St. Lucie Units 1 and 2
Docket Nos. 50-335 & 50-389
Proposed License Amendments
Flood Protection

ATTACHMENT 1

St. Lucie Unit 1 Marked-up Technical Specification Pages

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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

BASES

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DESIGN FEATURES

3/4.7.6 FLOOD PROTECTION

DELETE

LIMITING CONDITION FOR OPERATION

3.7.6.1 Flood protection shall be provided for the facility site.

APPLICABILITY: At all times.

ACTION:

With either a Hurricane Watch or a Hurricane Warning issued for the facility site, perform the St. Lucie Plant Beach Survey Procedure pursuant to Specification 4.7.6.1.1 below.

SURVEILLANCE REQUIREMENTS

4.7.6.1.1 The St. Lucie Plant Beach Survey Procedure shall be conducted at least once per year between the dates of May 25 and June 7 and within 30 days following the termination of either a Hurricane Watch or a Hurricane Warning for the facility site. A Special Report containing the results of these surveys shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 30 days following the completion of the survey. The Special Report shall include an evaluation of the facility flood protection if, as evidenced by this survey program, the beach dune described in Specification 5.1.3 is lost.

4.7.6.1.2 The St. Lucie Mangrove Photographic Survey Procedure shall be conducted at least once per 12 months and shall be a color infrared photograph(s), or equivalent, of the mangrove area between the facility and the FP&L east property line. The results of these surveys shall be included in the Annual Operating Report for the period in which the survey was completed. This report shall include an evaluation of the facility flood protection if the survey indicates deterioration, either man-made or natural, of this mangrove area.

4.7.6.1.3 Meteorological forecasts shall be obtained from the National Hurricane Center in Miami, Florida at least once per 6 hours during either a Hurricane Watch or a Hurricane Warning.

3/4.7.3 COMPONENT COOLING WATER SYSTEM

The OPERABILITY of the component cooling water system ensures that sufficient cooling capacity is available for continued operation of vital components and Engineered Safety Feature equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

3/4.7.4 INTAKE COOLING WATER SYSTEM

The OPERABILITY of the intake cooling water system ensures that sufficient cooling capacity is available for continued operation of vital components and Engineered Safety Feature equipment during normal and accident conditions. The redundant cooling capacity of this system, assuming a single failure, is consistent with the assumptions used in the accident analyses.

3/4.7.5 ULTIMATE HEAT SINK

The limitations on the ultimate heat sink level ensure that sufficient cooling capacity is available to either 1) provide normal cooldown of the facility, or 2) to mitigate the effects of accident conditions within acceptable limits.

The limitation on minimum water level is based on providing an adequate cooling water supply to safety related equipment until cooling water can be supplied from Big Mud Creek.

Cooling capacity calculations are based on an ultimate heat sink temperature of 95°F. It has been demonstrated by a temperature survey conducted from March 1976 to May 1981 that the Atlantic Ocean has never risen higher than 86°F. Based on this conservatism, no ultimate heat sink temperature limitation is specified.

3/4.7.6 ~~FLOOD PROTECTION~~ ← DELETED

~~The limitation on flood protection ensures that facility will be adequately protected from flooding.~~

3/4.7.7 CONTROL ROOM EMERGENCY VENTILATION SYSTEM

The OPERABILITY of the control room emergency ventilation system ensures that 1) the ambient air temperature does not exceed the allowable temperature for continuous duty rating for the equipment and instrumentation cooled by this system and 2) the control room will remain habitable

5.0 DESIGN FEATURES

5.1 SITE

EXCLUSION AREA

5.1.1 The exclusion area is shown on Figure 5.1-1.

LOW POPULATION ZONE

5.1.2 The low population zone is shown on Figure 5.1-1.

~~FLOOD CONTROL~~ DELETE

~~5.1.3 The flood control provisions (dunes and slope protection) shall be designed and maintained in accordance with the original design provisions contained in Section 2.4.2.2 of the FSAR.~~

5.2 CONTAINMENT

CONFIGURATION

5.2.1 The containment structure is comprised of a steel containment vessel, having the shape of a right circular cylinder with a hemispherical dome and ellipisoidal bottom, surrounded by a reinforced concrete shield building. The radius of the shield building is at least 4 feet greater than the radius of circular cylinder portion of the containment vessel at any point.

5.2.1.1 CONTAINMENT VESSEL

a. Nominal inside diameter = 140 feet.

b. Nominal inside height = 232 feet.

c. Net free volume = 2.5×10^6 cubic feet.

d. Nominal thickness of vessel walls = 2 inches.

e. Nominal thickness of vessel dome = 1 inch.

f. Nominal thickness of vessel bottom = 2 inches.

