Nuclear Safety Advisory Letter

Westinghouse Electric Company

This is a notification of a recently identified potential safety issue pertaining to basic components supplied by Westinghouse. This information is being provided to you so that a review of this issue can be conducted by you to determine if any action is required.

P.O. Box 355, Pittsburgh, PA 15230

Subject: Pressurizer Upper Level Instrument Line Safety Classification	**Number: NSAL-00-006**
Basic Component: Transient Analysis	**Date:** April 3, 2000
Plants: All Westinghouse NSSS plants	
Substantial Safety Hazard or Failure to Comply Pursuant to 10 CFR 21.21(a)	Yes ☐ No ☒
Transfer of Information Pursuant to 10 CFR 21.21(b)	Yes ☐
Advisory Information Pursuant to 10 CFR 21.21(d)(2)	Yes ☐
References: NSAL-95-010, November 30, 1995	

SUMMARY

Transient analysis performed by Westinghouse for several Westinghouse NSSS plants indicates that a break in the instrument line for the upper (steam side) portion of the pressurizer level instrument may result in a rapid depressurization of the reactor coolant system. This would lead to a relatively rapid reactor trip and emergency core cooling system (ECCS) actuation. A reactor trip and ECCS actuation would occur based on low pressurizer pressure. This condition conflicts with the classification of the instrument line as Safety Class 2.

The Westinghouse standard design specifies the pressurizer upper level instrument line as Safety Class 2. Breaks in Safety Class 2 reactor coolant lines should be mitigated using normal make up systems, that is without use of emergency core cooling systems. Depending on analysis assumptions and plant design ECCS, actuation occurs between several seconds and several minutes after the upper level tap instrument line break. Since automatic actuation of the ECCS may be required for a break in the pressurizer instrument line, the safety classification may have to be changed.

The analysis of a postulated small break LOCA would bound a break in the instrument line. This break would not represent a substantial safety hazard. Some plants may have to revise the safety classification and definition of the smallest LOCA described in the FSAR.

Additional information, if required, may be obtained from the originator. Telephone 412-374-4856.

Originator(s):

D. A. Lindgren
Regulatory & Licensing Engineering

H. A. Sepp, Manager
Regulatory & Licensing Engineering

TECHNICAL DESCRIPTION

ISSUE DESCRIPTION

Transient analyses performed by Westinghouse for several Westinghouse NSSS plants indicate that a break in the instrument line for the upper (steam side) portion of the pressurizer level instrument may result in a rapid depressurization of the reactor coolant system. This would lead to a relatively rapid reactor trip and emergency core cooling system (ECCS) actuation in less than a minute of the postulated break. Pressurizer mass (level) may be maintained with normal charging flow, however a reactor trip and emergency core cooling system actuation would occur based on low pressurizer pressure.

This condition is in conflict with ANSI-N18.2-1973 safety classification criteria. ANSI-N18.2-1973 cites as an example of a Condition III incident a loss of coolant accident "…which would prevent the orderly shutdown and cooldown assuming makeup is provided by normal makeup systems only." In other words, if a small LOCA triggers an actuation of the emergency core cooling system then it is a Condition III event. ANSI-N18.2 1973 also specifies that Safety Class 1 applies to components whose failure could cause a Condition III or Condition IV loss of reactor coolant. Therefore, where a break in an instrument line connected to the pressurizer level tap would result in actuation of the emergency core cooling system the line should be classified as Safety Class 1. This safety classification conflicts with the classification of the pressurizer instrument lines originally stated in the FSAR discussion for many plants. In other cases the safety classification of the instrument lines is not explicitly stated in the FSAR but is defined on the reactor coolant system drawings. The potential for a Safety Class 2 instrument line to result in a Condition III loss of coolant may also conflict with FSAR discussions of ECCS performance and small break transient analysis.

This situation is a result, in part, of the elimination at operating plants of a requirement for low pressurizer pressure coincident with low pressurizer level to actuate ECCS. The effect of this change and the necessity to revise the safety classification may not have been effectively communicated to affected utilities by Westinghouse previously.

