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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 166 TO FACILITY OPERATING LICENSE NO. DPR-53

AND AMENDMENT NO. 146 TO FACILITY OPERATING LICENSE NO. DPR-69

BALTIMORE GAS AND ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

By letter dated July 2, 1991, as supplemented November 15, 1991, the Baltimore Gas and Electric Company (the licensee) submitted a request for changes to the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, Technical Specifications (TS). The November 15, 1991, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

The requested changes would eliminate restrictions on the movement of heavy loads greater than 1600 pounds over fuel assemblies by the spent fuel cask handling crane. The proposed changes would revise TS 3/4.9.7, Crane Travel - Spent Fuel Storage Pool Building, and TS 3/4.9.13, Spent Fuel Cask Handling Crane.

Baltimore Gas & Electric (BG&E) is awaiting NRC's approval of its application for a license to construct and operate a NUHOMS-24P Independent Spent Fuel Pool Storage Installation (ISFSF) pursuant to the provisions of 10 CFR Part 72. NUHOMS-24P is a dry fuel storage system which will provide safe interim storage for irradiated fuel assemblies. The fuel assemblies are confined in a helium atmosphere by stainless steel canister. The canister is protected and shielded by a massive concrete module. The maximum weight (loaded) of the NUHOMS-24P cask is 180 kips which is more than three times the maximum drop weight analyzed (i.e., 50 kips) for the existing crane. Therefore, the licensee decided to upgrade the existing crane. The proposed TS changes support the upgrade of the spent fuel cask handling crane to a single-failure-proof design. A safety evaluation addressing the TS changes is provided in 2.1.

One of the requirements for the upgrade is that a seismic analysis be performed on the bridge structure, the trolley and trucks and the wire ropes. The licensee analyzed the crane components and the auxiliary building structure under the postulated seismic loadings (i.e., Operating Basis Earthquake-OBE, and Design Basis Earthquake-DBE). A seismic analysis for the proposed upgrade is presented in 2.2.

2.0 EVALUATION

2.1 Evaluation of the proposed TS changes and spent fuel cask handling crane upgrade.

The licensee has contracted Ederer Incorporated to upgrade the existing Whiting Corporation 150/15 ton (critical load capacity) Spent Fuel Cask Handling Crane, which has been in use since initial commercial operation. The maximum weight of the transfer cask used for this application could create sufficient punching shear stress in the event of a load drop to compromise the integrity of the spent fuel pool. The upgrade consists of replacement of the trolley and hoist system with an Ederer designed system that meets the "single-failure-proof" criteria specified in NUREG-0554, Single-Failure-Proof Cranes for Nuclear Power Plants, 1979, and NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, 1980. The existing crane bridge and bridge-mounted equipment will be retained with some modifications in order to meet the "single-failure-proof" criteria. The upgraded crane will have a new critical load capacity of 125/15 tons.

The Ederer designed trolley and hoist system that will be installed at Calvert Cliffs is comparable to that described in Ederer Incorporated generic licensing topical report EDR-1(P)-A, entitled, "Ederer's Nuclear Safety-Related Extra Safety and Monitoring (X-SAM) Cranes, Revision 3." The topical report describes the design and testing of the "single-failure-proof" features which are included in Ederer's X-SAM cranes intended for handling spent fuel casks and other safety-related loads at a nuclear power plant.

By letter dated January 2, 1980, the staff concluded that the generic design features described in this topical report are acceptable to assure that a single failure will not result in the loss of capability to retain a critical load. The letter goes on to state that, in the alteration or conversion of an existing crane to provide features found acceptable in the topical report, the licensee must provide relevant site-specific information and demonstrate the acceptability of unreplaced structures and components. Accordingly, this report evaluates the acceptability of site-specific features, and unreplaced components and structures.

The plant-specific crane data was reviewed and found to be consistent with the "single-failure-proof" criteria contained in NUREG-0554 and NUREG-0612. The licensee has committed to use administrative procedures to assure that a minimum of one foot clearance is maintained between the load and surfaces which cannot withstand the maximum kinetic energy associated with a drive train failure. An analysis has demonstrated that the maximum load motion following a drive train failure will be less than one foot. The licensee has also designated safe laydown and repair areas in the event of a crane failure while transporting a heavy load. Ederer has been contracted to provide updated operating procedures and perform operational testing. The staff has found these actions to be acceptable with regard to the "single-failure-proof" criteria contained in NUREG-0554 and NUREG-0612.

The licensee has committed to conduct "cold proof" 125% static load testing in accordance with NUREG-0554. Following the "cold proof" test, the licensee has also committed to perform a nondestructive examination of welds whose failure could result in the drop of a critical load. This testing serves to verify that brittle failure of unreplaced components and structures is unlikely. The testing is consistent with the "single-failure-proof"criteria contained in NUREG-0554 and NUREG-0612, and is, therefore, acceptable.

