NUCLEAR ENGINEERING PROGRAM · UNIVERSITY OF ILLINOIS

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Urbana, Illinois 61801
Area Code 217-333-2295

April 13, 1973

Mr. Donald J. Skovholt
Assistant Director for Reactor Operations
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

SUBJECT: Information Letter
Illinois Low Power Reactor Assembly (LOPRA)
License R-117

Dear Mr. Skovholt:

This letter describes two changes that are planned for the LOPRA. These involve changes in the region that surrounds the basic core from those that were described in the Safety Analysis Report (SAR). The changes do not require Commission authorization as specified in 10 CFR 50.59.

Changes:

To indicate the changes, reference is made to Figure 16, page 29 of S.A.R., February, 1970 and the figure enclosed with this letter. At the present time, criticality is obtained with 61 fuel elements using a basic 7 x 9 array. The 7 dimension is parallel to the thermal column as shown by the figures. The succeeding parallel rows contain 7 elements with the exception of the last row which contains only 5 elements.

The plans call for placing graphite reflectors on the two sides of the array which presently do not contain fuel elements. The reflector will have dimensions of 3 x 14 1/2 x 16 inches, which corresponds to the space on the grid plate and the lateral and height dimensions of the fuel array. Pins, which fit into the grid plate openings, will be placed on the bottom portion to keep the assemblies rigidly in place. To make room for the reflectors, the four outer (two on each side) poison tubes will be removed from both of the present safety rods.

With this change, it is estimated that a critical assembly may be obtained with 57-58 fuel elements. Graphite dummy elements may be placed in the outer (9th) row for either gaining or adjusting the excess reactivity of the core.

Evaluation

The changes have been evaluated and approved by the Reactor Staff and the Nuclear Reactor Committee. The approval is based on the conclusion that there will be no changes in the Technical Specifications and that the criteria of 10 CFR 50.59 are fully satisfied. Thus a licensed amendment or change with Commission authorization would not be required.

Removal of the outer pins of the safety control rods will result in a slight decrease in the negative reactivity. It can be noted from the figures that the pins to be removed are outside the core region. The present worth

of these rods is about $4.50 each, which is much larger than the tech spec minimum limit of $1.50. The same is also true of the shutdown margin since this is directly related to the worth of the safety control rods. The present margin is about $4.00 compared to the minimum limit of $1.00 for tech specs. The individual fuel elements will show a slight increase in reactivity since fewer elements will be needed.

The analysis of the consequences of accidents or malfunctions is the same as those evaluated in the S.A.R. In this connection, the probability of occurence or the consequence of an accident or malfunction of equipment important to safety previously evaluated in the S.A.R. would not be increased; the possibility for an accident or malfunction of a different type than any evaluated previously in the S.A.R. would not be created; and the margin of safety as defined in the basis for any technical specification is not reduced.

Initial Criticality

The fuel loading procedure outlined in Section XIII of the S.A.R. will be followed with the exception that the TRIGA will be used as the source. When the loading is completed, a check will be made on the excess reactivity. The reactivity worth of the poison rod and both safety rods will then be determined. Although the initial indication of the power level will be based on the present values, a check will be made using the negative temperature coefficient as the criterion.

