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

September 24, 1979

Docket No.: 50-309

Mr. Robert H. Groce
Licensing Engineer
Yankee Atomic Electric Company
20 Turnpike Road
Westboro, Massachusetts 01581

Dear Mr. Groce:

Control Element Assembly (CEA) guide tube wear has been an issue at Maine Yankee as well as other pressurized water reactors. The apparent cause of this wear is flow induced vibration of the CEA's. Sleeves have been installed at Maine Yankee to preclude guide tube wear and test fuel assemblies have been installed as part of a program to minimize CEA vibrations. These actions have been taken with Combustion Engineering fuel in the core.

You have indicated that Exxon fuel will be put in the core for the next reload. It is necessary that the CEA guide tube wear issue be addressed for the Exxon fuel. In addition the flow induced vibration of the CEA's has raised the concern of what effect this vibration has on the CEA's.

To address these areas you are requested to provide the information in the enclosure before or with your upcoming reload submittal.

Sincerely,

Robert W. Reid

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosure:
Information Request

cc w/enclosure: See next page

cc:
E. W. Thurlow, President
Maine Yankee Atomic Power Company
9 Green Street
Augusta, Maine 04330

Mr. Donald E. Vandenburgh
Vice President - Engineering
Yankee Atomic Electric Company
20 Turnpike Road
Westboro, Massachusetts 01581

John A. Ritsher, Esquire
Ropes and Gray
225 Franklin Street
Boston, Massachusetts 02110

Mr. John M. R. Paterson
Assistant Attorney General
State of Maine
Augusta, Maine 04330

Mr. Nicholas Barth
Executive Director
Sheepscot Valley Conservation
Association, Inc.
P. O. Box 125
Alna, Maine 04535

Wiscasset Public Library Association
High Street
Wiscasset, Maine 04578

Mrs. L. Patricia Doyle, President
SAFE POWER FOR MAINE
Post Office Box 774
Camden, Maine 04843

Mr. Robert R. Radcliffe
Office of Energy Resources
55 Capitol Street
Augusta, Maine 04330

INFORMATION REQUEST

The items detailed in this attachment are addressed primarily at the capability of the reload fuel design to mitigate the guide tube wear that was observed in the CE NSSS facilities. The overall capability of the reload fuel to perform its intended structural, thermal-hydraulic, physics, and power generation functions is beyond the intended scope of this attachment. However, since some of the reload fuel design features to mitigate guide tube wear may effect other aspects of the fuel design capabilities, some, overlap into reload areas is unavoidable.

It is our understanding that the reload fuel design will use sleeves in the upper section of the guide tubes to function as more resistant wear surfaces. This design feature is similar to that used by Combustion Engineering as an interim modification. Please note that CE attributes guide tube wear to flow-induced vibration of the Control Element Assemblies (CEAs). Sleeving the Control Rod Guide Tubes (CRGTs) is not expected to eliminate vibration of the CEAs. In regard to vibration of the CEAs, CE has performed loop-flow tests and installed a number of flow-modifying test assemblies in specific CE designed plants. The results of these tests are not yet complete. However the flow-modifying test assemblies are designed to eliminate or to reduce the flow-induced vibration of the CEAs.

Since current sleeving designs have not eliminated or reduced vibration of the CEAs, the long term vibration effects of the CEAs should be considered. Address the following items before or in your planned reload submittal. An early submittal of this information will expedite the completion of our review.

A. Design Information

Provide detailed drawing of the proposed reload fuel design. In particular describe and discuss those components and principles used in the reload fuel design to mitigate guide tube wear and vibration of the Control Element Assembly (CEA).

B. Test Data

1. Provide information on any out-reactor, loop-flow prototype testing of the reload fuel design. This information may include results of flow visualization tests, thermal-hydraulic flow tests, and flow-induced vibration of the CEAs. Discuss the results, conclusions, and correlations obtained from these tests.

2. Provide information on any in-reactor demonstration assemblies that verifies the wear performance characteristics of the reload fuel design. Discuss, and compare, the performance of the in-reactor test assemblies with the prototype test assemblies and the current CE-designed fuel assemblies.

3. Items 1 and 2 should include details of any examinations performed such as:

   (a) Methods of examinations i.e.: destructive, eddy current, periscope, borescope, mechanical gage, metallographic, flow visualization, T.V.

   (b) Areas of fuel assembly and guide tubes examined.

   (c) Results of examinations.

   (d) Numbers of samples in each data base including operations parameters such as: core location, Effective Full Power Hours, time in service under CEAs, neutron fluence, coolant flow, thermal cycles, and any other related core parameter.

   (e) Qualification of test procedures.

4. Provide all correlations supported by your tests relative to guide tube wear during reactor operations over the reactor life of the reload fuel.

5. Provide information on control rod scram tests that demonstrate CEA scramability for the reload fuel design. Address degraded scramability over the reactor life of the reload fuel. Include any strain, deflection, or time limits on control rod functions.

C. Analysis

1. Provide information and your evaluation of the chemical compatability between the sleeving and the CRGT. This evaluation should include consideration of corrosion product buildup, and coolant boiling in the annulus between the sleeving and the guide tubes.

2. Provide the results of your structural analyses summarizing the CRGT loads and the primary and secondary stress intensities for normal operation fuel handling, and accident loading conditions. The analyses should clearly demonstrate that a coolable geometry is maintained for all loading conditions, and that scram capability of the control rods is not impaired beyond "acceptable limits." Provide and discuss the determination of these "acceptable limits."

3. Discuss your structural design bases and the allowable stresses used in the structural analysis. Indicate what provisions have been made to account for wear in the design, and what amount of wear would be

unacceptable. Discuss the propensity for hydrogen uptake in the guide tubes as a function of wear. Discuss the effects of notch sensitivity, irradiation hardening, hydrogen content of the Zircaloy, and thermal cycling, on the analysis. Discuss any differential thermal expansion or stress relaxation between the sleeving and the guide tubes. How does this relaxation effect the design and operational performance?

4. Discuss any administrative, or operational procedures indicated prudent, or necessary, by your analyses.

D. Fuel Surveillance

Provide details of a planned surveillance program (see item B.3) for the next and future end-of-cycle outage and your commitment to carry out this program. We request that this program be submitted for NRC review before implementation. The fuel surveillance program should assure that the existing and reload fuel performs in accordance with design.

E. CEA Surveillance

You are requested to propose a CEA surveillance program which should include examinations and evaluations of the CEAs because of their continued vibration. The CEA surveillance program may include examinations addressed at identification of fatique cracking, stress corrosion cracking, abrasion, denting, poison material degradation (compaction, and leakage), and other phenomena which could impede their movement, degrade their design function, or reduce their design life.

F. Limits of Degradation

Specify the acceptance criteria, to be used in your surveillance programs, for continued use of the existing fuel, reload fuel and the CEAs. Justify the basis upon which these criteria have been determined. Specify the acceptance for repaired fuel and discuss the repair procedures. Specify the rejection criteria to discontinue the use of the fuel and the CEAs.