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SUBJECT: Forwards addl info requested re generic implications & resolution of CEA failure at plant.

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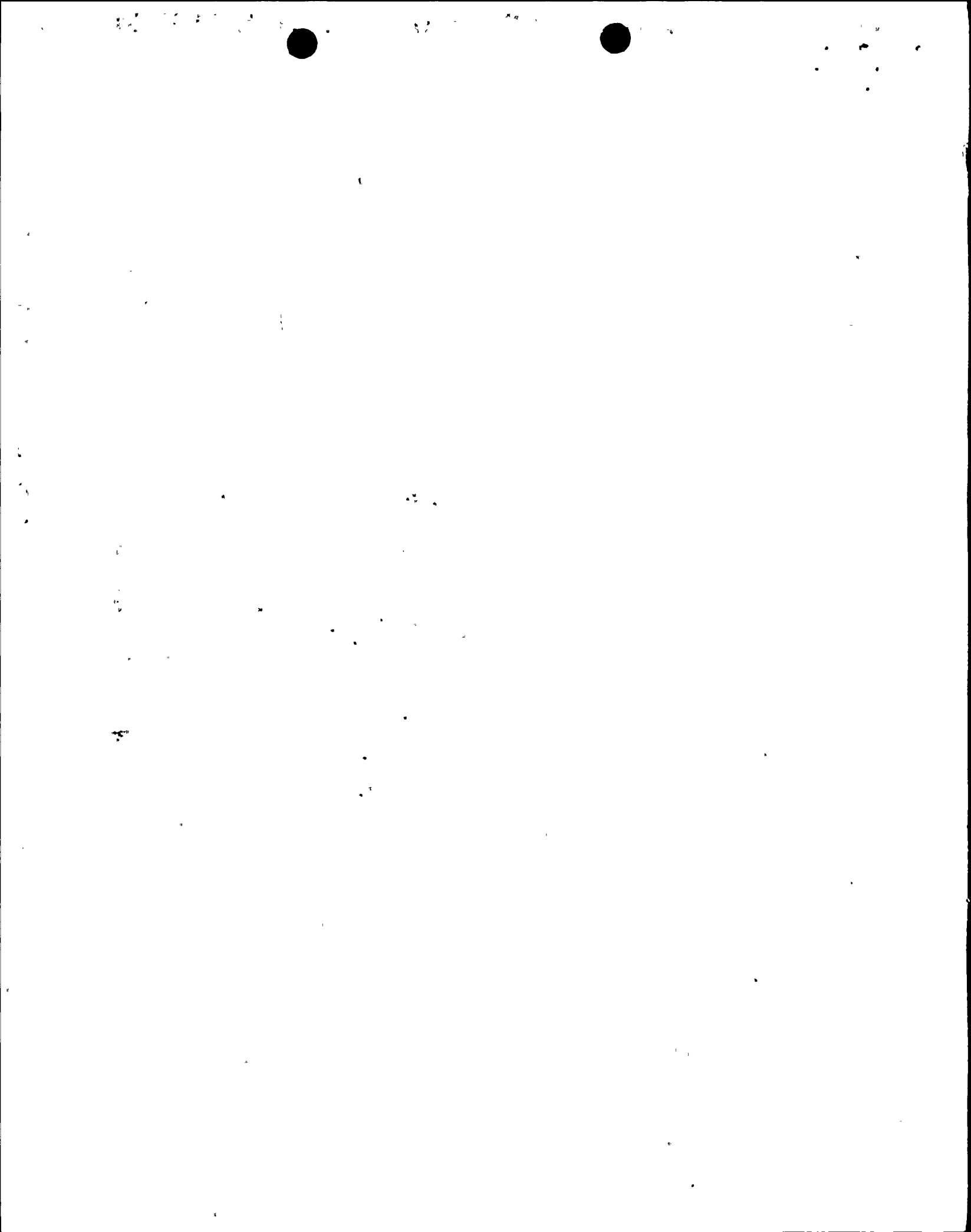
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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Gentlemen:


Re: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Generic Implications and Resolution
of CEA Failure at Maine Yankee

By letter dated July 6, 1990, the Nuclear Regulatory Commission (NRC) staff requested additional information from Florida Power and Light (FPL) regarding the Combustion Engineering Regulatory Response Group (CERRG) Action Program for addressing the issue of irradiation assisted stress corrosion cracking (IASCC) in Control Element Assemblies (CEAs). The staff also requested that FPL confirm its intention to implement the referenced Action Program for St. Lucie Unit 1.

