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Docket No. 50-302

DEC 10 1982

Mr. J. A. Hancock
Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing
P. O. Box 14042, M.A.C. H-2
St. Petersburg, Florida 33733

Dear Mr. Hancock:

SUBJECT: CRYSTAL RIVER UNIT NO. 3- NUREG-0737, TMI ITEM II.F.2

INADEQUATE CORE COOLING (ICC)

The Commission has issued the enclosed "Order for Modification of License" for the Crystal River Unit No. 3 Nuclear Generating Plant. This Order requires that you install an ICC instrumentation system which conforms to the design parameters specified in NUREG-0737, Item II.F.2. To assure that an acceptable system is installed as soon as practicable, the information described in Section III of the Order and Appendix A attached to the Order must be submitted to the NRC for review and approval, in accordance with the terms specified in the Order. This request for information has been approved by the Office of Management and Budget (OMB) under Clearance No. 3150-0065.

The Order is being forwarded to the Office of the Federal Register for publication.

Sincerely,

"ORIGINAL SIGNED BY:"

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure:
Order

cc w/enclosure:
See next page

OELD	AD-ORB:DL	D:DL
*	GLainas	DEisenhut
12/2/82	12/1/82	12/10/82

*See previous NRC 318 for concurrence.

OFFICE	ORB#4:DL RIngram	ORB#4:DL	C-ORB#4:DL JStolz	ORB#5:DL JShea*	C-ORB#5:DL DCrutchfield	AD-SA:DL FMiraglia	C-ORAB:DL TIppolito
	12/ /82	12/ /82	12/3/82	12/02/82	12/3/82	12/3/82	12/7/82
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12/2/82 per telephone call HS 12/2

OFFICE	OELD	AD-OR:DL	D:DL
	KCW	GLainas	DEisenhut
	12/2/82	11/ /82	11/ /82

OFFICE	ORB#4:DL	ORB#4:DL	C-ORB#4:DL	ORB#5:DL	C-ORB#5:DL	AD-SA:DL	C-ORAB:DL
	RIngram		JStolz	JShea	DCrutchfield	FMiraglia	TIppolito
SURNAME	11/ /82	11/ /82	11/ /82	12/ /82	11/ /82	12/ /82	12/ /82
DATE							

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

7590-01

In the Matter of	)	
FLORIDA POWER CORPORATION, ET AL	)	Docket No. 50-302
Crystal River Unit No. 3 Nuclear Generating Plant	)	
	)	
	)	

ORDER FOR MODIFICATION OF LICENSE

I.

The Florida Power Corporation (the licensee) and eleven other co-owners hold Facility Operating License No. DPR-72, which authorizes the licensee to operate the Crystal River Unit No. 3 Nuclear Generating Plant (the facility) at power levels not in excess of 2544 megawatts thermal. The facility is a pressurized water reactor (PWR) located at the licensee's site in Citrus County, Florida.

II.

Following the accident at Three Mile Island Unit No. 2 (TMI-2), the Nuclear Regulatory Commission (NRC) identified the need for additional instrumentation to detect inadequate core cooling (ICC). All licensees were required by Orders issued in December 1979, to review and upgrade existing instrumentation to assure that information on the reactor coolant subcooling margin and the temperature indicated by the core exit thermocouples over an elevated temperature range were available to operators in the control room. In addition, the NRC proposed that additional instrumentation to provide an unambiguous, easy-to-interpret indication of ICC be studied and such instrumentation be provided if found necessary. In NUREG-0737, Clarification

of TMI Action Plan Requirements, the design requirements and qualification criteria for additional instrumentation were specified. On October 31, 1980, licensees were required, pursuant to 10 CFR 50.54(f), to provide a report detailing their planned instrumentation system for monitoring ICC.

Following analysis of the information provided by the licensees, meetings with industry groups and independent studies by the NRC Staff, the Commission has determined that during a small break Loss of Coolant Accident (LOCA), there is a period of time before the core has boiled dry (indicated by core exit thermocouples) when the operators have insufficient information to clearly indicate void formation in the reactor vessel head or to track the inventory of coolant in the vessel and primary system. The Subcooling Margin Monitor gives early indication of a problem but does not indicate whether the condition is getting worse or better.

The addition of a reactor coolant inventory system will improve the reliability of plant operators to diagnose the approach of ICC and to assess the adequacy of responses taken to restore core cooling. The benefit will be preventive in nature in that the instrumentation will assist the operator in avoidance of a degraded or melted core when voids in the reactor coolant system and saturation conditions result from over cooling events, steam generator tube ruptures, and small break loss of coolant events. The addition of a reactor coolant inventory system, coupled with upgraded in-core thermocouple instruments and a subcooling margin monitor, provides an ICC instrumentation package which could reduce significantly the likelihood of incorrect operator diagnosis and errors for events such as steam generator

tube ruptures, loss of instrument bus or control system upsets, pump seal failures, or overcooling events originating from disturbances in the secondary coolant side of the plant. For low probability events, involving coincidental multiple faults or more rapidly developing small break LOCA conditions, the ICC instrumentation could also reduce the probability of incorrect operator diagnosis and subsequent errors leading to a degraded core.

