October 22, 2007

Mr. Gordon Bischoff, Manager
Owners Group Program Management Office
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

SUBJECT: DRAFT SAFETY EVALUATION FOR PRESSURIZED WATER REACTOR OWNERS GROUP (PWROG) TOPICAL REPORT (TR) WCAP-15981-NP, "POST ACCIDENT MONITORING INSTRUMENTATION RE-DEFINITION FOR WESTINGHOUSE NSSS [NUCLEAR STEAM SUPPLY SYSTEM] PLANTS" (TAC NO. MC4524)

Dear Mr. Bischoff:

By letter dated September 17, 2004, the PWROG (formerly the Westinghouse Owners Group) submitted TR WCAP-15981-NP, "Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants," to the U.S. Nuclear Regulatory Commission (NRC) staff for review. The PWROG submitted supplemental information in response to the NRC's request for additional information by letters dated March 20, 2006, August 10, 2006, June 28, 2007, and August 22, 2007. The PWROG also provided supplemental information in handouts during a September 20, 2007, NRC public meeting. Enclosed for PWROG 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 Tanya M. Mensah at 301-415-3610.

Sincerely,

/RA/

Stacey L. Rosenberg, Chief
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 694

Enclosure: Draft SE
cc w/encl: See next page

October 22, 2007

Mr. Gordon Bischoff, Manager
Owners Group Program Management Office
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

SUBJECT: DRAFT SAFETY EVALUATION FOR PRESSURIZED WATER REACTOR OWNERS GROUP (PWROG) TOPICAL REPORT (TR) WCAP-15981-NP, "POST ACCIDENT MONITORING INSTRUMENTATION RE-DEFINITION FOR WESTINGHOUSE NSSS [NUCLEAR STEAM SUPPLY SYSTEM] PLANTS" (TAC NO. MC4524)

Dear Mr. Bischoff:

By letter dated September 17, 2004, the PWROG (formerly the Westinghouse Owners Group) submitted TR WCAP-15981-NP, "Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants," to the U.S. Nuclear Regulatory Commission (NRC) staff for review. The PWROG submitted supplemental information in response to the NRC's request for additional information by letters dated March 20, 2006, August 10, 2006, June 28, 2007, and August 22, 2007. The PWROG also provided supplemental information in handouts during a September 20, 2007, NRC public meeting. Enclosed for PWROG 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 Tanya M. Mensah at 301-415-3610.

Sincerely,
/RA/
Stacey L. Rosenberg, Chief
Special Projects Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 694

Enclosure: Draft SE

cc w/encl: See next page

ADAMS ACCESSION NO. ML072260059 *No major changes to SE input. NRR-043

OFFICE	PSPB/PM	PSPB/LA	APLA/BC*	EICB/BC	SRXB/BC*	PSPB/BC
NAME	TMensah	DBaxley	MRubin	BMarcus for BKemper	GCranston	SRosenberg
DATE	10/ 9 /07	8/20/07	6/26 /07	10/10 /07	8/21 /07	10/22 /07

OFFICIAL RECORD COPY

Letter to Gordon Bischoff from Stacey L. Rosenberg dated: October 22, 2007

SUBJECT: DRAFT SAFETY EVALUATION FOR PRESSURIZED WATER REACTOR OWNERS GROUP (PWROG) TOPICAL REPORT (TR) WCAP-15981-NP, "POST ACCIDENT MONITORING INSTRUMENTATION RE-DEFINITION FOR WESTINGHOUSE NSSS PLANTS"

DISTRIBUTION:
PUBLIC
PSPB Reading File
RidsNrrDpr
RidsNrrDprPspb
RidsNrrPMTMensah
RidsNrrPMSPeters
RidsNrrLADBaxley
RidsOgcMailCenter
RidsAcrsAcnwMailCenter
RidsNrrDraApla
RidsNrrDeEicb
RidsNrrDssSrsb
SRosenberg (HardCopy)

External Email:
dimuzica@westinghouse.com

cc:
Mr. James A. Gresham, Manager
Regulatory Compliance and Plant Licensing
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355
greshaja@westinghouse.com

DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT (TR) WCAP-15981-NP

"POST ACCIDENT MONITORING INSTRUMENTATION RE-DEFINITION FOR

WESTINGHOUSE NSSS [NUCLEAR STEAM SUPPLY SYSTEM] PLANTS"

PRESSURIZED WATER REACTOR OWNERS GROUP

PROJECT NO. 694

1.0 INTRODUCTION AND BACKGROUND

By letter dated September 17, 2004 (Reference 1), the Pressurized Water Reactor Owners Group (PWROG) (formerly the Westinghouse Owners Group) submitted Topical Report (TR) WCAP-15981-NP, "Post Accident Monitoring Re-Definition for Westinghouse NSSS Plants," for U.S. Nuclear Regulatory Commission (NRC) staff review. In response to the NRC staff's requests for additional information by e-mails dated April 11, 2005, and May 10, 2006, the PWROG submitted supplemental material by letters dated March 20, 2006 (Reference 2), August 10, 2006 (Reference 3), June 28, 2007 (Reference 4), and August 22, 2007 (Reference 14). The PWROG also provided supplemental information in handouts during a September 20, 2007, NRC public meeting (Reference 15).

TR WCAP-15981-NP provides technical justification for identifying Post Accident Monitoring (PAM) instrumentation that should be included in the Technical Specifications (TS) for Westinghouse Nuclear Steam Supply System (NSSS) plants. In addition, TR WCAP-15981-NP provides a methodology to be used by licensees to reassess the PAM instrumentation that should be included in the plant-specific TS. TR WCAP-15981-NP was not submitted as a risk-informed application pursuant to Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated November 2002 (Reference 5), but uses probabilistic risk assessment (PRA) information as one element of the overall method to determine the instrumentation to be included in the PAM TS. Given that TR WCAP-15981-NP is not risk-informed, the NRC staff undertook a review of the methodology in order to provide perspectives into how PRA and other information (e.g., Emergency Operating Procedures (EOPs), Severe Accident Management Guidelines (SAMGs), and the Emergency Plan (EP)) would be used collectively to identify instrumentation for inclusion in the PAM TS.

Section 3.2 of this safety evaluation (SE) provides the results of the NRC staff's evaluation of the instrumentation that should be included in the PAM TS, and the instrumentation that can be relocated from the PAM TS, for Westinghouse NSSS plants. The NRC staff's evaluation of the alternate PAM instrumentation proposed in TR WCAP-15981-NP, is also provided in Section 3.2.21. Section 3.3 of this SE provides the results of the NRC staff's evaluation of the methodology to be used by licensees to reassess the PAM instrumentation that should be included in the plant-specific TS.

2.0 REGULATORY EVALUATION

The primary purpose of PAM 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.

2.1 Applicable Regulations

Criterion 13, "Instrumentation and control," of Appendix A to Title 10 of Part 50 of the *Code of Federal Regulations* (10 CFR), 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, "Control room," 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.

The regulation at 10 CFR 50.36(c)(2)(ii)(C) requires that TS limiting conditions for operation (LCOs) of a nuclear reactor be established for a structure, system, or component (SSC) that is part of the primary success path and which functions or actuates to mitigate a design-basis accident (DBA) or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The regulation at 10 CFR 50.36(c)(2)(ii)(D) requires that TS LCOs of a nuclear reactor be established for a SSC which operating experience or PRA has shown to be significant to public health and safety.

