50-188

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01 February 2001

ATTN: M. Mendonca
U.S. Nuclear Regulatory Commission
One White Flint North, MS 12 D 1
Washington D.C. 20555-0001

Subject: Request for Recovery of Facility Operating License Time, License R-88

Dear Mr. Mendonca:

The Kansas State University (KSU) TRIGA Mark II nuclear research reactor facility Operating License No R-88 is scheduled to expire at midnight August 15, 2001. KSU hereby requests that the license be amended to expire at midnight October 16, 2002. The proposed amendment will change the Facility License No. R-88, Section 4 from:

> "This amendment is effective as of date of issuance, and shall expire at midnight, August 15, 2001,"
>
> to:
>
> "This amendment is effective as of date of issuance, and shall expire at midnight, October 16, 2002."

The basis for the requested amendment is recovering time during which the reactor was under construction. Information supporting this request is contained in the Safety Review enclosed. This request was reviewed and approved by the KSU Reactor Safeguards Committee (RSC) on 01/31/2001. Correspondence regarding this matter should be directed to me at (785) 532-6657.

Sincerely,

Paul M. Whaley
KSU Nuclear Reactor Facility

encl: SAFETY REVIEW, Request for License Amendment – Recovery of Construction Time (Facility Operating License No. R-88)

cc: Distribution

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SAFETY REVIEW

Request for License Amendment – Recovery of Construction Time
(Facility Operating License No. R-88)

1. FACILITY DESCRIPTION

The KSU Nuclear Research Reactor is an open-pool (TRIGA Mark II) type reactor currently under Operating License R-88 to operate at 250 kW steady state power level with pulsing to nominal 250 MW. There are no historical sites located adjacent to the reactor facilities.

2. DESCRIPTION OF PROPOSED CHANGE

The requested change is an adjustment increasing the interval during which the KSU reactor operates under the current Facility Operating License

Facility Operating License R-88 expires at midnight, August 21, 2001. It is requested that this license be amended to expire at midnight October 16, 2002 in order to recover time during which the reactor was under initial construction, prior to operation of the facility. Facility Operating License No. R-88, Section 4 currently states:

> "This amendment is effective as of date of issuance, and shall expire at midnight, August 15, 2001,"
>
> and is requested to be revised to:
>
> "This amendment is effective as of date of issuance, and shall expire at midnight, October 16, 2002."

This change is administrative in nature, and does not involve any changes in systems, equipment, administrative controls or facility operating conditions.

3. BASIS FOR PROPOSED CHANGE

The proposed change is based on obtaining full benefit to society from the taxpayer investment in the KSU nuclear research reactor facility by amending the license period to permit 40 years of operation. The current expiration date of the facility operating license is based on the date the construction permit was issued, predating the period of actual reactor operation by 14 months. Facility material and equipment conditions have been rigorously maintained through the reactor surveillance and maintenance program; facility modifications have been used to improve equipment and operations. Radiological protection records demonstrate the reactor has been operated in a manner that minimizes releases and exposures. Amending the facility operating license to permit operating the facility for an additional 14 months will allow for continued operations under the current authorization bases, with no expected changes in operations or operating conditions.

3.1 Chronology of License

The facility operating license is currently scheduled to expire at midnight, August 15, 2001, 40 years from date of issuance of the construction permit. Work is in progress to prepare material required for license renewal.

On August 15, 1961, the United States Atomic Energy Commission (AEC) issued Construction Permit CPRR-66 (Docket number R-188) to Kansas State University of Agriculture and Applied Science. The last paragraph of the construction permit specified that, upon completion of required actions, KSU would be issued a Class 104 license with a term of 40 years from the date of the construction permit. On August 22, 1962, the Notice of Proposed Issuance of Facility License was issued, with an effective expiration date of August 15, 2001. The Facility License (R-88) was issued on October 16, 1962 effective as of date of issuance and expiring on August 15, 2001. Initial criticality occurred on October 16, 1962 at 8:25 p.m. Therefore, the facility operating license was issued 14 months prior to initial criticality. Table 1 provides a chronology of the milestones that occurred to bring the KSU reactor the current operating configuration.