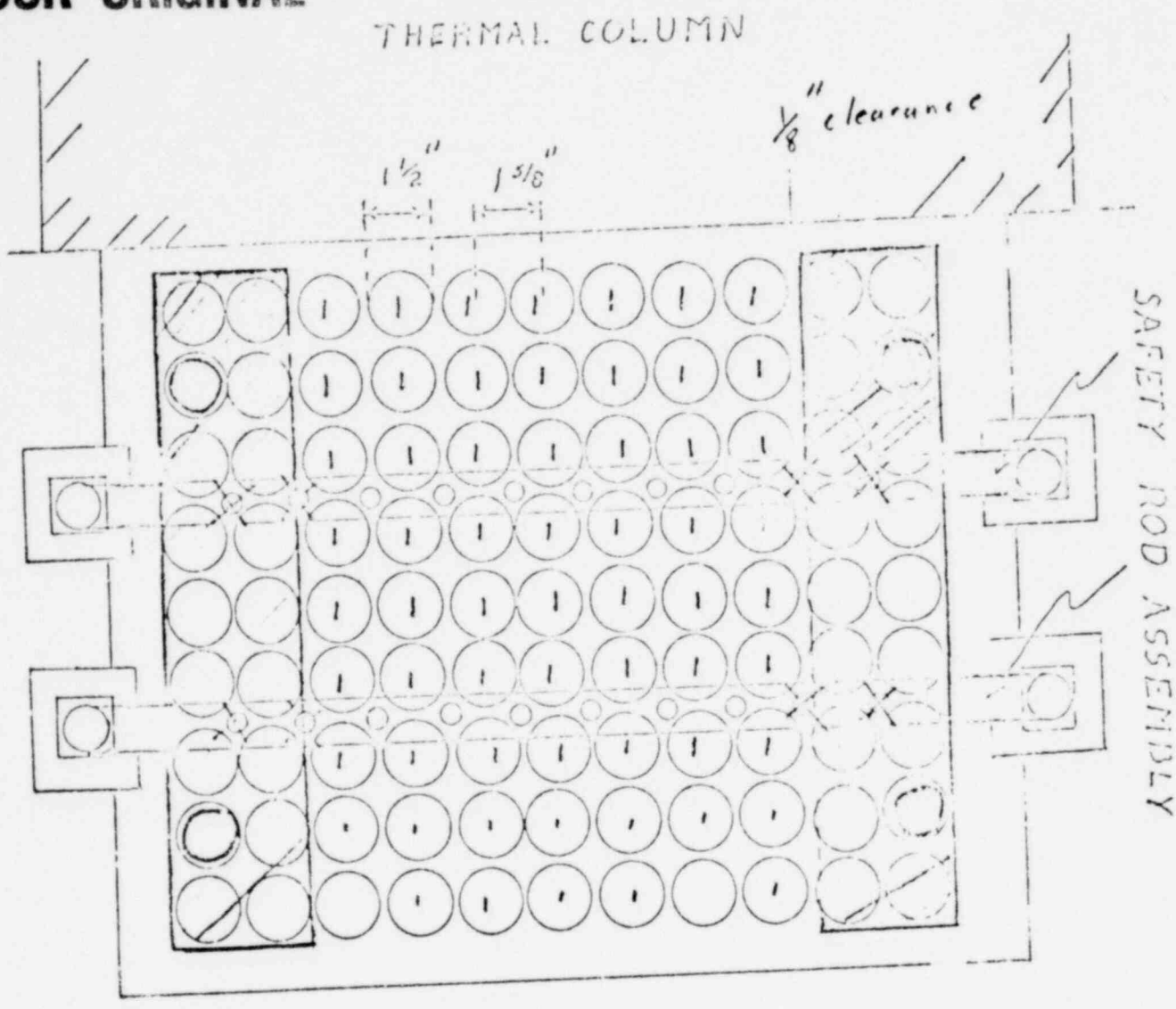
Experiments

The experiments that are planned for the facility will follow the rules as prescribed in Section 6.8 of the Technical Specifications.

Yours truly,

Gerald P. Beck
Reactor Supervisor

Daniel F. Hang
Chairman, Nuclear Reactor Committee



Sketch of Top View of the LOPEA Core Showing the Location of the Safety Control Rods in the LOPEA Core Lattice

• Location of 61 fuel elements with present core.

✕ Safety control rod pins to be removed.

Location of pins to give assembly rigidity.

Shaded areas are locations of new graphite reflector assemblies.

the experiment to determine the temperature increase. An increase of 33°C was noted giving an actual temperature of about 58°C. From this information, a gasoline sample was prepared and placed in an oven at a temperature of 95°C for two hours. Upon removal, it was noted that the plastic had softened, but there was no indication of any leakage. Upon this evaluation, the experiment was approved by the Nuclear Reactor Committee.

VI. RELEASE OF RADIOACTIVE MATERIALS

The average concentration of A-41 released to the environs via the building exhaust system was 3.3×10^{-8} uCi/cc. The total release for the year was 1.3 curies with a range of 35-200 mCi per month. It is estimated that about 1 mCi of tritium is released during a year from the evaporation of water in the reactor tank. The gross beta activity in the water effluent to the sanitary sewer from the reactor laboratory retention tank was 2.7 microcuries.