2.2 Applicable Regulatory Criteria/Guidelines

RG 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," dated May 1983 (Reference 6), 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 the monitored variables into five types. Each type separates the variables based on the general purpose (or function) of the variables. Individual variables may be monitored for multiple functions and therefore belong to multiple types.

- Type A variables provide the primary information required to permit the control room operator to take specific manually controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety function for design basis events.

- Type B variables provide information to indicate whether plant safety functions are being accomplished.

- Type C variables provide information to indicate the potential for being breached or the actual breach of the barriers to fission product releases.

- Type D variables provide information to indicate the operation of individual safety systems and other systems important to safety.

- Type E variables provide information for use in determining the magnitude of a release of radioactive materials and continual assessment of such releases.

RG 1.97 provides design and qualification criteria separated into three categories that provide a graded approach depending on the importance to safety of the measurement of a specific variable. The categories, and the design and qualification criteria associated with each category, are described in RG 1.97. The monitoring of individual variables for multiple functions may result in an individual variable needing to meet multiple design and qualification criteria and as a result belonging to multiple categories.

- Category 1 provides for full qualification, redundancy, and continuous real-time display, and on-site Class 1E power sources.

- Category 2 provides for qualification but is less stringent in that it does not include seismic qualification, redundancy, or continuous display, and only a highly-reliable power source is needed.

- Category 3 provides for high-quality commercial-grade equipment and only offsite power is needed.

This mixture of type and category results in several instruments that need to meet multiple type and category combinations. In cases were a single variable needs to monitor multiple functions, some licensees have provided one set of instrumentation that meets the highest category criteria of the multiple functions for that variable.

2.3 Regulatory Criteria/Guidelines Applicable To PRA

General guidance for evaluating the technical basis of proposed risk-informed changes is provided in Chapter 19.0 of NUREG-0800, Standard Review Plan (SRP) (Reference 7). SRP Chapter 19, Appendix D, “Use of Risk Information in Review of Non-Risk-Informed License Amendment Requests,” provides guidance to the NRC staff in determining if “special circumstances” exist for license amendment requests that are not risk-informed. Special circumstances would exist if, even though the application is in compliance with existing regulatory requirements, concerns associated with the application are identified regarding adequate protection of the public. Per the guidance of Appendix D, the NRC staff used elements of the risk-informed decisionmaking process described in RG 1.174 to focus the review.

Although the guidance presented in RG 1.174 does not constitute a definition of adequate protection, it does provide an appropriate set of guidelines that can be used in the initial process in determining the potential for “special circumstances” and in providing a basis for finding that there is reasonable assurance of adequate protection by compliance with the existing regulatory requirements. In addition, SRP Chapter 19 and RG 1.174 state that a

risk-informed application should be evaluated to ensure that the proposed change(s) meet five key safety principles:

- The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change.
- The proposed change is consistent with the defense-in-depth philosophy.
- The proposed change maintains sufficient safety margins.
- When the proposed changes increase risk, i.e., core damage frequency (CDF) or large early release frequency (LERF), the increases should be small and consistent with the intent of the Commission's Safety Goal Policy.
- The impact of the proposed change should be monitored using performance measurement strategies.

The quality of the PRA supporting the change must be compatible with the safety implications of the TS change being requested, and the degree to which the decision relies on the risk information. SRP Chapter 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities" (Reference 8), provides guidance for determining the technical adequacy of PRA results for risk-informed activities.

RG 1.174 and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications" (Reference 9), provide specific guidance and acceptance guidelines for assessing the impact of licensing basis changes, including proposed permanent TS changes.

The NRC staff considered the above guidance in assessing the proposed TS changes, but did not perform an in-depth review of every item since TR WCAP-15981-NP was not risk-informed.

3.0 TECHNICAL EVALUATION

3.1 Description of the Proposed Change

PAM instrumentation provides information required by the control room operators during accident situations to (1) provide information required to permit the control room operators to take preplanned manual actions to accomplish safe plant shutdown; (2) determine whether the reactor trip, engineered safety features systems, and manually initiated safety systems, and other systems important to safety are performing their intended functions; and (3) provide information that enable the control room operators to determine the potential for causing a gross breach of the barriers to reactivity release and to determine if a gross breach of a barrier has occurred.

TS 3.3.3 of the Standard TSs for Westinghouse plants (NUREG-1431 [Reference 10]), contains a generic list of PAM instruments for Westinghouse NSSS plants, and also contains a reviewer's note that states that a plant should include all of its plant-specific RG 1.97 Type A instrumentation and Category 1 instrumentation in the PAM TS. The generic list of PAM instrumentation was developed in the late 1980's based on DBA requirements and generic

insights from PRAs available at that time. TR WCAP-15981-NP states that the associated changes to NUREG-1431 (that have been reviewed by the NRC staff in TR WCAP-15981-NP) will be included in a Technical Specifications Task Force (TSTF) Traveler for submission to the NRC at a later date. It was the NRC staff's initial understanding that the TSTF would revise the generic list of PAM instrumentation on Table 3.3.3-1 of TS 3.3.3, "PAM Instrumentation," in NUREG-1431. The NRC staff believes that a revised list of PAM instrumentation on Table 3.3.3-1 of TS 3.3.3 could be misinterpreted by plants that do not plan to apply TR-WCAP-15981-NP. During a September 20, 2007, NRC public meeting (Reference 15), the PWROG clarified that instead of revising the generic list of PAM instrumentation on Table 3.3.3-1 of TS 3.3.3, that an additional Reviewer's Note to TS 3.3.3 would be added that would provide licensees with an option of revising their plant-specific PAM table to reflect the PAM instrumentation that satisfies Criteria 3 and/or 4 of 10 CFR 50.36 based on the methodology contained in TR WCAP-15981. The NRC staff is in agreement with this approach.

The PAM instrumentation that is currently included in TS 3.3.3 was selected based on application of the following criteria contained in 10 CFR Part 50.36(c)(2)(ii):

- Criterion 1: Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

- Criterion 2: A process variable, design feature, or operating restriction that is an initial condition of a DBA or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

- Criterion 3: A SSC that is part of the primary success path and which functions or actuates to mitigate a DBA or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

- Criterion 4: A SSC which operating experience or PRA has shown to be significant to public health and safety.

The fourth criterion was added to 10 CFR 50.36 in 1995, to reflect the insights gained from PRA. Such insights were not widely known or available at the time when TS 3.3.3 was issued in Revision 0 of NUREG-1431.

TR WCAP-15981-NP provides a methodology to be used by licensees to reassess the PAM instrumentation that should be included in the plant-specific PAM TS. The plant-specific implementation of the TR WCAP-15981-NP methodology requires a plant-specific evaluation of the instrumentation assumed or credited in the plant's: (1) DBAs, (2) EOPs, (3) PRA, (4) SAMGs, and (5) EP implementing procedures. It is noted in TR WCAP-15981-NP that the purpose of the PAM instrumentation is to provide the necessary indications in a post accident environment. Thus, in evaluating instrumentation for retention in the PAM TS, the methodology in TR WCAP-15981-NP focuses on instrumentation that satisfies Criteria 3 or 4 of 10 CFR 50.36(c)(2)(ii).

