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Docket No. 50-244

K. R. Goller, Assistant Director for Operating Reactors, DOR

ROUND ONE QUESTIONS - FUEL POOL CAPACITY EXPANSION

Plant Name: R. E. Ginna/Rochester Gas & Electric
Docket No: 50-244
Responsible Branch: ORB-1
Project Manager: T. V. Wambach
Requested Completion Date: March 12, 1976
Applicants Response Date Necessary For
Next Action Planned On Project: April 12, 1976
Review Status: Awaiting Response

Enclosed are the first round questions and positions for the Ginna fuel pool capacity expansion. These questions were prepared by S. Block, R. J. Clark, F. Clemenson, J. Donohew, C. Hofmayer, E. Lantz and M. Wohl.

Original signed by
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Attachment:
As stated

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"revised Radiological Evaluation" 3/15/76

OFFICE➤	DOR:RSB	DOR:OT/PSB	DOR:AD/OT	DOR:EB	DOR:EEB
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DATE➤	3/12/76	3/12/76	3/10/76	3/12/76	3/15/76

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NUCLEAR ANALYSIS

1. In the introduction it is stated that the new racks will have a mean distance between centers of fuel of 12 1/2 inches. This appears to be in error. Show how this number was calculated.

2. How do you plan to prevent the possible insertion of a fuel assembly into an H_2O box?

3. Will it be possible for the water holes in the H_2O boxes to be plugged so that the boxes may possibly not get filled with water or the water expelled by steam? How is this to be insured against over the life of the plant?

4. What active fuel length and what axial reflector savings were used for the base reactivity calculation which gave a k_{eff} of 0.8779?

5. Has a calculation with the 180° rotational symmetry boundary condition in the PDQ-7 program been verified with a critical experiment? If it has please describe the verification and provide the reference. If it hasn't please verify the 180° rotational symmetry boundary condition in PDQ-7 in an unambiguous way.

6. Since the heterogeneity of the water in this lattice is very important; as an additional check on the 180° rotational symmetry boundary condition please calculate the k_∞ of the transposed lattice cell; i.e., one with the H_2O space in the center surrounded by fuel assemblies. To do this you will probably have to use a stepped boundary between the fuel assembly and the H_2O since it will be at a 45° angle, but this should be a reasonable check on the 180° rotational cell calculation.

7. Please calculate the K_∞ of the cell described in Request 6, in which the fueled half is a composition which represents the most reactive fuel assembly (i.e., a new assembly with 3.5% U^{235} in fuel, pure H_2O at 68° F, and minimum burnable poison) as a function of the density of the pure H_2O in the other half of the cell. Plot a curve of the k_∞ all the way from almost zero density for the H_2O in the water box to a density of 1.0 gm/cm^3.

8. The calculations you have made were only for assemblies fueled with U^{235}. These calculations are not adequate for assemblies fueled with the mixed oxide; i.e., UO_2 + PuO_2. Because of their larger temperature defect these assemblies may be more reactive at fuel pool temperatures. If during the lifetime of this storage facility you forsee the possible use of mixed oxide fuel assemblies, please either make sufficient allowance for it in your subcriticality calculations or make the commitment that at that time you will be willing to remodify this facility if it does not meet the NRC subcriticality requirements.

ACCIDENT ANALYSES

Position 1 The licensee has stated that an analysis of the "cask drop" accident will be submitted to the NRC prior to the use of a spent fuel cask. Since R.E. Ginna Unit 1 fuel storage pool does not have a separate pit for the shipping cask, and thereby lacks protection for the spent fuel in the event of a cask drop and/or cask tip accident in the pool, we will require that the licensee provide information which will demonstrate that the cask handling crane meets or has been suitably modified to meet Branch Technical Position APCSB 9-1 entitled, "Overhead Handling Systems For Nuclear Power Plants." This submission and review must be found acceptable to the staff prior to handling the spent fuel shipping cask.

1. In reference to ANSI N17.2-1973, which states, "Heavy loads shall not be carried over stored fuel assemblies. The design shall prevent lifting a fuel shipping cask over fuel storage racks." Also, "Cranes capable of carrying heavy loads should be prevented, preferably by design rather than by interlocks from moving into the vicinity of the pool". FSAR Figure 1.2-12 shows the range of travel of the crane extends over the stored spent fuel therefore with the aid of drawings describe how the requirements of ANSI N18.2-1973 are met when handling heavy loads including the spent fuel shipping cask.

