UNIVERSITY OF MISSOURI-COLUMBIA

Research Reactor Facility

Research Park
Columbia, Missouri 65211
Telephone (314) 882-4211
FAX (314) 882-3443

March 8, 1991

Director of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Mail Station P1-137
Washington, DC 20555

REFERENCE: DOCKET 50-186
University of Missouri Research Reactor

SUBJECT: Requested Change to University of Missouri Research Reactor Facility License No. R-103

Dear Sir:

The University of Missouri Research Reactor (MURR) requests approval of an amendment to make the following revision to the Facility Operating License Number R-103:

2.B.(2)
Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," and the Commission Order dated September 27, 1985, to receive, possess, and use up to 45 kilograms of contained uranium-235, providing that no more than 5 kilograms of this amount be unirradiated; up to 80 grams of plutonium-beryllium neutron source; up to 20 grams of plutonium-239 in the form of sheets enclosed in aluminum for use in connection with operation of the reactor; and up to 40 grams of plutonium enriched to 90% plutonium-242 in the form of a rod sealed in a stainless steel can for use in connection with operation of the reactor subject to the following:

(a) The limit for possession, receipt, and use of contained uranium-235 is temporarily increased to 75 kilograms of which not more than 5 kilograms may be in an unirradiated state until December 31, 1992, for the purpose of maintaining uninterrupted reactor operation pending the establishment of a capability for the off-site shipment of spent fuel and the actual shipment of the spent fuel accumulated prior to the establishment of that capability.

(b) The licensee shall, as part of its annual reporting requirements, report the status of the establishment of the shipping capability and other activities relevant to the use of this temporary increase in the possession limit.

The reason for this request for a temporary increase in our licensed possession limit to 75 kilograms is to maintain uninterrupted reactor operation which is required for us to fill our critical role in research and education. Meanwhile we are continuing our efforts to establish capability for offsite shipment of spent fuel.

A020
1/1

The MURR was previously granted a temporary increase in possession limit to 60 kilograms on June 6, 1990 as Amendment No. 19 to Facility License R-103. This temporary increase in possession limit remains in effect until May 31, 1991. The NRC safety evaluation prepared in support of Amendment No. 19 stated that "if unavailability of shipping casks continues, MURR will perform a new analysis and apply for a new license amendment." Although MURR was approved by the NRC as a user of the BMI-1 fuel shipping cask on September 27, 1990, this cask has not been available for use by MURR or any other University Research Reactor (URR) and future prospects for its use are uncertain.

This letter will provide the basis for our request to extend the temporary possession limit to 75 kilograms and request that such temporary increase be in effect until December 31, 1992. The basis for this request will consist of a description of MURR staff efforts to achieve fuel shipping capability, a graphical analysis to demonstrate the need for increased possession limit, and an analysis showing there are no new safety or security issues related to an additional increase in the possession limit.

The MURR staff have aggressively attempted to resolve the fuel shipping question and most likely would have resolved the question before May 31, 1991 if not for a problem experienced by the cask owner, Cintichem Inc., in trying to ship its own fuel. A chronology of the MURR efforts to establish fuel shipping capabilities is attached and will be summarized in the following paragraphs.

New efforts to establish spent fuel shipping capability began in the fall of 1989 when General Electric informed us that we would not be receiving the GE-700 cask in October 1989. General Electric withdrew the cask and would not even consider selling it. MURR staff started analysis for using the only other shipping cask currently available for research reactor fuel. On April 18, 1990, MURR completed the necessary analysis and submitted a request to NRC to become an approved user of the BMI-1 cask owned by Cintichem, Inc., of Tuxedo, New York. MURR was approved by the NRC Transportation Branch as a user of the BMI-1 cask September 27, 1990.

During June and July 1990, anticipating approval by NRC to use the BMI-1 shipping cask, MURR staff began planning four fuel shipments for Fall 1990. MURR staff learned from Cintichem on July 26, 1990 that the BMI-1 cask would not be available for use until January 1991. MURR learned for the first time that use of the BMI-1 cask was being held up by completion of a Department of Energy (DOE) review of an Environmental Assessment (EA) necessary for Cintichem to ship fuel to DOE for reprocessing. Cintichem, in July 1990, was anticipating imminent approval from DOE to ship their fuel as part of decommissioning their Tuxedo, New York research reactor.

