DCR 016

June 7, 1984

Docket No. 50-302

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Florida Power Corporation
ATTN: Manager, Nuclear Licensing
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P. O. Box 14042; M.A.C. H-2
St. Petersburg, Florida 33733

SUBJECT: CRYSTAL RIVER UNIT 3 - TECHNICAL SPECIFICATION CHANGE REQUEST NO. 96 - INTAKE CANAL DIMENSIONS

Florida Power Corporation (FPC) submitted Technical Specification Change Request No. 96 on May 26, 1982 to revise the criteria requiring periodic dredging of the intake canal which serves as the ultimate heat sink for Crystal River Unit 3. In the process of evaluating this request, it has been necessary for the staff to require additional information to be submitted by FPC. Your most recent response, dated February 3, 1984, contained an engineering analysis on intake canal mimimum water levels during the postulated Probable Maximum Hurricane (PMH). The February 3 submittal also provided a draft version of proposed revisions to Sections 2.4.2.3 and 9.5.2.1.2(1) of the Crystal River Unit 3 Final Safety Analysis Report (FSAR) and to Section 3/4.7.5 of the Technical Specifications.

The staff has completed its review of your May 26, 1982 and February 3, 1983 submittals. Based on our review of FPC's analysis as well as our own independent analysis, we conclude that the mimimum water surface at the Intake Structure during the postulated PMH without normal cooling water usage for Units 1 and 2 (fossil) and 3 (nuclear) is EL 79.0 ft plant datum and that the minimum controlling Intake Canal dimensions proposed in the February 3, 1984 submittal will not adversely affect the supply of service water from the Ultimate Heat Sink. The proposed revisions of FSAR Sections 2.4.2.3 and 9.5.2.1.2(1) (modified as shown in Enclosure 1 to this letter) should be incorporated into the next scheduled update of the FSAR. We have also concluded that with the modifications that we have noted on the draft copy of the proposed Technical Specification in Enclosure 2, the proposed technical specification will be acceptable. These noted modifications identify the location where the water temperature and level are to be monitored and specify more frequent surveillance requirements as limiting conditions (such as high temperature and hurricane velocity winds speeds) are approached.

A notice regarding the subject amendment request was published in the Federal Register on December 21, 1983. Following receipt of a revised request, a second Federal Register Notice and subsequent 30-day public comment period will be required prior to issuance of an amendment. Should you have any questions regarding this matter, please contact the NRC Project Manager assigned to Crystal River Unit 3.

The recording and/or recordkeeping requirements of this letter affects fewer than ten respondents; therefore, OMB clearance is not required under PL 96-511.

Sincerely,

/s/

George W. Rivenbark, Acting Chief
Operating Reactors Branch No. 4
Division of Licensing

Enclosures:
As stated

cc w/enclosures:
See next page

ORB#4:DL
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06/06/84

ORB#4:DL
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CRYSTAL RIVER UNIT 3 FSAR
REVISED SECTION 2.4.2.3

2.4.2.3 Minimum Tide Hurricane

There are no established procedures available for rigorous analysis of extremely low, hurricane-related tides in open water bodies, as there are for analysis of onshore surge. The lack of a vertical barrier, the presence of an essentially infinite water body, and the effects of breaking waves, swell, and along-shore flow and winds make rigorous analysis of the condition intractable. Therefore, it is necessary to use simpler approaches with conservative approximations.

Studies of the hurricane blowout condition include: 1) a review of extreme low tides that have been observed in the vicinity of the site during major hurricanes of record (30, 31); 2) calculation of maximum offshore wind speeds for hurricanes approaching the site from either the Gulf or the Atlantic coasts; 3) determination of water surface setdown conditions in the intake canal for various sustained wind speeds (32); and 4) calculation of the minimum water level required at the plant end of the intake canal for proper submergence of the nuclear service cooling water pumps in case of shutdown conditions.

The review of extreme low tides that have been associated with severe hurricanes in the area and estimates of minimum tides that could be produced by a PMH established a figure of -4.7 feet MLW (elevation 83.3 relative to plant datum) as low water at the site (30,31).

Calculations of offshore wind speeds associated with a PMH approaching the site considered two hurricanes, each having a different mode of approach. One mode (Mode I) considered a Gulf hurricane approaching the site on a northeasterly track, where its offshore winds will produce the maximum setdown condition, as shown on Figure 2-33. The second mode (Mode II) of approach considered a South Atlantic hurricane entering the east coast of Florida, as shown on Figure 2-34, and traversing the peninsula in about eight hours. Maximum winds speeds for each mode were calculated based upon procedures established in HUR 7-97.

