

Docket Nos. 50-327  
and 50-328

June 18, 1993

Tennessee Valley Authority  
ATTN: Dr. Mark O. Medford, Vice President  
Technical Support  
3B Lookout Place  
1101 Market Street  
Chattanooga, Tennessee 37402-2801

Dear Dr. Medford:

SUBJECT: EXEMPTION FROM REQUIREMENTS OF 10 CFR 50.60, ACCEPTANCE CRITERIA FOR FRACTURE PREVENTION FOR LIGHT WATER NUCLEAR POWER REACTORS FOR NORMAL OPERATION - SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2 (TAC NOS. M86675 AND M86676)

The Commission has issued the enclosed exemption from the requirements of 10 CFR 50.60, Acceptance Criteria for Fracture Prevention for Light Water Nuclear Power Reactors for Normal Operation. This exemption permits using the safety margins recommended in the American Society of Mechanical Engineers Code Case N-514, "Low Temperature Overpressure Protection" in lieu of the safety margins required by Appendix G to 10 CFR Part 50.

A copy of the exemption is being forwarded to the Office of Federal Register for publication.

Sincerely,

Original Signed by  
Peter S. Tam

for: Frederick J. Hebdon, Director  
Project Directorate II-4  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Enclosure:  
As stated

cc w/enclosure:  
See next page

SRXB *
R. Jones
1/193

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OFC:	ADRII <i>AD</i>	D:DRRE <i>DR</i>
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DATE:	6/17/93	6/17/93

\* See concurrence on exemption

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June 18, 1993

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Tennessee Valley Authority  
ATTN: Dr. Mark O. Medford

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
TENNESSEE VALLEY AUTHORITY	)	Docket Nos. 50-327
(Sequoyah Nuclear Plant	)	and 50-328
Units 1 and 2)	)	

EXEMPTION

I.

The Tennessee Valley Authority (the licensee) is the holder of Facility Operating License Nos. DPR-77 and DPR-79, which authorize operation of the Sequoyah Nuclear Plant Units 1 and 2, respectively. The licenses provide, among other things, that the licensee is subject to all rules, regulations, and orders of the Commission now or hereafter in effect.

The facilities consist of two pressurized water reactors, Sequoyah Nuclear Plant Units 1 and 2, at the licensee's site located in Hamilton County, Tennessee.

II.

Title 10 CFR 50.60, "Acceptance criteria for fracture prevention measures for lightwater nuclear power reactors for normal operation," states that all lightwater nuclear power reactors must meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary as set forth in Appendices G and H to 10 CFR Part 50. Appendix G to 10 CFR 50 defines pressure/temperature (P/T) limits during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests to which the pressure boundary may be subjected

over its service lifetime. 10 CFR 50.60(b) specifies that alternatives to the described requirements in Appendices G and H to 10 CFR Part 50 may be used when an exemption is granted by the Commission under 10 CFR 50.12.

To prevent low temperature overpressure transients that would produce pressure excursions exceeding the Appendix G P/T limits while the reactor is operating at low temperatures, the licensee installed a low temperature overpressure (LTOP) system. The system includes pressure relieving devices called Power Operated Relief Valves (PORVs). The PORVs are set at a pressure low enough so that if an LTOP transient occurred, the mitigation system would prevent the pressure in the reactor vessel from exceeding the Appendix G P/T limits. To prevent the PORVs from lifting as a result of normal operating pressure surges (e.g., reactor coolant pump starting, and shifting operating charging pumps) with the reactor coolant system in a water solid condition, the operating pressure must be maintained below the PORV setpoint.

Based on information supplied by Westinghouse Electric Corporation, the licensee has determined that the generic methodology used by Westinghouse to calculate the LTOP setpoint for Sequoyah is deficient since it did not account for certain flow-induced differential pressures and piping losses. As a result, the analytical maximum pressure limits for LTOP events for a certain design basis condition exceed the pressure limits of the 10 CFR 50 Appendix G curves. In addition, in order to start a reactor coolant pump, the operator must maintain a differential pressure across the reactor coolant pump seals. Hence, the licensee must operate the plant in a pressure window that is defined as the difference between the minimum required pressure to start a reactor coolant pump and the operating margin to prevent lifting of the PORVs due to normal operating pressure surges. The licensee LTOP analysis

indicates that using the Appendix G safety margins to determine the PORV setpoint would result in a pressure setpoint within its operating window, but there would be no margin for normal operating pressure surges. Therefore, operating with these limits would likely result in the lifting of the PORVs during normal operation.

