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Docket No. 50-251

Florida Power & Light Company  
 ATTN: Dr. Robert E. Uhrig  
 Vice President  
 P. O. Box 013100  
 Miami, Florida 33101

Gentlemen:

Enclosed is a signed original of an Order for Modification of License, dated February 17, 1978, issued by the Commission for Turkey Point Unit No. 4. This Order amends paragraph 3.D of the Turkey Point Unit No. 4 Facility Operating License DPR-41 to confirm that you were granted authorization to operate Turkey Point Unit No. 4 from February 11, 1978 to February 14, 1978 with a limit of 0.35 gpm of primary to secondary leakage thru any steam generator.

A copy of the Order is being filed with the Office of the FEDERAL REGISTER for publication.

Sincerely,

**Original signed by**

George Lear, Chief  
 Operating Reactors Branch #3  
 Division of Operating Reactors

Enclosure:  
 Order for Modification  
 of License

cc w/enclosure:  
 See next page

*OELD*  
*[Signature]*  
*2/17/78*

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
FLORIDA POWER AND LIGHT COMPANY ) Docket No. 50-251  
Turkey Point Plant Unit No. 4 )

ORDER FOR MODIFICATION OF LICENSE

I.

The Florida Power and Light Company (the Licensee), is the holder of Facility Operating License No. DPR-41 which authorizes the operation of the nuclear power reactor known as Turkey Point Unit No. 4 (the facility) at steady state reactor power levels not in excess of 2200 thermal megawatts (rated power). The facility is a pressurized water reactor (PWR) located at the Licensee's site in Dade County, Florida.

II.

On Saturday, February 11, 1978, the licensee requested authorization to continue operation of Turkey Point Unit No. 4 with primary to secondary leakage indication in excess of 0.3 gpm (18 gph), in order to avoid shutdown for repair at a time of power shortage in the Dade County area of Florida.

Under ordinary circumstances, there is sufficient reserve in this area to permit shutdown of units for needed repairs without disruption of power supplies to users. However, the licensee informed us that on

Saturday, two other units in the Dade County area were out of service for repair. Efforts were being made to return Turkey Point Unit No. 1, a fossil fired unit, to operation on Monday, February 13, 1978. Turkey Point Unit No. 3, a nuclear unit, was completing repair work and was expected to return to power early in the week of February 13, 1978.

Cold weather conditions were anticipated to impose heavy demands in the Dade County area and projected power demand for Saturday was estimated to exceed all available capacity unless Turkey Point Unit No. 4 was in operation.

The restriction on primary to secondary leakage was imposed by NRC in its Order of February 8, 1977 and continued by its subsequent Orders of August 3, 1977 and February 10, 1978. This restriction assures that even if the leakage is associated with a single defect, the defect will be of such a size that there is significant margin to assure that the defect will remain stable even under the sudden loads imposed by a LOCA and MSLB. The margin may be reduced somewhat for short periods of time and still provide sufficient strength to withstand potential accidents. In light of the licensee's request, the staff has reviewed the available data and has concluded that for a leakage rate of 0.35 gpm, the associated single defect size would still maintain integrity under

normal operating loads and loads that may be associated with a LOCA or MSLB. Moreover, the probability of occurrence of an accident during the very short time periods involved is extremely small.

For these reasons, the staff concluded that operation of Turkey Point Unit No. 4, at a slightly increased maximum primary to secondary leakage rate (from 0.3 gpm to 0.35 gpm) could be continued, for the short periods of time involved, with reasonable assurance that public health and safety will not be endangered by continued operation. Authorization to operate at the slightly higher leak rate until Monday, February 13, 1978 was granted by telephone on Saturday, February 11, 1978 to be followed by formal action.

On Monday, February 13, 1978 the licensee requested an extension of the period of operation at the higher leak rate of 0.35 gpm because Turkey Point Unit No. 1 repairs were not completed during the weekend, Turkey Point Unit No. 3 repairs were projected to extend until Thursday, February 16, and there was further cold weather projected for Tuesday evening, February 14, 1978. After further review of the current status of Turkey Point Unit No. 4, the staff concluded that operation could continue for a limited period with reasonable assurance that public health and safety will not be endangered. The staff Safety Evaluation Report is attached. Authorization to continue to operate at the slightly higher leakage rate until Thursday, February 16, 1978 was granted by telephone to be followed by formal action.

On Tuesday, February 14, 1978, the licensee informed the staff that weather conditions had ameliorated from those projected on Monday and that repair efforts on Unit No. 3 were progressing rapidly and that the licensee had decided to shut down Unit No. 4 for repairs of the leaking tube and for inspection of the conditions of the steam generator. Unit No. 4 was removed from service at 1:00 p.m., February 14, 1978.

