GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

July 13, 1971

U. S. Atomic Energy Commission
Division of Reactor Licensing
Washington, D. C. 20545

Ref. Docket 50-160

Gentlemen:

This letter is a partial response to a number of questions from the DRL staff requesting additional information on our proposed ammendment to operate at 5 Mw. Specifically, we are responding to questions Nos. 3, 4, 6, 7, and 13. Responses to the remaining questions are currently being developed.

Question 3.

"Describe and evaluate the primary $D_2O$ system's operational capabilities when the reduced flow standby pump is on line. Include the following:

"a. How the standby pump is brought on line.
"b. Effects of the reduced flow on power, flow, reactivity, secondary systems and safety interlock system settings.
"c. Effects of the secondary $H_2O$ system standby pump on the primary system's operational capabilities when on line.
"d. Effects of the reduced flow secondary $H_2O$ standby pump on the secondary system."

Response

Circulation of the $D_2O$ in the primary system will normally be provided by a centrifugal pump that will deliver 1800 gallons per minute with a total head of 130 feet. A second, standby pump, is also installed in the $D_2O$ circulating system. This smaller capacity pump is expected to deliver approximately 1200 gallons per minute flow. The purpose of the standby pump is to provide backup capability for the main pump. There is, however, no need for rapid startup of the standby pump. Should a failure of the main circulating pump occur, an administrative decision would be made as to the desirability of removal and repair of the failed unit or operation of the reactor at a reduced power. Should reduced power operation appear desirable, it would then be necessary to change the safety system interlock settings on the Power Trip and Low $D_2O$ Flow circuits. The values for the trip settings will be those specified in the Technical Specifications (not developed at this time).

Circulation of the $H_2O$ in the secondary system will be provided in a manner very similar to the one described above for the $D_2O$ system. The main $H_2O$ pump will provide a flow of 1200 gallons per minute through the shell side of the heat exchangers. There will be a standby pump which is expected to deliver approximately 1000 gallons per minute flow. Again, there is no need for rapid startup of this standby pump. The decision to use it will be an administrative one. Should this reduced flow pump be placed in service, the Low $H_2O$ Flow safety circuit would be reset. Resetting of the reactor power and $D_2O$ temperature and flow interlocks will not be required. The limitation imposed by the secondary system on the primary system is one of heat removal capacity.

The design of the secondary system was based upon conditions that do not frequently occur, i.e., very high wet and dry bulb temperatures of the air near the cooling towers. It is therefore quite likely that operation of the secondary system at reduced flow would, of itself, impose no limitation upon the reactor power or $D_2O$ circulating system. Should the need arise for reduced secondary flow concurrent with adverse weather conditions, it would require operation of the reactor at a somewhat reduced power to maintain the $D_2O$ temperatures within the limitations proscribed in the Technical Specifications.

Question 4.

"Describe the operational limitations placed on the primary and secondary systems when one of the cooling towers becomes inoperable."

Response

The existing cooling tower for the secondary water is a two-cell unit. Each of the units has its own induced draft fan and water distribution system. The collection basin, pump suction well, and tower bypass valve are common to both units. Each of the cells is capable of handling 600 gallons per minute; the bypass valve can handle the entire secondary system flow of 1200 gallons per minute. Should a failure occur in one of the cells, the water to that cell would be isolated if required. Secondary flow would then be split between the other cell and the tower bypass loop. Under these conditions it is very likely that the secondary system would be unable to remove the heat in the primary system from operation of the reactor at 5 Mw. The reactor would therefore be operated at some reduced power that was within the heat removal capacity of the secondary system and consistent with the $D_2O$ temperature limitation as specified in the Technical Specifications.

Question 6.

"Indicate what criteria will be used to determine the following:

"a. Whether emergency cooling is required following an electrical power failure.

"b. Whether long-term city water is required during emergency cooling."

Response

The criteria for the $D_2O$ emergency coolant system is to supply 8 gal/min of $D_2O$ for 30 minutes to the reactor core. This requires 240 gallons of $D_2O$. The actual storage tank will have a capacity of 300 gallons. Therefore, in the event of a power failure which initiates the addition of emergency $D_2O$ coolant to the core, there is approximately seven minutes for the reactor operator to determine whether or not the emergency coolant is actually required, i.e., that an actual loss of coolant from the reactor has occurred simultaneously with the power failure. The operator's first action will be to observe the pneumatic reactor tank level indicator for any observed drop in level (battery-powered, emergency lighting is available). The reactor operator or his designate will then proceed to the reactor tank sight glass instrument located on the main floor. If there is any indication of a dropping reactor tank level, an entry will be made into the process equipment areas.

In the manner outlined above, the reactor operator will determine whether emergency coolant is required. If coolant is not needed, he will close the manual block valve in the $D_2O$ emergency coolant supply line.

The purpose of the 300-gallon emergency coolant tank is to have an immediately supply of water available to use in the unlikely event of a loss of coolant from the reactor core. $D_2O$ is put into the tank so that periodic operational checks can be made of the system without degradation of the primary coolant $D_2O$.

