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Docket No. 50-231

General Electric Company
ATTN: Dr. Bertram Wolfe
General Manager
310 DeGuigne Drive
Sunnyvale, California 94086

Change No. 10
License No. DR-15

Gentlemen:

By letter dated February 11, 1972, you proposed a change to the Technical Specifications appended to Provisional Operating License No. DR-15, as amended. The proposed change, which we have designated as Change No. 10, would increase the number of irradiated fuel rods permitted in the fuel storage tank when the coolant in the storage tank is gas. Further, the proposed changes would permit the cover of the storage tank to be removed when the ambient atmosphere is air, provided that the storage tank does not contain sodium.

During our review of your proposed change, we informed your staff that certain changes to your proposal were necessary to meet our regulatory requirements. These changes have been made. We conclude that Change No. 10 does not present significant hazards considerations not described or implicit in the Safety Analysis Report and that there is reasonable assurance that the health and safety of the public will not be endangered.

Pursuant to 10 CFR 50.59, the Technical Specifications appended to Provisional Operating License No. DR-15 are changed as shown on the revised pages in Attachment A. New requirements are identified by margin bars.

Sincerely,

/S/

Donald J. Skovholt
Assistant Director
for Reactor Operations
Division of Reactor Licensing

Enclosure:
Attachment A - Revised Pages
to the Technical Specifications

D-2/29/72 A/75

cc: Paul B. Van Buren, Attorney
General Electric Company

| OFFICE ▶ | | DRL | DRL | DRL | DRL |
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| DATE ▶ | | 2/24/72 | 2/25/72 | 2/ /72 | 2/ /72 |

Form AEC-318 (Rev. 9-53)

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

February 28, 1972

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General Electric Company

ATTACHMENT A

REVISED PAGES FOR THE SEFOR TECHNICAL SPECIFICATIONS

CHANGE NO. 10

PROVISIONAL OPERATING LICENSE NO. DR-15

GENERAL ELECTRIC COMPANY

DOCKET NO. 50-231

4. If the irradiated fuel storage tank has never contained sodium and residual sodium has been removed from stored components, the tank covers may be removed while the inner containment atmosphere contains more than 5 v/o oxygen.

(1) Fin assembly operations for the In umented Fuel Assembly.

(2) Removal of reactor vessel surveillance samples.

(3) Checking of core clamps.

(4) Replacement of reactor head seals.

During these operations, the oxygen content of the inner containment will remain well below the allowable limits and will be maintained as low as possible by means of the standard operating procedures. Bagging techniques will be used for the marine hatch when necessary. Clean room inventory procedures will be used to account for all tools and other items taken into and out of the cell, and lanyards or other keepers will be attached to all tools to prevent their falling into the reactor. A temporary cover will be installed over the core whenever possible. The sodium level will be lowered to the refueling level (below the tops of the extension rods), thus significantly reducing the sodium surface area exposed to the cell atmosphere. The sodium temperature will be reduced to as low a value as is practical, and will be kept within the allowable limits of 300°F to 450°F.

Temporary breaching of the inner containment barrier to repair equipment necessary to cover an open vessel of sodium would be less hazardous than leaving the vessel open for an extended period of time. Written procedures will be used to carry out such an operation with special attention given to maintenance of the argon atmosphere in the refueling cell.

The purpose of requiring less than 5 v/o oxygen under certain conditions is to reduce the severity of sodium fires, as discussed in the bases for Paragraph 3.5.B. Therefore, if the IFST has not been filled with sodium, the covers can be safely removed when the oxygen content of the inner containment atmosphere contains more than 5 v/o oxygen.

Use of the horizontal transfer port is not required, because handling operations that could be performed using the port are not planned. This port was included in the design for potential future use if a need for it should arise. No such need has been identified as yet.

The maximum allowable leakage rates are established on the basis of potential radiological effects as calculated for the CBRE.[3] These calculations show that the radiological effects calculated on the basis of the allowable leakage rates fall well within the guidelines given in 10 CFR 100.[4] The allowable leakage rates for each containment were calculated by the method recommended in Reference (5). Values for the outer containment and inner containment are identified by the subscripts, o and i, respectively, when appropriate. The

allowable leakage tes[6] are based on the conditi 's used in calculating the radiological effects as shown in the FDSAR. The allowable leakage rate

## 3.8 Irradiated Fuel Storage Tank

Applicability

Applies to parameters associated with the irradiated fuel storage tank whenever one or more fuel rods are stored in the tank.

Objective

To maintain safe conditions in the irradiated fuel storage tank (IFST).

Specification

A. When the IFST contains one or more irradiated fuel rods and sodium is used for cooling the fuel rods, the following conditions shall be maintained:

   1. The sodium temperature shall be maintained between 300°F and 500°F.
   2. The sodium level in the IFST shall be maintained at or above the opening of the discharge duct attached to nozzle N-6.
   3. The detachable lower end of the dip-tube drain line shall not be installed when more than 30 irradiated fuel rods are stored in the IFST.

