

July 5, 2006

Mr. Joseph E. Conen, Chairman
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6400 N. Dixie Highway
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SUBJECT: DRAFT SAFETY EVALUATION FOR THE BOILING WATER REACTOR
OWNERS' GROUP (BWROG) TOPICAL REPORT (TR) NEDO-33160,
REGULATORY RELAXATION FOR THE POST ACCIDENT SRV [SAFETY
RELIEF VALVE] POSITION INDICATION SYSTEM (TAC NO. MC5446)

Dear Mr. Conen:

By letter dated December 13, 2004, the BWROG submitted NEDO-33160, "Regulatory Relaxation for the Post Accident SRV Position Indication System" to the U.S. Nuclear Regulatory Commission (NRC) staff for review. Enclosed for the BWROG review and comment is a copy of the NRC staff's draft safety evaluation (SE) for the TR.

Twenty working days are provided to you to comment on any factual errors or clarity concerns contained in the SE. The final SE will be issued after making any necessary changes and will be made publicly available. The NRC staff's disposition of your comments on the draft SE will be discussed in the final SE.

To facilitate the NRC staff's review of your comments, please provide a marked-up copy of the draft SE showing proposed changes and provide a summary table of the proposed changes.

If you have any questions, please contact Michelle Honcharik at 301-415-1774.

Sincerely,

/RA/

Juan D. Peralta, Acting Chief
Special Projects Branch
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Office of Nuclear Reactor Regulation

Project No. 691

Enclosure: Draft SE

cc w/encl: See next page

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ADAMS ACCESSION NO.: **ML061810262**

*No major changes to SE input.

NRR-106

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DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT (TR) NEDO-33160

"REGULATORY RELAXATION FOR THE POST ACCIDENT

SRV [SAFETY RELIEF VALVE] POSITION INDICATION SYSTEM"

BOILING WATER REACTOR OWNERS' GROUP (BWROG)

PROJECT NO. 691

1.0 INTRODUCTION AND BACKGROUND

By letter dated December 13, 2004 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML043510165), the BWROG submitted TR NEDO-33160, "Regulatory Relaxation for the Post Accident SRV Indication System," for U.S. Nuclear Regulatory Commission (NRC) staff review. The TR requested a change in category for SRV position indication instrumentation, for boiling water reactors (BWRs), as classified by Regulatory Guide (RG) 1.97, Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident." The BWROG submitted supplemental material in response to the NRC staff's request for additional information, by letter dated October 31, 2005 (ADAMS Accession No. ML053110138).

2.0 REGULATORY EVALUATION

The primary purpose of Accident Monitoring Instrumentation is to display plant variables that provide information required by the control room operator during accident situations. This information provides the necessary support for the operator to take manual actions to initiate safety systems and other appropriate systems important to safety.

Criterion 13 of Appendix A to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 requires operating reactor licensees to provide instrumentation to monitor variables and systems over their anticipated ranges for accident conditions as appropriate to ensure adequate safety.

Criterion 19 of Appendix A of 10 CFR Part 50 requires operating reactor licensees to provide a control room from which actions can be taken to maintain the nuclear power unit in a safe condition under accident conditions, including loss-of-coolant accidents.

Section 50.34(f)(2)(xi) of 10 CFR requires plants to provide direct indication of relief and safety valve position (open or closed) in the control room.

NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.D.3 requires, "Reactor coolant system relief and safety valves shall be provided with a positive indication in the control

room derived from a reliable valve-position detection device or a reliable indication of flow in the discharge pipe."

RG 1.97 describes a method acceptable to the NRC staff for complying with the Commission's regulations to provide instrumentation for monitoring plant variables and systems during and after an accident. RG 1.97 groups these variables into five types, Types A, B, C, D, and E. Type D variables provide the operator with information on the operation of individual safety systems and other systems important to safety. Type D variables are to help the operator make appropriate decisions in using the individual systems important to safety in mitigating the consequences of an accident. For BWRs, RG 1.97 recommends that Type D key variables be monitored by instrumentation that meets the Category 2 criteria. The Category 2 criteria includes environmental qualification, augmented quality, and reliable power. In addition, RG 1.97 recommends that Type D variables that provide backup information should meet the Category 3 criteria. The Category 3 criteria includes high-quality commercial grade equipment that is designed to withstand the specified service environment.

