



OFFICE OF THE  
SECRETARY

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

May 8, 1979

Director  
Office of the Federal Register  
National Archives and Records Service  
Washington, D.C. 20403

Dear Sir:

Enclosed for publication in the Federal Register are an original  
and two certified copies of a document entitled:

DUKE POWER COMPANY

Docket Nos. 50-269/270/287

ORDER

Publication of the above document at the earliest possible date would  
be appreciated.

This material is to be charged to requisition number E-146.

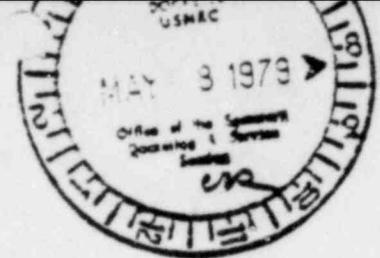
Sincerely,

Samuel J. Chilk  
Secretary of the Commission

Enclosures:  
Original and 2 certified copies

bcc: Records Facility Branch  
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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
DUKE POWER COMPANY ) Dockets Nos. 50-269  
 ) 50-270  
 ) and 50-287  
Oconee Nuclear Station, Units Nos. 1, 2 )  
and 3 )

ORDER

I.

The Duke Power Company (the licensee), is the holder of Facility Operating Licenses Nos. DPR-38, DPR-47 and DPR-55 which authorize the operation of the nuclear power reactors known as Oconee Nuclear Station, Units Nos. 1, 2 and 3 (the facilities, or Oconee 1, 2 and 3), at steady state power levels not in excess of 2568 megawatts thermal (rated power) for each unit. The facilities are Babcock & Wilcox (B&W) designed pressurized water reactors (PWR's) located at the licensee's site in Oconee County, South Carolina.

II.

In the course of its evaluation to date of the accident at the Three Mile Island Unit No. 2 facility, which utilizes a B&W designed PWR, the Nuclear Regulatory Commission staff has ascertained that B&W designed reactors appear to be unusually sensitive to certain off-normal transient conditions originating in the secondary system. The features of the B&W design that contribute to this sensitivity are: (1) the design of steam generators to operate with relatively small liquid volumes in the

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secondary side; (2) the lack of direct initiation of reactor trip upon the occurrence of off-normal conditions in the feedwater system; (3) reliance on an integrated control system (ICS) to automatically regulate feedwater flow; (4) actuation before reactor trip of a pilot-operated relief valve on the primary system pressurizer (which, if the valve sticks open, can aggravate the event); and (5) a low steam generator elevation (relative to the reactor vessel) which provides a smaller driving head for natural circulation.

Because of these features, B&W designed reactors place more reliance on the reliability and performance characteristics of the auxiliary feedwater system, the ICS, and the emergency core cooling system (ECCS) performance to recover from frequent anticipated transients, such as loss of offsite power and loss of normal feedwater, than do other PWR designs. This, in turn, places a large burden on the plant operators in the event of off-normal system behavior during such anticipated transients.

As a result of a preliminary review of the Three Mile Island Unit No. 2 accident chronology, the NRC staff initially identified several human errors that occurred during the accident and contributed significantly to its severity. All holders of operating licenses were subsequently instructed to take a number of immediate actions

to avoid repetition of these errors, in accordance with bulletins issued by the Commission's Office of Inspection and Enforcement (IE). In addition, the NRC staff began an immediate reevaluation of the design features of B&W reactors to determine whether additional safety corrections or improvements were necessary with respect to these reactors. This evaluation involved numerous meetings with B&W and certain of the affected licensees.

The evaluation identified design features as discussed above which indicated that B&W designed reactors are unusually sensitive to certain off-normal transient conditions originating in the secondary system. As a result, an additional bulletin was issued by IE which instructed holders of operating licenses for B&W designed reactors to take further actions, including immediate changes to decrease the reactor high pressure trip point and increase the pressurizer pilot-operated relief valve setting. Also, as a result of this evaluation, the NRC staff identified certain other safety concerns that warranted additional short-term design and procedural changes at operating facilities having B&W designed reactors. These were identified as items (a) through (e) on page 1-7 of the Office of Nuclear Reactor Regulation Status Report to the Commission on April 25, 1979.

