



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555

August 30, 1989

Docket Nos. 50-250  
and 50-251

Mr. C. O. Woody, Acting Senior  
Vice President-Nuclear  
Nuclear Energy Department  
Florida Power and Light Company  
P.O. Box 14000  
Juno Beach, Florida 33408-0420

Dear Mr. Woody:

SUBJECT: TURKEY POINT UNITS 3 AND 4 - SAFETY EVALUATION, NUREG-0737 ITEM II.D.1,  
PERFORMANCE TESTING OF RELIEF AND SAFETY VALVES (MPA F-14)  
(TAC NOS. 44626 AND 44627)

By letter dated June 16, 1989, Florida Power and Light Company (FPL) provided responses to the outstanding issues identified in the staff's Safety Evaluation Report dated May 16, 1989 on the above subject. As documented in the enclosed Safety Evaluation (SE), the staff has reviewed FPL's responses and has determined that all of the requirements of NUREG-0737, Item II.D.1 have been met with the following exceptions:

- (1) Procedures must be developed for inspection and maintenance of the safety valves following each lift involving loop seal or liquid water discharge in order to assure continued operability of the safety valves.
- (2) Maximum analyzed bending moments applied to the safety and relief valves must be demonstrated to be acceptable.

FPL should proceed to resolve these open issues which are discussed in more detail in the enclosed SE. Submittal of their resolution for staff review is not required. However, documentation of their resolution should be maintained and is subject to audit. If resolution of these issues results in changes to the facility, the changes remain subject to review under 10 CFR §50.59.

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Mr. C.O. Woody

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August 30, 1989

By this letter, staff action concerning NUREG-0737, Item II.D.1, and multiplant action number MPA F-14 for Turkey Point are considered complete, and TAC Nos. 44626 and 44627 are closed.

Sincerely,

Original signed by

Gordon E. Edison, Sr. Project Manager  
Project Directorate II-2  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Enclosure:  
Safety Evaluation

cc w/enclosure:  
See next page

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[TP/SER NUREG-0737]

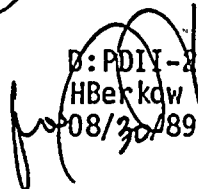
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Mr. C. O. Woody  
Florida Power and Light Company

Turkey Point Plant

cc:

Harold F. Reis, Esquire  
Newman and Holtzinger, P.C.  
1615 L Street, N.W.  
Washington, DC 20036

Mr. Jack Shreve  
Office of the Public Counsel  
Room 4, Holland Building  
Tallahassee, Florida 32304

John T. Butler, Esquire  
Steel, Hector and Davis  
4000 Southeast Financial  
Center  
Miami, Florida 33131-2398

Mr. K. N. Harris, Vice President  
Turkey Point Nuclear Plant  
Florida Power and Light Company  
P.O. Box 029100  
Miami, Florida 33102

County Manager of Metropolitan  
Dade County  
111 NW 1st Street, 29th Floor  
Miami, Florida 33128

Senior Resident Inspector  
Turkey Point Nuclear Generating Station  
U.S. Nuclear Regulatory Commission  
Post Office Box 57-1185  
Miami, Florida 33257-1185

Mr. Jacob Daniel Nash  
Office of Radiation Control  
Department of Health and  
Rehabilitative Services  
1317 Winewood Blvd.  
Tallahassee, Florida 32399-0700

Intergovernmental Coordination  
and Review  
Office of Planning & Budget  
Executive Office of the Governor  
The Capitol Building  
Tallahassee, Florida 32301

Administrator  
Department of Environmental  
Regulation  
Power Plant Siting Section  
State of Florida  
2600 Blair Stone Road  
Tallahassee, Florida 32301

Regional Administrator, Region II  
U.S. Nuclear Regulatory Commission  
101 Marietta Street, N.W. Suite 2900  
Atlanta, Georgia 30323

Attorney General  
Department of Legal Affairs  
The Capitol  
Tallahassee, Florida 32304

Plant Manager  
Turkey Point Nuclear Plant  
Florida Power and Light Company  
P.O. Box 029100  
Miami, Florida 33102



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
EVALUATION OF ADDITIONAL INFORMATION SUBMITTED IN RESPONSE TO  
OUTSTANDING ISSUES FOR NUREG-0737, ITEM II.D.1  
PERFORMANCE TESTING OF SAFETY AND RELIEF VALVES  
TURKEY POINT UNITS 3&4

INTRODUCTION

By a letter dated May 16, 1989, the staff transmitted a Safety Evaluation Report (SER) for TMI Item II.D.1 for Turkey Point Units 3 and 4. The SER identified several outstanding issues involving the functional capability of the primary system safety and relief valves and the attached discharge piping. The licensee submitted a response to these issues by letter dated June 16, 1989. The staff has reviewed the licensee's response. The staff evaluation of the proposed resolutions is provided below.

DISCUSSION AND EVALUATION

The licensee has categorized the outstanding issues and has addressed them as five major items. The staff agrees that these are generally the five major areas which need addressing. The following evaluation covers these items in the same order and numbering as the licensee's response.

Item 1.

One issue identified in the SER was the need for inspection and maintenance following each safety valve actuation involving discharge of liquid or loop seal water. The Electric Power Research Institute (EPRI) testing showed a pattern that after sequential tests of liquid or loop seal discharge, safety valve performance did degrade. Fluttering and/or chattering and leaking of the valve disk occurred in some subsequent tests which indicated a need for refurbishment. This occurred for both the 3K6 and 6M6 Crosby model test valves. The licensee argues that only the 3K6 data apply to the Turkey Point valves (4K,6). The staff applied both 3K6 and 6M6 data because these valves are both considered representative of the 4K,6 valve which is between the two tested valves in size. However, even if 3K6 data alone are used, the 3K6 valve also showed the same trends and required refurbishment to remain in good working order for subsequent tests. Regarding this issue, the licensee should review the plant operating procedures to insure that a safety valve which has been challenged with liquid or loop seal water will remain in good working order and operable condition.



