Florida Power
CORPORATION

March 30, 1990
3F0390-27

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
Station Blackout Rule Implementation

Dear Sir:

On April 17, 1989, Florida Power Corporation submitted a letter describing the actions taken and planned to assure compliance with the NRC rule on station blackout for Crystal River 3 (CR-3). On November 21, 1989 and January 4, 1990, the Nuclear Management and Resources Council (NUMARC) wrote letters to the NUMARC Board of Directors providing additional clarification of the rule and specifying additional actions necessary to assure compliance. The January 4 letter also requested each utility to provide a letter to the NRC by March 30 indicating that the previous submittal was based on use of the Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, NUMARC 87-00, and that any deviations from the accepted NUMARC 87-00 guidance have been or will be clearly indicated. The NUMARC letter indicated the utility should also affirm the understanding that the diesel generator target reliability is to be maintained. The attachment to this letter provides that information.

The submittal made by FPC on April 17, 1989 and the analyses supporting it were based, in general, on NUMARC 87-00 guidance. This submittal identified CR-3 would be required to, and can, cope with a four hour duration station blackout event. Several deviations from that guidance were identified in the letter. Since our initial submittal, supplemental guidance has been issued. FPC

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has reexamined the documentation to assure implementation is consistent with the original and supplemental guidance and all deviations are clearly identified and justified. This letter documents identified deviations from the NUMARC guidance, including those documented in the earlier response, and other, less significant deviations, not documented earlier. Other than the commitment to add an additional DC source and eliminate operation from the remote shutdown panel after Refuel 8, currently scheduled for Spring 1992, nothing in this letter supersedes the information submitted by FPC on April 17, 1989.

Should there be any questions, please contact Rolf C. Widell, Director, Nuclear Site Support, at (904) 563-4529.

Sincerely,

for

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

PMB/AEF:

xc: Regional Administrator, Region II
Senior Resident Inspector

ATTACHMENT TO LETTER 3F0390-27

BASELINE ASSUMPTIONS - NUMARC 87-00 - SECTION 2

The baseline assumptions of NUMARC 87-00 have been evaluated and it has been determined that, with the following clarifications and deviations, they are applicable to CR-3.

- Section 2.3.1, Assumption (3) is not applicable since CR-3 has no Alternate AC Source.

- Section 2.8 is not applicable to CR-3 since there is only one nuclear unit at Crystal River and there is no fluid or DC electrical system cross-tie capability to the coal units.

- The assumption in Section 2.9.1 that operators will take correct actions based on information from instrumentation powered from the station batteries is correct. The instruments to be used are not specifically identified in the procedure. The operators at CR-3 are trained to use all available instrumentation to assess plant conditions. This assures operators will not respond to failed or inaccurate instruments.

- The assumption in Section 2.10.1 that containment isolation valves will either fail in the safe condition or can be closed manually is not applicable to CR-3. However, adequate containment integrity is assured by redundant valves. This is discussed in the section of this letter on **Coping Assessment - Containment Isolation**.

- The assumption in Section 2.11.1 that procedural actions taken in anticipation of the effects of a hurricane will provide significant safety benefits and reduce the risk of a station blackout is correct. However, the shutdown requirement described in the bases has not been implemented as described. This is discussed in greater detail in this letter under **Actions for Hurricane**.

REQUIRED COPING DURATION CATEGORY - NUMARC 87-00 - SECTION 3

The station blackout duration proposed for CR-3 (4 hours) is based on NUMARC 87-00 methodology. No deviations to that guidance have been identified.

STATION BLACKOUT RESPONSE PROCEDURES - NUMARC 87-00 - SECTION 4

The station blackout response procedures are based on NUMARC 87-00, Section 4 guidelines with the following deviations and clarifications:

OPERATING PROCEDURES GUIDELINES - SECTIONS 4.2.1 AND 4.3.1

Guideline 1

Guideline 1 provides guidance on the content of plant procedures for restoration of AC power. The supporting information for Guideline 1 states, in part, "These actions should include:

(a) Early commitment of available staff to restore AC power. This should occur within the first few minutes of a station blackout."

FPC Position

The station blackout procedure for CR-3 does not contain specific steps directing early restoration of AC power. Licensed operator training is adequate to assure that prompt action will be taken to restore off-site or on-site power without written direction.

Guideline 2

Guideline 2 states "Plant procedures should specify actions necessary to assure that shutdown equipment (including support systems) necessary in a station blackout can operate without AC power."