TABLE 1: CHRONOLGY OF MILESTONES TO CURRENT CONFIGURATION	
DATE	MILESTONE
4/7/1961	Application for construction permit
6/9/1961	Application amendment
7/25/1961	Notice of Proposed Issuance of a Construction Permit..."
8/15/1961	Construction Permit CPRR-66 issued
10/16/1962	Facility License R-88 issued
10/16/1962	Initial criticality
8/26/1965	Amendment 1, permitted possession of 2 Ci Am-Be in addition to previously authorized source
2/9/1966	Amendment 2, allowed increase in U-235 and possession of MTR plate type fuel as a fission plate in the bulk shield tank
7/21/1968	Amendment 3, Increase maximum power to 250 kW, with pulsing capability
8/31/1970	Amendment 4, allowed increased in U-235 and authorized stainless steel clad TRIGA fuel elements

In the context of this chronology, KSU will not have received the full benefit of a 40 year facility operating license R-88 if it is allowed to expire at midnight, August 21, 2001. The failure to receive full benefit is not within the control of KSU. The failure to receive full benefit is an artifact of retroactively dating initiation of a facility operating license to date of issuance of the associated construction permit.

In the context of this chronology, an adjustment of the facility operating license expiration date is justified because the 40-year license period was based on the start of construction, and not a period of operation. A more appropriate basis for the expiration of the operating license would have been the period of time initiated by issuance of the license and initial operation (10/16/62) of the reactor. Therefore, we respectfully request the Facility Operating License be extended by approximately one year and two months to an expiration date of October 16, 2002.

Issuance of an operating license constitutes a significant investment on the part of the licensee, citizens of the State of Kansas, and regulating government agencies. Utilization of the facility for a full 40 year license period will ensure maximum benefit to society from this investment.

3.2 Operations and Maintenance History

The initial license permitted 100 kW steady state power operation. In July 1968, a license amendment authorized steady state operation at 250 kW, with pulsed reactivity insertions up to $2.00. Since 1981, the facility has operated about 34-40 MW hours per year (on average) as indicated in Table 2

The reactor is operated and maintained by implementing procedures and controls in the Kansas State University TRIGA Mark II Reactor Facility Operations Manual (Ops Manual). The Ops Manual includes a checklist of inspection and surveillance items required prior to operation of the reactor, as well as a comprehensive schedule of inspections and maintenance activities that ensure material conditions are controlled. The checklist encompasses requirements of KSU reactor Technical Specifications, Emergency Plan, Physical Security Plan as well as vendor recommended maintenance and periodic administrative review and reporting requirements. There are an average of 272 items completed each year, tracked to completion through the checklist. In addition, each fuel element is inspected after 100 pulse transients induced by reactivity insertions greater than one-dollar.

The Technical Specification Limiting Condition for Operation on primary cooling water conductivity and associated Surveillance Requirement have ensured the potential for degradation from corrosion is minimal. Visual inspection of the core is conducted as a preoperational check prior to the first startup on each calendar day. The only challenge to material conditions (related to shielding structure) was a minor leak in the thermalizing column in 1996, ultimately diagnosed as water in-leakage from the Bulk Shield Tank. The walls of the primary coolant tank are not discolored or corroding; visual inspection of the reactor tank shows no integrity or material condition issues.

In 1999, a visual inspection of the reactor building was performed (Ward Hall, including the primary structured system of the building and the reactor bay) attendant to preparing for the pending license renewal effort. Inspection indicated there was no evidence of structural movement or damage.

TABLE 2: Recent Operating History for the KSU Nuclear Research Reactor

Fiscal year	Total hours of operation	MWh of thermal energy	Typical weekly operation hours	Nuclear eng'g. student users
1981	398	30	8	62
1982	440	47	8	52
1983	501	58	10	51
1984	401	36	8	55
1985	410	36	8	20
1986	469	52	9	22
1987	441	43	9	18
1988	308	31	6	25
1989	257	26	5	27
1990	370	26	7	24
1991	411	35	8	38
1992	449	35	9	38
1993	299	34	*	37
1994	363	38	7	41
1995	394	27	8	29
1996	309	40	6	33
1997	388	28	8	36
1998	458	154	9	26
1999	346	25	7	10

*Utilization low in 1993 because of remodeling, console replacement and cooling system replacement.

In addition to routine surveillances, maintenance and inspection, several significant modifications have been accomplished over the years to improve equipment and system performance and reliability, as indicated in Table 3. Modifications have been accomplished which demonstrate a proactive attitude towards maintaining excellent facility material conditions as a means of ensuring safe and reliable operations, including:

- Replacement of the original aluminum clad Mark II fuel after 10 years of operation with stainless steel Mark III TRIGA fuel (noted to have a superior margin of safety),
- Renovation of the secondary cooling system,
- Replacment of the console,
- Replacement of the power level indicators, and
- HVAC modifications to ensure negative pressure in the reactor bay
- Improve effluent monitoring

In summary, the building is in good shape, the cooling systems are in excellent condition, and the instrumentation is state of the art.