The NRC staff position on which RG 1.97 variables should be included in the PAM TS, as stated in a May 1988 letter from T. E. Murley to W. S. Wilgus (Reference 11), has been that all Type A variables and all non-Type A Category 1 variables should be included in the PAM TS.

TR WCAP-15981-NP provides recommended changes to the list of variables that should be included in the PAM TS. The basis for these changes is the PWROG's position that variables that satisfy 10 CFR 50.36(c)(2)(ii) Criterion 3 or 4 should be included in the PAM TS. The TR WCAP-15981-NP recommended that instrumentation that satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) should be classified as Type A instrumentation and instrumentation that satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) should be classified as Category 1 instrumentation. The TR WCAP-15981-NP also recommended that instrumentation that do not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) but are currently in PAM TS could be downgraded in category and relocated from the PAM TS to licensee controlled documents.

The PWROG performed an analysis in TR WCAP-15981-NP to reevaluate the PAM variables against Criterion 3 and 4 of 10 CFR 50.36(c)(2)(ii) based on how each variable is used in accident management at Westinghouse NSSS plants. Based on the results of that analysis, TR WCAP-15981-NP recommends type and/or category changes for several variables. In some cases, this includes a change to the category of a variable, a change to the type of a variable, or a change to both the type and category of a variable.

TR WCAP-15981-NP proposes that the following variables be included in the PAM TS:

- Neutron Flux (Power Range)
- Reactor Coolant System (RCS) Pressure
- Core Exit Temperature
- High Head Safety Injection Flow
- Refueling Water Storage Tank Level
- Containment Pressure
- Containment Isolation Valve Position
- Pressurizer Level
- Steam Generator Level (Wide Range)
- Steam Generator Pressure
- Auxiliary Feedwater Flow
- Containment Area Radiation (High Range)

TR WCAP-15981-NP proposes that the following variables be relocated from the PAM TS:

- Neutron Flux (Source Range)
- RCS Hot-Leg Temperature
- RCS Cold-Leg Temperature
- Reactor Vessel Water Level
- Subcooling Margin
- Containment Sump Water Level (Wide Range)
- Condensate Storage Tank Level

TR WCAP-15981-NP also proposes that the following other PAM variables, which are not usually included in the PAM TS (but which may be included in the PAM TSs of other Westinghouse NSSS plants that have not converted to NUREG-1431) should be relocated from the PAM TS:

- Containment Sump Water Level (Narrow Range)
- Containment Hydrogen

- Pressurizer Pressure
- RCS Radiation Level
- Steam Generator Level (Narrow Range)
- Pressurizer Power Operated Relief Valve (PORV) Position
- Pressurizer PORV Block Valve Position
- Pressurizer Safety Valve Position
- Radiation Effluent
- Auxiliary Feedwater Valve Position
- Boric Acid Tank Level
- Containment Enclosure Negative Pressure
- Residual Heat Removal Flow
- Spray Additive Tank Level
- Component Cooling Water Temperature
- Component Cooling Water Flow
- Service Water Temperature
- Service Water Flow

3.2 Deterministic Evaluation of the Proposed Changes

Section 3.2.1 to 3.2.22 provide the NRC staff's evaluation of the proposed changes for each parameter identified in Section 3.1.

3.2.1 Neutron Flux (Power Range)

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Neutron Flux from 10^{-6} to 100 percent full power to provide function detection and accomplishment of mitigation of the Reactivity Control function. TR WCAP-15981-NP recommends that the Neutron Flux (Power Range) portion of the RG 1.97 recommended range remain as a Type B Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Neutron Flux (Power Range) satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.2 Neutron Flux (Source Range)

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Neutron Flux from 10^{-6} to 100 percent full power to provide function detection and accomplishment of mitigation of the Reactivity Control function. TR WCAP-15981-NP recommends that the Neutron Flux (Source Range) portion of the RG 1.97 recommended range be reclassified as Type B Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that Neutron Flux (Power Range) provides the most direct indication of the accomplishment of the Reactivity Control function. Neutron Flux (Source Range) provides verification of the automatic actuation of the RPS and is therefore a Type B variable and provides diagnostics of continued subcriticality during RCS cooldown and depressurization and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that Neutron Flux (Source Range) does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS.

However, TR WCAP-15981-NP does not discuss instrumentation to be used to provide an early indication of a return to criticality. Neutron Flux (Source Range) instrumentation provides this

information. In a letter dated August 22, 2007 (Reference 14), the PWROG provided additional clarification to support the RAI responses documented in a letter dated June 28, 2007. The letter dated August 22, 2007 (Reference 14), states that RCS Boron concentration provides information to ensure adequate shutdown margin. However, TR WCAP-15981-NP has not proposed that RCS Boron Concentration be upgraded to a Category 1 variable in lieu of Neutron Flux (Source Range). Based on the information provided the NRC staff does not agree with the proposed reclassification of Neutron Flux (Source Range) and concludes that Neutron Flux (Source Range) should be included in the PAM TS.

3.2.3 RCS Hot-Leg Water Temperature

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor RCS Hot-Leg Water Temperature to provide function detection, accomplishment of mitigation, verification, and long-term surveillance of the Core Cooling function. TR WCAP-15981-NP recommends that RCS Hot-Leg Water Temperature be reclassified as Type B Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that Core Exit Temperature provides the most direct indication of the accomplishment of the Core Cooling function. RCS Hot-Leg Water Temperature provides confirmatory information to indicate whether the Core Cooling function is being accomplished and is, therefore, a Type B variable and provides backup diagnostics to the Core Exit Temperature and High Head Safety Injection Flow indications and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that RCS Hot-Leg Water Temperature does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS.

Because High Head Safety Injection Flow is a second key variable for the accomplishment of the Core Cooling function and is included in the PAM TS (see Section 3.2.9), the NRC staff agrees that RCS Hot-Leg Water Temperature can be reclassified as a Type B Category 3 variable and does not need to be included in the PAM.

3.2.4 RCS Cold-Leg Water Temperature

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor RCS Cold-Leg Water Temperature to provide function detection, accomplishment of mitigation, verification, and long-term surveillance of the Core Cooling function. TR WCAP-15981-NP recommends that RCS Cold-Leg Water Temperature be reclassified as Type B Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that Core Exit Temperature provides the most direct indication of the accomplishment of the Core Cooling function. RCS Cold-Leg Water Temperature provides confirmatory information to indicate whether the Core Cooling function is being accomplished and is, therefore, a Type B variable and provides backup diagnostics to the Core Exit Temperature and High Head Safety Injection Flow indications and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that RCS Cold-Leg Water Temperature does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS.

The information provided by the PWROG during a September 20, 2007, NRC public meeting (Reference 15), indicated that the RCS cold-leg water temperature is used in the critical safety function (CSF) status trees of the Emergency Response Guidelines (ERG) for Westinghouse NSSS manufactured plants to direct the operators to a function restoration guideline, FR-P.1, which provides actions to avoid or limit pressurized thermal shock (PTS) to the reactor vessel.

The generic probabilistic risk assessment (PRA) information provided in Appendix A to TR WCAP-15981-NP does not show that the PTS, and thus, the RCS cold-leg water temperature indication used by the operators to avoid the PTS, are risk significant. Therefore, the NRC staff agrees with the PWROG that based upon the generic assessment, the RCS cold-leg water temperature does not satisfy Criterion 4 of 10 CFR 50.36(c)(2) (ii) and need not be included in PAM TS. However, licensees will need to confirm whether this instrument should be retained in the plant-specific TS using the methodology in TR WCAP-15981-NP.

