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

March 17, 1966

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

Subject: REPORT ON MH-1A FLOATING NUCLEAR POWER PLANT

Dear Dr. Seaborg:

At its seventy-first meeting, March 10-12, 1966, the Advisory Committee on Reactor Safeguards considered the proposal by the U. S. Army Corps of Engineers and the Martin Company to conduct initial operations of the MH-1A Floating Nuclear Power Plant at Whitestone Point on the Potomac River at Ft. Belvoir, Virginia. The Committee had the benefit of discussion with representatives of the Martin Company, the U. S. Army, and the AEC Regulatory Staff, and of the documents listed below. The Committee previously reviewed features of this project at its seventieth meeting, February 10-12, 1966. Subcommittee meetings were held at Washington, D. C. on December 16, 1965 and at Mobile, Alabama, on January 17, 1966, the latter including a visit to the vessel.

The nuclear power plant of the MH-1A consists of a pressurized-water reactor of conventional design, operating at a nominal power level of 45 MW(t). Water in the single, pressurized, primary coolant loop is circulated through a steam generator which drives a turbine-generator rated at 11,500 kw at 60 cycles. This plant is installed in the middle section of a modified Z-EC-2 Liberty Ship. The propulsion plant of the ship has been completely removed and the center section has been replaced with a new, larger section which includes a collision barrier, a deep inner bottom, and provisions for arresting crack propagation. At present, the MH-1A is berthed at Mobile, but it will be towed to the Ft. Belvoir site in the near future, prior to fuel loading and commencement of nuclear testing.

The MH-1A is provided with redundant decay heat removal systems as well as the following engineered safeguards: a containment vessel; automatic containment spray; automatic internal and external purge filter systems; and a low pressure, manually actuated, core safety injection system. These systems are designed to provide adequate protection to nearby personnel without movement of the facility in the event of an accident.

The general containment system including flange inserts, but not the attached piping, was hydraulically tested at 205 psia prior to the installation of the reactor and associated systems.

The Martin Company proposes to leak-test the complete containment system at pressures of up to 65 psia which it considers will provide an adequate basis for extrapolating measured containment leakage rate values to those that would apply at the calculated peak accident pressure condition of 150 psia. The Regulatory Staff has suggested that, in accordance with usual practice, at least one containment leak rate test be conducted at the peak accident pressure for the purpose of verifying leak-tightness, the operability of engineered safeguards, and the integrity of piping penetrations at the actual accident pressure condition. The Martin Company believes that a pressure test at 150 psia may cause actual or incipient damage to certain particularly susceptible components that would be difficult to remove from the vessel prior to such a test.

The Committee has considered each of these points of view, and suggests that further study be made to provide a basis for resolution of the question. The Martin Company's position could prove acceptable if it can be satisfactorily demonstrated that no adverse effects would remain undisclosed by the proposed testing at 65 psia. It is essential, for example, that all modes of motion or yielding of components, the adequacy of all seals and penetrations, the tightness of leakage paths, and the operability of engineered safeguards systems can be guaranteed to be satisfactory at full accident pressures as a result of individual component tests plus the proposed integral test.

On the other hand, if the argument that many pressure-sensitive components might be damaged by the 150 psia test is to be accepted, it should be supported by a careful enumeration and study of potential pressure effects on these components, and on those safety devices which must operate under high pressure, accident conditions. In any case, the integrity of vital components after leak-testing, at whatever pressure is decided, must be assured.

The Committee believes that the basis for the calculation of the course and consequences of a rod-ejection accident in the MH-1A should be reviewed by the Army, its contractors, and the Regulatory Staff to assure that conservative values are being used for important parameters, including reactivity effects. If the consequences of this unlikely accident are found to be unacceptable, alternative operating procedures or design modifications should be developed.

The ACRS recommends that the above points be resolved by the Regulatory Staff and the Army. When this is done, the Committee believes that the MH-1A can be operated at power at the Ft. Belvoir, Whitestone Point, site without undue risk to the health and safety of the public. Zero power physics tests may be safety conducted in the interim period.

Sincerely yours,

/s/ David Okrent

David Okrent
Chairman

References.

1. Final Safeguards Report, Sturgis (MH-1A) Floating Nuclear Power Plant, Volumes 1-4, Technical Specifications, and Illustrations (two volumes), dated 1965 (received July 20, 1965).

2. Addendum No. 1, "Answers to Questions from Division of Reactor Licensing," dated November 15, 1965.

3. Letter dated December 3, 1965 from W. B. Murphy, Department of the Army, to Dr. R. L. Doan, U. S. Atomic Energy Commission, with enclosure.

4. Addendum No. 2, dated January 24, 1966.

5. Interim Report, Health and Safety Review of MH-1A (Sturgis) Floating Nuclear Power Plant by the Army Reactor Systems Health and Safety Review Committee (ARCHS), dated 31 January 1966.

6. Supplementary MH-1A Safeguards Information, undated, received February 21, 1966.

7. Letter dated 25 February 1966 from W. B. Murphy, ENGSO, to Dr. Richard L. Doan, U. S. Atomic Energy Commission, with enclosure: ARCHS 66-4, "Interim Report Health and Safety Review of MH-1A (Sturgis) Floating Nuclear Power Plant Final Safeguards Report by the Army Reactor Systems Health and Safety Review Committee (ARCHS)", dated 1 March 1966.