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For Mode I, the offshore winds will be produced by the left half of the maximum radius storm, and the velocity will be greatest with the storm of lowest forward speed. A minimum forward speed of four knots and attenuation of the storm intensity due to coastal effects produced an offshore wind speed of 97 mph.

The Mode II hurricane of maximum radius was assumed to enter the east coast at 29°N at a forward speed of 20 knots. The determination of wind speed at the site was predicated on the assumption that the storm weakened in crossing the State, losing forward speed, resulting in a weakening of the isovel field and a reduction in maximum wind speed. Assuming the storm becomes stationary at the site, the maximum offshore wind speed at the site is 98.5 mph. If the forward speed is undiminished in crossing the State, the maximum offshore wind speed is 111 mph.

Figures A and B show plan views of the intake canal which extends about eight miles from the Crystal River generating units into the Gulf. When originally constructed for Units 1 and 2 in the 1960s, it had a design bottom elevation of 73 feet (relative to plant datum) from the Gulf to the barge turning basin; from the entrance of the turning basin to the intake structures, the design bottom elevation was 70 feet. In recent years, the canal bottom between the Gulf and the Unit 1 and 2 intake structures has been dredged in order to accommodate larger coal barges for these units. Therefore, the actual bottom elevations in this reach are lower than shown on these figures. Reference RA reports that the controlling depth in October 1981 was 21 feet relative to MLW (i.e., maximum bottom elevation was 67 feet relative to plant datum).

During construction of Unit 3, the canal was extended eastward approximately 600 feet to provide cooling water to the nuclear plant. At the entrance of the extension, the design bottom elevation is 70 feet; near the midpoint of the extension, the bottom slopes downward to elevation 67 feet.

Although the review of extremely low, hurricane-related, tides indicated that the minimum water level at the plant would be elevation 83.3 feet during a PMH (30, 31), an alternative analysis was made considering the

Verified for Webster 6/7/83

offshore wind speeds associated with a PMH. The bases of this analysis were (32):

a. An initial tide elevation of -1.0 feet MLW (i.e., elevation 87.0 feet) in the Gulf at the westward end of the canal, where canal bottom elevations approximate natural Gulf bottom elevations.

b. Some inflow to the canal during the setdown condition from offshore waves moving into the area and from natural channels that intersect the canal at several points. The latter flow to the channel would result from the difference in water levels in the channels. This inflow will modify, to some extent, the setdown effect of offshore winds on water levels in the canal.

c. Sustained hurricane wind speeds on the order of 110 mph at the plant end increasing to 115 mph at the western end of the canal. A sheltering effect of the adjacent land mass, shoreline vegetation, and the plant complex itself, will occur in the last mile or so of the canal near the shore, effectively reducing wind stress on the canal water surface in that reach.

As shown on Figure A, the canal water surface profile resulting from this analysis has an elevation of 87 feet at the Gulf end and a downward slope of 1.0 foot per mile toward the plant, giving a water level at elevation 79.0 feet at the Unit 3 intake structure. This water level is believed to be very conservative because it is:

a. 4.7 feet below the minimum level determined by comparing the intensities and effects of major hurricanes of record with the PMH intensity (31).

b. Based on offshore wind speeds that exceed the wind speeds calculated for the Mode I and Mode II hurricanes.

c. Based on canal bottom elevations that are higher than actually exist. In one-dimensional flow, the water surface slope caused by wind stress varies inversely with water depth. With lower actual bottom elevations, the actual setdown slope for the same wind speeds would be less than one foot per mile.

Verified
R Wakeman
6/17/83

During the PMH blowout condition, the maximum required flow will be 34,900 gpm for the Unit 3 nuclear service pumps. With the conservatively low water depths shown on Figure A, the canal friction loss associated with this flow will be negligible. However, flow-related losses in the nuclear service piping between the Unit 3 intake structure and the nuclear service pump chamber are a necessary consideration.

To evaluate the acceptability of the available minimum water level at the Unit 3 intake structure (elevation 79.0 feet), the required minimum level was calculated. The minimum pump submergence requires a water surface elevation of 70 feet 10-1/2 inches in the nuclear service pump chamber. Considering the hydraulic losses associated with the 34,900 gpm maximum flow, the corresponding required minimum canal level at the Unit 3 intake is 73.7 feet. Since the available minimum level is 5.3 feet above this, there will be considerable margin for safe operation.