FPC Position

During a station blackout at CR-3, the Emergency Feedwater System will be used to remove decay heat. The Emergency Feedwater Initiation and Control System assures proper flow to the steam generators. Other instrumentation is used by the operator to verify proper plant control. These systems are designed to operate without AC power. No other support systems are required and no additional specific plant procedural steps are needed to assure this capability.

Guideline 4

Guideline 4 specifies actions be taken to minimize reactor inventory loss. CR-3 procedures provide for this through closure of the letdown line and the power operated relief valve. The supporting information for the guideline recommends, in part, "Actions should be linked to clear symptoms of inventory loss (e.g., specific temperature readings provided by sensors in relief valve tail pipes), associated manual or DC motor driven isolation valves, and their location. Procedures should establish the priority for manual valve isolation based on estimated inventory loss rates early in the event."

FPC Position

CR-3 procedures contain actions sufficient to ensure Reactor Coolant System integrity. No additional monitoring of loss is

necessary and no manual valves require closure to prevent inventory loss.

Guideline 5

Guideline 5 states "Plant procedures should ensure that a flowpath is promptly established for makeup flow from the CST to the steam generator/nuclear boiler and identify backup water sources to the CST in order of intended use. Additionally, plant procedures should specify clear criteria for transferring to the next preferred source of water."

FPC Position

All valves between the emergency feedwater tank and the steam generators are either normally open or controlled automatically by a safety grade control system powered by the station batteries. The system starts automatically on loss of main feedwater. The valve lineup is verified monthly in accordance with Technical Specifications. No additional water sources are necessary since the emergency feedwater tank is required by Technical Specifications to contain over two and one half times the amount of water needed for a four hour station blackout.

Guideline 7

Guideline 7 states "Plant procedures should specify actions to permit appropriate containment isolation and safe shutdown valve operations while AC power is unavailable. These actions may include:

(a) providing additional bottled air or nitrogen at the valves;
(b) specifying manual valve operation to maintain shutdown (e.g., manual valve seating to reduce system losses)
(c) ensuring appropriate containment integrity."

FPC Position

Except for the atmospheric dump valves which are addressed in plant procedures, no manual actions are required to complete these functions. No air operated or manual containment isolation valves are relied upon to function during a station blackout. No operator action is needed to assure appropriate containment integrity.

Guideline 9

Guideline 9 provides guidance on procedural steps to assure access to plant areas during a loss of security system function. The supporting information for this guideline recommends, "At some plants, the security system may be adversely affected by the loss of the preferred or Class 1E power supplies in a station blackout. In such cases, manual actions specified in station blackout

response procedures may require additional actions to obtain access."

FPC Position

The on-shift operators at CR-3 routinely carry keys to access plant areas in the event of a failure of the security system. This is provided for and documented in plant procedures. No additional steps are needed in the station blackout procedure to resolve this issue.

Guideline 10

Guideline 10 states "Plant procedures should consider loss of ventilation effects on specific energized equipment necessary for shutdown (e.g., those containing internal electrical power supplies or other local heat sources that may be energized or present in a station blackout). These procedures should address:

(a) specific room or cabinet temperatures or symptoms (e.g., alarms or indication of loss of cooling) readily identifiable by the operator, and the response thereto; ..."

FPC Position

Calculations have been performed to evaluate what actions the operators need to take to compensate for the loss of ventilation and these actions are identified in the station blackout procedure. This assures energized electrical equipment is protected.

Supplemental Guidance

The supplemental guidance issued January 4 contained additional guidance for procedure content. In particular, a requirement was added that cabinet doors in the control room be opened within 30 minutes.

FPC Position

The FPC procedure will direct the operator to open cabinet doors only on those cabinets containing equipment relied upon during the blackout which do not have fans powered from a bus supplied by an inverter.

Guideline 10 (continued)

The supporting information for Guideline 10 states, in part, "Station blackout procedures should identify specific actions to be taken to ensure that equipment failure does not occur as a result of a loss of forced ventilation. Actions should be tied to either the actual loss of AC power or upon reaching certain temperatures in the plant. ... Cooling may be accomplished by

opening doors to rooms and electronic and relay cabinets, and/or providing supplemental cooling.

"Air temperatures may be monitored during a station blackout event through the use of locally mounted thermometers inside cabinets and in plant areas where cooling may be needed. Alternatively, procedures may direct the operator to take action to provide for alternate cooling in the event normal cooling is lost. Upon loss of these systems, or indication of temperatures outside the maximum normal range of values, the procedures should direct supplemental cooling be provided to the affected cabinet or area, and/or designate alternate means for monitoring system functions."