VII. ENVIRONMENTAL SURVEYS

There were no environmental surveys taken during the reporting period. Contamination surveys were made in the laboratory as indicated in the following section.

VIII. PERSONNEL RADIATION EXPOSURE AND SURVEYS WITHIN FACILITY

A. Personnel Radiation Exposure

Fifteen persons were assigned film badges at the facility. Three of these are full-time employees, while the others average less than 20 hours per week at the laboratory. The badges were sent to Radiation Detection Company of California where dosages less than 10 millirems are not reported. In addition to the badge, a dosimeter is worn by an individual if an above radiation exposure is likely to occur. The table below gives the dose received by those assigned film badges.

Dose (rems)	Number of Individuals	
No measurable exposure	11	
0.01 -- 0.10	3	
0.10 -- 0.25	0	
0.25 -- 0.50	1	Total = 15

The highest individual dose was 315 millirems. This was received by the Reactor Health Physicist, who handles 95% of the radioisotopes that are made, does smear tests on all Campus sealed sources, and performs calibrations on radiation monitoring instrumentation. Individual doses to students and visitors, from dosimeter readings, was less than 10 millirems.

B. Contamination Surveys

Smear samples from 34 locations in the laboratory are taken at six to eight week intervals. The removable beta contamination is determined by checking the samples with a flow counter.

The maximum concentration occurs in the vicinity of the tubes from which samples are removed after an irradiation in the reactor. During this year there were 2,672 samples irradiated. In this area, the contamination varied from 52 to 13,600 dpm/100 cm^2 or 2.3×10^{-7} to 6.1×10^{-5} uCi/cm^2. Smears from all other areas on the floor and from laboratory benches showed a maximum of 349 dpm/100 cm^2 or 1.6×10^{-6} uCi/cm^2.

IX. NUCLEAR REACTOR COMMITTEE

The present committee is composed of 4 members of the Nuclear Engineering Academic Staff, 2 members from the Health Physics Staff, and the Reactor Supervisor. Dr. Arthur C. Chilton continued as Chairman during the year.

University of Illinois at Urbana-Champaign

Nuclear Engineering Program

214 Nuclear Engineering Laboratory
Urbana, Illinois 61801
(217) 333-2295

September 4, 1979

Director
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

SUBJECT: Annual Report, Illinois LOPRA Reactor
License No. R-117
Docket No. 50-356

The following is written to comply with the requirements of Section 6.7.f. of the Technical Specifications and the conditions of Section 50.59 of 10 CFR 50. The outline follows the number sequence of Section 6.7.f. of the Technical Specifications.

Yours truly,

Gerald P. Beck, Reactor Supervisor

Arthur B. Chilton, Chairman
Nuclear Reactor Committee

GPB/ABC:rm

Attachment

ANNUAL REPORT

August 1, 1978 - August 1, 1979

ILLINOIS LOPRA REACTOR

Facility License R-117

I. SUMMARY OF OPERATING EXPERIENCE

A. Usage

The LOPRA was scheduled for operation a total of 63 hours and was in actual operation a total of 29.3 hours. Scheduled operations averaged 5.3 hours/month and actual operation 2.4 hours/month. The LOPRA was used for training during this period. The types and percentages of usage for the scheduled time were:

Approach to Critical Experiments	51%
Operator Training	13%
Measurements	36%

B. Performance Characteristics - None

C. Changes - None

D. New Experiments - None

II. TABULATION OF OPERATION

Hours Critical* and Energy

Steady State Operation	29.3 hours	.0043 MW-hrs

*This includes time for loading fuel elements during the approach to critical experiment. Actual critical time would be about 30% of this value.

III. EMERGENCY SHUTDOWNS - None

IV. MAINTENANCE

The Poisian Control Rod and both safety rods were inspected in July. No unusual wear or corrosion was noted. The fuel elements were also inspected in July and showed no excessive signs of corrosion. There were no leaking elements detected.

V. CONDITIONS UNDER SECTION 50.59 of 10 CFR 50

There were no changes to the system or procedures during this period.

VI., VII., VIII. RADIOACTIVITY

Because of the low power and infrequent use of the LOPRA, its operation does not contribute to the release of effluents. Personnel records for the laboratory are given in the Annual Report for the Advanced TRIGA Reactor, License No. R-115, dated February 19, 1979. (Docket No. 50-151)