After a series of discussions between the NRC staff and the licensee concerning possible design modifications and changes in operating procedures, the licensee agreed in letters dated April 25, 26, and May 4, 1979 to perform promptly the following actions:

- (a) Install automatic starting of the interconnected emergency feedwater system so that all three pumps will receive a start signal from any affected unit, and test the system for stability. The emergency feedwater pump discharge flow will be connected to the interconnection headers such that each or all emergency feedwater pumps can supply water to any unit. Until these modifications and tests are completed, operating personnel have been stationed at each emergency feedwater pump with a direct communication link to that unit's control room. In addition, the following procedural changes, put into effect on April 25, 1979 to enhance the reliability of the emergency feedwater system, will remain in force:

- (1) The discharges of these pumps have been tied together by alignment of manual valves such that each and all of the pumps can supply emergency feedwater to any Oconee Unit requiring it.

- (2) Administrative controls have been established so that in the event of loss of both main feedwater pumps on an affected unit, that unit's emergency feedwater pump will start automatically, backed up by remote manual start from the control room. If the pump fails to start automatically, the operator stationed at that pump will start the pump locally, and has been trained to do so. In addition, the other two available emergency feedwater pumps will be started remotely from their unit's control room or locally if required to provide two more redundant sources of feedwater to the affected unit.
- (3) Emergency feedwater flow to the steam generators will be assured by the control room operator who has been trained to maintain the necessary level.
- (b) Develop and implement operating procedures for initiating and controlling emergency feedwater independent of Integrated Control System control.
- (c) Implement a hard-wired control-grade reactor trip on loss of main feedwater and/or turbine trip.

- (d) Complete analyses for potential small breaks and develop and implement operating instructions to define operator action.
- (e) All licensed reactor operators and senior reactor operators will have completed the TMI-2 simulator training at B&W.
- (f) Station in the control room an additional full-time Senior Reactor Operator (SRO) (or previously licensed SRO) with Three Mile Island training for each operating unit to assist with guidance and possible manual action in case of transients until items (a) through (e) are completed.

In its letters the licensee also stated that (1) Oconee 3 would be shut down on April 28, 1979, and remain shutdown until (a) through (e) above are completed (the facility was shut down on April 28, 1979 as stated); (2) a second Oconee unit would be shut down on May 12, 1979, if items (a) through (e) have not been previously accomplished and remain shut down until items (a) through (e) have been completed; and, (3) a third Oconee unit would be shut down on May 19, 1979, if items (a) through (e) have not been previously accomplished and will remain shut down until completion of items (a) through (e).

In addition to these modifications to be implemented promptly, the licensee has also proposed to carry out certain additional long-term actions to increase the capability and reliability of the reactors to respond to various transient events. These are:

- The licensee will install two motor driven pumps for each Oconee unit, as more particularly described as Part III of a letter from W.O. Parker to the NRC of April 25, 1979, to provide greater assurance of emergency feedwater supply. The licensee will submit this system concept and analysis to the NRC staff for review.
- The licensee will submit a failure mode and effects analysis of the Integrated Control System to the NRC staff as soon as practicable. The licensee states that this analysis is now underway with high priority by B&W.
- The reactor trip on loss of the main feedwater and/or trip of the turbine to be installed promptly pursuant to this Order will thereafter be upgraded so that the components are safety grade. The licensee will submit this design to the NRC staff for review.
- The licensee will continue reactor operator training and drilling of response procedures to assure a high state of preparedness.

The Commission has concluded that the prompt actions set forth as (a) through (e) above are necessary to provide added reliability to the reactor system to respond safely to feedwater transients and should be confirmed by a Commission order. The immediate procedural changes to assure redundant sources of auxiliary feedwater that were put into effect on April 25 at the two operating Oconee units, as described in paragraph (a) above, and the immediate additions to the operating staff, as described in paragraph (f) above, provide the bases for continued safe operation of those facilities during the interim period until May 12 and May 19, 1979, respectively. The Commission finds, however, that operation of all units should not be resumed or continued on an indefinite basis until actions described in paragraphs (a) through (e) above have been satisfactorily completed.

For the foregoing reasons, the Commission has found that the public health, safety and interest require that this Order be effective immediately.

### III.

Copies of the following documents are available for inspection at the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C. 20555, and are being placed in the Commission's local public document room at the Oconee County Library, 201 South Spring, Walhalla, South Carolina 29691:

(1) Office of Nuclear Reactor Regulation Status Report on Feedwater Transients in B&W Plants, April 25, 1979.

(2) Letter from W. S. Lee (Duke Power Company) to Harold Denton (NRR), dated April 25, 1979.

(3) Two letters from W. O. Parker, Jr. (Duke Power Company) to Harold Denton (NRR), dated April 25, 1979.

(4) Letter from W. H. Owens (Duke Power Company) to Roger J. Mattson (NRR), dated April 25, 1979.