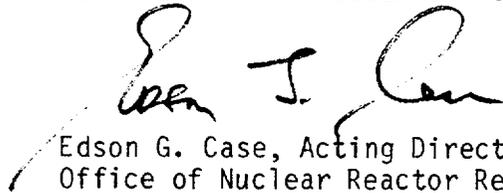
Copies of the following documents are available for public inspection in the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. 20555, and at the Environmental and Urban Affairs Library, Florida International University, Miami, Florida: (1) Memorandum, Clark to Lear, dated February 15, 1978, (2) Letter, Uhrig, FP&L, to Case, NRC, dated February 14, 1978.

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's Rules and Regulations in 10 CFR Part 2 and 50, IT IS ORDERED THAT paragraph 3.D.2 of Facility Operating License No. DPR-41, previously imposed by NRC Orders, is hereby amended as follows:

2. From Saturday February 11, 1978 until Tuesday, February 14, 1978, primary to secondary leakage through the steam generator tubes shall be limited to 0.35 gpm per

steam generator. With any steam generator tube leakage greater than this limit, the reactor shall be brought to the cold shutdown condition within 24 hours.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink, appearing to read "Edson G. Case", is written over a horizontal line.

Edson G. Case, Acting Director  
Office of Nuclear Reactor Regulation

Dated in Bethesda, Maryland  
this 17th day of February, 1978



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING ORDER FOR MODIFICATION OF LICENSE

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT NUCLEAR GENERATING UNIT NO. 4

DOCKET NO. 50-251

INTRODUCTION

Turkey Point Unit No. 4 is currently operating under an NRC Order dated August 3, 1977. One of the operating limitations imposed by the Order states that the primary to secondary leakage through the steam generator tubes shall be limited to 0.3 gpm per steam generator.

DISCUSSION

The leak rate limit of 0.3 gpm has been imposed to assure that even if all detected leakage is from a single crack in a single tube of one of the steam generators, sufficient margin is maintained to assure adequate tube integrity. There is substantial test data available from Westinghouse (W) which forms the basis for correlations of crack length, leakage rate and tube failure (fishmouth opening) pressure for straight sections of tubing. We have used this data in assessing tube integrity for denting induced stress corrosion cracks, even though some additional strength is provided by the restraining effect of the tube support plate. Based on Westinghouse's test data, the crack length corresponding to a 0.3 gpm leak rate is such that the tube with the crack has substantial margin against burst under the full range of normal operating conditions and the postulated main steam line break (MSLB) accident.

Westinghouse's test data for leak rate versus operating primary system to secondary system differential pressure for various axial simulated fatigue crack lengths, and failure differential pressure versus crack length (semi-empirical data) indicate that a leak rate of 0.3 gpm under normal operating pressure differential (about 1500 psid) corresponds to a crack of about 0.5 inch in length. For this crack length the associated factor of safety for normal operating pressures is approximately 2.3, and the factor of safety under postulated MSLB pressures is about 1.5.

We believe that these margins are appropriate to compensate for the uncertainties in the conditions which have given rise to the leakage. Semi-empirical and analytically-derived data from the Battelle Memorial Institute show that there is a significant decrease in tube burst pressure when a crack is superimposed on an area of 50 percent degradation (thinning). On the other hand, for denting induced cracks added strength is afforded by the restraining effect of the tube support plate. All things considered, we believe that the margin afforded by limiting

crack size to approximately 0.5 inch is the margin that should be available during operation for extended periods of weeks or months.

The margin may be reduced somewhat for shorter periods of operation under careful monitoring and still assure sufficient strength to withstand potential accidents without tube burst. An increase in primary to secondary leakage rate from 0.3 to 0.35 gpm corresponds to a small reduction in safety margin against tube burst. However, a tube with such a crack still retains sufficient strength characteristics to be able to withstand the loads imposed by normal operating and accident conditions.

### CONCLUSION

Based on the above discussion, the staff concludes the following:

1. Recent inspections of Turkey Point Unit No. 4 steam generators show that denting is more of a problem than wastage. Also, the unit has been operating for several weeks with a very slowly, steadily increasing leak rate which is indicative of leakage from a crack extending out of a tube/tube support plate intersection. If the crack were located in a U-bend region or along a straight section of tubing, the leak rate would increase much faster and more dramatically. Therefore, the leakage is most probably occurring from a crack at a tube/tube support plate intersection. The type of cracks associated with tube denting has been tightly held by the support plate, and will not burst open during a MSLB accident as easily as a crack located along a straight section of tubing.
2. The increase in allowable leakage from 0.3 gpm to 0.35 gpm will result in some decrease in safety margin. However, even if the crack were located in a straight section of tubing, there is still sufficient integrity to withstand normal and accident loads.
3. Tube burst tests indicate that a steam generator tube crack does not "run" when it fails under pressure, but that the tube bursts open in a "fishmouth" manner. Thus, primary to secondary leakage is limited under failed conditions by the nature of the failure.
4. For short periods during which careful attention is paid to monitoring of any increase in leakage rate, we believe that limitation of leakage rate to 0.35 gpm will still provide sufficient integrity to permit continued operation with reasonable assurance that the health and safety of the public will not be endangered.