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ATTACHMENT 2

St. Lucie Unit 2 Marked-up Technical Specification Page

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PLANTS SYSTEMS

3/4.7.6 FLOOD PROTECTION

LIMITING CONDITION FOR OPERATION

3.7.6.1 Flood protection shall be provided for the facility site via stoplogs which shall be installed on the southside of the RAB and the southernmost door on east wall whenever a hurricane warning for the plant is posted.

APPLICABILITY: At all times.

ACTION:

With ~~either~~ a Hurricane Watch ~~or a Hurricane Warning~~ issued for the facility site, ~~perform the St. Lucie Plant Beach Survey Procedure pursuant to Surveillance Requirement 4.7.6.1.1 below and~~ ensure the stoplogs are removed from storage and are prepared for installation. The stoplogs shall be installed anytime a hurricane warning is posted.

SURVEILLANCE REQUIREMENTS

~~4.7.6.1.1 The St. Lucie Plant Beach Survey Procedure shall be conducted at least once per year between the dates of May 25 and June 7 and within 30 days following the termination of either a Hurricane Watch or a Hurricane Warning for the facility site. A Special Report containing the results of these surveys shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 30 days following the completion of the survey.~~

DELETE

~~4.7.6.1.2 The St. Lucie Mangrove Photographic Survey Procedure shall be conducted at least once per 12 months and shall be a color infrared photograph(s), or equivalent, of the mangrove area between the facility and the FP&L east property line. The results of these surveys shall be included in the Annual Operating Report for the period in which the survey was completed. This report shall include an evaluation of the facility flood protection if the survey indicates deterioration, either man-made or natural, of this mangrove area.~~

~~4.7.6.1.3~~ DELETE Meteorological forecasts shall be obtained from the National Hurricane Center in Miami, Florida at least once per 6 hours during either a Hurricane Watch or a Hurricane Warning.

ATTACHMENT 3

SAFETY ANALYSIS

Introduction

The proposed changes to the St. Lucie Unit 1 & 2 Technical Specifications remove the surveillance requirements to perform, (1) the annual photographic infrared survey of the mangrove area, and (2) the beach dune surveys. The proposed changes modify Technical Specification 3.7.6.1, in both Unit 1 & Unit 2 Technical Specifications. It is proposed that design feature 5.1.3 also be removed from the Unit 1 Technical Specifications. The stoplog requirement for Unit 2 will remain in place.

Background

The effects of flooding events (i.e., flooding and erosion) on the entire St. Lucie Plant site was evaluated during the licensing of each St. Lucie unit. The probable maximum flood (PMF) results from the postulated probable maximum hurricane (PMH). During Unit 1 licensing the PMF surge was estimated, along with the highest calculated flood level including wave runup, and found not to exceed the lowest point of the fill grade. Also at the request of the NRC staff, FPL analyzed the effect of PMH wave action on safety-related structures assuming propagation of the PMH waves up the discharge canal. Erosion during the PMH was estimated to extend less than 150 ft from the nose of the discharge canal, however the nearest Class I structure (i.e., diesel oil storage tank) is in excess of 300 ft from the nose of the discharge canal.

The NRC required FPL to provide additional protection against wave erosion in the discharge canal. FPL stated that although credit was not taken for mangroves in the analysis, they offer considerable protection to the site and by themselves would provide protection from wave attack during the initial commercial operation of Unit 1. The NRC staff imposed a condition of license which required protection be provided for part of the discharge canal

peninsula associated with Unit 1 by June of 1977. The protection agreed upon for the discharge canal was a sheetpile bulkhead driven in at the top of the canal slope. FPL also committed to providing a Technical Specification for St. Lucie Unit 1 to cover a beach dune survey and mangrove photographic survey.

The completed discharge canal protection was a sheetpile bulkhead with a bottom elevation of 31.5 ft below mean low water (MLW) and a top elevation of 22 ft above MLW. This bulkhead has a concrete pile cap from elevation 17 ft to elevation 22 ft. The condition of license was completed and deleted from the operating license as part of Amendment 18 to the St. Lucie Unit 1 Technical Specifications.

During Unit 2 licensing, questions were raised regarding the site's ability to withstand erosion resulting from a stalled hurricane. The NRC concluded that a PMH would produce the highest water level and therefore should continue to be the postulated event which generates the design basis flood level; however, the stalled or looping hurricane which produces high water levels concurrent with a relatively long duration of wave induced erosion is also an appropriate design basis event for the site. The plant flooding analysis for Unit 2 (current flooding analysis) therefore considered both the steady-state and the stalled PMH.