3.2.5 RCS Pressure

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor RCS Pressure to provide function detection and accomplishment of mitigation, verification, and long-term surveillance of the Core Cooling function. TR WCAP-15981-NP recommends that RCS Pressure remains as a Type B Category 1 variable and also be classified as a Type A variable for the Core Cooling function. Therefore, TR WCAP-15981-NP concluded that RCS Pressure satisfies Criterion 3 and 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor RCS Pressure to provide function detection and accomplishment of mitigation of the Maintaining RCS Integrity function. TR WCAP-15981-NP recommends that RCS Pressure remains as a Type B Category 1 variable. Therefore, TR WCAP-15981-NP concluded that RCS Pressure satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type C Category 1 instrumentation be provided to monitor RCS Pressure to provide detection of potential for or actual breach, accomplishment of mitigation, and long-term surveillance of the Reactor Coolant Pressure Boundary function. TR WCAP-15981-NP recommends that RCS Pressure remains as a Type C Category 1 variable. Therefore, TR WCAP-15981-NP concluded that RCS Pressure satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type C Category 1 instrumentation be provided to monitor RCS Pressure to provide detection of potential for breach and accomplishment of mitigation of the Containment function. The letter dated August 22, 2007 (Reference 14), provides justification that RCS Pressure above the normal operating pressure is not a threat to containment integrity and, therefore, RCS Pressure is not considered to be an indicator of a potential breach and accomplishment of mitigation of the Containment function. The NRC staff agrees with this conclusion. Therefore, RCS Pressure does not need to be considered a Type C Category 1 variable for the Containment function and does not need to be included in the PAM TS for the Containment function.

TR WCAP-15981-NP recommends that RCS Pressure also be classified as a Type D Category 1 key variable to monitor Primary Coolant System status. The letter dated August 22, 2007 (Reference 14), provides justification that the RCS Pressure used in conjunction with Core Exit Temperature provides indication that there are no large breaches of the reactor coolant pressure boundary and that the primary system function of removing decay heat to the steam generators is available. The NRC staff agrees with this conclusion. Therefore, RCS Pressure

can be considered a Type D Category 1 key variable for Primary Coolant System status and should be included in the PAM TS for Primary Coolant System status.

3.2.6 Core Exit Temperature

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Core Exit Temperature to provide verification of the Core Cooling function. TR WCAP-15981-NP recommends that the Core Exit Temperature remains as a Type B Category 1 variable and also be classified as a Type A variable for the Core Cooling function. Therefore, TR WCAP-15981-NP concluded that Core Exit Temperature satisfies Criterion 3 and 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type C Category 1 instrumentation be provided to monitor Core Exit Temperature to provide detection of potential for breach, accomplishment of mitigation, and long-term surveillance of the Fuel Cladding function. TR WCAP-15981-NP recommends that Core Exit Temperature remains as a Type C Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Core Exit Temperature satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

TR WCAP-15981-NP recommends that Core Exit Temperature also be classified as a Type B Category 1 key variable for the Maintaining RCS Integrity function. The letter dated August 22, 2007 (Reference 14), provides justification that Core Exit Temperature in conjunction with RCS Pressure can identify when pressurized thermal shock conditions are being approached and would be an indicator for the Maintaining RCS Integrity function. The NRC staff agrees with this conclusion. Therefore, Core Exit Temperature can be considered a Type B Category 1 key variable for the Maintaining RCS Integrity function and should be included in the PAM TS for the Maintaining RCS Integrity function.

TR WCAP-15981-NP recommends that Core Exit Temperature also be classified as a Type C Category 1 key variable for the Reactor Coolant Pressure Boundary function. The letter dated August 22, 2007 (Reference 14), provides justification that the Core Exit Temperature used in conjunction with RCS Pressure provides indication that there are no large breaches of the reactor coolant pressure boundary and that the primary system function of removing decay heat to the steam generators is available. The NRC staff agrees with this conclusion. Therefore, Core Exit Temperature can be considered a Type C Category 1 key variable for the Reactor Coolant Pressure Boundary function and should be included in the PAM TS for the Reactor Coolant Pressure Boundary function.

TR WCAP-15981-NP recommends that Core Exit Temperature also be classified as a Type D Category 1 key variable to monitor Primary Coolant System status. The letter dated August 22, 2007 (Reference 14), provides justification that the Core Exit Temperature used in conjunction with RCS Pressure provides indication that there are no large breaches of the reactor coolant pressure boundary and that the primary system function of removing decay heat to the steam generators is available. The NRC staff agrees with this conclusion. Therefore, Core Exit Temperature can be considered a Type D Category 1 key variable for the Primary Coolant System status.

3.2.7 Reactor Vessel Water Level

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Reactor Vessel Water Level (RVLIS), or Coolant Inventory, to provide verification and accomplishment of mitigation of the Core Cooling function. TR WCAP-15981-NP recommends that Reactor Vessel Water Level be reclassified as Type B Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that Core Exit Temperature provides the most direct indication of the accomplishment of the Core Cooling function. Reactor Vessel Water Level provides information to indicate whether the Core Cooling function is being accomplished and is, therefore, a Type B variable and provides backup diagnostics to the Core Exit Temperature indication and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that Reactor Vessel Water Level does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS.

The information provided by the PWROG during a September 20, 2007, NRC public meeting (Reference 15) indicated that the RVLIS is used in the CSF status trees of the ERG for Westinghouse NSSS manufactured plants to direct the operators to the function restoration guidelines, including (1) FR-C.1 and FR-C.2 that provide actions to restore an adequate core cooling, and (2) FR-I.1 through FR-I.3 that provide actions to restore RCS inventory. The generic PRA information provided in Appendix A to TR WCAP-15981-NP does not show that the RVLIS used in FR-C.1 and FR-C.2 for core cooling and FR-I.1 through FR-I.3 for RCS inventory restoration is risk significant. Therefore, the NRC staff agrees with the PWROG that based upon the generic assessment, the RVLIS does not satisfy Criterion 4 of 10 CFR 50.36(c)(2) (ii) and need not be included in PAM TS. However, licensees will need to confirm whether this instrument should be retained in the plant-specific TS using the methodology in TR WCAP-15981-NP.

3.2.8 RCS Subcooling

RG 1.97 recommends that Type B Category 2 instrumentation be provided to monitor RCS Subcooling or Degrees of Subcooling to provide verification and analysis of plant conditions of the Core Cooling function. TR WCAP-15981-NP recommends that RCS Subcooling be reclassified as Type B Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that Core Exit Temperature and RCS Pressure are inputs to RCS Subcooling and provide the most direct indication of the accomplishment of the Core Cooling function. RCS Subcooling provides information to indicate whether the Core Cooling function is being accomplished. Therefore, it is a Type B variable and is a backup to Core Exit Temperature and RCS Pressure and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that RCS Subcooling does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS. The NRC staff agrees with the conclusion that RCS Subcooling is not a key variable for the Core Cooling function and may be relocated from the PAM TS.

Although the letter dated August 22, 2007 (Reference 14), discusses the Core Exit Temperature and RCS Pressure instrumentation that are the inputs to the RCS Subcooling indication, the NRC staff does not agree that RCS Subcooling should be reclassified from Type B Category 2 to Type B Category 3.

