



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 35 TO FACILITY OPERATING LICENSE NO. DPR-61
CONNECTICUT YANKEE ATOMIC POWER COMPANY
HADDAM NECK PLANT
DOCKET NO. 50-213

1.0 INTRODUCTION

By letters of May 14, 1974, March 21, 1978, April 18, 1980 and April 23, 1980, Connecticut Yankee Atomic Power Company (the licensee) provided information to demonstrate that spent fuel cask handling operations, under specified conditions, could be performed at the Haddam Neck Plant without undue risk to the health and safety of the public. The March 21, 1978 letter further proposed a change to the Appendix A Technical Specifications for Haddam Neck to allow handling of the spent fuel cask over the pool if all fuel in the pool has been sub-critical for at least 90 days. Additionally, in late February 1980, the licensee requested an expedited review of this proposal in order to allow shipment off-site of some damaged fuel assemblies prior to refueling operations that are to commence in the near future. Due to the limited time available, we have only reviewed this proposal with respect to the short term operations, i.e., shipment of the damaged fuel assemblies; and have not reviewed the proposal with respect to the long term operations, i.e., offsite shipment of spent fuel assemblies once long term waste repositories are established. For this evaluation, we used the guidelines and criteria contained in draft NUREG 0612 "Control of Heavy Loads at Nuclear Power Plants." This NUREG report is essentially complete and will be issued in the near future.

This Safety Evaluation Report provides the results of our evaluation and identifies the conditions that should be satisfied by the licensee with respect to the limited operations for shipment offsite of damaged fuel. The evaluation of the controls over cask handling operations beyond this limited authorization will be performed at a later date in conjunction with staff's evaluation of the implementation of NUREG 0612 for Haddam Neck.

2.0 BACKGROUND

Based on the information contained in the letters of May 14, 1974, and March 21, 1978, the approach proposed by licensee most closely parallels alternative 5.1.2(4) from draft NUREG 0612. This alternative requires that, in addition to satisfying certain general guidelines, analyses of load drops are performed to demonstrate that certain evaluation criteria are satisfied. Aspects to be analyzed due to the load drop are potential offsite doses due to release of gap activity, potential for criticality, damage to spent fuel pool integrity, and damage to safe shutdown equipment. The following provides our evaluation of the licensee's conformance with these general guidelines and evaluation criteria.

3.0 EVALUATION

3.1 GENERAL GUIDELINES

In its letters of April 18, 1980 and April 23, 1980, the licensee has indicated that: procedures have been developed and implemented to define the safe load path and proper handling method for movement of the 25 ton spent fuel cask; crane operators are trained, qualified, and conduct themselves in accordance with Chapter 2-3 of ANSI B30.2-1976; the yoke used for handling of the cask satisfies the guidelines of ANSI N14.6-1978; the sling used for movement of the cask cover satisfies the guidelines of ANSI B30.9-1971; the crane used for handling the cask and the fuel building auxiliary hoist have been inspected and tested in accordance with ANSI B30.2-1976; and industry standards appropriate at the time were used for the original design and installation of the crane. To further demonstrate the adequacy of the crane and lifting rig, a load test of 150% of the cask and lifting rig weight will be performed on the cask crane and lifting rig. Additionally, the movement of the cask crane is restricted by the roof opening through which the crane ropes pass. To preclude continued crane movement that could damage the ropes if the ability to open the breaker supplying power to the crane were to be lost (e.g., control circuit failure), the licensee will take the following special precautionary measure: an individual in communication with the crane operator will be stationed at the main power breaker to open it if required. Accordingly, we find that adequate measures are being taken to prevent a load drop that could impact spent fuel and that satisfy the intent of the general guidelines of draft NUREG 0612. In those areas where the specific guidelines of draft NUREG 0612 are not satisfied, adequate alternative measures are being taken for this limited application.

3.2 OFFSITE RADIOLOGICAL DOSES

By letter of March 21, 1978, the licensee provided the results of an analysis of the potential offsite doses due to a cask drop accident. This analysis assumed that all fuel assemblies postulated to be damaged had decayed for only 90 days, and that 400 fuel assemblies were damaged by the cask drop. These assumptions are considered conservative for this application because all of the fuel in the Haddam Neck pool has decayed for over 400 days (last previous refueling); and the total pool inventory at present is approximately 340 fuel assemblies. The licensee concludes that the calculated doses resulting from such an accident would be well within the guidelines of 10 CFR Part 100. We have reviewed the other assumptions used in the licensee's analysis and agree with these assumptions with the possible exception of the peaking factor used. However, based on our evaluation we find that the postulated doses from such an accident would be well within the criterion established in draft NUREG 0612 for such an accident of doses less than 1/4 of 10 CFR Part 100 guideline.