The response provided in Attachment One to this letter confirms FPL's intent to follow the CERRG Action Program and provides the requested additional information.

Should you have any questions, please contact us.

Very truly yours,


D. A. Sager
Vice President
St. Lucie Plant

DAS:JMP:kw

cc: Stewart D. Ebnetter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant

DAS/PSL #212

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Attachment One

FLORIDA POWER AND LIGHT

ST. LUCIE UNIT ONE

REQUEST FOR ADDITIONAL INFORMATION RE:
ST. LUCIE UNIT 1 CEA ACTION PROGRAM

Florida Power and Light (FPL) provides the following information in response to the NRC request dated July 6, 1990:

Request Number 1:

It is our understanding that additional information and analyses are being performed relative to the Maine Yankee CEA failure.

Provide a description of the additional information being developed and what impact this information may have on your Action Program.

FPL Response:

The following additional information gathering programs are being evaluated:

Non-Destructive Examination of Old CEAs in Spent Fuel Pool

A representative sample of old CEAs discharged to the Spent Fuel Pool will be eddy current tested (ECT) and visually examined. The resulting information will be reviewed and used as a basis for revisions to the Action Program as appropriate.

Hot Cell Examination of Failed Maine Yankee CEAs

A proposal for the hot cell examination of the failed Maine Yankee CEAs is being prepared by Combustion Engineering/ABB for consideration by the CE Owners' Group (CEOG). This examination will be followed by FPL, and the resulting information will be reviewed and used as a basis for revisions to the Action Program as appropriate.

CEA Manufacturing Record Search

A manufacturing record search/comparison has been conducted by FPL personnel. The resulting information is being reviewed and will be used as a basis for revisions to the Action Program as appropriate.



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Request Number 2:

The Action Program defines "old CEA" as one with no AG-IN-CD slug in the center finger and has achieved high exposure. Recently, CEA degradation was identified associated with one Maine Yankee CEA with only 2732 EFPD exposure. Additionally, one Maine Yankee CEA with only 3415 EFPD exposure failed with loss of end cap and absorber material from the center finger and loss of full insertion capability.

- a. Define how many EFPD constitute "high exposure" and clarify your plans and criteria for replacement of old style CEAs.
- b. Provide justification for continued operation with any of the old style CEAs beyond the next refueling outage.
- c. Provide information on the availability of replacement CEAs and the procurement lead time required to replace all old style CEAs.

FPL Response:

- a. The existing evidence regarding a correlation between EFPD and failure of old CEAs is not conclusive. Therefore, the FPL Action Program has been amended to define an "old CEA" as one with no AG-IN-CD slug in the center finger. All old style CEAs meeting the revised definition are scheduled for replacement by the end of the next Unit 1 refueling outage.
- b. All old style CEAs will be replaced by the end of the next Unit 1 refueling outage. Therefore, no justification for continued operation beyond the end of that outage is necessary.
- c. New replacements for all old style CEAs are scheduled for delivery to St. Lucie Unit 1 by October 1990.

Request Number 3:

Your Action Program indicates that only a representative number of old CEAs will be ECT inspected. ECT inspection is not sensitive to circumferential cracking and, as a minimum, visual inspection should also be performed to verify end cap integrity.

- a. Provide more detail on your proposed inspection program, including the number of old CEAs that have been discharged, the number planned for inspection and the selection criteria. Also describe any inspections that will be performed to verify end cap integrity.
- b. Provide justification for not inspecting all of the discharged old style CEAs.
- c. Provide your schedule for completing this inspection. Upon completion of this inspection, submit the results to the NRC for our review.



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FPL Response:

- a. Through the first nine core cycles, 54 uninspected old style CEAs have been discharged at St. Lucie Unit 1. An initial sample of 25 old CEAs¹ has been selected for ECT and visual inspection. The combined inspection method is intended to identify both axial and circumferential cracking, as well as the absence of center finger end caps.
- b. The exposures of the discharged old CEAs selected for inspection are comparable to the projected exposures for old CEAs in the Cycle 10 core. The resulting information will be reviewed and used as the basis for determining if a revision to the Action Program inspection plan is appropriate.
- c. The inspection program is scheduled to commence the week of July 16, 1990. It is FPL's intention to complete this inspection as soon as possible. When complete, the results will be submitted to the NRC for review.

Request Number 4.a:

The staff understands that there have been no ECT inspections of St. Lucie 1 CEAs even though many of them have exceeded their expected design lifetime or will exceed it during the current operating cycle.