FPC Position

Operator actions at CR-3 are dictated by the station blackout procedure which is based on the analyses of expected temperatures and the guidance in NUMARC 87-00, Appendix F. This assures equipment is adequately protected without continuous monitoring during the blackout event. This allows operators to focus their attention on assuring adequate decay heat removal.

Guideline 11

Guideline 11 states "Plant procedures should consider habitability requirements at locations where operators will be required to perform manual operations."

FPC Position

Engineering calculations of room temperatures indicate that habitability is not a problem in any of the areas occupied during a station blackout, except for the area near the atmospheric dump valves. A modification will be installed to satisfy this concern. Therefore, adequate consideration of habitability has been demonstrated and additional guidance in the station blackout procedure is unnecessary.

Guideline 13

Guideline 13 states "Plant procedures should consider loss of heat tracing effects for equipment necessary to cope with a station blackout. Alternate steps, if needed, should be identified to supplement planned action."

FPC Position

Since none of the equipment relied upon to cope with a station blackout requires heat tracing to function, no action is necessary to compensate for the loss of heat tracing.

AC POWER RESTORATION - SECTIONS 4.2.2 AND 4.3.2

Guideline 1

Guideline 1 states "Load dispatchers should give highest possible priority to restoring power to nuclear units. Procedures and training should consider several potential methods of transmitting power from black-start capable units to the nuclear plant."

FPC Position

Load dispatchers give highest priority to restoring power to the nuclear plant and their procedures recommend various factors to be considered in the power restoration process. The primary method of restoration is from an unaffected portion of the grid, because of the greater capacity. This is considered to be a preferable methodology.

Guideline 3

Guideline 3 advises that priority should be given to repair crews engaging in power restoration activities to the nuclear plant. The supporting information for that guideline states "During severe weather conditions, repair activities will be competing for repair resources and manpower. Procedures should be implemented to ensure that repair crews are assigned on a priority basis to tasks related to power restoration to nuclear units. Manpower, equipment, and materials should be allocated to these crews on a priority basis."

FPC Position

Repair crews give high priority to restoration of power to the Crystal River site because of the nuclear plant and the importance of the site to the FPC system. Detailed written procedures are not used by repair crews or their management to ensure that priorities are properly assigned and that manpower, equipment and materials are properly allocated. The managers responsible for these activities perform this function.

Guideline 4

Guideline 4 states "Portable AC generators should be designated as backup sources, if available, and directed to nuclear power plant sites. Procedures should address pre-planned actions and identify required equipment."

FPC Position

Portable generators of the size needed to power equipment at CR-3 are not available within a distance of the plant site such that they could be made operable within four hours. Therefore

procedures to address pre-planned actions and identify required equipment are unnecessary.

ACTIONS FOR HURRICANE - SECTIONS 4.2.3 AND 4.3.3

Guidelines 1, 2, and 3

Guideline 1 states "Plant procedures should identify site-specific actions necessary to prepare for the onset of a hurricane. These actions should be initiated when a hurricane warning is issued for the plant site area and should include:

(a) inspecting the site for potential missiles and reducing this potential;
(b) reviewing the adequacy of site staff to support operations and repair;
(c) expediting the restoration of important plant systems and components to service;
(d) warming and lubricating standby (Class 1E) AC power sources;
(e) determining the status of Alternate AC sources (if available) and taking necessary actions to ensure their availability;
(f) increasing CST inventory;
(g) placing battery chargers in service (if applicable); and,
(h) start and load test EDG's."

Guideline 2 states "Utility procedures should identify additional plant support staff and the method of contacting them once a hurricane notice has been issued by the National Weather Service."

Guideline 3 states "Plant procedures should specify actions necessary to ensure equipment required for station blackout response is available."

FPC Position

All applicable aspects of these guidelines have been implemented. Additionally, FPC has committed to extensive preparation and controls for hurricanes. These are documented in Attachment 2 to FPC's April 17, 1989 submittal.

Guideline 4

Guideline 4 states "Plant procedures should address the following items prior to a hurricane arrival at a site:

(a) the site specific indicator should ensure that the plant would be in safe shutdown two hours before the anticipated hurricane arrival at the site (i.e., sustained windspeeds in excess of 73 mph);"

FPC Position

FPC has developed equivalent alternative criteria to part (a) of this guideline. That criteria and the justification for it are documented in Attachment 2 to FPC's previous submittal. Additional information expanding on FPC's alternative approach and providing additional justification will be submitted on or before September 1, 1990.