3.3 CRITICALITY DUE TO LOAD DROP

The evaluation criteria of NUREG 0612 require that damage to fuel and fuel storage racks based on calculations involving accidental dropping of a postulated heavy load does not result in a configuration of the fuel such that k_{eff} is larger than .95. In support of its application to expand the capacity of the Haddam Neck spent fuel pool, the licensee submitted to the NRC a report entitled, Haddam Neck Plant Spent Fuel Pool Modifications, dated December 1975. This report contains certain details on the construction of the spent fuel storage racks. It states that there is a neutron absorbing plate in each of the four walls of each fuel assembly container,

and that these plates contain a minimum of fifty volume percent boron carbide with a minimum thickness of 0.21 inches. Since there is one plate in each of the walls, there are two absorber plates between every two fuel assemblies. This results in an areal density of 0.19 grams of boron-10 per square centimeter of area between every two fuel assemblies. The licensee also has a surveillance program to assure that this boron remains in these plates throughout the life of the racks.

This boron would remain between the fuel assemblies for any compaction the racks might experience during a heavy load drop accident. We find that, even if the heavy load were to crush the fuel and racks to result in an optimum spacing to maximize k_{eff} , the boron in the racks will assure that the fuel remains sub-critical under any heavy load accident as long as the fuel loading of any assemblies does not exceed 44.6 grams of uranium-235 per axial centimeter of fuel assembly. In the present 14 x 14 assemblies, this would be equivalent to approximately four weight percent uranium-235. However, in its letter of April 23, 1980, the licensee has indicated that for the limited cask handling operations to take place in 1980, the spent fuel pool will not contain any fuel assemblies with greater than four weight percent uranium-235. In addition, the present license only allows the licensee to possess special nuclear material as necessary for operation of the reactor and the Technical Specifications limit the reactor fuel to less than four weight percent uranium-235.

We find that adequate measures are being taken to preclude a cask drop from resulting in criticality in the spent fuel pool.

3.4 SPENT FUEL POOL INTEGRITY

A drop analysis has been conducted by Stone and Webster Engineering Corporation for a spent fuel pool of similar design to that of the Haddam Neck Plant. The cask used in that analysis weighed 100 tons and was assumed to drop from a distance of 42 feet (4 feet through air, 38 feet through water). The analysis further assumed a concrete strength of 3,000 psi with a crush zone of a 45° cone with a bottom diameter of 15 feet. The line of impact was assumed to go through the cask center of gravity and the cask's edge was assumed to penetrate the concrete slab. Using these conservative assumptions, the results indicated that the leak rate caused by this impact would not exceed 10 gpm if all the kinetic energy were absorbed by the concrete slab. Since the Haddam Neck pool is of the similar size and the same floor thickness, the cask to be used weighs 25 tons and the dropping distance is 37-1/2 feet (4 feet through air and 33-1/2 feet through water), the leak rate caused by the dropping of this smaller cask will not exceed 10 gpm. In the event of loss of all electrical power to normal makeup water supplies, diesel powered pumps are available to supply raw river water to the pool to keep the fuel covered. With the available makeup water rate of more than 120 gpm, we conclude that the drop of the 25 ton cask will not cause a loss of the spent fuel cooling capability.

3.5 SAFETY RELATED EQUIPMENT

The evaluation criteria of NUREG 0612 require that damage to equipment based upon accidental dropping of a postulated heavy load will be limited so as not to result in loss of required safe shutdown functions. In its letter of April 18, 1980, the licensee has indicated that no safe shutdown equipment or cabling is located below potential travel paths of the spent fuel cask or related heavy loads such as the cask cover or the hatch removed from elevation 47 feet. In addition there is no risk of flooding to safety related equipment because the leak rate is small, the

bottom of the spent fuel pool is 7-1/2 feet below grade, and equipment in the fuel building is above grade. Accordingly, we find that cask handling operations will not present a hazard to safe shutdown of the plant and continued decay heat removal.

4.0 SUMMARY

Based on the above we find that the requested authorization, as modified, for limited spent fuel cask handling operations at the Haddam Neck Plant for off-site shipment of certain fuel assemblies in 1980 will be performed in a safe manner and satisfy the provisions of draft NUREG 0612, subject to compliance with the commitments made in the licensee's letters of April 18 and 23, 1980.

5.0 ENVIRONMENTAL CONSIDERATION

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

6.0 CONCLUSION

We have concluded, based upon the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: April 24, 1980