- a. Provide details regarding any testing that was performed at the beginning of Cycle 10 which would demonstrate that all of the old style CEAs were capable of full insertion at that time.

FPL Response:

Standard startup testing as described below was performed at the beginning of Cycle 10 which demonstrates that all of the old style CEAs were capable of full insertion:

- At the beginning of Cycle 10, rod bank worth testing was performed, which involves moving the CEAs from the fully withdrawn position to the fully inserted position. All CEAs functioned normally.
- CEA symmetry tests were performed at the beginning of Cycle 10, which involves insertion of shutdown group CEAs to the 50% insertion position. The CEAs tested met all acceptance criteria.
- At the beginning of Cycle 10, all 73 CEAs underwent rod drop testing in accordance with Technical Specification requirements. The rod drop times

¹ Four of the 54 old style CEAs have aluminum slugs in the center finger, and do not contain any B₄C within the center finger tip. These CEAs are not considered to be subject to the postulated failure mechanism and are therefore excluded from the inspection program.



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were well within the stated requirements.

Request 4.b:

Your Action Program proposes monthly exercising of the old CEAs that were installed in the core if evidence of cracking is found when ECT inspection of the old CEAs that were previously discharged from the core is performed, while waiting for delivery of replacement CEAs. It is prudent to assume that cracks may exist in the old CEAs until ECT inspection is completed. Therefore, your Action Program should be modified to require immediate and monthly rod exercising to demonstrate insertion capability until the ECT inspection results are available. This would be consistent with your existing Action Program requirements for interim operation with a cracked CEA finger.

- b. Provide your assessment and resolution of the NRC staff position discussed above, including any changes to your Action Program to account for uncertainties.

FPL Response:

FPL concurs with the staff assessment of the prudence of monthly testing of CEAs until ECT inspections are completed. Therefore, FPL intends to perform monthly CEA exercising of old style CEAs when Unit 1 is in Modes 1 and 2 during the interim period while ECT inspection and evaluation are underway.

Request Number 5:

Your proposed Action Program provides for extended operation (approximately 18 months) with no inspection or functional testing of old CEAs in the Cycle 10 core unless cracks are found in the discharged CEAs or there is a reactor trip or cold shutdown during the operating cycle. Your justification appears to be predicated on experience with one CEA which may have operated for more than one cycle without functional failure after a crack had initiated. Since the postulated CEA failure mechanism is IASCC and vulnerability is very sensitive to variations in material properties and composition, applicability of the previous experience to St. Lucie 1 CEAs has not been established.

The propagation rate for IASCC is known to be a function of stress level (including residual stresses), vulnerability of the specific material and the operating environment. Additionally, the vulnerability to cracking is increased during plant operation due to continuous radiation exposure and continued swelling of boron carbide pellets. Currently, there is no assurance that cracks do not exist in the old style CEAs and service duration without functional failure after crack initiation is unknown.

Provide your assessment and resolution of the considerations stated above, including any proposed changes to your Action Program to account for uncertainties.

FPL Response:

Although old CEA service duration after crack initiation has not been quantified, there is evidence that a cracked CEA operated at a similar unit for a long period of



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time (i.e., an extended cycle) without any signs of further crack propagation. The data gathered during the planned ECT and visual inspection of discharged CEAs is intended to provide valid indication of the condition of the CEAs in the Cycle 10 core. The information gleaned from this inspection will be reviewed and used as a basis for revisions to the Action Program as appropriate.

Request Number 6:

In the accident analysis, the worst case CEA is assumed to be stuck in the fully withdrawn position during a postulated event. The IASCC CEA failure mechanism could result in a multiple failure of CEAs to fully insert during the postulated event and must be considered.

Provide a comprehensive Safety Evaluation of the multiple rod failure event that could be postulated assuming that old CEAs are subject to the Maine Yankee failure mechanism. If your evaluation cannot be completed in time to support the required response date, provide a description of your planned evaluation and your schedule for completion.

FPL Response:

Defining the scope of a "multiple" CEA failure scenario is critical to assessing the parameters for reanalysis beyond the existing licensing basis of a single stuck CEA. FPL is of the opinion that further clarification of the staff request is needed before such an analysis can be considered.

The data gathered during the planned ECT and visual inspection of discharged CEAs is intended to provide valid indication of the condition of the CEAs in the Cycle 10 core. If revisions to the Action Plan are indicated as the result of these inspections, FPL confirms its intent to make such changes.