The NRC has completed its review of several generic reactor level or inventory system instrumentation systems which have been proposed for the detection of ICC in PWRs. The Combustion Engineering Heated Junction Thermocouple (HJTC) system and the Westinghouse Reactor Vessel Level Instrumentation System (RVLIS) are acceptable for tracking reactor coolant system inventory and provide an enhanced ICC instrument package when used in conjunction with core exit thermocouple systems and subcooling margin monitors designed in accordance with NUREG-0737 and operated within approved Emergency Operating Procedure Guidelines. The details of the NRC Staff review of these generic systems are reported in NUREG/CR-2627 and NUREG/CR-2628 for the Combustion Engineering and Westinghouse systems respectively.

Other differential pressure (d/p) measurement techniques for reactor coolant system inventory tracking are acceptable provided that they meet NUREG-0737 design requirements and monitor the coolant inventory over the range from the vessel upper head to the bottom of the hot leg as a minimum. For Babcock and Wilcox (B&W) reactors in which the steam or

noncondensables can accumulate in the hot leg candy-cane (high point of the system) and interfere with natural circulation, a d/p measurement extending from the top of the hot leg candy cane to the low point in the hot leg is also required. A d/p measurement extending from the bottom of the reactor vessel need not be provided if equivalent instrumentation (e.g., pump power or pump current monitor) is provided to trend the Reactor Coolant System void content when pumps are running.

Consequently, the Commission has determined that an instrumentation system for detection of ICC consisting of upgraded subcooling margin monitors, core-exit thermocouples, and an inventory tracking system is required for the operation of PWR facilities. To assure that an acceptable system is installed as soon as practicable, the information described below and in Appendix A must be submitted to the NRC for review and approval.

III.

Accordingly, pursuant to Sections 103, 161i, and 182 of the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 CFR Parts 2 and 50, IT IS HEREBY ORDERED THAT Facility Operating License No. DPR-72 is modified as follows:

1. The licensee shall install an ICC instrumentation system consisting of subcooling margin monitors, core-exit thermocouples and a reactor coolant inventory tracking system all of which conform to the design parameters specified in NUREG-0737, Item II.F.2. Installation of the ICC instrumentation system shall be completed and made operational in accordance with the timetables approved pursuant to the terms of this Order.

2.- Within 90 days of the date of this Order, the licensee must complete a conceptual design review for a reactor coolant inventory tracking system, identify the design selected and submit to the Director, Division of Licensing detailed schedules for engineering, procurement and installation of the inventory tracking system. References to generic design descriptions, where applicable, are acceptable.

3. Within 90 days of the date of this Order, the licensee shall review the status of conformance of all components of the ICC instrumentation system with NUREG-0737, Item II.F.2, and submit a report on the status of such conformance. For your convenience in performing the status review, a checklist of the nine items of documentation cited on pp. II.F.2 - 3 and 4 of that document is provided in the Appendix to this Order.

4. The licensee shall develop a schedule for installation and making operational the ICC instrumentation system which ensures installation during the earliest refueling shutdown consistent with the existing status of the plant and practical design and procurement considerations. This schedule shall be subject to approval by the Director, Division of Licensing.

5. Prior to using the installed ICC instrumentation system as a basis for operator decisions or actions, final documentation, including calibration data and proposed emergency procedure revisions, shall be submitted for NRC review and approval, and the task analysis portion of the control room design review must be completed by the licensee. Prior to NRC approval, the system may be used for the purpose of operator training and familiarization and may be used with prudence as supplemental input to plant operating decisions.

6. The licensee may request from the Commission an extension of time for submittals of the required information. Such a request must set forth the proposed schedule and justification for the delay. Such request shall be directed to the Secretary of the Commission, U. S. NRC, Washington, D. C. 20555. Any such request must be submitted at least 30 days prior to the date the information is required.

IV.

The licensee may request a hearing on this Order within 25 days of the date of its publication in the Federal Register. A request for hearing shall be submitted to the Director, Office of NRR, U. S. NRC, Washington, D. C. 20555. Copies of the request shall also be sent to the Secretary of the Commission and the Executive Legal Director at the same address.

If a hearing is requested by the licensee, the Commission will issue an order designating the time and place of any such hearing. If a hearing is held, the issue to be considered at such hearing shall be:

Whether, on the basis of the matters set forth in Section II of this Order, this Order should be sustained.

V.

This Order shall become effective upon expiration of the period within which a hearing may be requested or, if a hearing is requested, on the date specified in an order issued following further proceedings on this Order.