EMERGENCY AC POWER AVAILABILITY

FPC will implement a program that monitors emergency generator unavailability. This program will comply with the requirements of the recently approved NUMARC initiative 5a and will be based on NUMARC 87-00, Appendix D and Regulatory Guide 1.9, Selection Design, Qualification, Testing, and Reliability of Diesel Generator Units Used As Onsite Electric Power Systems at Nuclear Power Plants, as appropriate.

COPING ASSESSMENT - CONDENSATE INVENTORY FOR DECAY HEAT REMOVAL

There are no deviations from the NUMARC 87-00 guidance in the calculation performed to assure adequate condensate inventory for decay heat removal during a station blackout.

COPING ASSESSMENT - ASSESSING THE CLASS 1E BATTERY CAPACITY

There are no deviations from the NUMARC 87-00 guidance in the calculation performed to assure adequate battery capacity to support decay heat removal during a station blackout.

The supplemental guidance issued January 4, 1990, contained an additional requirement that the control room not be disabled to conserve battery capacity. FPC's station blackout coping strategy includes transferring control to the remote shutdown panel and depowering the main control room. This is necessary to assure the operability of the batteries for four hours. In Refuel 8, currently scheduled for the Spring of 1992, FPC will add a non-safety related battery to supply power for some of the non-Class 1E loads currently loaded on the Class 1E batteries. At that time, the procedure will be modified and disabling of the control room will no longer be required.

COPING ASSESSMENT - COMPRESSED AIR

There are no deviations from the NUMARC 87-00 guidance in the assessment performed to assure air operated valves required for decay heat removal have sufficient reserve air or can be manually operated under station blackout conditions.

COPING ASSESSMENT - EFFECTS OF LOSS OF VENTILATION

Except for four areas, NUMARC 87-00 guidance was used to determine the effects of loss of ventilation in areas where station blackout equipment is located. The areas where alternative methodology was used are the main control room, the Intermediate Building 95 and 115 foot elevations, and the Reactor Building.

For the main control room and Intermediate Building calculations, the Thermal System Analysis Program, TSAP (T. Kao, Version 1.01, 1982) was used. The heatup calculations were performed by developing a thermal model of the room air, walls, equipment and boundaries. This thermal model employs the lumped parameter analytical methodology in which nodes of finite size are used to represent room air and concrete walls/metal structures of finite thickness.

The air within the modeled rooms was considered to be well mixed. The heat load has been applied directly into the room air as generated heat, or applied to an equipment node from which it is transferred to the room air via convection and to the room walls via radiation. Heat within the room air is transferred to room walls and when applicable to the outside environs via natural circulation.

The room walls were divided into multiple slabs with the thinnest slabs near the heat absorbing surface, thus conservatively creating the steepest thermal gradients within the room walls.

The masses of the wall slabs were connected by conductances to each other. The system energy balance can be expressed by a finite difference equation. The computer program, TSAP, accepts this finite difference input and solves the resulting set of simultaneous equations.

For the Reactor Building heatup calculation, CONTEMPT-LT - A Computer Program For Predicting Containment Pressure-Temperature Response To A Loss Of Coolant Accident, was used. The Reactor Building Design Basis Accident model was modified for this calculation.

All equipment operability evaluations were performed using NUMARC 87-00 methodology.

The assumption in Section 7.2.4 that the station blackout event is expected to be bounded by analyses previously performed is not applicable to the Reactor Building for CR-3. Because of the heat removed by the Reactor Building fan coolers following a LOCA, and the resulting decrease in temperature, the station blackout temperature profile slightly exceeds the LOCA profile during the final hour of the station blackout event. This does not present an equipment operability problem, however, because all of the

equipment in the Reactor Building required for a station blackout was tested to a temperature profile which significantly exceeds both the LOCA and the station blackout profile for this period of the event.

COPING ASSESSMENT - CONTAINMENT ISOLATION

An analysis of the containment isolation capability was performed using the methodology in Section 7.2.5. As a result of performing Step 1 (Valve Identification) of that section, four containment isolation valves were identified as not meeting any of the 5 criteria. Adequate containment integrity is assured without operator action because the penetrations containing these valves have valves on the other side of the penetration which do meet at least one of the criteria. Thus, single, rather than double, containment isolation is provided for these penetrations.