On December 20, 1990, MURR sent a proposal to Cintichem for use of the BMI-1 cask for spent fuel shipments in late January 1991. MURR staff were aware that Cintichem had not yet gotten DOE approval to ship their own fuel, so the proposal for MURR use of the BMI-1 cask included a guarantee to interrupt MURR fuel shipments if Cintichem received DOE approval to ship spent fuel. At this point in time, DOE still projected two months before completing review of the EA which would allow Cintichem to ship spent fuel. In early January, anticipating use of the BMI-1 cask for spent fuel shipping in late January/early February 1991, MURR staff began making necessary contacts with the NRC, the state governor's designees, the local law enforcement agencies and the spent fuel shipping transporter. However, on January 18, 1991, MURR was notified by Cintichem that our proposal to use the BMI-1 cask was denied, because Cintichem believed they would need to use the cask during the same time frame we requested. DOE continued to inform Cintichem that their approval to ship spent fuel was imminent.

Taking a parallel but different approach to establishing fuel shipping capability, MURR staff on January 23, 1991 discussed with the NRC Transportation Branch the possibility of MURR seeking a specific exemption under 10 CFR 71.7 to ship spent fuel using the National Lead cask owned by the University of Missouri and used to ship fuel between 1970 and 1978 (eight shipments from MURR and many from other research reactors). This direction was strongly discouraged by the NRC Transportation branch. So MURR staff looked for another cask that might be licensed to ship fuel and on January 31, 1991 discussed with the NRC Transportation Branch and General Electric the feasibility of MURR applying to use the GE-1600 cask for fuel shipping. MURR staff is currently performing the criticality and shielding analyses for this application submittal.

Further efforts to understand why the BMI-1 cask was unavailable were pursued. On February 8, 1991, MURR staff confirmed in telephone conversations with DOE representatives that the review process for an Environmental Assessment was holding up approval for Cintichem to ship spent fuel. DOE's best projection for when Cintichem could ship fuel remained two months. However, Cintichem, on February 22, 1991, informed MURR staff that they did not plan to lease the BMI-1 cask to any user. They intended to use it to ship their own fuel, when approved by DOE, then they are planning to sell the cask. This means that MURR may have to negotiate the use of the BMI-1 cask with its eventual owner. The uncertainty surrounding the availability of the BMI-1 cask to ship MURR spent fuel is therefore twofold:

(1) The uncertainty as to when Cintichem will be approved by DOE to ship their spent fuel (shipping is estimated to take between three and five months after approval) and

(2) The uncertainty as to who will be the eventual owner of the BMI-1 cask and the negotiation of lease agreements for MURR to use the cask for spent fuel shipping.

These uncertainties appear to extend well beyond the May 31, 1991 effective ending date of the temporary possession increase to 60 Kg provided by Amendment No. 19.

Attached are two graphs (Figure 1 and Figure 2) similar to those submitted in MURR's previous Amendment request for increased possession limit. These graphs show receipt of new fuel and typical fuel burnup to graphically represent the need for an additional increase to MURR's possession limit.

The projected graph for 1991 (Figure 1), assuming no increase in the 60 Kg limit, shows that we cannot accept the scheduled shipments of four new elements in July and November, and can accept only two elements in September 1991. By October 1991, we will have only 8–9 pairs of elements in service, about two cores, instead of the usual 3–4 cores (12–16 pairs). We will be forced to start up with Xenon-containing elements, and we will not have an adequate reserve of Xenon-free elements to maintain our 150 hr/week full power operation in some cases of unplanned shutdowns.

The projected graph for 1991/92 (Figure 2) assumes an increase to 75 Kg possession limit and the addition of 32 new element storage locations that will comply with Technical Specification requirements. Figure 2 shows that we cannot accept any new elements after July 1992. In fact, the last six elements received in May and July cannot be put into service without additional storage capacity above that specified above. With the last new elements going into service in late March 1992, we will begin having operation difficulties by August 1992.

MURR requests an increased possession limit of 75 Kg. This possession limit was derived by considering projected operating schedules, anticipated experimental needs, operating experience with the fuel cycle, the need for excess reactivity to meet a one week operating cycle, and Technical Specification constraints on fuel element fission density. MURR's practice is to maximize fuel depletion and to keep the amount of U-235 on site to a minimum. Therefore, if the spent fuel is

shipped before December 31, 1992, MURR will apply for a license amendment to return the possession limit to 45 Kg.

The requested increase in possession limit will not require changes to the "Physical Security Plan for the University of Missouri Research Reactor Facility." If MURR did not ship spent fuel until December 1992, the two elements with the longest decay time then (1410 days) would be self-protecting with a dose rate of about 1100 R/hr at three feet from the element. In fact, such elements with 145 MWD burnup are self-protecting (> 100 R/hr at 3 feet) for well over ten years.