TABLE 3: CHRONOLGY OF SIGNIFICANT MODIFICATIONS	
YEAR	MODIFICATION
1961	(8/15/61) construction Permit CPRR-66 issued
1962	Initial criticality
1968	Increase maximum power to 250 kW, with pulsing capability
1973	Replaced Mark II aluminum clad fuel elements with Mark III stainless steel clad fuel elements
1993	Replaced primary heat exchanger and secondary cooling system
1993	Replaced control console
1994	Replaced power level indicators with new nuclear instrumentation
1997	Modified reactor bay ventilation system to negative pressure system, installed on-line effluent monitoring system
1998	Replaced primary coolant makeup water system

3.3 Radiological Consequences of Facility Operations

The Hazards Summary Report for the Kansas State University TRIGA Mark II Reactor and the change analysis submitted to support the power upgrade to 250 kW steady state note two potential contributors to routine gaseous effluent releases, Nitrogen 16 and Argon 41. The Nitrogen 16 half-life precludes any significant contribution to gaseous effluent releases, and the hazards analysis demonstrated the maximum dose from Argon 41 is well below 10 CFR 20 limits. Since bounding production rates for Nitrogen 16 and the Argon 41 were calculated for the upgrade to 250 kW, radiological consequences will not be affected by continued operation under the current license conditions and approved analysis. In addition, a continuous monitoring system installed attendant to the 1997 HVAC modification (see Table 3) provides positive assurance all effluents are controlled to meet ALARA goals.

In preparing for the pending license renewal, a number of reviews of operating history were conducted which support the observation that the KSU TRIGA Mk II has been operated in a manner that ensures the safety and health of the public. The history of liquid releases from June 1997 through August 1999 was tabulated (Table 4), showing Tritium as the major contributor to the small, routine releases of radioactive materials in liquid effluents.

A survey of 12 years of occupational exposure records was conducted to support the pending license upgrade (Table 5). No dose exceeded the KSU ALARA limit (10% of 10 CFR 20 limits) for radiation workers monitored because of their affiliation with the KSU facility. In only one case did a radiation worker get an occupational exposure exceeding the 10 CFR 20 non-occupational exposure limit. Since radiation workers at KSU have more potential exposure than non-radiation workers, non-rad worker exposures can reasonably be inferred to be less than occupational limits under any possible facility operating conditions. All non-occupational workers are monitored with personal dosimetry when entering the reactor bay during operation, and at least a sample (2 persons per group of 15) of non-occupational workers are monitored with personal dosimetry when entering the reactor bay when the reactor is not operating. Records indicate exposures easily meet the applicable KSU ALARA goals (less than 50% of 10 CFR 20 limits for non-occupational exposure).

TABLE 4: HISTORICAL SURVEY OF LIQUID EFFLUENT RELEASES				
Date	Quantity Released (m^3)	Measured pCi/ml above background		
		Alpha	Beta[a]	Gamma[b]
11 Aug 99	2.5	0	38	0
6 Jul 99	2.5	0	26	0.034
26 Aug 98	2.5	0	55	0.10
27 Jul 98	25[c]	0	67	0.23
21 Jun 98	2.5	0	206	0.27
26 Jun 98	2.5	0	89	0
16 Oct 97	2.7	0	120	0
8 Aug 97	2.3	0	250	0
27 May 97	0.7	0	0	0
5 Dec 96	3.3	0	150	0
12 Aug 96	3.0	0.004 [d]	193	0
26 Jun 96	3.2	0	116	0
5 Sep 95	3.0	0	135	0
15 Aug 95	4.	0	138	0
17 Jul 95	4.2	0	54	0
7 Jun 95	3.2	0	54	0

[a] Tritium as HTO
[b] 137 Cs – 137m Ba
[c] Draining Bulk Shield Tank
[d] Unidentified Anomaly

TABLE 5: HISTORICAL SURVEY OF MONITORED EXPOSURE				
	Numbers of Persons in Annual-Dose Categories			
YEAR	< detectable	<0.1 rem	0.1 – 0.5 rem	>0.5 rem
1992	28	0	0	0
1991	23	0	0	0
1990	20	0	0	0
1989	19	1	0	0
1988	23	3	1	0
1987	23	0	0	0
1986	26	1	0	0
1985	31	8	0	0
1984	33	1	0	0
1983	29	2	0	0
1982	26	7	0	0
1981	11	23	0	0