Once it has been determined that emergency cooling is required, i.e., a loss of coolant condition exists, then city water ($H_2O$) will be required as soon as the 300 gallons of $D_2O$ is exhausted. The 30-minute time between initiation of $D_2O$ to the core and its exhaustion will provide sufficient time to install a quick-connect jumper into the $H_2O$ supply line to the ECS system from the building city water supply.

Question 7.

"Describe the safety precautions or safety interlock circuit which ensures that the normally locked-open manual stop valve in the emergency cooling line has been reopened following an electrical power failure or is reopened in the event that emergency coolant is subsequently required."

Response

Following a power failure, the reactor operator will determine whether emergency cooling to the core is required. If not, i.e., no loss of coolant has occurred, he will unlock and close the manual stop valve to conserve the $D_2O$ in the ECS tank. Unlocking the valve will open an interlock in the permissive startup circuitry. This will prevent a subsequent startup with the valve in the closed position.

During the time when no electrical power is available, it will be necessary for the status of the reactor tank to be monitored by a reactor operator to ascertain if there is a need for emergency cooling. Assurance of this monitoring requirement will be accomplished by administrative procedure. It will be necessary for the monitoring to continue up to eight hours following shutdown of the reactor. This operator surveillance is similar to that required following a normal reactor shutdown, except that no electrical power is available. Adequate emergency lighting is available. The level of $D_2O$ in the reactor tank will be monitored by a passive sight glass instrument located on the main floor of the containment building. Additionally, access to the process equipment area will permit monitoring of the $D_2O$ piping system. Any significant $D_2O$ loss would collect in this area of the building.

Question 13.

"Describe how it is assured during reactor operation that at least 300 gallons of coolant is in the emergency coolant tank. Indicate how valve or pipe leaks are detected. Include alarms and/or interlocks that exist."

Response

The criteria for the emergency coolant tank volume is to provide a supply of $D_2O$ at a rate of eight gallons per minute for 30 minutes. This requires 240 gallons of $D_2O$; the actual tank volume is approximately 300 gallons at overflow. The water level in the tank will be monitored by a DP cell having a low-level detection circuit. Actuation of the low-level circuit at a level equivalent to approximately 280 gallons will warn the reactor operator that the $D_2O$ is not at overflow. This same circuit will actuate an interlock in the reactor permission startup circuitry to assure that the reactor is not started up with less than 280 gallons of $D_2O$ in the tank.

The majority of the piping in the emergency coolant system will be of welded construction. This and the mild temperature and pressure conditions occurring in the system should minimize $D_2O$ leakage. Those points from which leakage might be expected, i. e., valve packings and flanges will be monitored by a conductance type leak detection system connected to the presently installed $D_2O$ Leak Detection system. There is an existing alarm on the Control Room annunciator panel to warn the reactor operator of a $D_2O$ leak.

Please advise me if you should require additional information on any of the above questions or responses. Thank you for your consideration and patience in this matter.

Sincerely yours,

R. S. Kirkland, Reactor Supervisor
Nuclear & Biological Sciences Division

RSK: jh

Lydia S. Geealer
Notary Public, Georgia, State at Large
My Commission Expires July 13, 1973

Notary Public

cc: Nuclear Safeguards Committee
Dr. G. W. Leddicotte

Research
Medicine
Education
Industry

# GEORGIA TECH RESEARCH REACTOR

900 Atlantic Drive, N. W.
Atlanta, Georgia 30318

GTRR REF. NO:

## REQUEST FOR MINOR EXPERIMENT APPROVAL

REQUESTING ORGANIZATION:
ADDRESS:

| DATE: | NAME OF CONTACT: | TELEPHONE NO: |
|---|---|---|
| | | |

MATERIAL TO BE IRRADIATED: (DIMENSIONS AND WEIGHT, INCLUDING WEIGHT PERCENTAGES OR ELEMENTS IN ALLOYS AND COMPOUNDS):

DESIRED IRRADIATION LOCATION OR FLUX:
DESIRED IRRADIATION TIME:

ITEMIZE ESTIMATED ACTIVITIES OF PRINCIPAL ISOTOPES: (ATTACH COPY OF CALCULATIONS):

| ISOTOPE | ACTIVITY | ISOTOPE | ACTIVITY |
|---|---|---|---|
| | | | |

DESCRIPTION OF SAMPLE CONTAINER:
PREFERRED RETURN SHIPPING METHOD: PURCHASE ORDER NO:
LICENSE (ISSUING AGENCY AND LICENSE NUMBER):
(ENCLOSE A COPY OF THE LICENSE UNDER WHICH POSSESSION OF THE ABOVE ISOTOPE IS AUTHORIZED.)

SIGNATURE____________________ TITLE____________________

FOR GEORGIA TECH USE ONLY:

ACCOUNT NUMBER:
IRRADIATION CONTAINER:
IRRADIATION HOLDER:
SPECIAL INSTRUCTIONS:

APPROVALS:

EXPERIMENT COORDINATOR ____________________ DATE__________

BUSINESS OFFICE: ____________________ DATE__________

REACTOR SUPERVISOR ____________________ DATE__________

O.R.S. ____________________ DATE__________

FORM II (3-68) **OFFICE OF RADIOLOGICAL SAFETY**