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March 26, 1981

Standardization and Special Projects Branch
ATTN: James R. Miller
Division of Licensing
U.S. Nuclear Regulator Commission
Washington, D. C. 2[illegible]5

RE: Docket 50-188, License R-88

Gentlemen:

This is in response to questions raised about power fluctuations at the KSU TRIGA MkII Nuclear Reactor Facility.

When operating in the power range, typically 200 kWt, we experience fluctuations in power of random amplitude ranging to a maximum of about ± 20 kWt. The fluctuations are not periodic, but are slow and typically 30 seconds peak-to-peak. The KSU reactor core is cooled by natural convection. The primary water is cooled by an external heat exchanger. Return water is discharged above the core, transverse to the natural convection plume. This is done deliberately to break up the plume and delay transfer of ^{16}N to the pool surface. If the external forced flow of coolant is interrupted, reactor power drops and fluctuations cease. If operation is at 200 kW when external cooling is interrupted, the power drops quickly (few seconds) to about 150 kW. If operation is at 10 kW when external cooling is interrupted, the power drops slowly (about three minutes) to about 7 kW.

We have discussed these power fluctuations with General Atomics (G.A.) personnel and with operators of other TRIGA reactors. We are advised by G.A. that these fluctuations are generic to TRIGA reactors cooled by natural convection. Similar fluctuations have been reported by Reed College [Proceedings, TRIGA User's Conference, San Diego, 1980, p.2-57].

The concern over indications of power fluctuations seems not to be whether cooling flow causes fluctuations, but whether cooling flow affects the ability to monitor power fluctuations. The main question is whether coolant flow might cause motion of detectors (compensated ion chambers) leading to erroneous indications. We are convinced that this is not the case. During apparent power fluctuations, all ion chambers respond coherently, and these chambers are located in separate quadrants around the core.

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A second concern over coolant-flow-induced power fluctuations is whether they might be caused by flow-induced displacement of control rods. Since fluctuations take place only in the high-power range, this would seem not to be the case. In this regard, we measure control rod insertion times with coolant flow in operation, and for training purposes at frequencies much greater than called for by Technical Specifications. Never have we observed effects of coolant flow on control insertion times.

We submit that the power fluctuations are not unique to the KSU TRIGA Reactor, that we are able to monitor the fluctuations, that we are operating within Technical Specifications, and that the fluctuations do not risk the integrity of the reactor nor the safety of personnel.

We are presently of the opinion that the fluctuations are caused by changes in natural convection patterns within the coolant channels, and consequent fuel-temperature changes, promoted by turbulent coolant flow across the top of the core transverse to the convection plume. As our operation schedule permits, we plan to investigate these fluctuations more thoroughly in order to characterize better their nature and cause.

Sincerely,

Richard E. Faw

Richard E. Faw, Director
KSU Nuclear Reactor Facility

REF:sb

cc: United States Nuclear Regulatory Commission
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