Docket No. 50-231
ERF:BKL

DEC 1 1964

General Electric Company
Atomic Products Division
P. O. Box 254
San Jose, California

Attention: Mr. George White
Manager

Gentlemen:

Reference is made to the application filed jointly by the General Electric Company and Southwest Atomic Energy Associates for licenses to construct and operate the Southwest Experimental Fast Oxide Reactor. We have completed an initial review of the Preliminary Hazards Summary Report submitted with this application and have developed a list of additional information (copy attached) that is necessary to complete our review.

If you desire to discuss any of these items before submitting a formal reply, we will be pleased to arrange a meeting at your earliest convenience for this purpose.

Sincerely yours,

R. L. Doan, Director
Division of Reactor Licensing

Enclosure:
Questions on SEFOR - 6

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QUESTIONS ON SEFOR PRELIMINARY SAFEGUARDS SUMMARY REPORT

1. Plant Site and Environment

a. Amplify the information presented on the seismology and geology of the site by summarizing the seismic history of the area. Provide an estimate of the maximum ground acceleration which might credibly occur at the site during the lifetime of the plant, and discuss the possibility of differential ground movement.

b. Provide information concerning the frequency and severity of storms experienced at or near the plant site, including tornadoes and other cyclonic storms. Describe the probable damage, and the consequences of this damage, that could be caused by these severe storms.

c. Describe the program being conducted to obtain accurate water table data for the site. Describe the provisions to be included in the design of the site facilities for the indicated high water table. What is the estimated rate of ground water and surface water movement from the SEFOR site toward the nearest locations of public water utilization?

d. In view of the dissimilarity in the local topology of Springfield, Missouri; Little Rock, Arkansas; Hanford, Washington; and the SEFOR site; provide justification of the use of the local climatology from any of these locations to describe dispersion characteristics at the SEFOR site.

e. Describe the design criteria used to determine that the required stack height is 110 feet. Is it anticipated that the distribution of the effluent from the 110 foot stack may be affected by local terrain which rises approximately 200 feet above the site elevation? What limitations on stack effluents will be required to prevent undue uptake of radioactive materials by dairy cattle?

f. Describe the meteorological program to be conducted prior to reactor operation to develop diffussion parameters applicable to the proposed facility.

2. Containment

a. Inasmuch as the first containment barrier consists of reinforced concrete cells whose design is presently not fully defined by code rules, provide the design criteria which will be applied with respect to:

(1) the design stress (limits of primary and secondary stresses in terms of per cent of yield strength) for the reinforcing steel and containment liner for each combination of calculated loadings associated with (a) normal operating conditions (b) the pressurized condition during the structural integrity proof test (c) the leakage rate test pressure conditions, and (d) the postulated design accident condition;

(2) the margin of safety provided in the proposed reinforced concrete structure as compared with the margin available in a steel containment vessel designed in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Nuclear Vessels Class B.

b. Provide the design specifications or criteria which will be applied to reflect the consideration given to the first containment barrier and second containment barrier with respect to:

(1) the capability of the first containment barrier to withstand an external pressure imposed by the pressurization of the second containment barrier during an integrated leakage rate test if pressure equalization is not planned between containments, or

(2) the capability of systems, equipment, and instrumentations in the first containment barrier, whose operation is essential from a safety standpoint, to withstand the design pressure of first barrier containment without impairment of function, if pressure equilization is planned between containments during an integrated leakage rate test.

c. Provide the basis for the proposed substitution of a periodic soap bubble test at 5 psig of penetrations of both containment barriers (without measurement of leakage rate) in lieu of integrated leakage rate measurements and the basis of leakage rate extrapolations proposed in determining the leakage rate at peak accident pressure, if leakage rate tests of both barriers are planned at pressures less than the design pressure.

d. On the basis that the first containment barrier is designed to contain an explosion equivalent to 200 pounds of TNT, state the design criteria to be applied or provisions planned to insure that the maximum design leakage rate selected for the first containment barriers will not be exceeded due to the transmission of the shock waves from this postulated accident.

e. With respect to the leakage monitoring systems proposed (a) for individual cell or liner penetrations on a continuous basis, and (b) for electrical penetrations and access locks on a periodic basis, state the proposed pressures at which monitoring will be performed and the basis for the selection of the test pressure.

f. State the criteria or provisions planned (a) to verify the leak tight integrity of all isolation valves and the vacuum breakers of the second containment barrier, and (b) the means proposed to verify the operability of the isolation systems under accident conditions, giving particular attention to the possibility that portions of the system may be exposed to severe environmental conditions.

g. Discuss the manner in which effects of severe weather conditions have been factored into the design criteria or specifications of the second containment barrier.

h. Discuss in detail the basis on which the maximum design pressures in the primary and secondary containment barriers were determined.

i. What are the design criteria for all the seals within the first containment cells and at penetrations through the first and second containment barriers. Indicate the type or types of seal to be used, the pressure and temperature operating limits, permissible leakage and method of leak testing.

3. Reactor Design

a. Calculate the maximum reactivity effect that could be associated with a vertical movement of a portion of the core, within the freedom of movement provided by the design.

b. Submit the criteria which will be used to establish the limits on (a) the available excess reactivity in the core, and (b) the minimum normal shutdown margin and the margin provided for the possibility of stuck rods.

c. The description of the core loading indicates a complex fuel handling program. Describe the considerations to the applied to ensure that (a) the fuel rods are easily distinguished from boron and steel rods and (b) placement of a given rod into its required location is guaranteed.

d. Provide the vessel design specification as required by paragraph N-141 of Section III of the ASME Boiler and Pressure Vessel Code.

e. Describe the material surveillance program which will be employed to monitor and predict the mechanical property changes of reactor vessel material caused by the irradiation at the reactor vessel belt line.

