DEPARTMENT OF MECHANICAL ENGINEERING
Nuclear Engineering Teaching Laboratory

*Pickle Research Campus R-9000 • Austin, Texas 78758 • 512-232-5380 • FAX 512-471-4589*
*nuclear.engr.utexas.edu • wcharlton@austin.utexas.edu*

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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

50-602

Geoffrey Wertz, P.E.
Non-Power Production and Utilization Facility Licensing Branch
Division of Advanced Reactors and Non-Power Utilization
Nuclear Reactor Regulation

SUBJECT: Request for Extension of Date for Completion of Neutronic and Thermal-Hydraulic Analyses for The University of Texas at Austin

REFERENCE: October 18, 2018 letter: University of Texas at Austin – Summary of Site Visit and Request for Schedule for Completion of the Reactor Analyses RE: Renewal of Facility Operating License No. R-129 for The University of Texas at Austin Research Reactor (EPID NO. L-2017-RNW-0032)
December 14, 2018 letter, Docket No. 50-602, Facility Operating License NO. R-129, Schedule for Completion of the Reactor Analyses for the University of Texas at Austin Research Reactor
August 12, 2019 letter, Docket No. 50-602, Facility Operating License NO. R-129, Revised Schedule for Completion of the Reactor Analyses for the University of Texas at Austin Research Reactor

Sir:

We respectfully request an extension of the scheduled date for providing the neutronics and thermal-hydraulic analyses (supporting relicensing of The University of Texas at Austin nuclear research reactor) by an additional 90 days, to 28 February 2020.

The Radiation Center of the Oregon State University (OSU) developed a neutronics model using MCNP to support safety analysis and provided preliminary results. The results were reviewed with the Oregon State University analyst. Calculations of excess reactivity are within a reasonable range for the OSU analysis, but the calculated control rod worth values are not. Potential for improvement was identified.

Specification of the UT control rods is based on General Atomics schematics at the facility. The UT TRIGA core has a hexagonal pitch while most U.S. TRIGA reactors are either circular or rectangular geometry, not directly comparable. The Moroccan TRIGA design is a hex-core, similar to the UT TRIGA. There are a number of publications analyzing the Moroccan reactor in print or in press based on MCNP. Comparison of the UT and Moroccan MCNP models could either identify potential sources of error in the UT model or provide a level of confidence in the UT model. A request has been made for a copy of the input file from the Moroccan facility.

A single nominal value for fuel density was used in the UT TRIGA MCNP model, but the fuel density for the elements used in the initial core are neither nominal nor single valued. Using a value for fuel density consistent with the uranium mass and enrichment for the individual elements could remove a potential source of error.

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The isotopic concentrations used in the initial core were taken from a UT TRIGA model previously developed in SCALE (T-6 depletion sequence). There are significant differences between SCALE depletion and depletion in MCNP and, although the composition may prove comparable, using MCNP to derive the initial composition of the fuel elements with prior operating history (i.e., all fuel elements except for those in the fuel follower control rod) could remove a potential source of error.

The MCNP model developed by OSU included three segments for each fuel element. However, because of the complication involved in mapping the variety of serial numbers at UT into a manageable scheme only one fuel material was used for each fuel element. Fuel followers are not completely exposed in the core during reactor operation and, as a minimum, the fuel follower materials could be segmented and burned separately to reduce a potential source of error.

Other work (completed or in progress) based on the discussion to improve the analysis includes:

The MCNP model developed by OSU was generated using arrays and three segments for each fuel element. A revised model without arrays returned comparable results, indicating array methodology does not introduce errors.

The MCNP model developed by OSU used natural boron cross section libraries to characterize the boron carbide poison section of the control rods, but the latest version of ENDF defined natural boron as graphite rather than (previous) boron isotopes in natural concentrations. The carbon in boron carbide is not graphite. Following confirmation with analysts at Idaho National Laboratories, the boron specification was changed to the naturally occurring isotopes with a minor effect on criticality calculations.

The Moroccan MCNP model developer suggests the criticality simulations for control rod worth should be performed in a manner that reflects the actual measurement more closely. OSU is currently performing analysis to determine if this is a potential source of error.

We have identified other potential diagnostic operations as well.

As note, OSU is currently performing calculations and I am hopeful that we will be able to see the Moroccan model. The remaining work is not trivial and coordination with the holiday will be required; the OSU analyst indicates the work can be completed by February 28.

If you have any questions, please contact me at 512-232-5373 or whaley@mail.utexas.edu

P. M. Whaley

I declare under penalty of perjury that the foregoing is true and correct.

W. S. Charlton