The licensee proposed that in determining the design setpoint for LTOP events for Sequoyah Units 1 and 2, the allowable pressure be determined using the safety margins developed in an alternate methodology in lieu of the safety margins currently required by Appendix G, 10 CFR Part 50. Designated Code Case N-514, the proposed alternate methodology is consistent with guidelines developed by the American Society of Mechanical Engineers (ASME) Working Group on Operating Plant Criteria to define pressure limits during LTOP events that avoid certain unnecessary operational restrictions, provide adequate margins against failure of the reactor pressure vessel, and reduce the potential for unnecessary activation of pressure-relieving devices used for LTOP. Code Case N-514, "Low Temperature Overpressure Protection," has been approved by the ASME Code Committee. NRC has reviewed the Code Case and endorsement is expected soon.

An exemption from 10 CFR 50.60 is required to use the alternate methodology for calculating the maximum allowable pressure for the LTOP setpoint. By application dated June 5, 1993, the licensee requested an exemption from 10 CFR 50.60 for this purpose.

By letter dated June 14, 1993, the licensee supplied additional information that described administrative constraints that would be necessary to ensure that sufficient LTOP margins are maintained during certain

evolutions, assuming that the exemption was not granted. The information showed that the operational constraints would preclude the use of administrative controls to ensure sufficient LTOP margins.

### III.

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50 when (1) the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security; and (2) when special circumstances are present. Special circumstances are present whenever, according to 10 CFR 50.12(a)(2)(ii), "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule...".

The underlying purpose of 10 CFR 50.60 Appendix G is to establish fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences, to which the pressure boundary may be subjected over its service lifetime. Section IV.A.2 of this appendix requires that the reactor vessel be operated with P/T limits at least as conservative as those obtained by following the methods of analysis and the required margins of safety of Appendix G of the ASME Code.

Appendix G of the ASME Code requires that the P/T limits be calculated:

- (a) using a safety factor of 2 on the principal membrane (pressure) stresses,
- (b) assuming a flaw at the surface with a depth of one quarter of the vessel wall thickness and a length of six times its depth, and (c) using a

conservative fracture toughness curve that is based on the lower bound of static, dynamic, and crack arrest fracture toughness tests on material similar to the Sequoyah reactor vessel material.

In determining the setpoint for LTOP events, the licensee proposed to use safety margins based on an alternate methodology consistent with the proposed ASME Code Case N-514 guidelines. The ASME Code Case N-514 allows determination of the setpoint for LTOP events such that the maximum pressure in the vessel would not exceed 110% of the P/T limits of the existing ASME Appendix G. This results in a safety factor of 1.8 on the principal membrane stresses. All other factors, including assumed flaw size and fracture toughness, remain the same. Although this methodology would reduce the safety factor on the principal membrane stresses, the proposed criteria will provide adequate margins of safety to the reactor vessel during LTOP transients and will satisfy the underlying purpose of 10 CFR 50.60 for fracture toughness requirements.

Using the licensee's proposed safety factors instead of Appendix G safety factors to calculate the LTOP setpoint will permit a higher LTOP setpoint than would otherwise be required and will provide added margin to prevent normal operating surges from lifting the PORVs. The result would be continued use of the present setpoint.

#### IV.

For the foregoing reasons, the NRC staff has concluded that the licensee's proposed use of the alternate methodology in determining the acceptable setpoint for LTOP events will not present an undue risk to public health and safety and is consistent with the common defense and security. The NRC staff has determined that there are special circumstances present, as

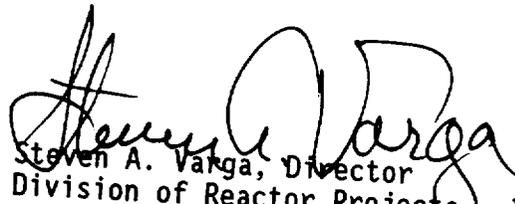
specified in 10 CFR 50.12(a)(2), such that application of 10 CFR 50.60 is not necessary in order to achieve the underlying purpose of this regulation.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), an exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants the Tennessee Valley Authority an exemption from the requirements of 10 CFR 50.60 such that in determining the setpoint for LTOP events, the Appendix G curves for P/T limits are not exceeded by more than 10 percent in order to be in compliance with these regulations. This exemption is applicable only to LTOP conditions during normal operation.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not result in any significant adverse environmental impact (58FR33676, June 18, 1993).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

  
Steven A. Varga, Director  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland,  
this 18th day of June 1993

specified in 10 CFR 50.12(a)(2), such that application of 10 CFR 50.60 is not necessary in order to achieve the underlying purpose of this regulation.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), an exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants the Tennessee Valley Authority an exemption from the requirements of 10 CFR 50.60 such that in determining the setpoint for LTOP events, the Appendix G curves for P/T limits are not exceeded by more than 10 percent in order to be in compliance with these regulations. This exemption is applicable only to LTOP conditions during normal operation.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not result in any significant adverse environmental impact (58FR33676, June 18, 1993).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION  
 ORIGINAL SIGNED BY:  
 Steven A. Varga, Director  
 Division of Reactor Projects - I/II  
 Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland,  
 this 18th day of June 1993

*R Jones*  
*RLX B*  
*6/16/93*

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