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ACCESSION NBR:9308120229 DOC.DATE: 93/08/04 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
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SUBJECT: Responds to GL 93-04, "Rod Control Sys Failure & Withdrawal of Rod Control Cluster Assemblies." Cautions added to surveillance & preventative maint procedures.

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L-93-186
10CFR50.54

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
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AUG 0 4 1993

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
NRC Generic Letter 93-04
Rod Control System Failure and Withdrawal of
Rod Control Cluster Assemblies

NRC Generic Letter 93-04, issued June 21, 1993, requested that licensees provide information to the NRC which addresses the licensing basis of the plant with regard to a failure in the rod control system, and specify what type of short and long term corrective actions have been taken or are planned for resolution of this issue. In accordance with the generic letter, Florida Power and Light Company provides the attached response for Turkey Point Units 3 and 4.

Should there be any questions regarding this information, please contact us.

Very truly yours,

T. F. Plunkett
Vice President
Turkey Point Nuclear

TFP/CLM/cm

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
R.C. Butcher, Senior Resident Inspector, USNRC, Turkey Point Plant

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STATE OF FLORIDA)
) ss.
COUNTY OF DADE)

T. F. Plunkett being first duly sworn, deposes and says:

That he is Vice President, Turkey Point Nuclear, of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

T. F. Plunkett

Subscribed and sworn to before me this 4 day of August, 1993.

Cheryl A. Kelly

CHERYL A. KELLY

Name of Notary Public (Type or Print)

NOTARY PUBLIC, in and for the County of Dade, State of Florida

CHERYL A. KELLY
MY COMMISSION # CC 223781
EXPIRES: September 27, 1996
Bonded Thru Notary Public Underwriters

My Commission expires:
Commission No. _____

T. F. Plunkett is personally known to me.

ATTACHMENT

RESPONSE TO GENERIC LETTER 93-04
"ROD CONTROL SYSTEM FAILURE AND WITHDRAWAL
OF ROD CLUSTER CONTROL ASSEMBLIES"

Background

On May 27, 1993, Salem Unit 2 experienced the uncontrolled withdrawal of a single Rod Cluster Control Assembly (RCCA). The movement of this single RCCA was postulated to have resulted from control system logic cabinet card failures, possibly the result of a single initiating failure coupled with failures and/or effects that have yet to be identified. The current Salem licensing basis as described in their Final Safety Analysis Report (FSAR) indicates that multiple failures would have to be present in order for an inadvertent single rod withdrawal event to occur. If this event were the result of a single failure, the uncontrolled single rod withdrawal event of May 27th would place the Salem plant outside of its stated FSAR design basis, with the potential for a core power distribution not considered in their original design basis analysis.

As a result of this event, the NRC issued Generic Letter 93-04, which requested a written response from Westinghouse licensees under the requirements of 10 CFR 50.54(f). According to the generic letter, each licensee is required to provide technical/licensing information to the NRC which addresses the licensing basis of the plant with regard to a single failure in the rod control system, and specify what type of short and long term corrective actions have been taken or are planned for resolution of this issue.

Requested Action Item 1(a)

Pursuant to Section 182a of the Atomic Energy Act of 1954 as amended, and 10 CFR 50.54(f), each action addressee is required to submit written information as follows:

1. Within 45 days from the date of this generic letter:

(a) Provide an assessment of whether or not the licensing basis for each facility is still satisfied with regard to the requirements for system response to a single failure in the rod control system and provide a supporting discussion for this assessment in light of the information generated as a result of the Salem event.

FPL Response to Items 1(a)

In order to address the licensing basis for Florida Power and Light Company's (FPL) Turkey Point rod control system, an assessment of appropriate licensing criteria applicable to rod control system malfunctions and an analysis of the design capabilities of the core have been performed as documented in the following sections.

1.0 Probability of Uncontrolled Rod Withdrawal Events

Turkey Point Technical Specifications include a number of operability and surveillance requirements which help reduce the potential for various undetected failure modes and unsafe operating conditions. Technical Specification 3/4.1.3 requires the operability of the full length (shutdown and control) rods and would place the plant in an Action Statement if RCCAs are not within $\pm$ 12 steps of their respective group step counter demand position. The surveillance requirements contained within this Technical Specification require operators to verify each full length rod to be within $\pm$ 12 steps of the group counter at least once per 12 hours. If the type of failure experienced at Salem were present, the operator would observe rod misstepping, which would lead to the discovery of the failures.