4. SAFETY EVALUATION

4.1 Scope and Focus

Since the proposed change is administrative in nature, and does not involve any changes in systems, equipment, administrative controls or facility operating conditions, the focus of this safety assessment is potential changes in facility operation based on revising the license expiration date by 14 months. This change is administrative in nature and does not involve any changes in systems, equipment, administrative controls

or facility operating conditions, therefore historical performance to date provides an accurate assessment of the impact of continuing operation to the proposed date for expiration of license. The historical data provided above demonstrates that there is no significant negative impact of current facility operation to the public (including the environment) or facility workers. Operation under current license conditions for a longer period of time will not intrinsically cause a change in the character of liquid radioactive effluents from the facility, or a change in the character of source terms for on-site worker exposure. Therefore, there are no changes to public or worker safety, and no changes to environmental impact from the proposed adjustment to the Facility operating License.

The facility material condition is excellent because of management practice in controlling potentially degrading conditions and implementing equipment improvements. Administrative controls have ensured low potential impact on environment, safety, and health by controlling facility operations and material conditions. Therefore the potential for degradation of material conditions or component-age failures based on nearing the original license expiration is not a concern.

The remainder of this safety assessment will be focused on demonstrating that the facility will continue to operate in a manner consistent with the requirements of the Code of Federal Regulations, the KSU Facility Operating license and embodied in the KSU TRIGA Mark II Facility Operations Manual.

4.2 Administrative Controls and Configuration Management

The KSU TRIGA Mark II Reactor Technical Specifications (Appendix A, License No. R-88) contains administrative requirements for safety oversight and change control. A Reactor Safeguards Committee is required to evaluate whether proposed procedures and/or changes in the facility are authorized under existing approvals, or require review by the license authority. New experiments are similarly required to be reviewed by the Committee prior to implementation.

The Committee exercises authority through a "Reactor Facility Operations Manual," which includes all approved procedures, the Emergency Plan, Physical Security Plan, and the Requalification Program, approved experiments, and applicable vendor manuals and reports specific to the KSU reactor. All changes to the Reactor Facility Operations Manual are subject to Committee review and approval prior to implementation with the exception that temporary changes to procedures may be implemented prior to Committee review if (1) they do not change the intent of the procedure, (2) adequate communication of the changes occur, and (3) Committee review occurs at the earliest possible time following the change.

The Committee conducts a formal review of audits conducted by the Reactor Manager (the KSU Reactor Manager is required by the Administrative Plan to conduct two management audits of operations each year).

In addition to (KSU) internal reviews of changes in the components of the Facility Operations Manual, the reactor Emergency Plan, Radiological Protection Program and Requalification Program are reviewed and approved by the regulatory authority, with

minor changes controlled as per regulation. Although the Physical Security Plan (PSP) does not require regulatory approval, the PSP has received USNRC approval in its current form.

In addition to (KSU) internal audits, the USNRC conducts inspections on a biennial basis covering all aspects of facility operation that are important to safety.

Resources involved are those that had been considered in the Hazards Analysis prepared for issuance of the original license and safety evaluations attendant to license amendments.

5. SUMMARY

The proposed change in the facility operating license expiration date to be consistent with the actual operating period of the reactor is an administrative change. Operating history reflects capable and safe management of the facility; administrative controls that ensured this exemplary record will not be affected by the change in expiration date so that the period of safe operation under the current license conditions will continue.

Historical precedence demonstrates the adequacy of administrative systems to control material condition and operations at the KSU nuclear reactor in a safe manner and provides confidence that the facility will continue to be operated in such a manner during the requested 14 month "recapture" period. This change will not challenge the environment, safety or health.

This change does not change the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report; does not introduce the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report; and does not change the margin of safety as defined in the basis for any technical specification

The alternative to approval and implementation of the proposed action is to denial of the amendment. If the amendment is not approved, KSU will submit license renewal at least 30 days prior to original expiration date. KSU will then continue to operate the reactor under the timely renewal provisions of 10 CFR 2.109 until action is completed to renew or deny the Facility Operating License (FOL). Therefore, even in the absence of approval for this proposed amendment, there is likely to be some increase the interval KSU will operate under the current license requirements and conditions.

This change does not affect the environment or safety and health of the public or facility workers. This change does permit facility resources to be directed at a more measured approach to preparing the license renewal package, and therefore indirectly provides opportunity for a better and stronger definition and understanding of the bases for facility operation.