4. Plant Design

a. Discuss the criteria to be used in the design of the various plant components and containment as they are affected by seismic forces.

(1) State how the siesmic design criteria are applied in design of the various structures and components. Include representative lists of the primary and auxiliary equipment that must continue to function during and after an earthquake in order to provide adequate protection to public health and safety. If appropriate, provide a family of curves on a log-log plot of acceleration response spectrum as a function of period from 0.01 second to 1.0 second for various values of damping. State how these curves will be used in the seismic design of t[illegible] facility and structures, and provide a table of damping factor[illegible]r typical structures and components.

(2) State the maximum allowable stresses in terms of a percentage of working or yield stress for these structures and components under seismic, functional, and accident loadings.

b. Discuss the design features incorporated into the plant design in view of the site's location in an area with a relatively high incidence of tornadoes.

c. Describe the material compatibility criteria to be used in the selection of the insulation for plant components.

d. State the criteria that will be used to establish the integrity and periodic replacement of the removable filter spools in the main and auxiliary primary coolant loops.

e. Assuming a rupture of the primary main coolant loop, are there conditions which could occur as a result of auxiliary loop operation, auxiliary loop component failures, or differences of elevation between auxiliary coolant system and the reactor which could cause the auxiliary loop to also become inoperative?

f. What is the basis for your design criteria relating to the use of single wall piping in the main and auxiliary primary sodium coolant systems?

g. Describe the means by which the leak tight integrity of the reactor safety vessel will be periodically verified.

5. Waste Disposal

a. Provide information on the path taken by the low level liquid waste subsequent to its discharge from the plant. What considerations have been given to the possibility of reconcentration of discharged wastes?

b. In view of the location of the liquid and gas holdup tanks external to the plant containment, describe your criteria concerning operational restrictions for the radwaste system which will limit the activity release from the radwaste system to acceptable limits in connection with the plant design accident, lesser magnitude accidents, or damage and destruction due to natural phenomena.

6. Control and Safety Instrumentation

Outline the design criteria that will be utilized in design development and procurement of control and safety instrumentation. In particular, emphasize basic tests that will be performed on both the individual components and the systems to verify their reliability under normal and abnormal service conditions. Will circuits be designed in such a manner that no single component or wiring failure can compromise the effectiveness of the safety system?

7. Safety Analysis and Dose Calculations

a. Provide the assumptions, model, and results of analyses which, using the Bethe-Tait approach, lead to the conclusion that 1600 Mw-sec of energy appears to be an upper bound to the severity of excursions. Discuss the relationships between the 400 Mw-sec blast energy release,

which is used as the first containment design basis, and the 1600 Mw-sec release described above.

b. In our evaluation of the dose calculations provided for the modified Bethe-Tait accident, we have identified areas in which the assumptions used in the Safety Analysis appear to be inadequately supported. Accordingly, the accident dose calculations may not be suitably conservative and consideration should be given to their re-evaluation based on the following considerations:

   (1) Following the modified Bethe-Tait design accident excursion, the transient pressure and temperature of the atmosphere inside the first containment barrier is determined by a combination of several factors, such as gas heating, combustion, available volume, cell leak rate, and heat transfer through the cell walls. Under some conditions, it appears that the leak tightness of the first containment barrier may not be maintained to the degree assumed in the analysis. As the first containment barrier is used in establishing the leak rate for the dose calculations, it appears prudent to consider all the various possible combinations of conditions that might disrupt the integrity of the first containment barrier. In particular, it appears that the following cases should be considered:

      (a) the refueling cell contains an argon atmosphere which is heated and pressurized as a result of ejection of the core contents from the reactor vessel; failure of the reactor ~~shield~~ vessel and/or intercell rupture disks also makes the atmosphere (assumed to be air) of the reflector and reactor shield cell available to react with the accident excursion products in the refueling cell. The resulting atmosphere is available to leak out of the first containment into the second containment barrier at a rate that can be realistically established by the foregoing considerations.

      (b) similar to case (a) but with an initial air atmosphere in the refueling cell.

   (2) Inasmuch as the core may vaporize during an excursion and sodium coolant may not be available to trap fission products or plutonium, it appears that essentially all of the fission products and plutonium could be released from the fuel directly into the containment cell. Unless evidence to the contrary is available, it appears prudent, in order to establish a conservative basis for the analysis, to assume that (a) 50% of the iodine and 10% of the plutonium could remain airborne and available to leak out of the first containment barrier, and (b) subsequent to leakage from the first containment barrier, 50% of the iodine and all of the plutonium could remain airborne and available for leakage through the second containment barrier.

(3) In view of the absence of directly applicable data from the site, calculations of the dispersion of radioactive effluent from the reactor containment building should be based on suitably conservative meteorological conditions.

c. State the criteria, and its basis, that will be used to establish the relationship between a measured Doppler coefficient and the worth of the FRED.

d. Provide an analysis of the probability and consequences of a potential fuel meltdown accident in the spent fuel storage pit as a result of a loss of sodium coolant from the pit.