Through the use of the stated procedures and conservative assumptions, it is concluded that during the PMH blowout condition, the nuclear service pumps will be able to satisfactorily operate to maintain the reactor in a safe condition.

ASSOCIATED FSAR SECTION 2 CHANGES:

Add two figures:

A. Hurricane Blowout Conditions in Intake Canal

B. Intake Canal Near Power Plant

Add one reference:

RA. Chart 11408, "United States, Gulf Coast, Florida, Crystal River to Horseshoe Pt.", National Ocean Survey, NOAA, July 17, 1982.

Verified 6/7/83

CRYSTAL RIVER UNIT 3 FSAR
REVISED SECTION 9.5.2.1 (SUBSECTION 1.)

9.5.2.1.2 Reliability Considerations (NSCWS)

1. The intake and discharge canals connecting the intake structure with the Gulf of Mexico are shown on Figure 1-3. The intake canal has ~~a minimum width of 133 feet at the bottom, and~~ a minimum thalweg depth of 15 feet at the Gulf mean low tide level of elevation 88 feet relative to plant datum and a minimum flow width of 120 feet above elevation 75 feet plant datum. Under probable maximum hurricane blowout conditions, a very conservative estimate of water surface setdown in the canal indicates a minimum water level of elevation 79 feet at the Unit 3 intake structure. However, as described in Section 2.4.2.3, this system can safely operate with a water level at the intake end of the canal as low as elevation 73.7 feet. The nuclear services and decay heat seawater pumps are designed to deliver the required cooling water under these blowout conditions. The extremely large intake canal flow area (minimum area exceeds 2250 square feet at mean low tide) precludes the possibility of any vessel or natural phenomena obstructing the canal to the extent that the minimum required cooling water flow (24,000 GPM) for maintaining the reactor in the cold shutdown condition cannot pass.

Verified R. W. Widell 6/7/83

CRYSTAL RIVER UNIT 3 TECH. SPEC.
REVISED SECTION 3/4.7.5.

PLANT SYSTEMS

3/4.7.5 ULTIMATE HEAT SINK

LIMITING CONDITION FOR OPERATION

3.7.5.1 The ultimate heat sink shall be OPERABLE with:

a. A minimum water level at or above elevation 79 feet Plant Datum at the Unit 3 end of the intake canal,

b. An inlet water temperature of $\leq 105^{\circ}F$, and

c. The following minimum intake canal dimensions:

(1) From Gulf end to turning basin: highest thalweg (thalweg is the line following the deepest part of the canal) elevation at or below elevation 73 feet Plant Datum and a minimum flow width of 120 feet above elevation 75 feet Plant Datum.

(2) From turning basin to canal cross-section located 100 feet from Unit 3 intake structure: highest thalweg (thalweg is the line following the deepest part of the canal) elevation at or below elevation 70 feet Plant Datum and a minimum flow width of 70 feet above elevation 72 feet Plant Datum.

(3) From canal cross-section located 100 feet from Unit 3 intake structure to inlet of dual 48" diameter pipes: highest bottom elevation at or below elevation 67.2 feet Plant Datum and, to the face of the intake structure, a minimum flow width of 100 feet.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With the water level <79 feet Plant Datum (as measured at the dual 48-inch diameter pipes in the intake structure) or the inlet water temperature >105°F, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. If, in any reach, the controlling (highest) intake canal bottom elevation is above the level cited in 3.7.5.1.c (above) and/or the minimum flow width is less than the width cited in 3.7.5.1.c (above), restore the dimensions of the canal reach to those cited in 3.7.5.1.c within 90 days or be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.7.5.1 The ultimate heat sink shall be determined OPERABLE:

4.7.5.1 (cont) is equal to or less than 102°F

a. At least once per 24 hours by verifying that the inlet water temperature and water level ~~to be~~ within ~~their~~ limits, ~~and~~

b. At least once per ~~24~~ 12 months by determining that the intake canal dimensions meet the criteria cited in 3.7.5.1.c,

c. At least once per shift whenever the inlet water temperature exceeds 102°F by verifying that its temperature has not exceeded 105°F, and

d. At least once per hour when a hurricane warning with windspeeds in excess of 100 mph has been reported for the State of Florida by verifying the water level at the Unit 3 end of the intake canal is at or above elevation 79 feet Plant Datum.