Technical Specifications further require operators to verify movement of at least 10 steps for all rods not fully inserted within the core, at least once every 31 days. Movement in one direction requires movement in the opposite direction to return rods to their initial positions. These movements, along with those changes in position required for reactivity changes and load adjustments, provide opportunities for the operators to detect any rod control system failures.

The design and operation of the Turkey Point rod control system provide additional opportunities to detect and manually terminate unplanned continuous rod withdrawal events. The rod control system has been designed with the capability for both automatic and manual control of the RCCAs during power operation of the reactor. In the automatic mode of operation, the rod control system has the capability for rod insertion only. The Turkey Point rod control system no longer has the capability for automatic rod withdrawal. These features make the rod control system less vulnerable to uncontrolled continuous rod withdrawal events.

Turkey Point is currently operated as a base-loaded plant and does not normally follow load demands in the FPL distribution system. As a result, the rod control system is normally operated with all rods out; long-term reactivity adjustments are handled by adjusting boron concentration. The rod control system is operated in manual mode until steady-state full power is reached, then placed in the automatic mode. This operating approach reduces the potential for unplanned continuous rod withdrawal events. In addition, the Turkey Point rod control system is equipped with mechanical step counters, which produce audible clicks in the control room whenever rods move in either direction. This feature provides additional assurance that operators will immediately be alerted to and terminate any rod control system failures which result in an unplanned continuous movement of control rods.

2.0 Analysis of Asymmetric Rod Control Withdrawal Events

The Turkey Point reactor protection system was designed and licensed to comply with the requirements identified in the Atomic Energy Commission's (AEC) 1967 Proposed General Design Criteria (Draft GDCs). Compliance with Draft GDC 31 requires that the reactor protection system be capable of accommodating any credible single malfunction of a reactivity control system, such as the rod control system, by limiting reactivity transients to avoid exceeding acceptable fuel damage limits.

Analyses of various beyond-design-basis asymmetric rod withdrawal events was performed by FPL using reactor analysis computer codes, which are available in-house (RETRAN-03 thermal/hydraulics code, SIMULATE-3 physics code, and VIPRE-01 DNBR analysis code). These codes have been reviewed and approved by the NRC for application to nuclear power plants. The codes were used to assess whether sufficient margin exists to accommodate single rod, double rod, and group asymmetric rod withdrawal events without violation of the following criteria: (1) cladding Departure from Nucleate Boiling Ratio (DNBR) limits; (2) fuel centerline temperature limit; (3) reactor coolant system pressure limit; and (4) steam generator pressure limit. The impact on DNB margin from these beyond-design basis events was quantified by calculating a loss of DNB margin relative to the uncontrolled rod withdrawal analysis results for the design basis withdrawal of two banks in sequential overlap, as discussed in Sections 14.1.1 and 14.1.2 of the Turkey Point Units 3 and 4 Updated Final Safety Analysis Report (UFSAR).

Best-estimate analyses were performed at hot zero power, 10%, 60%, 80% and 100% reactor power. The results of these analyses show that the transient is the most limiting with the reactor at 60% power, where rod movement has its greatest impact on core power and radial power tilt. The analyses show that the margins in the Turkey Point Units 3 and 4 fuel designs are adequate to accommodate the increase in the core peaking factors without violating the DNBR limit. The analyses also show that fuel centerline temperatures, and primary and secondary system pressures remain well below their respective limits.

In addition, Westinghouse is analyzing asymmetric rod withdrawal events using their SPNOVA (3D) physics code in conjunction with LOFT-5 transient analysis code to address this issue on a generic basis for all Westinghouse plant designs. This analysis is being performed under the direction of the Westinghouse Owners Group, and the Turkey Point units will be enveloped by this analysis.

3.0 Compliance With NRC General Design Criteria

The Turkey Point reactor protection system was designed and licensed to comply with the requirements identified in the AEC's 1967 Proposed General Design Criteria. UFSAR Section 7.2 discusses design requirements for the reactor protection system, which include compliance with draft GDC 31. Draft GDC 31 establishes the following design criterion:

> "The reactor protection system shall be capable of protecting against any single malfunction of the reactivity control system, such as unplanned continuous withdrawal (not ejection or dropout) of a control rod, by limiting reactivity transients to avoid exceeding acceptable fuel damage limits."