The steady-state PMH resulted in the highest flood surge of 17.2 ft above MLW. This surge level was approximately 1 ft higher than the Unit 1 value based on new high tide information which was available when this analysis was performed. The analysis showed that, except at the nose of the discharge canal and the parking lot north of Unit 1, the maximum water level (surge plus wave runup) would be at or below the plant grade elevation of 18.5 ft above MLW. At the nose of the discharge canal the wave runup was calculated to be 28 ft above MLW. During the peak of the surge, the wave would break on the slope in front of the sheet piling and result in water overtopping the barrier. The water behind the barrier would drain back into the discharge canal. The temporary flooding around the nose area would be of no concern since there are no Category I structures located in that area of the plant. The FPL analysis for waves propagating up the discharge canal conservatively assumed the State Road A1A bridge would be swept away in a manner that would not interfere with a wave moving up the discharge canal, and took no credit for the existence of the Steam Generator Blowdown Treatment Facility Building. At the parking lot north of Unit 1, the wave runup was calculated to be 18.8 ft above MLW. The temporary flooding in this area was also of no concern since there are no safety-related Category I structures located in that area of the plant. The plant layout north of Unit 1 has been modified since the Unit 2 flood analysis was performed. The construction of

the non safety-related Training/Simulator Building offers additional protection against wave runup propagating from the north.

FPL's analysis of the stalled PMH considered both theoretical models and historical records for determining the effects of erosion on the site. Large wave tank experiments were performed to develop the theoretical models. Conservatism existed since the tank experiment results used were from a smaller grain size of soil than the average which was sampled around the plant. A similar conservatism was that storm waves are short and choppy, as compared to the fixed waves of the wave tank, and therefore have less energy than those assumed in FPL's analysis. Thirty historical hurricanes were selected for detailed study and analysis, which included 24 stalled or looping hurricanes, and 6 very intense, fast moving hurricanes. Of the 24 stalled or looping hurricanes, 8 were located in the western Atlantic Ocean and are therefore more site representative. The 6 intense hurricanes were studied for the purpose of comparing characteristics of fast hurricanes and stalled hurricanes. The analysis for the stalled hurricanes looked at erosion both during and after the PMH.

Selected hurricanes were transposed to the site and erosion around the plant was estimated based on the combined effects of frontal wave attack, littoral drift, and current induced scouring. The dune was conservatively assumed to be eroded, with no credit taken for the energy dissipated or the time consumed in erosion of the dune. Similarly, no reduction of wave height or energy by the mangroves was assumed. The FPL analysis determined there was adequate reserve distances to Class I structures after applying these erosion effects at the edges of the plant.

As documented in the Unit 2 SER, the NRC staff considered entrances to safety-related buildings to be sufficiently protected from high water level by their location, except for the Unit 2 RAB. Stop logs were required for additional wave runup protection for the entrance on the south wall, and the southern most entrance on the east wall of the RAB.

The Unit 2 Technical Specification was developed to cover the stoplog requirement (not applicable to Unit 1 based on the plant layout) and to have the same surveillances as the existing Unit 1 Technical Specification. Although the dune and mangroves were not relied upon in the present analysis, their existence was considered to add still additional conservatism.

Analysis

The selection of the PMH characteristics in the FPL Flood Protection Analysis followed the recommendations of the United States National Oceanic and Atmospheric Administration Report HUR 7-97 "Meteorological Characteristics of the Probable Maximum Hurricane, Atlantic and Gulf Coasts of the United States" which is consistent with NRC Regulatory Guide 1.59 "Design Basis Floods for Nuclear Power Plants". This FPL Analysis (hydrology report) provided the basis for designing/ensuring the St. Lucie Facility would conform to the requirements of General Design Criterion 2 "Design Bases for Protection Against Natural Phenomena" for flooding and erosion. FPL has provided flood protection from the probable maximum hurricane plus the probable maximum precipitation of the safety-related structure, systems, and components by a combination of the "Dry Site Plant Island" and the "Incorporated Barrier" methods as defined in Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants".

Seismic Category I structures and safety-related systems and components are protected from the PMH high water level and wave runup conditions by one or more of the following design features: (1) Designing structures and components to withstand the effects of flooding where functionally required, (2) Positioning of the structures and components such that they are located at sufficient grade to preclude inoperability due to external flooding, and/or (3) Housing components within waterproof structures.

The nose of the discharge canal is protected by a sheetpile bulkhead with a bottom elevation of 31.5 ft below MLW and a top elevation of 22 ft above MLW. This bulkhead has a concrete pile cap from elevation 17 ft to elevation 22 ft. The width of a postulated attacking wave is limited by the width of the canal, therefore the bulkhead is 267.5 feet long and located at the Unit 1 and Unit 2 junction (>100 feet in each canal). Additionally, the fill material utilized in the construction of the discharge canal nose consists of well graded granular materials compacted to 95% of maximum dry density. The degree of compaction improves the erosion resistance of the fill material.

The flooding analysis for the St. Lucie Plant is considered bounding with respect to all postulated design basis flooding events as demonstrated by the following list of conservative assumptions:

(1) No credit is taken for the 8-14 ft high beach dune,

(2) No credit is taken for the mangroves.

