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August 18, 1994

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

Subject: McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Request for Exemption - ASME Code Case N-514

Dear Sir:

By letter dated June 28, 1994, an exemption request from certain requirements of 10 CFR 50.60, "Acceptance criteria for fracture prevention measures for light water nuclear power reactors for normal operation", was submitted for McGuire Nuclear Station. This exemption was requested to allow the application of American Society of Mechanical Engineers (ASME) Code Case N-514, "Low Temperature Overpressure Protection", for determining the setpoint for the Low Temperature Overpressure Protection (LTOP) system for McGuire Units 1 and 2.

In support of the NRC staff review, please find attached additional information regarding the basis for the exemption request.

Please contact Paul Guill at (704) 875-4002 if there are any questions regarding this.

Very truly yours,

T. C. McMeekin

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xc: Mr. S. D. Ebneter
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ATTACHMENT

DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION

INTRODUCTION

The exemption requested by a letter dated June 28, 1994 would allow the application of American Society of Mechanical Engineers (ASME) Code Case N-514, "Low Temperature Overpressure Protection", in determining the acceptable Low Temperature Overpressure Protection (LTOP) system setpoint for McGuire Nuclear Station, Units 1 and 2. The following discussion provides additional clarification as to the specific needs for the exemption request.

DISCUSSION

The requested exemption to the regulations is authorized by law, will not represent an undue risk to public health and safety, and is consistent with the common defense and security. Duke Power believes the requested exemption meets the criteria in 10CFR 50.12(a)(2) in that special circumstances are present. One special circumstance includes:

10 CFR 50.12(a)(2)(iii)

Compliance would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted, or that are significantly in excess of those by others similarly situated.

Basis A: The Low Temperature Overpressure Protection (LTOP) system consists of two Power Operated Relief Valves (PORVs) actuated by pressure transmitters connected to the Reactor Coolant System (RCS) "A" and "D" hot legs.

The minimum setpoint of the PORVs is limited by the required pressure for the number one seal on the Reactor Coolant pumps. The required RCS pressure for starting a Reactor Coolant pump is 325 psig. An operating pressure range of 325 psig - 365 psig is provided to the Operators. This pressure range is considered the minimum acceptable range for adequate control of the RCS. The 40 psig operating range is necessary to account for such aspects as normal pressure fluctuations during startup of a Reactor Coolant pump, initiation and securing of Residual Heat Removal (RHR) and operation of the Chemical and Volume Control System (CVCS) pressure control system during water solid conditions.

A margin of 70 psig is applied based on the instrument uncertainty for the limiting of the two pressure transmitter circuits. This instrument uncertainty is based on the accuracy of the Reactor Coolant pressure transmitter (0-3000 psig), the loop bistables and the Operator Aid Computer (OAC) interface, among other considerations.

In order to fill and vent the RCS and Reactor Vessel head, the Reactor Coolant pumps must be operated to remove air trapped in the Steam Generator U-tubes and other high points. Since the limiting Reactor Vessel material is on the vessel inlet (cold leg side of the reactor core) and the PORV actuation circuitry is based on hot leg pressure, there is a pressure difference, when flow exists in the system, between the sensed pressure and the pressure at the limiting Reactor Vessel location. Additionally, there is a pressure difference due to elevation differences between the limiting vessel location and the pressure transmitter locations.

Finally, there is a pressure increase beyond the PORV setpoint during relief valve actuation due to accumulation while the valve is stroking open. McGuire Units 1 and 2 have Control Components Inc. PORVs with a 2 second opening time. The relief valve accumulation due to the limiting transient (inadvertent start of a safety injection pump), is 65 psi. This pressure accumulation is based on the methodology developed by Westinghouse Electric Company and referenced in the original McGuire LTOP licensing submittals. The relief valve accumulation calculation assumes the RCS is water solid, as is the case during initial starting of the Reactor Coolant pumps.

The resulting peak pressure is provided in the table below:

Min. Pressure for RCS Pump Operation:	325 psig
Operating range of the RCS during LTOP:	40 psig
Elevation Corrections:	4.7 psi
DP Corrections due to RCS Flow:	46 psi
Instrumentation Uncertainty:	70 psi
PORV Accumulation:	65 psi
Peak Pressure:	551 psig

For the establishment/setting of the low setpoint for the PORV, a 20 psig range is provided, as such the nominal PORV setpoint is 365 psig - 385 psig. This setpoint range is necessary to provide adequate setpoint repeatability in the controls circuitry over the operating cycle. Accordingly, the worst case peak pressure would be **571 psig**.

The worst case peak pressure could exceed the current Technical Specification heatup and cooldown curves for Unit 1 (10 EFPY) when the RCS temperature is less than about 180 °F (for heatup rate of 60 °F/hour or for a cooldown rate ≤ 20 °F/hour). To avoid potential violation of the Technical Specification pressure/temperature limits, additional operating restrictions have been imposed. These restrictions result in the operation of the unit in a risk significant configuration, as discussed below in "Basis B".