3.2.9 High Head Safety Injection Flow

RG 1.97 recommends that Type D Category 2 instrumentation be provided to monitor High Head Safety Injection Flow or Flow in High Pressure Injection System to monitor the operation of the Safety Injection Systems. TR WCAP-15981-NP recommends that High Head Safety Injection Flow also be classified as a Type B Category 1 key variable for the Core Cooling function as it provides information for the verification of automatic actuation of safety injection and direct information to verify the operation of safety injection to maintain the inventory for the Core Cooling function. TR WCAP-15981-NP concluded that High Head Safety Injection Flow satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.10 Refueling Water Storage Tank Level

RG 1.97 recommends that Type D Category 2 instrumentation be provided to monitor Refueling Water Storage Tank Level to monitor the operation of the Safety Injection Systems. TR WCAP-15981-NP recommends that Refueling Water Storage Tank Level also be classified as a Type D Category 1 variable because it provides information on the accomplishment of Safety Injection System function. For plants with manual switchover to Emergency Core Cooling System (ECCS) recirculation, Refueling Water Storage Tank Level should be classified as a Type A variable. TR WCAP-15981-NP concluded that Refueling Water Storage Tank Level satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. TR WCAP-15981-NP also concluded that for plants with manual switchover to ECCS recirculation Refueling Water Storage Tank Level satisfies Criterion 3 of 10 CFR 50.35(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

TR WCAP-15981-NP recommends that Refueling Water Storage Tank Level also be classified as a Type B Category 1 key variable for the Core Cooling function. TR WCAP-15981-NP concluded that Refueling Water Storage Tank Level satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. However, TR WCAP-15981-NP does not discuss how Refueling Storage Tank Level instrumentation provides information concerning the Core Cooling function. Therefore, the NRC staff is unable to determine the applicability of Refueling Water Storage Tank Level to the Core Cooling function.

3.2.11 Containment Sump Water Level (Wide Range)

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Containment Sump Water Level (Wide Range) or Containment Water Level to provide function detection, accomplishment of mitigation, and verification of the Maintaining RCS Integrity function. TR WCAP-15981-NP recommends that Containment Sump Water Level (Wide Range) be reclassified as Type B Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that Containment Sump Water Level (Wide Range) indication provides backup information to other key indicators for identifying the accomplishment of the Maintaining RCS Integrity function and is a Type B Category 3 variable. Therefore, TR WCAP-15981-NP concludes that Containment Sump Water Level (Wide Range) indication is a Type B variable and provides information on the status of ECCS recirculation flow delivery and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that Containment Sump Water Level (Wide Range) does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS.

The information provided in the letter dated August 22, 2007 (Reference 14), does not satisfactorily demonstrate that the Containment Sump Water Level (Wide Range) instrumentation used in the CSF status trees of the ERGs for Westinghouse NSSS plants does not meet Criterion 4 of 10 CFR 50.36(c)(2)(ii). Based on the information provided the NRC staff does not agree with the proposed reclassification of Containment Sump Water Level (Wide Range) and concludes that Containment Sump Water Level (Wide Range) should be included in the PAM TS.

RG 1.97 also recommends that Type C Category 1 instrumentation be provided to monitor Containment Sump Water Level (Wide Range) to provide detection of breach, accomplishment of mitigation, verification, and long-term surveillance of the Reactor Coolant Pressure Boundary function. TR WCAP-15981-NP recommends that Containment Sump Water Level (Wide Range) be reclassified as Type C Category 3 and be relocated from the PAM TS. The justification provided in TR WCAP-15981-NP is that degradation of the RCS Pressure Boundary can more appropriately be indicated by RCS Pressure, Pressurizer Level, and Steam Generator Level (Wide Range). While Containment Sump Water Level (Wide Range) indication can provide a direct indication of the potential degradation of the RCS Pressure Boundary, it is not the only indication or the most direct indication that can be used for this diagnosis. Therefore, TR WCAP-15981-NP concludes that Containment Sump Water Level (Wide Range) indication is a Type C variable and provides backup information to other primary indicators for identifying the accomplishment of the Reactor Coolant Pressure Integrity function and should be reclassified as a Category 3 variable. Therefore, TR WCAP-15981-NP concluded that Containment Sump Water Level (Wide Range) does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS.

The information provided by the PWROG during a September 20, 2007, NRC public meeting (Reference 15) indicated that the containment sump water level (wide range) is used in the CSF status trees of the ERG for Westinghouse NSSS manufactured plants to direct the operators to a function restoration guideline, FR-Z.2, which provides actions for the operators to respond to containment flooding. The generic PRA information provided in Appendix A to TR WCAP-15981-NP does not show that prevention of the containment flooding, and thus, the containment sump water level indication used by the operators to prevent containment flooding from occurring are risk significant. Therefore, the NRC staff agrees with the PWROG that based on the generic assessment, the containment sump water level (wide range) does not satisfy Criterion 4 of 10 CFR 50.36(c)(2) (ii) and need not be included in PAM TS. However, licensees will need to confirm whether this instrument should be retained in the plant-specific TS using the methodology in TR WCAP-15981-NP.

3.2.12 Containment Pressure

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Containment Pressure to provide function detection, accomplishment of mitigation, and verification of the Maintaining RCS Integrity function. TR WCAP-15981-NP recommends that RCS Pressure remains as a Type B Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Containment Pressure satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Containment Pressure to provide function detection, accomplishment of mitigation, and

verification of the Maintaining Containment Integrity function. TR WCAP-15981-NP recommends that Containment Pressure remains as a Type B Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Containment Pressure satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type C Category 1 instrumentation be provided to monitor Containment Pressure to provide detection of breach, accomplishment of mitigation, verification, and long-term surveillance of the Reactor Coolant Pressure Boundary function. TR WCAP-15981-NP recommends that Containment Pressure remains as a Type C Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Containment Pressure satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

RG 1.97 recommends that Type C Category 1 instrumentation be provided to monitor Containment Pressure to provide detection of potential for or actual breach and accomplishment of mitigation of the Containment function. TR WCAP-15981-NP recommends that Containment Pressure remains as a Type C Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Containment Pressure satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.13 Containment Isolation Valve Position

RG 1.97 recommends that Type B Category 1 instrumentation be provided to monitor Containment Isolation Valve Position to provide function detection and accomplishment of mitigation of the Maintaining Containment Integrity function. TR WCAP-15981-NP recommends that Containment Isolation Valve Position remains as a Type B Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Containment Isolation Valve Position satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.14 Pressurizer Level

RG 1.97 recommends that Type D Category 1 instrumentation be provided to monitor Pressurizer Level to ensure proper operation of the pressurizer in the Primary Coolant System. TR WCAP-15981-NP recommends that Pressurizer Level remains as a Type D Category 1 variable and also be classified as a Type A variable to provide information to permit the operator to take actions to terminate safety injection. Therefore, TR WCAP-15981-NP concluded that Containment Pressure satisfies Criterion 3 and 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

TR WCAP-15981-NP recommends that Pressurizer Level also be classified as a Type C Category 1 key variable for the Reactor Coolant Pressure Boundary function. The letter dated August 22, 2007 (Reference 14), provides justification that Pressurizer Level provides indication for termination of safety injection for secondary side breaks and other non-LOCA events that result in automatic start of safety injection. The NRC staff agrees with this conclusion. Therefore, Pressurizer Level can be considered a Type C Category 1 key variable for the

Reactor Coolant Pressure Boundary function and should be included in the PAM TS for the Reactor Coolant Pressure Boundary function.