3.0 TECHNICAL EVALUATION

One of the RG 1.97 Type D systems is the main steam system. RG 1.97 recommends that primary system SRV positions, including automatic depressurization system (ADS) or flow through or pressure in valve lines (SRV position) is a key variable for providing detection of an accident and boundary integrity indication for the main steam system and, therefore, should meet the Category 2 criteria.

NEDO-33160 states that for BWRs, reactor pressure vessel (RPV) pressure and suppression pool temperature instrumentation in combination with other instruments (e.g., RPV water level, suppression pool level, containment pressure) satisfy the RG 1.97 accident detection and boundary integrity indication purpose as specified in RG 1.97 for the SRV position variable. This alternate instrumentation either meets or exceeds the Category 2 criteria. SRV position indication instrumentation provides backup information and does not need to be classified as a Category 2 variable. Therefore, NEDO-33160 recommends that, for BWRs, SRV position indication should be reclassified as a Type D Category 3 variable.

NEDO-33160 states that the knowledge of SRV position is not used by the operator to make appropriate decisions in using individual systems important to safety in mitigating the consequences of an accident. SRVs are used as part of ADS whose successful indication of performance of the safety function is the reduction of RPV pressure to enable use of low pressure Emergency Core Cooling System (ECCS) to mitigate the consequences of an accident. Other operator indications and requirements for ADS operation include an increase in suppression pool water temperature, increase in suppression pool water level, and change in RPV water level before the ADS will function. These other indications are included as RG 1.97 Category 1 or 2 variables, but the primary RG 1.97 variables are RPV pressure and suppression pool water temperature. The operator would use SRV position indication as a confirmation of SRV opening; however, this would be a backup to the main safety function for ADS of reduction in RPV pressure to enable use of low pressure ECCS.

BWRs are specifically designed to depressurize the RPV during certain accident scenarios. Depressurization allows the initiation of low pressure ECCS loops to provide core cooling. Low pressure ECCS initiation and operation is independent of the causes for RPV depressurization

(e.g., line break or ADS actuation). ECCS initiation and operation are primarily based on RPV water level, RPV dome pressure, containment pressure, and suppression pool temperature. Knowledge of SRV position or its indication does not significantly affect automatic or manual low pressure ECCS operation and thus does not affect short-term or long-term core cooling.

SRV position indication instrumentation provides direct indication of flow through a main steam SRV. This can occur as a result of: (1) planned manual operation of the SRV under normal operating conditions, (2) planned manual opening of the SRV under shutdown conditions (i.e., pressure control), (3) primary reactor system pressure exceeding the SRV relief function setpoint during power operation, (4) the effect of a system isolation and reactor shutdown, (5) a spurious actuation of the valve while at power (i.e., stuck open SRV), or (6) manual or automatic operation of the ADS function.

A review of the BWR Emergency Procedures Guidelines (EPGs) shows that suppression pool temperature, not SRV position, is an entry condition for the EPGs.

Of the above six scenarios, only the usage of SRV position information, as it relates to operation of the ADS function, is associated with an accident within the context of the guidance of RG 1.97. The function of ADS is to provide the capability to reduce reactor pressure to allow low pressure ECCS to function to provide core cooling.

While SRV position information provides positive indication of flow through SRVs, this information is of secondary importance to the operator during ADS operation. Successful indication of ADS actuation is provided by RPV pressure and suppression pool temperature. Flow indication through SRVs does not provide the operator with a unique indication of ADS actuation, a positive indication that an accident has occurred, or essential confirmation that an accident mitigation has occurred.