TECHNICAL EVALUATION

The Westinghouse standard design specifies the pressurizer upper level instrument line as Safety Class 2. The original Westinghouse design basis required both low pressurizer level and low pressurizer pressure for ECCS actuation. Industry and NRC review after the accident at TMI recommended elimination of this coincident requirement. Post TMI requirements only require low pressurizer pressure for ECCS actuation. Therefore, while the analyses shows that pressurizer mass (level) is maintained by normal charging, low pressurizer pressure would initiate ECCS actuation.

Depending on analysis assumptions and plant design (some plants have added a 3/8 inch flow restrictor in the pressurizer upper level instrument line), ECCS actuation occurs between several seconds and several minutes after the line break. Automatic actuation of the ECCS may be used for an orderly shutdown of the reactor, in addition to normal charging flow for such a break of the instrument line.

The equipment that may not be appropriately classified is the small diameter piping and the root valves between the upper level tap and the instruments. This piping was, in most cases, designed and constructed using the rules of the ASME Boiler and Pressure Vessel Code, Section III, Class 2. Depending on the age of the plant, the valves may also have been designed using the rules of the ASME Code, Section III. The design and construction of the instruments themselves are excluded from the ASME Code rules.

The design basis for the instrument lines as represented by the design and construction codes and standards is not altered by a change from Safety Class 1 to Safety Class 2. ASME Code, Section III, Class 1 piping of one-inch nominal pipe size and smaller may use Section III, Class 2 design requirements. ASME Code, Section XI requirements for volumetric and surface examination are not applied to pipes of one-inch nominal pipe size and smaller.

The other components affected by a safety class change are the root valves in the instrument lines. There are little or no differences between ASME Code Class 1 and Class 2 requirements for valves of this small size. For both ASME Class 1 and ASME Class 2 applications, valves satisfying the appropriate pressure temperature ratings of ANSI B16.5 or ANSI B16.34 may be used. The ASME Code design requirements specify a minimum wall thickness based on ANSI B16.5 or ANSI B16.34 rules. Because of the small size of the root valves, it is expected that the root valves were a standard valve design based on the ANSI B16.5 or ANSI B-16.34 rules and not based on the alternative design rules of the ASME Code. Many plants were not required to use ASME Code rules for design and construction of the valves. The design and construction requirements for these valves focused on the fluid pressure, temperature and composition. There was no distinction between Safety Class 1 and 2 valve requirements for valves operating at reactor coolant system conditions. The valves are not considered active valves and are not included in the valve in-service testing requirements. Based on this assessment, the valves procured for use in the Safety Class 2 instrument lines are acceptable for use in a reclassified Safety Class 1 instrument lines.

ASSESSMENT OF SAFETY SIGNIFICANCE

In the referenced Nuclear Safety Advisory Letter (NSAL-95-10), Westinghouse discussed the evaluation of the Pressurizer Upper Level Instrument Tap Cracking issue. That evaluation determined that the Westinghouse generic Small Break LOCA analysis bounds a break of a pressurizer level tap. The small break LOCA would also bound a break in the instrument line. This break would not represent a substantial safety hazard.

NRC AWARENESS/REPORTABILITY CONSIDERATIONS

The NRC has not been informed of this issue by Westinghouse. This issue is not reportable pursuant to the requirements of 10 CFR Part 21.

RECOMMENDED ACTIONS

Utilities should review the safety classification for the lines connected to the pressurizer upper level instrument taps and the description of the safety classification in their FSAR. The suggested actions include the following.

1. Reclassify the lines between the level tap and instrument as Safety Class 1. This may require changes to design documents and the FSAR in some cases. An evaluation of the piping and components as outlined above may be appropriate.

2. The FSAR discussion of the performance of the emergency core cooling system (typically in Section 6.3) and the discussion of the small break LOCA (typically in Chapter 15 or Chapter 14) should be reviewed to find statements that may be inconsistent with a break in the instrument line leading to ECCS initiation.