemptions and above analyses, provide analyses and proposed Technical Specification that establish the maximum reactivity addition before exceeding the safety limit or 10 CFR Part 20 occupational or public radiological exposure limits.*

**PSBR Response:** Following a change to the core, the control rods, or an experimental configuration, routine operations are not permitted until appropriate measurements of reactivity have been performed, evaluated, and verified to be in conformance with TSs. If a measurement is made and found not to be in conformance to TSs, appropriate modifications are made to the core, control rods, or experimental configuration and another set of measurements is made. Only when conformance to the TSs is demonstrated is routine operation permitted. Therefore it is not necessary to consider power operation or pulsing in regard to the requested exemption since it only applies to initial physics testing at power levels less than 1 kw. At power levels less than 1 kw there is essentially no sensible heat generated within the fuel and thus there is no challenge to the safety limit. Power operation and pulsing are not permitted until the confirmatory measurements are complete and conformance with the TSs demonstrated.

The conclusions of the PSBR SAR, Chapter IX remain valid for the exemption since operation is restricted to less than 1 kw. As a check of those conclusions we utilized an excess reactivity of 10% over the \$7.00 of TS 3.1.2 along with extrapolations for our current core (Loading 51) for steady state and pulse operations in a similar manner to that described in SAR page IX-44, paragraph 3. This check produces an extrapolated fuel temperature of 500°C at 115% of full power with a commensurate reactivity withdrawal of \$4.40. Assuming 10% over the allowed \$7.00 would result in \$3.30 for pulse

insertion; the extrapolated additional fuel temperature would be 514°C with a resultant summed fuel temperature of 1014°C which is under the 1150°C safety limit. Thus departures (<10%) above the limit of TS 3.1.2 would not challenge the safety limit; further as pointed out in SAR page IX-44, paragraph 3 these conditions cannot be achieved due to interlocks and overpower scrams. Since there is no challenge to the safety limit there is no challenge to 10 CFR Part 20 occupational or public radiological exposure limits.