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

November 23, 1979

Docket No. 50-346

Mr. Lowell E. Roe
Vice President, Facilities
Development
Toledo Edison Company
Edison Plaza
300 Madison Avenue
Toledo, Ohio 43652

Dear Mr. Roe:

Significant wear of the Zircaloy control rod guide tubes has been observed in facilities designed by Combustion Engineering (CE). Similar wear has also been reported in those facilities designed by Westinghouse (W). In our letter of June 13,1978, we requested information from Babcock and Wilcox (B&W) on the susceptability of the facilities designed by B&W to guide tube wear. The information provided by B&W by letter dated January 12, 1979 was insufficient for us to conclude that guide tube wear was not a significant problem in the facilities designed by B&W. This was documented in our letter to B&W dated August 22, 1979.

Because significant guide tube wear could impede the control rod scram capability, and also effect the required coolable geometry of the reactor core, we consider this wear phenomenon a potential safety concern. Therefore, we are requesting that you provide detailed information on the wear characteristics of the control rods on the guide tubes in fuel assemblies in Davis-Besse, Unit No. 1.

The enclosed NRC concerns are provided to assist you in planning your control rod and guide tube surveillance program. When you have completed your surveillance program plan, we request that this program be submitted for NRC review before implementation. Although this data-gathering program may be performed on available irradiated assemblies in spent fuel pools, we find that this issue should be resolved for each facility before startup from your next scheduled refueling outage commencing after January 1, 1980.

To expedite our review of your program, a meeting at NRC headquarters in Bethesda, Maryland, has been scheduled for December 20, 1979, at 9:30 a.m. This meeting will provide you the opportunity to clarify and discuss the enclosed NRC concerns and the details of your proposed program. Your agenda of the meeting should be provided by December 17, 1979.

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Should you have any questions on the type of information we need or scheduling requirements, please contact our Operating Reactors Branch #4 Project Manager assigned to your facility.

Sincerely,

Robert W. Reid

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

Enclosure

cc: w/enclosure
See next page

Toledo Edison Company

cc w/enclosure(s):

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Enclosure

NRC CONCERNS ON

CONTROL ROD GUIDE TUBE WEAR IN

FACILITIES DESIGNED BY B&W

The B&W surveillance experience on worn control rod guide tubes, as described in their January 12, 1979 letter, consists of (a) air testing of sixteen guide tubes from an Oconee-1 15x15 fuel assembly that had experienced one cycle of operation under a control rod assembly and (b) clam-shell sectioning of two guide tubes from a 17x17 fuel assembly that had undergone a 1000-hour flow test under a control rod assembly. As documented in our letter of August 22, 1979, we find that this experience is not sufficient to support the B&W conclusion that there is strong evidence for the absence of wear in B&W-designed plants. In fact, to the contrary, worn guide tubes have been observed in Crystal River, Unit 3 spent fuel (see BAW-1490 Rev. 1, July 1978). Our position is further based on observations made by other NSSS vendors who have found a "plant-specific" and "core-position" dependence in the observed wear. Furthermore, out-of pile flow tests have demonstrated that the wear rate is a function of several design and operating variables.

1. Propose a post-irradiation examination (PIE) program with a schedule for its implementation and a commitment to execute the program for NRC review. This data-gathering program should be completed expeditiously considering the availability of irradiated assemblies in all B&W-designed plants. Details of the surveillance plan should include the following:

   a. Methods of examination (e.g., destructive, eddy current probe, boroscope, mechanical gage) accompanied by qualification of those methods.

   b. Characterization of the examined guide tubes, including their in-core locations, EFPHs, flow rates, fluence, and wear time under rods (control, instrument, axial-power shaping, burnable poison, startup source, and orifice).

   c. Examination of those rods (control, instrument, axial-power shaping, burnable poison, startup source, and orifice) contained within the guide tubes to identify fatigue, stress corrosion

cracking, wear, denting, or any other conditions that can degrade their design function, reduce their design lifetime, or impede their movement.

d. Analysis of results including quantification of guide tube wall wear depth and distribution. This PIE program may be satisfied in part of totality by reference to data taken from another B&W designed plant(s) that uses the same type of fuel assemblies. In such case, justification must be given that wear in the referenced plant adequately represents that of the plant design in question.

Provide all correlations supported by your tests and discuss how these correlarions are used to predict guide tube wear during reactor operations over the fuel lifetime.

2. Provide an evaluation on the predicted guide tube wear on the stress analyses contained in the FSAR. The evaluation should address loadings associated with Condition-1 through -4 events including fuel handling accidents, control rod scrams, and seismic and LOCA transients. The discussion should describe the state of stress in the worn guide tubes and how the wear affects the loadbearing characteristics of the worn tubes. (Note that nonuniform wear results in a shift of the neutral tube axis which then induces not only direct stresses but also bending stresses.) Show that the loadbearing capacity of the worn guide tubes satisfies the acceptance criteria for these loading events.

3. Provide or reference all material property correlations that are used in the guide tube stress analyses. These correlations should accommodate the effects of hydrogen absorption and the propensity for hydrogen uptake in the Zircaloy guide tubes as a function of accumulative wear.

4. Address the consequences of hole formation in worn guide tubes. Consider the extent and distribution of wear to see if hole formation is possible. If the potential for hole formation cannot be discounted, evaluate the impact of such holes on the guide tube integrity, control rod motior and local thermal-hydraulic performance. This evaluation should account for flow-induced vibration resulting in crack propagation and possible fatigue fracture in locally thinned areas of the tube wall. This discussion should also address the entire core residence time, both during periods of wear (under rods; i.e., control, instrument, axial-power shaping, burnable poison, startup source, and orifice) and when the tubes are not rodded.