Storage of spent fuel will be in existing or new storage positions that meet Technical Specification requirements. The fuel will be stored in a geometry such that the calculated K-effective is less than 0.9 under all conditions of moderation and such that sufficient convection cooling is provided.

There are no specific accidents in the Hazard Summary Analyses for MURR associated with the storage of spent fuel in compliance with the Technical Specification requirements. The Design Basis accident of complete fission product release from four fuel plates is not affected by increasing the amount of stored fuel. Because all fuel is stored in compliance with Technical Specifications, accidents previously evaluated remain unchanged and no new or different type of accident is created.

We respectfully request an expedient review of this Amendment application. This application would have been submitted earlier, but MURR staff, until two weeks ago, still had hopes of shipping spent fuel before May 31, 1991. If there are any questions, please call Roland Hultsch at (314) 882-5205 or me at (314) 882-5203.

Sincerely,

W.A. Meyer Jr.
Reactor Manager

ENDORSEMENT:

Reviewed and Approved

J.C. McKibben
Associate Director

Mary Martin
MARY MARTIN
NOTARY PUBLIC STATE OF MISSOURI
BOONE COUNTY
MY COMMISSION EXP MAR. 1,1994

Attachments

CHRONOLOGY OF SPENT FUEL SHIPMENT PLANNING FOR
MISSOURI UNIVERSITY RESEARCH REACTOR (MURR)
SEPTEMBER 1989 — FEBRUARY 1991

In the ten year period from June 1979 to April 1989, the MURR made 32 shipments of 8 spent fuel elements per shipment using the GE-700 shipping cask. The MURR uses an average 24 fuel elements per year. In order to keep the on-site inventory of fuel as low as possible, MURR typically ships on the average 24 spent fuel elements per year. These shipments have been in accordance with NRC and DOT regulations.

1. 27 Sept. 1989: MURR had planned and scheduled 3 shipments when informed by GE, without prior warning, that GE was withdrawing the GE-700 cask from service.

2. 26 Dec. 1989: MURR requested reactor license amendment from NRC to raise U-235 possession limit from 45 kg to 60 kg.

3. 18 April 1990: Submitted request to NRC for MURR to be a user of the BMI-1 cask owned by Cintichem, Inc., and the only currently licensed alternative to the GE-700 cask for shipping research reactor fuel.

4. 6 June 1990: NRC approved temporary license amendment to raise MURR U-235 possession limit to 60 kg.

5. 13 June 1990: Sent proposed spent fuel shipping route to NRC. Planned 4 shipments in Fall 1990..

6. 6 July 1990: NRC Transportation Branch requested additional information regarding MURR's request to become an approved user of BMI-1 cask.

7. 26 July 1990: Learned from Cintichem that the BMI-1 cask would not be available until January 1991. Cintichem was anticipating imminent shipping of their own fuel as part of decommissioning contingent on DOE's estimate that approval was two months away.

8. 30 July 1990: Spent fuel shipment route approval received from NRC.

9. 8 August 1990: MURR staff responded to request for additional information regarding BMI-1 shipping cask by NRC Transportation Branch.

10. Late summer/fall 1990: Followup discussions with Cintichem about the lack of DOE permission to ship their fuel.

11 27 Sept. 1990: NRC approved MURR as a user of the BMI-1 cask.

12. 20 Dec. 1990: MURR sent letter to Cintichem proposing our use of the BMI-1 cask for 6 shipments beginning late January 1991. MURR guaranteed to interrupt shipments and return cask to Cintichem if Cintichem received DOE permission to ship their fuel during this time frame. At this time, DOE still estimated approval at two months.

13. 7 Jan. 1991: Began phone calls and mailings to NRC, governors' designees, local law enforcement agencies, reprocessing plant and trucker as part of fuel shipping regulatory requirements.

14. 18 Jan. 1991: Completed Requisition on Purchasing for BMI-1 cask rental. Cask Lease Agreement delivered to UM counsel for negotiation with Cintichem.

Cintichem refused proposal for MURR use of BMI-1 starting in January because DOE continued to inform them that approval to ship their fuel was imminent. Cancelled proposed shipping dates.

15. 23 Jan. 1991: Discussed with NRC the possibility of MURR getting a 10 CFR 71.7 Specific Exemption to ship spent fuel in the National Lead cask owned by he University of Missouri. Was strongly discouraged by the NRC.

16. 31 Jan 1991: Discussed with the NRC and General Electric the possibility of MURR applying to use the GE-1600 cask to ship spent fuel. MURR is pursuing this.

