Branch Technical Position HICB-1

Guidance on Isolation of Low-Pressure Systems from the High-Pressure Reactor Coolant System

A. Background

During normal and emergency conditions, it is necessary to keep low-pressure systems that are connected to the high-pressure reactor coolant system properly isolated in order to avoid either damage by overpressurization or the loss of integrity of the low-pressure system and possible radioactive releases. The residual heat removal system used for cold shutdown conditions when in service becomes an extension of the reactor coolant pressure boundary. General Design Criterion 15 requires that reactor coolant system and associated auxiliary, control, and protection systems shall be designed with sufficient margin to ensure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences. There have been a number of recommendations for accomplishing this aim. Until a more definitive guide is published, the criteria in Part B, below, provide an adequate and acceptable design solution for this concern.

B. Branch Technical Position

The following measures should be incorporated in designs of the interfaces between low-pressure systems and the high-pressure reactor coolant system:

1. At least two valves in series should be provided to isolate any subsystem whenever the primary system pressure is above the pressure rating of the subsystem.

2. For system interfaces where both valves are motor-operated, the valves should have independent and diverse interlocks to prevent both from opening unless the primary system pressure is below the subsystem design pressure. Also, the valve operators should receive a signal to close automatically whenever the primary system pressure exceeds the subsystem design pressure.

3. For those system interfaces where one check valve and one motor-operated valve are provided, the motor-operated valve should be interlocked to prevent the valve from opening whenever the primary pressure is above the subsystem design pressure, and to close automatically whenever the primary system pressure exceeds the subsystem design pressure.

4. Suitable valve position indication should be provided in the control room for the interface valves.

5. For those interfaces where the subsystem is required for emergency core cooling system operation, the above recommendations need not be implemented. System interfaces of this type should be evaluated on an individual basis.

6. The system should satisfy the requirements of the General Design Criteria and Section 50.55a(h) of 10 CFR Part 50 with regard to the protection system requirements (ANSI/IEEE Std 279, "Criteria for Protection Systems for Nuclear Power Generating Stations"). As described in Reg. Guide 1.153, "Criteria

for Power, Instrumentation, and Control Portions of Safety Systems," compliance with IEEE Std 603, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," as modified and supplemented by the regulatory guide, is considered by the NRC staff to satisfy the provisions of ANSI/IEEE Std 279. Appendices 7.1-B and 7.1-C provide procedures for reviewing systems against ANSI/IEEE 279 and Reg. Guide 1.153.

C. References

ANSI/IEEE Std 279-1971. "Criteria for Protection Systems for Nuclear Power Generating Stations."

IEEE Std 603-1991. "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations."

Regulatory Guide 1.153. "Criteria for Power, Instrumentation, and Control Portions of Safety Systems." Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, 1996.