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Items 2. and 3.

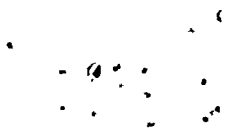
These items involve the acceptability of the bending moments applied to the safety valves and relief valves (PORVs). One objective of the EPRI testing was to show by open and close cycle testing that large applied bending moments to the safety and relief valves did not affect functional capability.

In an earlier submittal, the licensee showed that, for the conditions which were analyzed, the bending moments on the plant safety valves are bounded by the moments imposed on the representative test valves during testing. In the SER, the staff determined that this was not adequate because the licensee had not combined the analyzed loads with the plant Safe Shutdown Earthquake (SSE) to determine the maximum bending moments which could be applied to the safety valves. In the June 16, 1989 response to the SER, the licensee stated that the load combinations used to analyze the safety and relief valve system are consistent with the plant FSAR; therefore, a combination of the SSE and safety and relief valve discharge loads is not required to be evaluated. The staff agrees that not combining the valve discharge loads with the SSE is consistent with the FSAR and with the design of the overall plant; therefore this will not be required for the II.D.1 analysis. However, one load combination which does apply and has been analyzed is for the SSE combined with normal operating loads. The licensee states that for this loading the attached piping is not overstressed; therefore, it is expected that the safety valves will operate satisfactorily. The staff agrees that for piping stresses less than the allowable limits, the valve body stresses probably remain elastic; however, the valve internals and sliding parts may distort excessively and not operate properly for large bending moments. Therefore, the licensee should assure that for all load combinations applicable to Turkey Point, including the SSE combined with normal operating load, the bending moments applied to the safety valves are less than those demonstrated acceptable by testing.

The licensee has also provided the maximum induced moment on the PORVs for the most severe condition analyzed. This moment is larger than the maximum moment applied to the test valves. Again, the licensee states that because the attached piping remains below allowable stress limits, the valves are expected to operate satisfactorily. As stated above for the safety valves, the staff has determined that this does not assure operability of the PORVs. Therefore, the licensee should assure that for all applicable load combinations, the bending moments applied to the PORVs are less than those demonstrated acceptable by testing.

Items 4. and 5.

These items involve the acceptability of the licensee's criteria for service loading and allowable stresses in piping and piping supports. In an earlier submittal, the licensee outlined a piping functional criterion which allowed 70 percent of the ultimate bending moment capability which the licensee stated would ensure structural integrity. The SER disagreed with the proposed 70 percent of ultimate moment criterion because of unknown effects of the resulting plastic strain on fatigue, ratcheting, buckling and functional capability. In addition, it was not known if sufficient margin existed when considering the amount of plastic strain required for collapse failure and the possible loads in the piping system.



In the June 16, 1989 response, the licensee stated that the piping has been reevaluated and the reanalyzed stresses have been compared to ASME service levels. All piping stresses fall below Level C ( $2.25 S_y$  or  $2.25 S_u$ ) for the most severe loading conditions analyzed. Similarly, the piping support loads fall below Level C limits. The licensee stated that the analyzed loading conditions which meet the Level C criteria are: sustained + safety valve, sustained + operating basis earthquake (OBE) + relief valve, and sustained + SSE. While the use of the ASME Code allowable stresses is inconsistent with the original piping design (ANSI B31.1) which specifies lesser stress limits, this is acceptable to demonstrate functional capability of the piping and supports in this system. Meeting these stress levels will provide reasonable assurance that gross deformation or structural collapse will not result. The Service Level C limit exceeds the yield strength for the piping material of construction, yet assures generally less than 1 percent strain and significant margin to failure.

It was recommended by EPRI that the SSE and valve discharge loads be combined and evaluated unless otherwise specified by the plant FSAR. As discussed above for items 2 and 3, an analysis of the Faulted Service Level (D) for these combined loads is not required because this is beyond the plant design basis. The staff notes that even though not analyzed, there is some margin in the piping design to resist these combined loads in the unlikely event they occur simultaneously. Therefore, the piping analysis which has been performed by the licensee is acceptable for demonstrating the functional capability of the safety and relief valve system for the applicable design conditions at the plant.

#### CONCLUSION

The additional information the licensee has provided in response to the outstanding issues for Item II.D.1 is generally acceptable for resolving these issues except as discussed above. The licensee has demonstrated that the loading conditions and the resulting stress levels in the safety and relief valve piping system are acceptable and consistent with the plant design basis. Therefore, the requirement for qualification of the piping and supports has been met.

There remain two issues which must be addressed by the licensee. The licensee must develop procedures for inspection and maintenance of the safety valves following each lift involving loop seal or liquid water discharge in order to assure continued operability of the safety valves. The licensee must also assure acceptability of the maximum analyzed bending moment applied to the safety and relief valves. This may be accomplished by modifying the piping configuration and reducing the bending moment to values less than those shown acceptable by test. This could also be accomplished by demonstrating by testing that the valves will remain operable with the greater bending moments. The resolution of these items by the licensee will complete the Item II.D.1 requirements for Turkey Point Units 3 and 4 and will ensure the functional capability of the primary safety and relief valve system.

Dated: August 30, 1989

Principal Contributor:  
G. Hammer