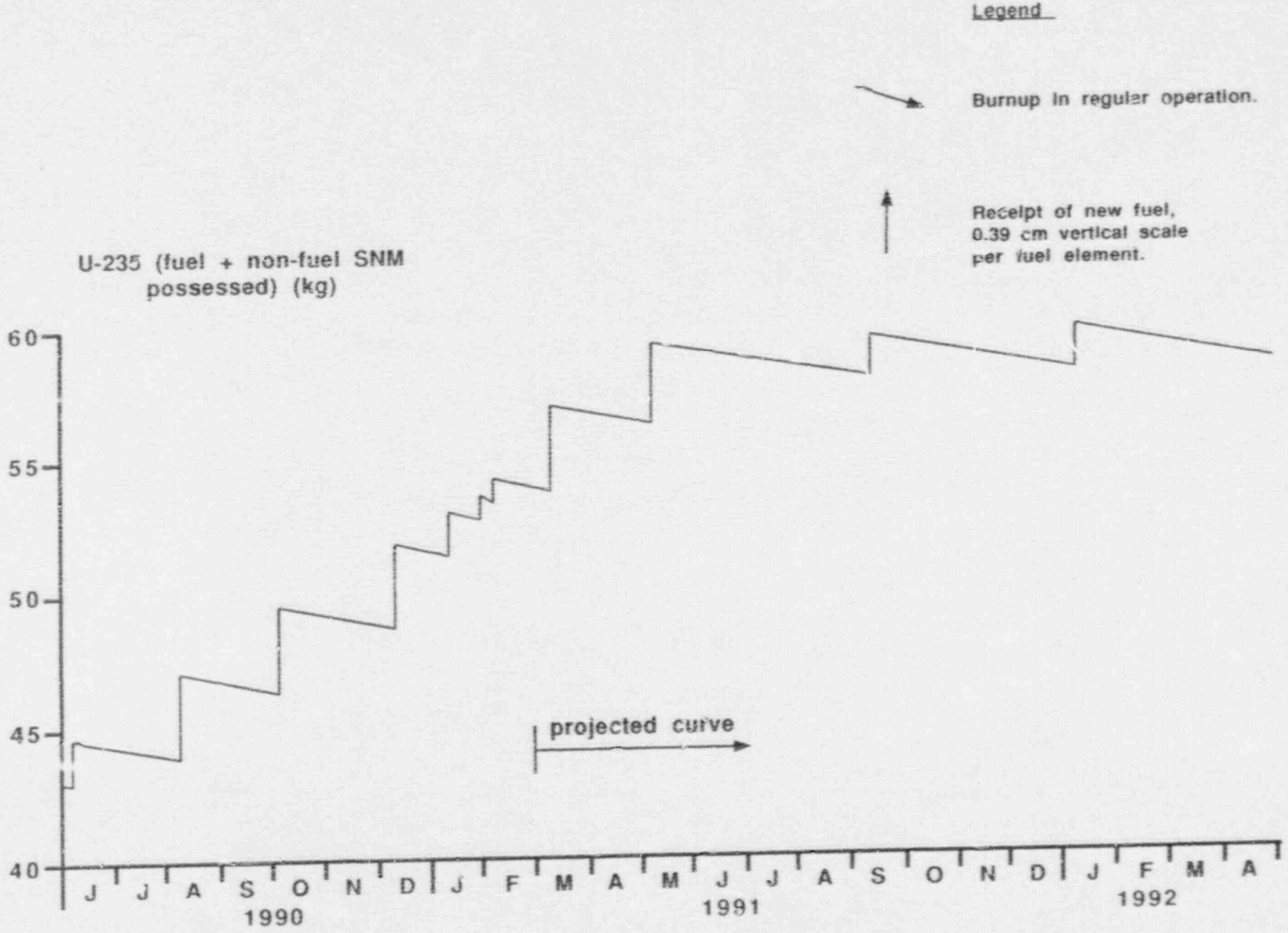
17. 8 Feb. 1991: In conversations with DOE representatives, MURR staff confirmed that the Environmental Assessment (EA) process has been holding up approval for Cintichem to use the BMI-1 cask. DOE's best estimate for the approval for Cintichem to ship fuel remains two months.

MURR begins expanding on-site storage capacity consistent with NRC license conditions.

18. 22 Feb. 1991: Cintichem informed MURR that they may not lease the cask to any user. They may use it to move their fuel, when approved to do so, then sell the cask.

University of Missouri Research Reactor (MURR)

Fig. 1



University of Missouri Research Reactor (MURR)

Fig. 2