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Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

TO: T. R. QUAY

SUBJECT CONTAINMENT ISOLATION FOR NORMAL RESIDUAL HEAT REMOVAL SYSTEM

Dear Mr. Quay:

This letter documents and discusses the Westinghouse position on isolation of the containment isolation valves in the normal residual heat removal system. As outlined below the staff position is inconsistent with practices approved in operating nuclear power plants.

DSER Open Item 6.2.4.2-1 (OITS #1002) specifies that:

> The staff will explore with Westinghouse the requirements that must be followed to allow the RHR penetration to be opened while a containment isolation signal exists.

The current status detail (based on an E-Mail from W. Huffman on 2/3/97) for the open item specifies:

> Action W - The use of a single parameter (i.e., containment radiation level) to isolate a non-safety system penetration (NRHR) is not in compliance with SRP criteria which specifies the use of diverse parameters. Westinghouse has still not provided justification for deviating from the diversity criteria.

The AP600 normal residual heat removal system suction isolation valves serve as containment boundary isolation valves. The valves are isolated automatically on an engineered safeguards signal indicative of elevated radiation levels within containment to assure offsite doses following a design basis event do not exceed 10 CFR 100 limits. The basis for the proposed design and signal selection is provided in the following paragraphs.

During power operation, the RNS does not operate, and the two lines that penetrate containment (the RNS suction and discharge lines) are normally isolated. Therefore, similar to current operating plants, the RNS is isolated during power operation and therefore does not require isolation following

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design basis events. To further address the issue of containment bypass due to the RNS, the system piping outside containment is safety class 3, seismic category I. This provides assurance that the RNS will be available following an accident to perform its defense-in-depth function, and will not provide a means for containment bypass. Current typical operating PWR's utilize the residual heat removal system as a safety-related accident mitigation system and recirculate contaminated post accident fluid outside containment following a DBA and therefore the systems have been classified as safety class 2, seismic category I. On AP600 contaminated fluids are not to be recirculated outside containment andto provide additional confidence of containment isolation, the RNS suction isolation valves are provided an ESF signal to isolate on high radiation. There are instances when the RNS system would be utilized following transients or accidents. For example, following an accident where ADS may be actuated, the RNS may be placed into service by the operators. In this case, the RNS suction side is aligned to the IRWST, and will operate to provide low-pressure RCS makeup when the RCS pressure is reduced. The RNS would continue to operate with this alignment, and eventually through the injection and recirculation phases of the accident. To permit the operators to use the RNS to perform this defense-in-depth function, the RNS containment isolation valves do not isolate on the generic containment isolation signal, but rather on a high containment radiation signal. This provides the AP600 with the benefit of allowing the nonsafety related systems to perform a defense-in-depth function, while protecting containment integrity when it is needed, in the case of high radiation.

The signal for isolating the normal residual heat removal system lines is generated upon the coincidence of containment radioactivity above the High-2 setpoint in any two of four divisions. The high containment radiation signal is an ESF signal derived in the same reliable manner as other ESF signals and as described in AP600 Safety Analysis Report section 7.3. Four qualified 1E radiation sensors monitor containment radiation and when the individual channel exceeds the setpoint, it results in a channel partial trip condition. When the required coincidence of partial trips exists an actuation signal is generated.

During shutdown modes of operation, the RNS is aligned to the RCS and provides shutdown decay heat removal. Similar to current plants, no automatic closure signals are provided that would cause an interruption of core cooling while on RNS. The risk of high containment radiation during shutdown . an accident that would lead to core damage) was quantified in the shutdown PRA as 5.5E-8, with the dominating event being a loss of the RNS. Since the risk of core damage at shutdown is very low, and since the addition of a high containment radiation signal to isolate the RNS during mode 4 would lead to an increase in loss of RNS events due to spurious high radiation signals, the high radiation signal to isolate the RNS is blocked in Modes 4, 5 and 6.

This design configuration is consistent with the containment isolation General Design Criteria 54, through 57.

Criterion 54 "Piping systems penetrating containment" specifies:

> Piping systems penetrating primary reactor containment shall be provided with leak detection, isolation, and containment capabilities having redundancy, reliability, and performance capabilities which reflect the importance to safety of isolating these piping systems.

The AP600 RNS suction isolation is designed consistent with the intent and letter of this criterion to isolate the RNS with the reliability and performance capabilities which reflect the importance to safety of isolating these piping systems. That is, as described above, overall plant safety is enhanced by utilizing a non-generic containment isolation signal to provide a defense in depth response to plant accidents.

Regulatory Guide 1.141(For Comment) and Standard Review Plan 6.2.4 suggests diversity in sensed parameters should be provided for the initiation of containment isolation.

> "There should be diversity in the parameters sensed for the initiation of containment isolation to satisfy the requirement of General Design Criterion 54 for reliable isolation capability."

Although the general containment isolation signal is generated by a diversity of sensed parameters andis utilized for the isolation of the containment penetrations, selected penetrations are isolated on other signals to improve overall plant safety, defense in depth and flexibility in system mitigation of accidents. This approach is consistent with operating plants designs. Specifically for example, the component cooling water to the reactor coolant pump thermal barrier in operating PWR's is isolated upon receipt of a phase B containment isolation signal. The phase B containment isolation is derived from the single sensed parameter, containment pressure. Similarly, this design improved overall plant safety by insuring the integrity of the reactor coolant pump seals and thereby limiting the severity of a LOCA or a main steam line break which results in a containment isolation. Further, similar to AP600 these lines are class 3 lines outside containment but unlike the RNS system the lines are normally open during power operation. The approach taken by AP600 is indicative of when isolation of containment is important to public health and safety and on the basis of consistency with acceptable operating systems design is deemed not only an acceptable design but one which enhances overall plant safety.

Based on the information outlined in this letter and previous NRC staff actions, the staff should reconsider its position on this issue and accept containment isolation of the RNS using a high radiation signal.

Please contact D. A. Lindgren at (412) 374-4856 with any questions.

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cc: W. Huffman, NRC