A seismic analysis of the original bridge structure members performed for the licensee by Bechtel Corporation indicated potential overstress conditions in the bridge girders, trolley rail anchorage clips, and end tie bolted connections under certain seismic loading conditions. The licensee has committed to modify these components in order to eliminate these potential overstress conditions by strengthening the girders, adding additional trolley rail anchorage clips, and using stronger bolts in the end tie bolted connections. The staff has reviewed these commitments and found them to be acceptable with regard to the "single-failure-proof" criteria contained in NUREG-0554 and NUREG-0612.

2.2 Seismic Analysis

This evaluation addresses the seismic adequacy of the proposed upgraded crane and the supporting auxiliary building structure.

The crane consists of the bridge girders (existing) with center-line to center-line of rail span of 56 ft. 5 1/2 in.. The new trolley (proposed) spans 16 ft. 6 in. between the center lines of trolley rails. The rated capacity of the main hook is 150 tons, and that of the auxiliary hook is 15 tons. The new trolley and the hooks will be qualified to the SFP crane criteria of NUREG-0554. With the installation of the proposed new trolley and other associated modifications, the licensee will be able to move loads larger than 1600 lbs. (present limit) over the spent fuel assemblies.

The seismic analysis of the crane consisted of finite elements, response spectrum analysis using the Bechtel Computer program BSAP. In order to accurately define the seismic characteristics of the modified crane assembly, i.e. existing bridge structure and new trolley structure, a three dimensional finite element model was created. The three dimensional model allows for an evaluation of cross directional effects in two perpendicular directions due to an input in a third, orthogonal direction. To include the effects of local building steel (runway girder and building column), the analysis incorporated equivalent springs.

The crane modelling procedure used by the licensee is acceptable to the staff. The required response spectra (RRS) for the analysis were computed from the average of the spectra at elevations 69 ft. 0 in. and 117 ft. 0 in. since the elevation of the top of the bridge is 93 ft. 0 in. The runway girders on east and west side of the building is separated by 1 in. gap for expansion. For the purpose of the seismic analysis, the RRS used was the envelope of the east and

west side of the building. The seismic input for the crane analysis was based on the conservative considerations of RRS and building frequencies. Additionally, the following load and analysis parameters were evaluated: (1) bridge position along runway girders, (2) variation in lifted load from 0 to 300 kips, (3) lifted load position (high hook, low hook), (4) trolley position on the bridge (at end, at 1/4 span and 1/2 span), (5) OBE, DBE load cases, and (6) horizontal and vertical load cases in two directions.

The analysis results indicated that a number of modifications will be required to optimize the crane design and to comply with the UFSAR acceptance criteria. One major modification will consist of welding reinforcing (angles and plates) to the webs of the bridge girders near top and bottom flanges. The reinforcing will be in the middle 374 in. span of the bridge girders. The second modification will consist of welding sufficient number of rail-clips to change the present staggered configuration of clips to the one having symmetrical clips on both sides of the trolley rails. The third modification is to replace the existing ASTM A-325 bolts joining splice plate to the cover plate of the end ties of the bridge girder with ASTM A-490 bolts. The licensee has committed to install these modifications to the crane prior to its proposed use. With the installation of these modifications, the staff considers the proposed SFP crane to be adequate to withstand the postulated seismic loads.

The staff has also reviewed the licensee's evaluation of the existing crane girders and the auxiliary building structure and agrees with the licensee's conclusion that the structures are adequate to withstand the postulated seismic loading.

3.0 SUMMARY

The staff finds the generic design features of the Ederer trolley and hoist acceptable for use as part of a "single-failure-proof" crane in a topical report evaluation promulgated by letter dated January 2, 1980. Site specific crane features were evaluated in this report to be acceptable for a "single-failure-proof" crane. The actions the licensee has committed to perform with regard to testing and modification of unreplaced components and structures are consistent with the "single-failure-proof" criteria of NUREG-0554 and NUREG-0612, and are acceptable. Restrictions on the handling of heavy loads prescribed by NUREG-0612 will no longer be required once the criteria for a "single-failure-proof" crane are satisfied. The staff concludes that the upgraded (modified) crane will be able to withstand the postulated seismic loads without exceeding the acceptance criteria of the plant UFSAR. The staff also reviewed the impact of the upgrade on the auxiliary building structure and concludes that the structure is able to withstand the postulated seismic loads without exceeding the acceptance criteria in the plant UFSAR. The staff therefore concludes that the proposed TS changes are acceptable.

4.0 STATE CONCLUSION

In accordance with the Commission's regulations, the Maryland State official was notified of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (56 FR 37577). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors:
S. R. Jones
H. Ashar

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