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January 4, 2019

Mr. Michael Balazik
U. S. Nuclear Regulatory Commission
Research and Test Reactors Branch A
Office of Nuclear Reactor Regulation
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Reference: Oregon State University TRIGA Reactor (OSTR)
Docket No. 50-243, License No. R-106
License Amendment Request Letter to the NRC dated November 5, 2018

Subject: Proposed new basis for the Limiting Safety System Setting

Mr. Balazik:

This letter serves as a request for a license amendment for the purpose of modifying the proposed basis for the Limiting Safety System Setting (LSSS) in a letter to you dated November 5, 2018. The basis that we proposed removed some of the language with respect to the 510°C limit. To avoid confusion, we would like to add that language back in to the basis. Additionally, we are proposing to add some language to the basis to strengthen the argument for a LSSS based on power when not pulsing.

We propose to revise the proposed basis with the added revisions noted in bold underlined italics:

> Basis. During steady state operation, maximum temperatures are predicted to occur in the LEU MOL ICIT core. Linear extrapolation of temperature and power from Table 4-27 of section 4.7.8 indicates that ***an IFE power of 23.1 kW will produce an indicated temperature of 510°C in the IFE at the midplane thermocouple location. Additionally, a maximum IFE power of 23.1 kW in conjunction with the highest ratio of maximum to minimum power for elements in the B-ring is 1.121, limits the maximum power in any B-ring element to 23.1 x 1.121 = 25.9 kW.*** Figures 4-59, 4-64 and 4-69 indicate that at 25.9 kW, the maximum temperature anywhere in the hot channel fuel element will be less than 600°C.
>
> Additional analysis has shown that if a B-ring element in the LEU MOL ICIT or LEU EOL ICIT core is replaced with fresh fuel, the highest ratio of maximum to minimum power in the B-ring is 1.378. In these cores, if the ***maximum single B-ring fuel element*** is generating 23.1 kW, the maximum power in any B-ring element would be limited to 23.1 x 1.378 = 31.8 kW. Figures 4-59, 4-64 and 4-69 indicate that at 31.8 kW, the maximum temperature anywhere in the hot channel fuel element will be less than 700°C. ***This, and all steady-state analyses, were performed at the maximum licensed steady state power of 1.1 MW.***

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Table 4-21 shows that, during steady state 1.1 MW_{th} operation, maximum temperatures are predicted to occur in the LEU MOL ICIT core, with a maximum hot rod thermal power of 18.52 kW. Figure 4-65 shows that the MDNBR in the hot channel (using the Bernath correlation) will reach a value of 2.00 at approximately 19.85 kW hot channel steady state 1.1 MW_{th} power. This is 107.2% of the 18.52 kW produced in the hot channel of the LEU MOL ICIT core configuration. The power level channels scram the reactor at 106% of 1 MW_{th} power which is far below the power level required to reach a MDNBR of 2.00. The two power level channels provide redundant and independent protection from exceeding the safety limit of 1,150°C. Therefore, measurement of the reactor power by two redundant and independent power level channels will ensure that the safety limit is not reached during steady state operations and when transient operation modes are precluded.

Table 4-27 indicates that at 18.52 kW, the maximum temperature anywhere in the hot channel fuel element will be less than 500°C, which is less than half of the safety limit of 1,150°C.

Additional analysis was performed on the very unlikely accident involving the simultaneous withdrawal of all four control rods, with an initial power of 100 W, a scram setpoint of 1.06 MW_{th}, and a 0.5 second delay time to scram the reactor. The analysis showed that the maximum hypothetical reactivity insertion would be $1.13, which is far below the maximum allowable pulse of $2.30. Pulsing thermal hydraulic analysis showed that a pulse of $2.30 would not exceed 830°C, which is below the safety limit and prevents potential damage due to exceeding eutectic limits.

Pulsing is precluded by removing the reactor top transient rod bracket, which causes an electrical interlock that prevents the reactor from entering pulse mode and annunciates a "Transient Modes Disabled" window in the control room. The status of the bracket is documented by the Duty SRO (Reactor Supervisor) on the daily startup checklist.

I hereby affirm, state, and declare under penalty of perjury that the foregoing is true and correct.

Executed on: 1/4/19.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Steve Reese
Director

cc: Document Control, USNRC
Craig Bassett, USNRC
Dr. Irem Tumer, OSU
Dan Harlan, OSU
Robert Schickler, OSU
Ken Niles, ODOE