2. The proposal to increase the storage capability of the spent fuel storage pool from 210 fuel assemblies to 595 appears to change the possible consequences if an object such as a tornado missile or dropped crane load impacts on the stored spent fuel. Provide the following additional information:

(a) Assuming a tornado, as described in Regulatory Guide 1.76 passes over the Auxiliary Building and the spectrum of missiles and their associated parameters as presented in Standard Review Plan 3.5.1.4, demonstrate that the radiological release, should they impact the spent fuel pool, will be kept within acceptable limits.

(b) Assume that the lower block of the main crane hook, which is not carrying any load, "two blocks" as it passes over the stored spent fuel; i.e., the crane up-limit switch fails such that the two blocks come together and the cable is broken. Please provide an analysis which demonstrates that the resulting radiological release will be within acceptable limits should the hook and the lower load block fall into the pool or please show

how the hook and lower load block can be prevented from falling into the pool should "two blocking" occur.

THERMAL-HYDRAULIC ANALYSIS

1. Figure 9.3-1 of the FSAR shows that the spent fuel pool water is cooled by a single loop having a pump and heat exchanger. Assuming a failure or maintenance requires that the heat removal system be stopped for repairs describe and discuss:

   (a) the rate of rise in pool water temperature and its maximum temperature before the backup cooling system mentioned in Section IX C of Attachment B is installed and operational,

      (1) with the aid of drawings, this backup cooling system,

      (2) any portions or requirements of the backup system that is to be used to cool the fuel pool water that may degrade or otherwise impair the operation of equipment essential in attaining and maintaining the reactor in a controlled safe shutdown condition.

2. In reference to the Spent Fuel Pool increased heat removal capability mentioned in Attachment B Section I present the following:

   (a) the design criteria

   (b) the proposed P&I diagram

   (c) the proposed increase in heat removal capability

   (d) the schedule for the submittal of this amendment and the installation completion date.

3. On Attachment B page III-3 it is stated that, "The Spent Fuel Pool water temperature is measured and a high temperature alarm is actuated in the control room if the Spent Fuel Pool water temperature exceeds 115°F." But on page VI-1 it is stated that the cooling system must be capable of maintaining the Spent Fuel Pool (SFP) temperature less than or equal to 120°F during Normal Refueling operations and less than or equal to 150°F during Full Core Discharge situations. Under this proposal please describe and discuss what additional means will be provided to inform the operator of water temperature in excess of 120° and 150°F.

4. Since a refueling load will consist of 40 fuel assemblies and the new racks will have a capacity to store 595 fuel assemblies, describe and discuss what measures will be taken to prevent grouping all of the last discharged batch of fuel assemblies in one area and thereby avoiding (a) local water temperatures

much higher than that indicated by the bulk pool water temperature monitoring system and (b) avoiding high direct radiation levels due to a higher local concentration of radionuclides.

5. FSAR Figure 9.3-1 indicates that makeup water to the spent fuel pool is provided by the makeup water system. Verify that the makeup water system is a seismic Category I system as set forth in Regulatory Guide 1.13 Fuel Storage Facility Design Basis Regulatory Position C-8.

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RADIOLOGICAL EVALUATION

1. Please provide the following information related to the water purification system:

   (a) What is the maximum and average volume of water in the SFP?

   (b) What is the present equipment in the purification system, and what additional equipment will be added due to the expansion of the capacity of the SFP? Please state the size of the equipment and the criteria for the replacement of the demineralizer and filter.

   (c) What are the <u>design</u> and <u>normal</u> purification flow rates for the present and for the new purification systems? What is the frequency of operation of the present purification system equipment, and what frequency of operation is expected for the new equipment?

   (d) What is the present annual quantity of solid radioactive wastes generated by the SFP purification system? What is the expected increase in solid wastes which will result from the expansion of the capacity of the SFP?

   (e) Discuss the effect of an increased water temperature due to the SFP modification on the operation of the purification system.

2. Please provide data regarding krypton-85, tritium and iodine-131 measured from the fuel building ventilation system by year for the last three years. If data are not available from the fuel building ventilation system, provide this data for the overall plant.

3. What is the design burnup of the fuel in MWD/MT?

4. Describe the ventilation filter assemblies for the fuel storage building and discuss the effect, if any, of the SFP modification on the efficiency of these assemblies. Provide an analysis of the ESF filter assemblies for the fuel handling and cask drop accidents with respect to the positions in Section C of Regulatory Guide 1.52. References to FSAR Sections are acceptable.

5. Please provide a discussion of the models and calculations used to estimate doses to personnel from radionuclide concentrations in the spent fuel pool including the following:

(a) identify the important radionuclides and their concentrations (μci/cc) in the fuel pool water including ^{134}Cs, ^{137}Cs, ^{58}Co, ^{60}Co.

