ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

March 16, 1959

Honorable John A. McCone
Chairman
U. S. Atomic Energy Commission
Washington 25, D. C.

Subject: NUCLEAR MERCHANT SHIP REACTOR PROJECT ( N. S. SAVANNAH)

Dear Mr McCone:

At its fourteenth meeting (March 12-14, 1959) the Advisory Committee on Reactor Safeguards continued its review of the Nuclear Merchant Ship (N. S. Savannah). Representatives were present from the Division of Reactor Development, Babcock & Wilcox Company, New York Shipbuilding Corporation, Geo. G. Sharpe Co., States Marine Corporation, and the United States Coast Guard. The ACRS has also had the benefits of thorough review of the ship by the Hazards Evaluation Branch and by Oak Ridge personnel. The pertinent documents are listed at the end of this letter.

Inasmuch as a final hazards review for the N. S. Savannah has not yet been submitted, and considerable information is still outstanding, the ACRS is not in a position to make a final recommendation to the Commission concerning the overall safety of this nuclear ship and the possible restrictions which may be required for the adequate protection of the public. However, the Committee has been asked to make an interim report. The ACRS has focused its attention primarily upon the nuclear propulsion system for which a large part of the information is available.

Pressurizer In the N. S. Savannah, the pressurizer not only maintains the primary system pressure, but also provides a heat source and sink for reducing pressure transients which occur during changes in load demand. The ACRS believes that the pressurizer can be made to work without jeopardizing the safety of the ship. The ACRS is somewhat uncertain as to the adequacy of the detailed design of the pressurizer

inasmuch as the detailed information of transient response of the pressurizer has not been submitted to us. Under any circumstances, the actual performance of the system in addition to analog simulation, must be available before complete confidence in the adequacy of the system can be assured.

Rod Control and Scram System The design of this combined electrical rod drive and hydraulic scram system is new. The adequacy of this system should be demonstrated by extensive testing of prototypes and selected production units under all credible conditions of life, presence of solids in the water, misalignment, angle of roll and tilt, etc.

Containment The design of the containment vessel seems adequate provided the numerous penetrations do not themselves provide a channel through which fission products escape. The ACRS does not yet have sufficient information to decide whether the valving on these penetrations is adequate.

Interlocks on Loop Pumps A cold water accident initiated by the starting of an idle, cold-loop pump might create a serious nuclear excursion even if the scrams work. Therefore, it is essential that reliable and multiple interlocks be used to prevent this possible accident.

Miscellaneous Comments The considerations of the shock-loading under collisions appear to be adequate. However, ACRS has not fully completed its review in this area.

In view of the new design and unproven features associated with the reactor used in the N. S. Savannah, the Committee is of the opinion that the extension shakedown and testing required should not be carried out over the full power range at the dockside location. The Committee advises that severe limits must be placed on the operations during the dockside testing and understands that the necessity for restrictions has been recognized.

Subject: N. S. Savannah, cont.

The meteorological problems at this site (and also in general for rivers, estuaries, ports and at sea) have not been adequately resolved.

The required maneuverability of the ship results in a large amount of thermal cycling of the $UO_2$ fuel elements. This places an increased burden on the testing required to prove adequacy of fuel elements. It is obvious that a steam bypass around the turbine would reduce the problems associated with the thermal cycling.

The Committee is also not yet convinced that the operator will have a sufficiently informed staff to execute its overall responsibility for the safety of the nuclear ship. It is aware that crew members are in training. However, it urges that States Marine Corporation quickly acquire individuals who can understand and partake in the hazards analyses which are now under way.

Sincerely yours,

/s/ C. Rogers McCullough

C. Rogers McCullough
Chairman

cc: A. R. Luedecke, GM
H. L. Price, DLR

References:

1) Preliminary Safeguards Report - Babcock & Wilcox Company, BAW-1117 - Volume I - Revised December 22, 1958
Volume II - Revised November 3, 1958

2) DLR Comments to ACRS on Nuclear Merchant Ship Reactor Project (N. S. Savannah), November 4, 1958

3) DLR Report to ACRS on N. S. Savannah Control System, January 5, 1959

4) DLR Report to ACRS on(N.S. Savannah) Nuclear Merchant Ship Reactor, February 24, 1959