

SAFETY EVALUATION

GRAND GULF UNIT 1

LOW PRESSURE ECCS SYSTEM PRESSURE PERMISSIVE INTERLOCKS

Facility Operating License NPF-29, Condition 2.C.(18) requires the licensee to implement isolation protection against overpressurization of the low pressure emergency core cooling systems (RHR/LPCI and LPCS) through the implementation of reactor vessel pressure permissive interlocks. The licensee has proposed Technical Specification (T.S.) changes to support the required design change. The Instrumentation and Control Systems Branch (ICSB) focused its review on the revisions to T.S. Tables 3.3.3-1 and 4.3.3.1-1. The Reactor Systems Branch with the assistance of the Mechanical Engineering Branch focused its attention on systems and piping design aspects of the proposed changes.

Instrumentation and Control Systems Aspects

The licensee proposes to include the new high/low pressure permissive interlocks for the low pressure ECCS injection valves in T.S. Table 3.3.3-1 (ECCS Actuation Instrumentation). The Technical Specifications will require a minimum of three channels operable for all operating conditions with Action 31 (declare ADS trip system or ECCS inoperable) applicable for Operating Conditions 1, 2, and 3 and Action 35 (trip inoperable channel after one hour or declare associated systems inoperable) applicable for Operating Conditions 4 and 5. Upon request, the licensee provided information (Letter dated October 5, 1985) to clarify what constitutes a channel for the pressure

permissive interlocks. The licensee states that the minimum requirement of 3 operating channels per trip function is applicable to the "one-out-of-two twice" logic utilized in the design change and is adequate to assure operability of the required low pressure injection function considering the diversity of injection systems and logic channels available (four per trip function).

The licensee also proposes to add the surveillance requirements for the new interlock channels to T.S. Table 4.3.3.1-1 (ECCS Actuation Instrumentation Surveillance Requirements). The surveillance frequencies will be once per 12 hours for channel check, once per month for channel functional test, and once per refueling cycle for channel calibration for all operating conditions.

Based on the above information, the staff finds the channel operability requirements proposed for revised T.S. Table 3.3.3-1 to be acceptable. We also find the channel surveillance frequencies proposed in T.S. Table 4.3.3.1-1 to be acceptable.

After implementation of the proposed design, the high/low pressure permissive interlocks for the low pressure ECCS injection valves will be active for both automatic and manual control room operation. The licensee has proposed not to include such an interlock for the remote shutdown panel (RSP) control circuits for the ECCS injection valves. Based on the current information provided by the licensee, the staff finds the requested interlock omission to be unacceptable.

It is the staff's position that pressure permissive interlocks should be installed as part of the RSP control circuits consistent with the corresponding control room control circuits. This position is based on the Standard Review Plan (SRP Section 7.4) interpretation of GDC 19 which requires that the remote shutdown station equipment be designed to the same standards as the corresponding equipment in the main control room. Also, Section 6.3.4 of the Grand Gulf, Unit 1 SER Supplement No. 2 requires that interlocks be present at all times for both manual and automatic actuation unless the reactor vessel pressure is lower than the design pressure of the ECCS involved. Thus, without special control over the operation of these valves, inadvertent operation must be assumed from the RSP which could result in overpressurization of the low pressure ECCS.

The following is an acceptable alternative (method of special control) to the implementation of pressure permissive interlocks for the RSP control circuits associated with the low pressure ECCS injection valves:

- (1) The provision of spring-return-to-normal control switches on the RSPs which would alleviate the concern related to the change-of-state of equipment upon transfer of control to the RSP and
- (2) (A) Continue to implement special Technical Specification 4.4.3.2.2.b for LPCS and LPCI outboard check valves to ensure integrity since the licensee takes credit for these valves as part of the omission justification, or

- (B) Implementation of a keylocked control switch separate from the RSP controls (preferably at MCC) which would block operation of the valve via the RSP control. This should include administrative controls to ensure that RSP control of the valve is actually blocked when the valve is closed. Also, valve position indication should not be negated in the control room or at the RSP by the implementation of this special control scheme.

Systems and Piping Design

The licensee has proposed Technical Specification (TS) changes regarding the low pressure ECCS injection system, in response to an NRC position regarding the prevention of an intersystem LOCA which was expressed in Supplement No. 2 to the Grand Gulf Nuclear Station (GGNS) Safety Evaluation Report (NUREG-0831) and which became License Condition 2.C.(18).. These TS changes would implement design changes adding pressure interlocks to the injection valves on the low pressure ECCS systems, require respective trip setpoints, and require periodic surveillance of associated ECCS actuation instrumentation.

Two of the proposed changes are administrative in nature. For instance, in connection with the installment of pressure interlocks, an additional trip function has been added to the ECCS low pressure systems. The minimum number of operable channels, applicable operational conditions, and action to be

taken are supplied for the new trip function (see Tables 1 and 2). Instrumentation surveillance intervals are also designated for this function (see Table 3). These proposals are acceptable to us, as discussed above.

In the original submittal, MP&L proposed to delete ECCS response times for low pressure systems. Subsequently, in a letter dated September 25, 1985, MP&L proposed to use " ≤ 29 seconds" as response times for both LPCI and LPCS injection valves. This is acceptable to us because this response time is within the value used in analyses of loss of coolant accidents.

One issue that has not been resolved is the interlock setpoint for the high pressure to low pressure interface valve. The setpoint 534 psig, is above the design pressure of the low pressure system, 500 psig. The ASME Code, dated 1977, which was the first Code edition to address such interlocks, required the interlocks to prevent the pressure from exceeding the design pressure of the low pressure side. Section 6.3.4 of GGNS SSER's (June 1982), states that the valves in question should be "interlocked to prevent opening unless the reactor vessel pressure is lower than the design pressure of the ECCSs involved." From discussions with the licensee, we understand that maintaining the setpoint below the design pressure will result in increased peak cladding temperature for the postulated loss of accident from 2151°F to 2157°F, which is still less than the limiting value of 2200°F required by 10 CFR 50.46. The staff concludes that exceeding the Code allowable design pressure for the interlocks is unacceptable because the Code position can be

met without reducing the acceptable margin of safety for peak cladding temperature. If meeting the Code requirement results in a hardship, the hardship should be described and justification should be provided for our consideration. Include in the justification the results of an analysis to show that pressure in the ECCS piping equal to the upper analytical limit of the interlock setpoint will satisfy the ASME Code stress allowable values for the piping, valves and other components of the affected portions of the ECCS.