B. Irradiated fuel rods may be stored in the IFST without adding sodium to the tank for cooling purposes, provided that the following conditions are maintained:

   1. The total decay heat load from fuel rods in any channel shall be less than 90 watts.
   2. The total decay heat load for all fuel rods in the IFST shall be less than 10 kW. If at anytime the heat load is greater than 6 kW, the IFST shall not be filled subsequently with sodium.
   3. Each channel in the IFST shall contain at least two unoccupied fuel rod positions which shall be diametrically opposite each other.
   4. At least one of the three nitrogen blower-freon cooling systems shall be operating when the heat load from irradiated fuel rods in the IFST exceeds 1 kW.

5. If conditions occur which prevent cooling of the IFST by the nitrogen blowers, as required by Paragraph 4 above or the IFST nitrogen cooling gas outlet temperature is above 150°F, the refueling cell shall be closed to establish its containment integrity, and one or more covers shall be removed from the IFST.

C. The criticality factor within the tank shall be less than 0.95.

D. The gas pressure in the tank shall be less than 5 psig.

E. The lower surface of the tank cover shield blocks shall not be elevated more than eight feet above the refueling cell floor.

Bases

The sodium temperature in the irradiated fuel storage tank will normally be maintained between 350°F and 400°F.(1) A value of 700°F was used as a basis for its design.(2) The specified upper limit of 500°F provides margin to assure that the design temperature will not be reached. The minimum value of 300°F provides assurance that sodium plugging or freezing will not occur.

The sodium level in the tank will remain well above the top of the fuel region as required by 3.8.A. It is not possible to lower the sodium below the specified level without installing a special dip-tube in the tank.(3)

The irradiated fuel storage tank is designed to store and cool up to one and one-half cores of irradiated fuel using liquid sodium. Since refueling is not necessary or planned during the planned experimental program, the number of irradiated fuel rods that will be stored in the tank until the end of the program is expected to be less than 30. Results from analyses have shown(4) that this number of fuel rods, irradiated for an infinite time at 20 MWt, can easily be cooled with only argon gas in the tank. If the decay heat load for a given fuel rod were less than the value assumed in the analyses, the cladding temperature would be reduced, even though the argon temperature remained at the assumed value (210°F). If the total decay heat load from rods stored in the tank were less than the assumed value, the argon temperature would be correspondingly reduced. Consequently, it will be safe to store more than 30 irradiated fuel rods in the tank provided the total decay heat load is less than the specified value. This heat load will be estimated based on the irradiation history of each rod. Therefore, the specification is written to allow storage of more than the expected maximum of 30 irradiated rods without sodium in the tank to provide for the possibility of temporary storage of additional irradiated rods during investigation of unexpected reactor problems and during future preparations for decommissioning of the reactor.

Storage of the full core loading of irradiated fuel rods in the IFST without adding sodium to the tank is permitted by the specifications. Under these conditions, the irradiated fuel rods are cooled by natural circulation of gas within the tank and the heat is removed by the nitrogen cooling system for the IFST. If necessary, the decay heat can also be removed by free convection to the refueling cell atmosphere when the tank covers are removed.

During periods of normal facility operation, the number of fuel rods in the tank will be small, and they will be located such that there is only one rod per channel, insofar as this is practical. With only one fuel rod per channel, adequate cooling can be provided for the maximum plausible decay heat, as discussed above.

A larger number of irradiated fuel rods may be stored in the tank as permitted by Section 3.8.B. The decay heat load for fuel rods can be estimated from the operating history of the reactor,[8] the rod position in the core, and the core power radial profile. The limit for heat load in a single channel corresponds to the decay heat load of four fuel rods from the center of the core with a core decay heat load of 10 kW. Although such a loading is permissible, it is planned to distribute the hottest fuel rods throughout the IFST, so that the maximum heat load per channel will be reduced. For a total decay heat load of 10 kW, the average decay heat per channel is about 62 watts. The maximum total decay heat load of 10 kW provides assurance that the gas temperatures within the IFST will remain below 600$^{\circ}$F and that the maximum fuel cladding temperature will remain below 1000$^{\circ}$F. The value of 10 kW, or 34,130 Btu/hr, is well within the value of 140,000 Btu/hr used to evaluate emergency cooling with one $N_2$ blower[9] and the maximum expected decay heat load for the IFST. Thermocouples installed in the IFST atmosphere will be used during initial loading of the fuel to verify experimentally that a margin exists between actual and computed gas temperatures.

Evaluations of the effect on the IFST at heat loads greater than 6 kW without sodium have not been complete enough to support subsequent use of the IFST as a sodium containing vessel. Additional structural analysis would be required to support filling the IFST with sodium if at anytime the heat load has exceeded 6 kW.

At least two rod positions will be unoccupied in each of the standard channels to assure proper cooling flow to the channel through the support plate at the bottom of the channel and to provide sufficient coolant flow area within the channel.