This request for information was approved by the Office of Management and Budget under Clearance No. 3150-0065 which expires on June 30, 1983. Comments on burden and duplication may be directed to the Office of

Management and Budget, Reports and Management, Room 3208, New Executive Office Building, Washington, D. C.

FOR THE NUCLEAR REGULATORY COMMISSION

Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Attachment:
Appendix A

Dated at Bethesda, Maryland
this 10th day of December 1982.

APPENDIX A

Checklist
for Plant Specific Review of
Inadequate Core Cooling (ICC) Instrumentation System

For _____ Docket No. _____

Operated by: _____

_____

_____

The following items for review are taken from NUREG-0737, pp II.F.2-3, and 4. Responses should be made to full requirements in NUREG-0737, not abbreviated forms below. Applicants should provide reference to either the applicant's submittal or the generic description under the column labled "Reference." These items are required to be reviewed on a plant specific basis by NUREG-0737 for all plants. Differences from the generic descriptions provided by Westinghouse, the Westinghouse Owner's Group, Combustion Engineering, or Combustion Engineering Owner's Group must be indicated by "yes or no" in the column labled deviations and must be justified. Under the Column labeled schedule, either indicate that your documentation of the item is complete or provide a proposed schedule for your submittal.

	Reference	Deviations	Schedule
1. Description of the proposed final system including:			
a. a final design description of additional instrumentation and displays;			
b. detailed description of existing instrumentation systems.			
c. description of completed or planned modifications.			
2. A design analysis and evaluation of inventory trend instrumentation, and test data to support design in item 1.			
3. Description of tests planned and results of tests completed for evaluation, qualification, and calibration of additional instrumentation.			

4. Provide a table or description covering the evaluation of conformance with NUREG-0737: II.F.2, Attachment 1, and Appendix B (to be reviewed on a plant specific basis)* _____
5. Describe computer, software and display functions associated with ICC monitoring in the plant. _____
6. Provide a proposed schedule for installation, testing and calibration and implementation of any proposed new instrumentation or information displays. _____
7. Describe guidelines for use of reactor coolant inventory tracking system, and analyses used to develop procedures. _____
8. Operator instructions in emergency operating procedures for ICC and how these procedures will be modified when final monitoring system is implemented. _____
9. Provide a schedule for additional submittals required** _____

*II.F.2 Attachment 1 (for Core Exit Thermocouples)

In response to item 4 in the above checklist, the following materials should be included to show that the proposed system meets the design and qualification criteria for the core exit thermocouple system.

1. Provide diagram of core exit thermocouple locations or reference the generic description if appropriate.
2. Provide a description of the primary operator displays including:
   a. A diagram of the display panel layout for the core map and description of how it is implemented, e.g., hardware or CRT display.
   b. Provide the range of the readouts.
   c. Describe the alarm system.
   d. Describe how the ICC instrumentation readouts are arranged with respect to each other.
3. Describe the implementation of the backup display(s) (including the subcooling margin monitors), how the thermocouples are selected, how they are checked for operability, and the range of the display.
4. Describe the use of the primary and backup displays. What training will the operators have in using the core exit thermocouple instrumentation? How will the operator know when to use the core exit thermocouples and when not to use them? Reference appropriate emergency operating guidelines where applicable.

5. Confirm completion of control room design task analysis applicable to ICC instrumentation. Confirm that the core exit thermocouples meet the criteria of NUREG-0737, Attachment 1 and Appendix B, or identify and justify deviations.

6. Describe what parts of the systems are powered from the 1E power sources used, and how isolation from non-1E equipment is provided. Describe the power supply for the primary display. Clearly delineate in two categories which hardware is included up to the isolation device and which is not.

7. Confirm the environmental qualification of the core exit thermocouple instrumentation up to the isolation device.

Appendix B (of NUREG-0737, II.F.2)

Confirm explicitly the conformance to the Appendix B items listed below for the ICC instrumentation, i.e., the SMM, the reactor coolant inventory tracking system, the core exit thermocouples and the display systems.

	Reference	Deviations
1. Environmental qualification		
2. Single failure analysis		
3. Class 1E power source		
4. Availability prior to an accident		
5. Quality Assurance		
6. Continuous indications		
7. Recording of instrument outputs		
8. Identification of instruments		
9. Isolation		

**For the users of either Combustion Engineering Heated Junction Thermocouple (HJTC) System or Westinghouse Differential Pressure (dp) system a detailed response to the plant specific items stated below should be provided.

	Reference	Deviations
A. Westinghouse dp System		
1. Describe the effect of instrument uncertainties on the measurement of level.		
2. Are the differential pressure transducers located outside containment?		
3. Are hydraulic isolators and sensors included in the impulse lines?		
B. CE HJTC System		
1. Discuss the spacing of the sensors from the core alignment plate to the top of the reactor vessel head. How would the decrease in resolution due to the loss of a single sensor affect the ability of the system to detect an approach to ICC?		