3.2.15 Steam Generator Level (Wide Range)

RG 1.97 recommends that Type D Category 1 instrumentation be provided to monitor Steam Generator Level (Wide Range) to monitor operation of the Secondary System. TR WCAP-15981-NP recommends that Steam Generator Level (Wide Range) remains as a Type D Category 1 variable and also be classified as a Type A variable to provide information for operator action to maintain a heat sink. Therefore, TR WCAP-15981-NP concluded that Steam Generator Level (Wide Range) satisfies Criterion 3 and 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

TR WCAP-15981-NP recommends that Steam Generator Level (Wide Range) also be classified as a Type C Category 1 key variable for the Reactor Coolant Pressure Boundary function. The PWROG letter dated August 22, 2007 (Reference 14), provides justification that Steam Generator Level (Wide Range) provides information on the availability of a secondary side heat sink for core decay heat removal for accident sequences when RCS Pressure and Temperature are above the cut-in point for shutdown cooling using the residual heat removal system. The NRC staff agrees with this conclusion. Therefore, Steam Generator Level (Wide Range) can be considered a Type C Category 1 key variable for the Reactor Coolant Pressure Boundary function and should be included in the PAM TS for the Reactor Coolant Pressure Boundary function.

3.2.16 Steam Generator Pressure

RG 1.97 recommends that Type D Category 2 instrumentation be provided to monitor Steam Generator Pressure to monitor operation of the Secondary System. TR WCAP-15981-NP recommends that Steam Generator Pressure also be classified as a Type A Category 1 variable to provide information for operator action for steam generator tube rupture break flow termination. Therefore, TR WCAP-15981-NP concluded that Steam Generator Pressure satisfies Criterion 3 and 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.17 Auxiliary Feedwater Flow

RG 1.97 recommends that Type D Category 2 instrumentation be provided to monitor Auxiliary Feedwater Flow to monitor operation of the Auxiliary Feedwater System. TR WCAP-15981-NP recommends that Auxiliary Feedwater Flow also be classified as a Type B Category 1 variable. Auxiliary Feedwater Flow provides information on the verification of the automatic actuation of Auxiliary Feedwater and provides the direct verification of satisfying the heat sink function. Therefore, TR WCAP-15981-NP concluded that Auxiliary Feedwater Flow satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.18 Condensate Storage Tank Water Level

RG 1.97 recommends that Type D Category 1 instrumentation be provided to monitor Condensate Storage Tank Water Level to ensure water supply for the Auxiliary Feedwater

System. TR WCAP-15981-NP recommends that Condensate Storage Tank Water Level be reclassified as a Type B Category 2 variable and a Type D Category 3 variable. Condensate Storage Tank Level provides information on whether the Steam Generator heat sink can be maintained from the condensate storage tank. It does not provide information on the operation of the Auxiliary Feedwater System which is provided by Auxiliary Feedwater Flow and Steam Generator Level (Wide Range). Therefore, TR WCAP-15981-NP concluded that Condensate Storage Tank Water Level does not satisfy either Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) and does not need to be included in the PAM TS. Because, Auxiliary Feedwater Flow provides the key information on the operation of the Auxiliary Feedwater System and is included in the PAM TS, the NRC staff agrees that Condensate Storage Tank Water Level can be reclassified as a Type B Category 2 and Type D Category 3 variables and does not need to be included in the PAM TS.

3.2.19 Containment Area Radiation (High Range)

RG 1.97 recommends that Type E Category 1 instrumentation be provided to monitor Containment Area Radiation (High Range) for detection of significant releases, release assessment, long-term surveillance, and emergency plan actuation for Containment Radiation. TR WCAP-15981-NP recommends that Containment Area Radiation (High Range) remains as a Type E Category 1 variable. Therefore, TR WCAP-15981-NP concluded that Containment Area Radiation (High Range) satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

TR WCAP-15981-NP recommends that Containment Area Radiation (High Range) also be classified as a Type C Category 1 variable for the Reactor Coolant Pressure Boundary function as it provides key information to identify a fission product barrier challenge, detection of breach, and verification of the Reactor Coolant Pressure Boundary function. Therefore, TR WCAP-15981-NP concluded that Containment Area Radiation (High Range) satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS. The NRC staff agrees with this conclusion.

3.2.20 Other PAM Variables

TR WCAP-15981-NP provides justification for various other RG 1.97 Category 2 and Category 3 variables and non-RG 1.97 variables that do not need to be included in the PAM TS. These variables include Containment Sump Water Level (Narrow Range), Containment Hydrogen, Pressurizer Pressure, RCS Radiation Level, Steam Generator Level (Narrow Range), Pressurizer PORV Position, Pressurizer PORV Block Valve Position, Pressurizer Safety Valve Position, Radiation Effluent, Auxiliary Feedwater Valve Position, Boric Acid Tank Level, Containment Enclosure Negative Pressure, Residual Heat Removal Flow, Spray Additive Tank Level, Component Cooling Water Temperature, Component Cooling Water Flow, Service Water Temperature, and Service Water Flow. The NRC staff agrees that since these variables do not satisfy either Criterion 3 or Criterion 4 of 10 CFR 50.36(c)(2)(ii), they do not need to be included in the PAM TS. However, if for a plant-specific application one of these variables is classified as a Type A variable, that variable would satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS.

3.2.21 Proposed Alternate Instrumentation

Alternate instrumentation should meet the same RG 1.97 category as the primary instrumentation. RG 1.97 recommends two channels of Category 1 instrumentation for each Type A or Category 1 variable. TR WCAP-15981-NP recommends the use of alternate instrumentation for various PAM instrumentation.

3.2.21.1 Neutron Flux Power Range

TR WCAP-15981-NP proposed that Neutron Flux (Intermediate Range) or Neutron Flux (Source Range) and Rod Position Indication or Rod Bottom Lights be used as alternate instrumentation for Neutron Flux (Power Range). TR WCAP-15981-NP has not discussed the qualification of Neutron Flux (Intermediate Range), has proposed a down grade of Neutron Flux (Source Range), and Rod Position Indication and Rod Bottom Lights are Category 3. Therefore, based on the information provided the NRC staff does not agree with the proposed use of these alternate instrumentation on a generic basis.

3.2.21.2 High Head Safety Injection Flow

TR WCAP-15981-NP proposed that High Head Safety Injection Pump Amperage and High Head Safety Injection Pump Discharge or Header Pressure and Automatic Safety injection Valve Position be used as alternate instrumentation for High Head Safety injection Flow. TR WCAP-15981-NP has not discussed the qualification of the proposed alternate instrumentation. Therefore, based on the information provided the NRC staff does not agree with the proposed use of these alternate instrumentation on a generic basis.

3.2.21.3 Containment Area Radiation (High Range)

TR WCAP-15981-NP proposed that portable radiation instrumentation be used as alternate instrumentation in the event that both required channels of Containment Area Radiation (High Range) are unavailable. NUREG-1431 currently includes the initiation of action that requires a report that outlines the preplanned alternate method of monitoring the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the function to operable status. The selection of a preplanned alternate method of monitoring is plant specific. Therefore, the determination of the appropriateness of the use of portable radiation instrumentation should be performed on a plant specific basis.