(5) Letter from W. S. Lee (Duke Power Company) to Harold Denton (NRR), dated April 26, 1979.

(6) Letter from W. O. Parker, Jr. (Duke Power Company) to James P. O'Reilly (IE), dated May 4, 1979.

#### IV.

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's Rules and Regulations in 10 CFR Parts 2 and 50, IT IS HEREBY ORDERED THAT:

(1) The licensee shall take the following actions with respect to Oconee 1, 2 and 3:

(a) Install automatic starting of the interconnected emergency feedwater system so that all three pumps will receive a start

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signal from any affected unit, and test the system for stability. The emergency feedwater pump discharge flow will be connected to the interconnection headers such that each or all of the emergency feedwater pumps can supply water to any unit. Until these modifications and tests are completed, operating personnel will be stationed at each emergency feedwater pump with a direct communication link to that unit's control room. In addition, the following procedural changes, put into effect on April 25, 1979 to enhance the reliability of the emergency feedwater system, will remain in force:

- (1) The discharges of these pumps have been tied together by alignment of manual valves such that each and all of the pumps can supply emergency feedwater to any Oconee Unit requiring it.
- (2) Administrative controls have been established so that in the event of loss of both main feedwater pumps on an affected unit, that unit's emergency feedwater pump will start automatically, backed up by remote manual start from the control room. If the pump fails to start automatically, the operator stationed at that pump will start the pump locally, and has been trained

to do so. In addition, the other two available emergency feedwater pumps will be started remotely from their unit's control room or locally if required to provide two more sources of feedwater to the affected unit.

- (3) Emergency feedwater flow to the steam generators will be assured by the control room operator who has been trained to maintain the necessary level.
  
- (b) Develop and implement operating procedures for initiating and controlling emergency feedwater independent of Integrated Control System control.
  
- (c) Implement a hard-wired control-grade reactor trip on loss of main feedwater and/or turbine trip.
  
- (d) Complete analyses for potential small breaks and develop and implement operating instructions to define operator action.
  
- (e) All licensed reactor operators and senior reactor operators assigned to the Oconee control rooms will have completed the TMI-2 simulator training at B&W.

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- (f) Station in the control room an additional full-time Senior Reactor Operator (SRO) (or previously licensed SRO) with Three Mile Island training for each operating unit to assist with guidance and possible manual actions until items (a) through (e) are completed.
- (2) The licensee shall maintain Oconee 3 in a shut down condition (the facility was shut down on April 28, 1979) until items (a) through (e) in paragraph (1) above are satisfactorily completed and such completion has been confirmed by the Director, Office of Nuclear Reactor Regulation.
- (3) The licensee shall shut down a second of the three Oconee units on May 12, 1979, unless items (a) through (e) in paragraph (1) above have been satisfactorily completed and the completion has been confirmed by the Director, Office of Nuclear Reactor Regulation, before that date. In the event the second unit is shut down on May 12, 1979, it will remain shutdown until items (a) through (e) in paragraph (1) above are satisfactorily completed and such completion has been confirmed by the Director, Office of Nuclear Reactor Regulation.

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- (4) The licensee shall shut down the third of the three Oconee units on May 19, 1979, unless items (a) through (e) in paragraph (1) above have been satisfactorily completed and the completion has been confirmed by the Director, Office of Nuclear Reactor Regulation, before that date. In the event the third unit is shut down on May 19, 1979, it shall remain shut down until items (a) through (e) in paragraph (1) above are satisfactorily completed and such completion has been confirmed by the Director, Office of Nuclear Reactor Regulation.
- (5) The licensee shall as promptly as practicable also accomplish the long-term modifications set forth in Section II of this Order.

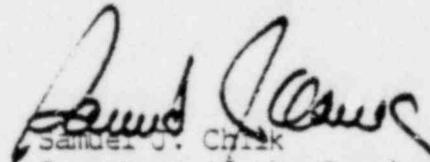
Satisfactory completion of items (a) through (e) in paragraph (1) and in paragraphs (2) through (4) above will require confirmation by the Director, Office of Nuclear Reactor Regulation, that the actions specified have been taken, the specified analyses are acceptable, and the specified implementing procedures are appropriate.

V.

Within twenty (20) days of the date of this Order, the licensee or any person whose interest may be affected by this Order may

request a hearing with respect to this Order. Any such request shall not stay the immediate effectiveness of this Order.

FOR THE NUCLEAR REGULATORY COMMISSION



Samuel J. Chisk  
Secretary of the Commission

Dated at Washington, DC  
this 7<sup>th</sup> day of May 1979.