(3) No credit is taken for the grass covered berm located just west of State Road A1A which conceals the plant parking lots from the road. The berm is approximately 6 ft higher than adjacent grade for an average elevation of 21 ft above MLW.

(4) No credit is taken for the resistance to erosion provided by the paved surface of State Road A1A.

(5) No credit is taken for the State Road A1A bridge to deter wave action either when intact or when washed into the canal.

(6) Use of worst case hurricanes (steady-state and stalled).

The recent St. Lucie site post-Hurricane Andrew dune survey was compared to a survey performed approximately five years previously for trending results. The results show only minor fluctuations in the dune and the shoreline over an approximate five year time frame (October 1987 vs. August 1992).

Hurricane Andrew placed the St. Lucie site into a Hurricane Watch; however, the Turkey Point site was hit directly by Andrew. Andrew, a category 4 hurricane with average wind speeds of 140 mph, approaches the same strength as the St. Lucie PMH. Damage at Turkey Point was primarily to the fossil units and to non safety-related systems of the nuclear units. The ability of safety-related structures at Turkey Point to withstand the effects of Andrew provides additional assurance that safety-related structures at St. Lucie should withstand the effects of a PMH.

A low temperature of 24.7 °F was recorded at the site on December 24, 1989, that adversely affected the mangroves which have yet to fully recover from the freeze. Since the mangroves are susceptible to freezing, it is appropriate that they not be relied upon for flood protection.

Conclusion

The St. Lucie Plant has met the requirements of Technical Specification 3/4.7.6 since the licensing of Units 1 and 2. The Technical Specification requires surveillance of mangroves and beach dune and to provide the results of the surveillances to the NRC. FPL was required as part of the licensing of Units 1 and 2 to include a Technical Specification for this surveillance due to the NRC's assertion that these natural features provide additional assurance that safety-related structures are adequately protected during design basis flooding events.

FPL has re-evaluated the need for performing these surveillances and has concluded that they are not necessary since credit is not taken for the dune or mangroves in the flooding analysis. In addition, the flooding analysis is conservative and bounding in that it assumes the worst case flooding events based on historical and hypothetical data. Finally, a review of design features demonstrates adequate flood protection for safety-related structures and components. Thus FPL proposes removal of the subject Technical Specification surveillance requirements since the burden is not justified by a significant reduction in nuclear safety. Note that this request does not affect any other requirements, or commitments, related to the dune or mangroves.

FPL proposes to remove design feature 5.1.3 from the Unit 1 Technical Specifications. These provisions are not considered to be important in relation to the other design features described within this section of the Technical Specifications.

ATTACHMENT 4

NO SIGNIFICANT HAZARDS CONSIDERATION

Title 10 of the Code of Federal Regulations, Part 50.92, states that a proposed amendment to an operating license involves a no significant hazards consideration, if operation of the facility in accordance with the proposed amendment would not; (1) involve a significant increase in the probability or consequences of an accident previously evaluated, or (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. The changes proposed are a no significant hazards consideration and will be discussed as follows:

(1) Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated.

Deletion of the flood protection surveillance (beach dune and mangrove survey) requirements would not involve a significant increase in the probability or consequences of the design basis events for flooding (the PMH or the stalled PMH). The lack of these surveillances does not increase the frequency of occurrence of such a storm. The beach dune and mangroves are not relied upon to provide mitigating protection from hurricanes. Rather, the dune is assumed to be eroded and no reduction of wave height or energy by the mangroves is assumed. The probable maximum surge flooding analysis for the St. Lucie site is based on a comparison of the storm strength versus the plant layout, the plant grade elevation, and existing structures/barriers. Flood protection for seismic Category I structures and safety-related systems and components at the St. Lucie site is based on positioning components and structures at sufficient grade to preclude inoperability due to external flooding, designing them to withstand such effects, or housing them within waterproof structures.

(2) Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated.

Deletion of the flood protection surveillance requirements does not create a new or different kind of accident since the beach dune and mangroves are passive elements which do not provide new failure types. The dune and mangroves, although considered, are not relied upon for safety in the present St. Lucie site's PMH analysis. Natural ground elevations (which are not dependent on the existence of the mangroves) are used in determining breaking wave heights. No reduction of wave height or energy by the mangroves is assumed. The beach dune and the mangroves are not credited in the analysis but only add conservatism into the erosion estimates.

(3) Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety.

Deletion of the flood protection surveillance requirements would not involve a significant reduction in a margin of safety since the dune and mangroves are not relied upon to provide protection from hurricanes. The dune and mangroves do not perform a safety function. The dune is conservatively assumed to be eroded with no credit taken for the energy dissipated or the time consumed in erosion of the dune. Similarly, wave height and energy is assumed to be unaffected by the mangroves.

Based on the above, the proposed amendment does not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, or (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety, and therefore does not involve a significant hazards consideration.