3.2.21.4 Steam Generator Level (Wide Range)

TR WCAP-15981-NP proposed that a combination of Steam Generator Level (Narrow Range) and Auxiliary Feedwater Flow be used as alternate instrumentation for Steam Generator Level (Wide Range). The use of Steam Generator Level (Narrow Range) and/or Auxiliary Feedwater Flow as a alternate channel to Steam Generator Level (Wide Range) has been accepted previously for a limited number of plant specific applications based on the plant specific design. The use of these instruments as alternates should continue to be reviewed on a plant specific basis and should not be applied on a generic basis.

3.2.21.5 Auxiliary Feedwater Flow

TR WCAP-15981-NP proposed that (1) Auxiliary Feedwater Pump Amperage and Auxiliary Feedwater Pump Discharge Pressure or Flow Control Valve Position for motor driven auxiliary feedwater pumps and (2) Auxiliary Feedwater Pump Discharge Pressure or Steam Supply Valve Position and Flow Control Valve Position for turbine driven auxiliary feedwater pumps, as alternate instrumentation for Auxiliary Feedwater Flow. TR WCAP-15981-NP has not discussed the qualification of the proposed alternate instrumentation. Therefore, based on the information provided the NRC staff does not agree with the proposed use of these alternate instrumentation on a generic basis.

3.2.21.6 Core Exit Temperature Channels

NUREG-1431 includes the number of required channels of Core Exit Temperature instruments as two required channels per quadrant with a channel consisting of two Core Exit Thermocouples. TR WCAP-15981-NP proposed that the number of required channels be changed to two with a limitation on which Core Exit Thermocouples should be excluded from being included in the TS. As part of this recommendation, TR WCAP-15981-NP referenced TR WCAP-14696-A (Reference 16). However, TR WCAP-15981-NP and TR WCAP-14696-A did not discuss the quadrants or how many channels should be required per quadrant. Therefore, based on the information provided the NRC staff does not agree with the proposed change for the number of required channels for Core Exit Temperature in NUREG-1431.

3.2.22 Summary of the Deterministic Evaluation

The NRC staff agrees with the TR WCAP-15981-NP recommendation that the following variables should be included in the PAM TS for the functions indicated:

Variable	Function	Type/ Category
Neutron Flux (Power Range)	Reactivity Control	B1
RCS Pressure	Core Cooling	A1, B1
RCS Pressure	Maintaining RCS Integrity	B1
RCS Pressure	Reactor Coolant Pressure Boundary	C1
RCS Pressure	Primary Coolant System Status	D1
Core Exit Temperature	Core Cooling	A1, B1
Core Exit Temperature	Fuel Cladding	C1
Core Exit Temperature	Maintaining RCS Integrity	B1
Core Exit Temperature	Reactor Coolant Pressure Boundary	C1
Core Exit Temperature	Primary Coolant System Status	D1
High Head Safety Injection Flow	Core Cooling	B1

Variable	Function	Type/ Category
Refueling Water Storage Tank Level	Safety Injection Systems Status	A1,D2
Containment Pressure	Maintaining RCS Integrity	B1
Containment Pressure	Maintaining Containment Integrity	B1
Containment Pressure	Reactor Coolant Pressure Boundary	C1
Containment Pressure	Containment	C1
Containment Isolation Valve Position	Maintaining Containment Integrity	B1
Pressurizer Level	Primary Coolant System Status	A1, D1
Pressurizer Level	Reactor Coolant Pressure Boundary	C1
Steam Generator Level (Wide Range)	Secondary System Status	A1, D1
Steam Generator Level (Wide Range)	Reactor Coolant Pressure Boundary	C1
Steam Generator Pressure	Secondary System Status	A1, D2
Auxiliary Feedwater Flow	Auxiliary Feedwater System Status	B1, D2
Containment Area Radiation (High Range)	Reactor Coolant Pressure Boundary	C1
Containment Area Radiation (High Range)	Containment Radiation	E1

The NRC staff agrees with the TR WCAP-15981-NP recommendation that the following variables can be relocated from the PAM TS for the functions indicated:

Variable	Function	Type/ Category
RCS Hot-Leg Water Temperature	Core Cooling	B3
RCS Cold-Leg Water Temperature	Core Cooling	B3
RCS Pressure	Containment	N/A
Reactor Vessel Water Level	Core Cooling	B3
Containment Sump Water Level	Reactor Coolant Pressure Boundary	C3

Variable	Function	Type/ Category
RCS Subcooling	Core Cooling	B2
Condensate Storage Tank Level	Auxiliary Feedwater System Status	B2, D3
Other PAM Variables	Various	Various

The NRC staff does not agree with the TR WCAP-15981-NP recommendation that the following variables can be relocated from the PAM TS for the functions indicated:

Variable	Function	Type/ Category
Neutron Flux (Source Range)	Reactivity Control	B1
Containment Sump Water Level	Maintaining RCS Integrity	B1

The NRC staff was unable to determine the applicability of the following variable for the function indicated and, therefore, does not agree with the TR WCAP-15981-NP recommendation that the following variable should be included in the PAM TS for the function indicated:

Variable	Function	Type/ Category
Refueling Water Storage Tank Level	Core Cooling	A1, D2

The attachment to this SE provides a detailed list of each RG 1.97 variable and TR WCAP-15981-NP proposed changes that have been reviewed and accepted by the NRC staff in Section 3.2 of this SE.

3.3 Evaluation of the Proposed PRA Changes

TR WCAP-15981-NP was not submitted as a risk-informed application pursuant to RG 1.174, but uses PRA information as one element of the overall method to determine the instrumentation to be included in the PAM TS. Instrumentation associated with DBA response, as well as implementation of EOPs, SAMGs, and the plant's EP is also considered. Therefore, the methodology is potentially more prescriptive than a risk-informed approach.

3.3.1 Review Methodology

The NRC staff notes that the methodology provides a basis for assessing which instrumentation should be retained within the plant-specific PAM TS, and which instrumentation could be removed from the PAM TS. The methodology establishes a clear expectation that any instrumentation removed from the PAM TS would be relocated to licensee controlled documents. The methodology does not address or propose removal of such instrumentation from the plant. This constraint provides additional assurance that the risk implications of the

methodology would be minimal, and that adequate protection would not be called into question as a result of implementation. Accordingly, treatment of TR WCAP-15981-NP as a non-risk-informed application is reasonable.

The NRC staff undertook a review of the methodology in order to provide perspectives into how PRA and other information would be used collectively to identify instrumentation for inclusion in the PAM TS. The NRC staff considered the guidance and key safety principles discussed in Section 2.3 of this SE for assessing the impact of proposed risk-informed changes, including proposed permanent TS changes, but did not perform an in-depth review of every item since TR WCAP-15981-NP is not risk-informed.

3.3.2 NRC Evaluation

The overall process to be used by licensees to identify the instrumentation to be included in the PAM TS is described in Section 8 and Table 14 of TR WCAP-15981-NP. The process requires a plant-specific determination of the plant parameters that are the basis for important operator actions to bring the plant to a safe stable state following an accident. This involves an evaluation of operator actions assumed or credited in the plant's DBA, EOPs, PRA, SAMG, and EP implementing procedures. Screening criteria for identifying operator actions and supporting instrumentation in each of these areas are provided in Section 3.2 and Table 5 of the TR. Instrumentation that does not satisfy Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) can be relocated to a licensee controlled document, following a focused evaluation to confirm the adequacy of the PRA and human reliability analysis (HRA) with regard to the treatment of the operator actions associated with that instrumentation.