In addition to the possibility of exceeding current Technical Specification pressure/temperature limits, another concern would be the potential for inadvertently opening a PORV. During normal operations, a potential exists that routine activities associated with heatup or cooldown may cause inadvertent opening of a PORV. As discussed earlier a 40 psig margin is provided to account for normal operational evolutions. This is considered to be a minimally acceptable operating margin for preventing inadvertent opening of a PORV. Reduction of operating margin for preventing inadvertent opening of a PORV will only continue to degrade further as the pressure/temperature limit curves are extended beyond the current 10 EFPY Technical Specification limit (Unit 1 currently at approximately 8.2 EFPY). This will, over time, increase the likelihood of an inadvertent opening of a PORV.

Basis B: The limiting pressure transients are evaluated to ensure compliance with the 10 CFR 50 Appendix G pressure/temperature limits during Low Temperature Overpressure Protection (LTOP) operation (less than 300 °F). This evaluation consists of the determination of the minimum pressure necessary to operate the unit, selection of the relief valve setpoint, and determination of additional margins and pressure corrections to determine peak pressure during the limiting transient. As discussed above, the worst case peak pressure is 571 psig. This peak pressure is used to determine acceptable heatup and cooldown limits and other operating restrictions to ensure the pressure/temperature limits are not exceed. This peak pressure allows the following heatup/cooldown rates at or above the specified temperatures (for Unit 1 which is limiting):

CONDITION	MINIMUM ACTUAL TEMPERATURE	MINIMUM INDICTED TEMPERATURE
Steady State	125 °F	137 °F
5 °F/hour cooldown	130 °F	142 °F
10 °F/hour heatup	128 °F	140 °F

In order to facilitate a unit startup, the RCS must be heated to a temperature of greater than 142 °F before the Reactor Coolant pumps may be started. Operationally, this is very difficult and risk sensitive. To facilitate the RCS heatup without Reactor Coolant pump heat, the Operators must use the secondary side of the Steam Generators to supply heat. This is accomplished by using auxiliary steam to heat the Steam Generators secondary side, while blowing down using the Steam Generator blowdown system. It is operationally difficult to determine the temperature of the Steam Generator tube bundle using this heating method, and it is difficult to achieve an even temperature distribution throughout the RCS.

When the Reactor Coolant pumps are first jogged in the startup processes, the Steam Generators act as a heat sink or source, depending on the temperatures of the RCS and Steam Generator. Small differences in temperatures can produce a heatup or cooldown, and a corresponding pressure transient due to expansion or shrinkage of coolant. The Operator is then faced with obtaining nearly exact Steam Generator secondary side and RCS temperatures, or draining the Steam Generator secondary side to remove the secondary side heat sink/source. Either option creates a risk significant situation which is considered an undue hardship.

Using Code Case N-514, the allowable pressure for the LTOP system is increased 10%, with the end result of higher allowable heatup or cooldown rates for the same calculated worst case peak pressure of 571 psig. The 10 CFR 50 Appendix G limit in conjunction with ASME Code Case N-514 results in an allowable pressure of 519 psig (519 psig * 1.1 = 571 psig). The allowable heatup and cooldown limits for the 519 psig limit are:

CONDITIONS	MINIMUM ACTUAL TEMPERATURE	MINIMUM INDICATED TEMPERATURE
Steady State	85 °F	97 °F
10 °F/hour cooldown	102 °F	114 °F
30 °F/hour heatup	100 °F	112 °F

These limits will allow the operators to warm the RCS prior to starting a Reactor Coolant pump, without producing large temperature differences between the Steam Generators and the RCS. Further, the acceptable heatup and cooldown limits are reasonable, and the Reactor Coolant pump starts could be controlled to within the acceptable conditions.

These limits and operating restrictions apply for vessel operation up to 10 EFPY, the current Technical Specification limits. In the near future, the pressure/temperature limit curves will be extended. These limits and operating restrictions that have been imposed, will be negatively impacted when the pressure/temperature curves are extended beyond the current 10 EFPY limit. Additional efforts (to reduce instrument uncertainty and to supplement McGuire Unit 1 surveillance capsule program with Diablo Canyon materials data) are underway to offset the effect associated with extending the pressure/temperature curves. These efforts will recover additional margin, whereby these limits and operating restrictions can be somewhat abated. A Technical Specification amendment request will be submitted in the near future which will be based on the results of the additional efforts being under taken.

In summary, the special circumstances or basis for granting an exemption, as discussed above, are:

1) Without the benefits provided by Code Case N-514, the resulting peak pressure for a worst case LTOP event has the potential for exceeding the pressure/temperature limits specified within the Technical Specifications.

2) Due to reduced operating margin, a potential exist that routine activities associated with heatup or cooldown operation may result in an inadvertent opening of a PORV.

3) To ensure that the pressure/temperature limits will not be violated in the event of an overpressure event, additional operating restrictions were imposed. This resulted in placing the unit in a risk significant configuration in order to startup the unit following a cold shutdown or refueling outage.