Therefore, NEDO-33160 concludes that there is no event where SRV position indication is relied upon for accident detection.

The NRC staff agrees with the NEDO-33160 conclusion that the RG 1.97 SRV position indication does not perform or ensure a safety-related function. The purpose of SRV position indication instrumentation is the detection of a stuck open SRV. This was the original intent of the NUREG-0737 Item II.D.3 requirement for, "Reactor coolant system relief and safety relief valves shall be provided with a positive indication in the control room derived from a reliable valve-position detective device or a reliable indication of flow in the discharge pipe." Per the requirements of NUREG-0737 Item II.D.3 and 10 CFR 50.34(f)(2)(xi), BWRs are required to have instrumentation that will provide the operator with direct indication of SRV position.

Although licensees may reference NEDO-33160 as the basis for revising SRV position indication from Type D Category 2 to Type D Category 3, they are still required to meet the requirements of NUREG-0737 Item II.D.3 and 10 CFR 50.34(f)(2)(xi). Licensees will be required to maintain SRV position indication in the control room consistent with these requirements.

The reviewer's note in Technical Specification (TS) Table 3.3.3.1-1 of NUREG-1433 and NUREG-1434 reads:

Table 3.3.3.1-1 shall be amended for each plant as necessary to list:

1. All Regulatory Guide 1.97, Type A instruments and
2. All Regulatory Guide 1.97, Category 1, non-Type A instruments specified in the plant's Regulatory Guide 1.97, Safety Evaluation Report.

Therefore, if a BWR licensee has classified SRV position as a Type A variable, NEDO-33160, would not be applicable for that plant and the licensee would be expected to maintain the TS status of SRV position.

SRV position may be reclassified as a Type D Category 3 instrument provided there is alternate instrumentation that provides the main steam system status for detection of an accident or boundary integrity indication information.

For certain BWR plants the RG 1.97 SRV position information is provided by SRV discharge pipe thermocouples. The information from SRV discharge pipe thermocouples can be used to determine if an SRV is open or closed. Therefore, if the SRV discharge pipe thermocouples meet the RG 1.97 Category 3 criteria, they may be used in lieu of SRV position indication to meet the RG 1.97 function of SRV position indication.

4.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the proposed change for SRV position indication to Category 3 as detailed in NEDO-33160 is acceptable for BWR plants. Licensees electing to adopt NEDO-33160 should perform a plant-specific review to determine the applicability of NEDO-33160. This change in RG 1.97 category does not relieve licensees from meeting the requirements of NUREG-0737 Item II.D.3 and 10 CFR 50.34(f)(2)(xi).

5.0 REFERENCES

1. Letter from K. S. Putnam (BWROG) to US NRC, "BWR Owners' Group Licensing Topical Report NEDO-33160, Regulatory Relaxation for the Post Accident SRV Position Indication System," dated December 13, 2004 (ADAMS Accession No. ML043510165).
2. Regulatory Guide 1.97, Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," NRC Office of Nuclear Regulatory Research, dated May 1983 (ADAMS Accession No. ML003740282).
3. Letter from J. E. Conen (BWROG) to US NRC, "BWR Owners' Group SRV Position Indication Committee Response to NRC's Request for Additional Information Regarding Licensing Topical Report NEDO-33160, Regulatory Relaxation for the Post Accident SRV Position Indication System," dated October 31, 2005 (ADAMS Accession No. ML053110138).
4. Part 50 of Title 10, Chapter 1 of the *Code of Federal Regulations*.

5. NUREG-0737, "Clarification of TMI Action Plan Requirements," dated November 30, 1980 (ADAMS Accession No. ML051400209).
6. NUREG-1433, Rev. 3, "Standard Technical Specification General Electric Plants, BWR/4," dated June 2004 (ADAMS Accession No. ML041910194).
7. NUREG-1434, Rev. 3, "Standard Technical Specification General Electric Plants, BWR/6," dated June 2004 (ADAMS Accession No. ML041910204).

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