(b) Please provide the models and calculations used to determine the external dose equivalent rate from these radionuclides. Consider the dose equivalent rate at the center and edge of the pool respectively. (Use relevent experience if necessary).

(c) Identify the important radionuclides and their concentrations (μci/cc) in the air above the fuel pool including ^{131}I and ^{3}H.

(d) Provide the models and calculations used to determine the inhalation dose rate from these radionuclides within the building and at the site boundary.

(e) Provide an estimate of the increase in the annual man-rem burden from more frequent changing of the demineralizer resin and filter cartridges.

(f) Discuss the buildup of crud (e.g., ^{58}Co, ^{60}Co) along the sides of the pool and the removal methods that will be used to reduce radiation levels at the pool edge to as low as reasonably achievable.

(g) Specify the expected total man-rem to be received by personnel occupying the fuel pool area based on all operations in that area including the doses resulting from (e) and (f) above and from least favorable grouping of fuel assemblies (See Thermal Hydraulics Analysis Request 4b).

6. Assuming that pool integrity problems resulting from a cask drop will be resolved prior to cask movement, provide (1) the number of bundles that could be struck by a cask fall or tip, including effects of any superstructure on the cask; (2) a conservative analysis of fission product release from fuel bundles potentially subject to impact assuming that the most recently off-loaded fuel is in the impact area; (3) a realistic (best estimate) radiological analysis of a cask fall or tip; and (4) any technical specifications proposed on the decay time required prior to loading storage positions within the zone which could be struck by a cask fall or tip.

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STRUCTURAL & SEISMIC ANALYSIS

1. Provide sketches of the fuel pool storage racks which define the primary structural aspects and elements relied upon for the structure to perform its safety function. Include typical details of the seismic pipe restraints for the racks and indicate how they are fastened to the fuel pool wall and rack. Also provide sketches of the fuel storage pool showing its principal dimensions and structural features and its relationship with surrounding structures and the support rock.

2. Provide a list of all design codes, standards, specifications, regulatory guides and other standards which will be used in the design, fabrication, construction and inspection of the fuel pool racks.

3. Provide more specific information on the loads, load combinations and acceptance criteria which will be utilized in the design of the racks. The staff position concerning this matter is indicated in 3.8.4-II.3 and 5 of the Standard Review Plan.

4. Describe the design and analysis procedures for the fuel storage rack, including the expected behavior under load and the mechanism of load transfer to the foundation. Computer programs should be referenced to permit identification with available published programs.

5. Identify all the materials and the QA/QC program to be followed for the procurement, fabrication and construction of the fuel pool racks. Describe the extent to which you intend to comply with ANSI N45.2.5, "Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants".

6. Indicate whether ground response spectra, appropriate damping values, and combination of modes and spatial excitation will be in accordance with Regulatory Guides 1.60, 1.61 and 1.92 respectively for the analysis of the fuel pool and the fuel storage rack seismic system.

7. Provide sketches of the mathematical model of the fuel pool, fuel storage rack and fuel assembly system which was used in the analysis. Illustrate on the sketches the mechanism of shear and load transfer to the fuel pool walls and foundation slab. Discuss the effects of sloshing water and possible impact of the fuel assemblies with the rack.

8. It is indicated in the report that the fundamental frequency of the racks is greater than 33 Hz in both vertical and horizontal modes of vibration. Provide mode frequencies, mode shapes and participation factors for the first few modes to substantiate your position. The relevant dynamic model should also be presented. The staff position is that at the high frequency end, the ground response spectrum may not have any amplification over the maximum ground acceleration but contribution from significant modes should be considered for overall response.

9. Discuss the extent to which the fuel pool has been analyzed to verify its ability to withstand the increase in overall loading. Identify the loads and load combinations investigated and the acceptance criteria for concluding that the original structure is adequate. It is noted that no discussion has been provided with regard to the increased shear and bending stresses in the pool walls and floor.

10. Provide the factors of safety against sliding and overturning of the fuel pool under OBE and DBE conditions in view of the increased mass of the pool.

11. Indicate the most severe temperature distribution considered for the structural design of the fuel pool structure. Justify any assumptions made regarding the temperature distribution.

12. The discussion on the top of Page VII-2 appears to indicate that calculations were performed only on the fully loaded type A rack. Clarify how the other types of racks were analyzed and designed, as well as the extent to which the behavior of the racks when bolted together within the fuel pool was analyzed. Discuss the effect on the rack design when only some of the racks are loaded with fuel.

13. Discuss the construction precautions required to prevent damage to stored fuel during the installation of the new racks.