ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

December 18, 1969

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON SHOREHAM NUCLEAR POWER STATION UNIT 1

Dear Dr. Seaborg:

At its 116th meeting, December 11-13, 1969, the Advisory Committee on Reactor Safeguards completed its review of the application by Long Island Lighting Company for authorization to construct the Shoreham Nuclear Power Station Unit 1. The project was considered at Subcommittee meetings on October 30, 1969, at the plant site, and on December 4, 1969, in Washington, D. C. During its review, the Committee had the benefit of discussions with representatives of Long Island Lighting Company, General Electric Company, Stone and Webster Engineering Corporation, the AEC Regulatory Staff, and their consultants. The Committee also had the benefit of the documents listed.

The site for the Shoreham station is located in the Town of Brookhaven, Suffolk County, New York, on the shore of Long Island Sound, north of Brookhaven National Laboratory. The exclusion zone radius for the plant is 1,000 ft. and the reactor will be located 1,500 ft. from the nearest residence. The low population zone radius is five miles. The population within the low population zone was 7,500 in 1960, and is estimated to be 12,300 in 1980. The nearest town with a population over 25,000 is Stratford, Connecticut with a 1960 population of 45,000, 18 miles from the site across Long Island Sound.

The Shoreham Nuclear Power Station Unit 1 will use a single cycle, forced circulation, boiling water reactor similar to the previously reviewed reactors of the Cooper, Hatch, and Brusnwick stations (ACRS reports of March 12, 1968, May 15, 1969, and October 16, 1969). The Shoreham reactor is designed to produce 2436 MWt with a maximum performance rating of 2550 MWt.

The Shoreham primary containment is a steel lined, reinforced concrete structure having a conical drywell section located directly over a cylindrical wetwell section. This arrangement provides a more direct path from the drywell to the wetwell than the "light bulb and torus" design

used in other boiling water reactor plants. The applicant reports that this design results in a lower peak pressure in the structure in the event of a loss-of-coolant accident. A reinforced concrete floor separates the drywell and wetwell sections of the primary containment and is connected to the wall of the containment by a flexible seal which includes provisions for periodic leak testing.

The applicant has stated that he will perform analyses to determine the potential dynamic loads on the drywell vent pipes during a loss-of-coolant accident and that he will provide conservatively designed structural restraints at the lower portions of the pipes to resist these forces. In order to provide increased assurance that the design pressures for the vapor-suppression system are conservative, the applicant should perform additional parametric analyses. These analyses should be completed in a manner satisfactory to the Regulatory Staff.

Shear forces in the containment structure caused by earthquakes will be resisted by diagonal steel reinforcing bars. On the basis of recent tests, the applicant has suggested that these shear forces could be resisted by shear friction and aggregate interlock in the concrete alone. The Committee believes that the diagonal steel reinforcing should be provided unless convincing evidence, both analytical and experimental, can be presented to show that it is not needed, both from the standpoint of the integrity of the steel liner and from the standpoint of the possible effects of containment deformations on the reactor vessel support structure.

The reactor building, which serves as the secondary containment, is cylindrical in shape, with reinforced concrete walls up to the level of the main crane rail. Above this point the building is steel framed, with sheet metal siding and a metal deck roof. Leakage from the primary containment, in the event of an accident, is mixed in the reactor building and is filtered through redundant absolute and charcoal filter banks. It is important that no leakage from the primary containment bypass the secondary containment and the associated filtering systems in the event of an accident. The applicant should study the effects of leakage through possible bypass paths, with particular emphasis on the main steam line isolation valves, and should prpopse measures to deal with any such bypass leakage. This matter should be resolved in a manner satisfactory to the Regulatory Staff during construction of the plant. The Committee wishes to be kept informed of progress in this area.