Nitrogen cooling for the IFST can be provided by one blower during reactor shutdown conditions. The nitrogen flow rate will be adjusted as necessary, based on temperature data from the IFST. If a malfunction of the nitrogen cooling system were to occur such that none of the three independent systems were operable, the fuel cladding temperatures would increase slowly, 40°F/hr based on the heat capacity available in the fuel and internal to the hexagonal storage channels and a decay heat load of 10 kW. At 1 kW, the rate of temperature increase would be negligible. Their initial temperature would be less than 1000°F. During this time, the refueling cell containment integrity would be established, if it were not already established, and the IFST covers would be removed. This would permit removal of the decay heat by natural circulation to the gas in the refueling cell. The heat capacity of the cell walls is large; therefore, the cell temperature would increase slowly, and there would be sufficient time to re-establish the operability of at least one of the three nitrogen cooling systems. The normal inlet temperature to the IFST cavity is 90°F and the outlet is 113°F when the flow rate is matched to the heat load. A 150°F outlet temperature would indicate a significant reduction in flow and a potential need for backup cooling, but would still permit heat removal with acceptable temperatures in the IFST.

The storage array and materials used in the tank are designed to permit storage of one and one-half reactor core loadings of fuel in such a manner that non-criticality is assured. A radiation monitor is provided to assure warning of any unforeseen increase in the criticality factor.

The gas pressure will normally be set at 1/2 psig. A value of 5 psig was used for tank design requirements, and the tank has been hydrostatically tested to a pressure equal to 1.5 times the sum of 5 psig cover gas pressure plus 127 inches of sodium at 400°F.[5] A rupture disk-type safety relief valve designed for 5 psig is installed in the tank cover gas system.

The tank cover shield blocks will normally be removed one at a time, which requires a lift of only one foot to permit stacking on an adjacent shield block. If all three shield blocks are removed and stacked on the head storage stand (as provided for in the equipment design), the third shield block would have to be raised about 6.5 feet above the cell floor. The tank and shield blocks have been designed so that if a shield block were dropped inadvertently from a height of up to 10 feet 9 inches above the cell floor (12 feet above the tank flange), it would not be able to enter the tank and damage the fuel rods.[6,7]

References


(1) SEFOR FDSAR, Supplement 13, Para. 2.2.4, p. 5.

(2) SEFOR FDSAR, Supplement 13, Para. 2.3.2, p. 6.

(3) SEFOR FDSAR, Supplement 13, Para. 2.4.8.1, p. 20.

(4) SEFOR FDSAR, Supplement 21, p. 34.

(5) SEFOR FDSAR, Supplement 13, Para. 2.5.5, p. 24.

(6) SEFOR FDSAR, Supplement 18, Answer to Question 6, p. 18 ff.

(7) SEFOR FDSAR, Supplement 19, Answer to Question 3, p. 12 ff.

(8) Proposed Change No. 9 to the SEFOR Technical Specifications, dated February 11, 1972.

(9) SEFOR FDSAR, Table V-11, p. 5-23.

TABLE 4.1-1

MINIMUM FREQUENCIES FOR TESTING

OF SAFETY INSTRUMENTATION

| Channel | Channel Check | Channel Test | Channel Calibration | Remarks |
|---|---|---|---|---|
| Source Range Monitor | ea strt up | 1/wk | 1/6 mo | |
| Wide Range Monitor | 1/d | 1/wk | 1/6 mo | |
| Undervoltage Relays | N/A | 1/mo | 1/6 mo | |
| a) 2.4 KV Main Bus | | | | |
| b) 480 V Bus 2A | | | | |
| Sodium Level Probes | 1/d(1) | 1/mo(2) | 1/6 mo(3) | (1) Check of DC current to the probe. (2) Change of process level to effect a level trip. (3) Initial calibration shall be based on verification of probe position. Subsequent calibration shall use J-probes as a reference. |
| a) Reactor Level | | | | |
| b) Aux. Expansion Tank | | | | |
| c) Main Expansion Tank | | | | |
| Temperature Monitors | 1/d | 1/wk | 1/6 mo | |
| a) Reactor Core Outlet Upper Region | | | | |
| b) Reactor Core Outlet Lower Region | | | | |
| c) Reactor Cavity | | | | |
| d) Main Secondary Cold Leg | | | | |
| e) Aux. Primary Pump Duct Wall | | | | |
| f) IFST $N_2$ Cooling | | | | |
| Flow Monitors | 1/d | 1/wk | 1/6 mo | |
| a) Main Primary | | | | |
| b) Main Secondary | | | | |
| Pressure Switches | N/A | 1/3 mo | 1/6 mo | |
| a) Reflector Accumulator Switch (Hi) | | | | |
| b) Reflector Accumulator Switch (Lo) | | | | |
| Reflector Accumulator Leak Detector | N/A | 1/3 mo | 1/6 mo | |
| Ventilation Radiation Monitor | 1/d | 1/wk | 1/6 mo | |
| High Differential Pressure Monitor (Reactor cover gas - drain tank cover gas) | N/A | 1/mo | 1/6 mo | |

Change No. 10
February 28, 1972