In response to this requirement, the UFSAR indicates that reactor shutdown with RCCAs (i.e., the reactor protection system) is completely independent of the normal control functions, since the trip breakers interrupt the power to the control rod drive mechanisms regardless of the existing control signals.

The uncontrolled withdrawal of two banks of control rods in sequential overlap was analyzed for both power operation and for subcritical conditions in Sections 14.1 and 14.2 of the UFSAR, respectively. These events were considered to be the limiting credible single failure events for the rod control system. Analysis of these events as documented in the UFSAR shows that no fuel damage will occur. The AEC found this acceptable in their 1972 Safety Evaluation for Turkey Point Units 3 and 4, which states:

> "In order to assess the safety margins of the plant design, a number of operating transients were considered by the applicant, including rod withdrawal during startup and at power,...we conclude that the Turkey Point control and protection system design is such that these transients can be terminated without damage to the core or to the reactor coolant boundary, and with no offsite radiological consequences."

The UFSAR analyses for uncontrolled rod withdrawal incidents takes full credit for the reactor protection system to mitigate the effects of the rod control system malfunctions. Compliance with Draft GDC 31 requires that the reactor protection system be capable of accommodating any credible single failure of a reactivity control system (such as the rod control system) by limiting reactivity transients to avoid exceeding acceptable fuel damage limits. No credit is taken in the UFSAR for any design features contained within the rod control system itself to mitigate or prevent either of the uncontrolled rod withdrawal events discussed in the UFSAR. Furthermore, unplanned continuous rod withdrawal events do not challenge either the reactor coolant pressure boundary or the containment boundary.

4.0 Conclusion

Analyses show that the design margins in the Turkey Point Units 3 and 4 cores are adequate to accommodate the increase in the core peaking factors resulting from asymmetric rod withdrawals, without exceeding fuel design safety limits and pressure limits applicable to the primary and secondary systems. These analyses are discussed in Section 1.0 above.

Consideration must also be given to those rod control system design features and operating procedures, as discussed above in Section 2.0. These features and practices make an unplanned and undetected continuous rod withdrawal extremely unlikely.

Based on both the preventive and mitigative factors discussed above, FPL concludes that fuel failure as a result of previously analyzed or postulated single failures would not occur. Therefore Turkey Point Units 3 and 4 remain in compliance with their licensing basis relating to single malfunctions within the rod control system.

Requested Action Item 1(b)

(b) If the assessment in 1(a) indicates that the licensing basis is not satisfied

- **provide an assessment of the impact of potential single failures in the rod control system on the licensing basis of the facility;**
- **describe any compensatory short-term actions taken or that will be taken to address any actual or potential degraded or nonconforming conditions (see Generic Letter 91-18), such as:**
  - **additional cautions or modifications to surveillance and preventative maintenance procedures**
  - **additional administrative controls for plant startup and power operation**
  - **additional instructions and training to heighten operator awareness of potential rod control system failures and to guide operator response in the event of a control rod system malfunction**

FPL Response to Item 1(b)

As a precaution, until the rod withdrawal issue can be studied further and resolved by the Westinghouse Owner's Group, Westinghouse has recommended (Nuclear Safety Advisory Letter NSAL-93-007), and FPL has taken, certain actions which include the following:

1. Licensed operators will continue the normal process of verifying that rod motion is proper for required movement.

2. Plant personnel will continue to confirm the functionality of rod deviation alarms.

3. Licensed operators are aware of the Salem rod withdrawal event, and have each received a copy of NRC Information Notice 93-46 to ensure their understanding of the event.

4. FPL will continue to work within the Westinghouse Owner's Group in an effort to satisfactorily resolve this issue.

Requested Action Item 2

2. **If the assessment in 1(a) indicates that the licensing basis is not satisfied, within 90 days from the date of this generic letter provide a plan and schedule for the long-term resolution of this issue.**

FPL Response to Item 2

FPL has demonstrated compliance with its licensing basis regarding malfunctions of the rod control system. No additional actions are planned beyond the precautionary measures identified above, which correspond to those identified by Westinghouse in Nuclear Safety Advisory Letter NSAL-93-007.