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AUG 1 6 1971

Docket No. 50-231

Change No. 5
License No. DR-15

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

Gentlemen:

By letter dated August 6, 1971, you submitted Proposed Change No. 6 to the Technical Specifications appended to License No. DR-15 for the SEFOR reactor. The proposed change would increase the minimum allowable ejection time of the Fast Reactivity Excursion Device.

After reviewing the proposed change, we conclude that it 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. We have redesignated the proposed change as Change No. 5. Pursuant to 10 CFR 50.59, Change No. 5 is hereby authorized as indicated by margin bars on the enclosed replacement pages 3.12-2, 3.12-3, 3.12-3.1, and 3.12-5 for the Technical Specifications.

Sincerely,

Original Signed by
Peter A. Morris

Peter A. Morris, Director
Division of Reactor Licensing

Enclosure:
Replacement pages

cc: Paul B. Van Buren, Attorney
General Electric Company
175 Curtner Avenue
San Jose, California 95125

Dispatched 8/19/71

A/66

OFFICE ▶	DRL	DRL	DRL	DRL	DRL	DRL
SURNAME ▶	RWWoodruff:pl	SATeets	RJSchemel	DJSkovholt	FSchroeder	PAMorris
DATE ▶	8/13/71	8/13/71	8/13/71	8/16/71	8/16/71	8/16/71

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

August 16, 1971

Docket No. 50-231

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310 DeGuigne Drive
Sunnyvale, California 94086

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General Electric Company
175 Curtner Avenue
San Jose, California 95125

B. General

1. An excursion test shall be performed with the FRED only if the analysis of previous operating data indicates that the sodium-in Doppler coefficient ($T\frac{dk}{dT}$) is negative and has a magnitude equal to or greater than 0.005.

2. The time required for the poison slug to travel the first 20 inches after lift-off shall be equal to or greater than 0.097 second.

3. The main primary coolant flow rate shall be at least 4000 GPM when the poison slug is ejected from the core.

4. The scram system may be modified in accordance with the description in Supplement 17 to the FDSAR, page G-1, to provide an additional 400 millisecond delay between a scram signal and the point in time when the reflector segments start to move.

5. Whenever a poison slug worth more than 1$ is lowered into the core by means of the FRED, containment integrity shall be maintained and the isolation valves on the outer containment ventilation lines shall be closed.

6. If fuel rod inspections called for in Section 4.3 indicate that the limits of fuel defects (as defined in Section 3.3.K.2 and 3) are being approached, succeeding excursion tests shall be limited to power excursions below that at which such behavior was observed.

7. The initial reactor power level for excursion tests shall be equal to or greater than 0.1 MW.

8. System checkout of the FRED components may be performed at power levels less than 0.1 MW, provided the initial position of the poison slug is more than 20 inches above the core mid-plane.

9. The core coolant inlet temperature shall not be below 700°F at the start of each excursion test.

10. Excursion tests shall not be conducted if there is evidence that the core contains defective fuel rods.

Change No. 5
AUG 1 6 1971

Bases

The experimental program with FRED is graded so that small transients precede larger transients. The information from the small transients will be used (1) to evaluate the performance of the reactor, (2) to compare the performance with predicted behavior, and (3) to predict performance of the reactor for the larger prompt critical transients.

The characterization of the tests into the categories of (1), (2) and (3) above is self-explanatory. The maximum power levels indicated in each case are to assure that the safety limits as given in Section 2.1 will not be violated and are in accordance with Figure 2.1-1 and the explanation in Section 2.1. The limits given in this specification also assure that the maximum energy addition to the core during a planned transient does not exceed that calculated for the Maximum Planned Transient.[10] This in turn assures that the maximum consequence of inadvertently running a transient with a defective (sodium-logged) fuel rod in the core would be limited to deformations corresponding to about 0.6% strain of the cladding of the defective fuel rod.[11] This amount of strain is only 4% of the minimum ductility of the SEFOR cladding at the end of the three-year experimental program.[12]

The value of the Doppler coefficient for SEFOR Core I with sodium in the core is estimated to be $T\frac{dk}{dT} = -0.0085$. This value was verified experimentally by means of Doppler measurements on the SEFOR mockup in the ZPR-III Critical Facility.[1] From further measurements on this mockup, it was established that the Doppler coefficient with sodium out is 17.5% lower than the value with sodium in, or $T\frac{dk}{dT} = -0.0070$ for SEFOR Core I with sodium out.

The safety analysis of the MHA for SEFOR was based on a sodium-out Doppler coefficient of $T\frac{dk}{dT} = -0.004$, which corresponds to a sodium-in Doppler coefficient ($T\frac{dk}{dT}$) of -0.005.[2] The demonstration of a negative

Doppler coefficient with a magnitude equal to or greater than 0.005 during the approach to maximum power will verify predictions of this coefficient based on the ZPR-III measurements and will provide the basis for safe performance of prompt critical tests in SEFOR.

The total reactivity worth of each poison slug used in the FRED will be known and the value will be checked before each transient test. The maximum reactivity insertion rate will be limited to less than 20$ per second by limiting the reactivity worth of the slug to 1.3$ and by limiting the minimum allowable time for the slug to travel the first 20 inches to 0.097 second.[3] This time will be measured by means of the lift-off switch and a proximity switch which marks 20 inches of travel by the poison slug. The safety of the plant has been assessed for a maximum rate of 50$ per second with a sodium-out Doppler coefficient ($T\frac{dk}{dT}$) of -0.004.[4]

starting from initial power levels as low as 0.1 MWt is still well below the safety limit.

Initial checkout tests of the FRED after it is installed on the reactor head will be performed with the reactor either sub-critical or at low power level (less than 0.1 MWt). The FRED will have a negligible effect on reactivity when it is in a position more than 20 inches above the core midplane.

The minimum limit of 700°F on the core coolant inlet temperature is to assure that the total reactivity of the core is maintained at the equivalent of 50¢ excess at 20 MW conditions.(5) At lower temperatures, the excess core reactivity would be higher. The 50¢ excess limit assures that the Maximum Planned Transient will not be initiated from a power level in excess of 11 MWt, and also limits the final reactor power if the reactor does not scram and the FRED slug remains out of the core following any excursion test.

References

(1) SEFOR FDSAR, Appendix B, Section B.5, p. B-3.

(2) SEFOR FDSAR, Section 16.4.2.6.1.1, p. 16-28.

(3) Proposed Change No. 6 for the Southwest Experimental Fast Oxide Reactor, August 5, 1971.

(4) SEFOR FDSAR, Volume II, Section 16.2.7

(5) SEFOR FDSAR, Volume II, Section 16.2.7, p. 16-10.

(6) SEFOR FDSAR, Supplement 17, p. G-1.

(7) SEFOR FDSAR, Supplement 3, Section 5.1.3.

(8) SEFOR FDSAR, Supplement 19, p. 57.

(9) SEFOR FDSAR, Volume II, Section 12.3.6, pp. 12-15, 16.

(10) SEFOR FDSAR, Supplement 10, page 1-48

(11) Additional Information Regarding Sodium Logging of SEFOR Fuel Rods, February 1, 1971.

(12) SEFOR FDSAR, Supplement 21, page 4.