The applicant proposes to carry out a full radiographic examination of all butt welds in the steam system piping from the main steam line isolation valves to the turbine stop valves, and to the first block valve in each branch line 2½ inches or larger in size. He also proposes to examine essentially all of the pressure-containing bodies of the main turbine stop and bypass valves by radiographic means, and to examine branch line valve bodies 2½ inches or larger by radiographic or surface inspection means. The Committee believes that the proposed program is acceptable for this system.

A large number of instrument lines, approximately one inch in diameter, penetrate the primary containment and terminate as closed systems at pressure sensing devices. Some of these lines connect directly to the reactor primary system. The isolation provisions for these instrument lines include a manual shutoff valve and a spring-loaded excess flow check valve for each line, with both valves located outside the primary containment. The Committee believes that such provisions may be satisfactory without inclusion of remotely operable isolation valves. However, since these lines represent a potential source for a primary system and containment leak, it is essential that proper attention be given during design and construction to questions of isolation, control of leak rate, quality assurance, integrity of safety signals, and minimization of the possible mechanical damage while the primary system is pressurized. The applicant should propose design criteria for these lines that are satisfactory to the Regulatory Staff. Also, the applicant should study and propose means to reduce the rate of possible leakage from instrument lines in the event of failure so that such leakage would not damage the secondary containment or bypass the building filters.

Plant grade has been established at 20 feet above mean sea level and protection of essential components against the effects of storm flooding has been planned to an elevation of 25 feet above mean sea level. The applicant is currently recalculating the peak storm surge water level and will increase the elevation to which the plant is to be protected against flooding if the recalculation shows this to be necessary.

The Shoreham station is located about four and three quarter miles from the Peconic River Airport, operated by the Grumman Aerospace Corporation for the U. S. Navy. The applicant and the Regulatory Staff have independently reviewed the probability of an aircraft enroute to or from this airport crashing into the nuclear station. The Regulatory Staff review has included the available statistics on all of the types of aircraft using the airport, the types of flights made, and on both fatal and non-fatal crashes. The Staff concludes that the Shoreham station is far enough from the airport so that the probability of an aircraft striking the Shoreham station is not significantly increased by the presence of the airport, and that special protective measures against an aircraft crash are not required for this station. The Committee concurs in these conclusions.

Information on a number of items, identified in previous reports of the Committee, is to be provided by the applicant to the Regulatory Staff during construction. These include:

(a) A study of means of preventing common failure modes from negating scram action and of design features to make tolerable the consequences of failure to scram during anticipated transients.

(b) Review of development of systems to control the buildup of hydrogen in the containment following a loss-of-coolant accident.

(c) Analysis of methods to limit damage to the spent fuel pool and to reduce the release of fission products in the event of a dropped fuel cask.

Other problems related to boiling water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee feels that resolution of these items should apply equally to the Shoreham plant.

The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the nuclear plant proposed for the Shoreham site can be constructed with reasonable assurance that it can be operated without undue risk to the health and safety of the public.

Sincerely yours,

/s/

Stephen H. Hanauer
Chairman

References - Shoreham Nuclear Power Station

1) Letter from Long Island Lighting Company dated April 18, 1969; Amendment No. 4 to License Application; Volumes I, II and III of the Preliminary Safety Analysis Report

2) Letter from Long Island Lighting Company dated April 18, 1969; Amendment No. 5 to License Application; Responses to comments contained in DRL's letter of January 19, 1969

3) Letter from Long Island Lighting Company dated June 30, 1969; Amendment No. 6 to License Application; Replacement pages

4) Letter from Long Island Lighting Company dated August 22, 1969; Amendment No. 7 to License Application; Replacement pages

5) Letter from Long Island Lighting Company dated October 24, 1969; Amendment No. 8 to License Application; Replacement pages

6) Letter from Long Island Lighting Company dated November 19, 1969; Amendment No. 9 to License Application; Replacement pages

7) Letter from Long Island Lighting Company dated December 5, 1969; Amendment No. 10 to License Application; Replacement pages