Implementation is carried out through a 6-step process, as itemized below:

1. Identification of operator actions in the DBA analyses.

2. Verification of PRA technical adequacy.

3. Identification of important operator actions identified in the risk assessments.

4. Identification of important operator actions identified in accident management.

5. Identification of variables and associated instrumentation for the important operator actions identified in Steps 1, 3, and 4.

6. Identification of instrumentation to be included in or relocated from the PAM TS.

The focus of the NRC staff's review was on the process and guidance for: verification of PRA technical adequacy (Step 2), the use of the PRA to identify important operator actions (Step 3), and the focused evaluation of the adequacy of the HRA treatment of operator actions associated with any instrumentation to be relocated from the PAM TS (Step 6).

3.3.2.1 Verification of PRA Technical Adequacy

TR WCAP-15981-NP states that the licensee should ensure that the internal events PRA is technically adequate for this application, but that only a limited assessment is required since

this is not a risk-informed application. The TR states that the assessment of PRA technical adequacy needs to consider the areas of the accident sequence analysis and the HRA to assure that the treatment of operator actions based on plant instrumentation is appropriate. It further states that the licensee should confirm that all operator actions potentially impacted by the subject instruments have been identified, that the treatment of these operator actions in the PRA is appropriate (including the human error probability values and dependencies), and that there are no peer review comments that can affect the conclusions regarding instrument importance. Table 14 also indicates that the licensee should confirm that the PRA reflects the as-built, as-operated design, and that any plant modifications and operational changes not reflected in the PRA do not impact the plant-specific PAM instrumentation application. As discussed in Section 3.3.2.2 below, for any PAM instrumentation that is proposed to be relocated from the PAM TS to a licensee controlled document, the process includes an additional, focused evaluation to confirm the adequacy of the HRA with regard to the treatment of the operator actions associated with that instrumentation.

The assessment of technical adequacy is limited to the internal events PRA. TR WCAP-15981-NP justifies this treatment on the basis of a review of the important operator actions from several Westinghouse NSSS plants with a fully quantified external events PRA that has shown that the important operator actions that are based on control room instrumentation in the external events PRA are the same as those already determined to be significant in the internal events PRA.

In the NRC staff's view, the guidance regarding PRA technical adequacy sufficiently addresses those aspects of the PRA most important to this application, specifically, the completeness of the PRA with regard to important operator actions, the adequacy of the HRA treatment of those actions, and the impact of any related peer review comments. The assessment of PRA technical adequacy is less than what might be expected if this were a risk-informed application in which the instrumentation to be retained within the PAM TS hinged on the use of PRA; but it is considered adequate given that the instrumentation importance in PRA is just one of several considerations in the methodology.

3.3.2.2 Use of PRA to Identify Important Operator Actions

TR WCAP-15981-NP provides a discussion of instrumentation importance in PRAs within Section 3.2 and Appendix A of the TR. Generic lists of operator actions with the highest mean Risk Achievement Worth (RAW) and Fussell-Vesely (FV) importances are provided in Appendix A based on a proprietary database of plant-specific PRA results for Westinghouse plants. A table relating specific PAM instrumentation to the important operator actions and applicable EOPs is also provided in Appendix A. The TR indicates that the instrumentation utilized for each operator action was identified by reviewing the detailed PRA models for several plants and confirming these results with an independent review of the generic Westinghouse Owners Group (WOG) Emergency Response Guidelines, upon which all of the WOG plant EOPs are based. The generic lists of important operator actions and associated instrumentation presented in TR WCAP-15981-NP are indicative of the types of operator actions and instrumentation that might be retained in the PAM TS, but would not be entirely applicable to any given plant. As described in the implementation guidance in Section 8, each licensee would need to confirm the specific instrumentation to be relocated from the plant-specific PAM TS based on a plant-specific implementation of the TR WCAP-15981-NP methodology.

TR WCAP-15981-NP states that the plant-specific RAW and FV importances are to be used to identify the risk important operator actions for both CDF and LERF. The guidance specifies that a RAW value greater than 2.0 or a FV value greater than 0.05 should be used to define the risk-important operator actions (for both CDF and LERF). Although the emphasis of the identification process is on operator actions in internal events, operator actions in external events are also considered. The guidance states that if a quantitative PRA for external events (e.g., fire and seismic initiating events) is available, the risk importance of operator actions can be identified in the same manner as in the internal events PRA. If only a qualitative external events risk assessment is available, the results of the assessment can also be used to identify important operator actions by identifying operator actions required for risk-important external events. As noted in Sections 3.1 and 8, the evaluation of external events would be limited to ensuring that instrumentation proposed to be relocated from the PAM TS is not used for important operator actions to respond to external initiating events. The requirement to verify that any instrumentation proposed for relocation from the PAM TS does not cue an operator action important to risk for external initiating events is provided in Step 6 of the implementation process (Table 14).

In the NRC staff's view, the guidance regarding the use of the PRA to identify important operator actions is reasonable. Consideration of operator actions important to CDF as well as LERF provides some assurance that both the core and containment barriers will not be significantly and adversely impacted by changes to the PAM TS. Use of both the RAW and FV importance measures provides additional confidence that the key operator actions from a risk point of view would be captured. The RAW importance metric provides a measure of the potential risk increase if instrument reliability is reduced as a result of its removal from the TS, and is the most relevant metric for preserving the existing level of safety. The FV importance metric provides a measure of the potential risk reduction if the associated operator actions are improved via training or procedure modifications, and is less relevant to this application. The specified screening criteria for the RAW metric (RAW > 2.0) is consistent with that established for individual basic events in NRC and industry guidance on risk-informing the special treatment requirements of 10 CFR Part 50 (i.e., NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," [Reference 12] which is endorsed by the NRC in RG 1.201 [Reference 13]). The NRC staff concludes that the guidance on the use of PRA to identify important operator actions is acceptable given that the instrumentation importance in PRA is just one of several considerations in the methodology.

3.3.2.3 Focused Evaluation of PRA/HRA for Instrumentation to be Relocated from the PAM TS

The final step of the implementation process (Step 6 in Table 14) is to identify the instrumentation that can be relocated from the PAM TS to licensee controlled documents. The guidance states that an instrumentation that does not satisfy Criterion 3 or 4 of 10 CFR 50.36(c)(2)(ii) can be relocated to a licensee controlled document, following a focused evaluation to confirm the adequacy of the HRA with regard to the treatment of the operator actions associated with that instrumentation. The guidance also states that at this point, the external events risk assessment should be reviewed to determine that none of the instrumentation proposed to be relocated from the PAM TS supports a risk important operator action.

In concept, the preceding steps in the implementation process would provide assurance that potentially risk significant instrumentation is not removed from the PAM TS. The inclusion of this final verification, through its focus on the specific instrumentation proposed for relocation and on the treatment of the associated operator actions in the HRA, provides added assurance that risk significant instrumentation is not inadvertently relocated from the PAM TS. The NRC staff concludes that this guidance is sufficient to ensure that any instrumentation proposed to be relocated from the PAM TS will receive specific consideration for risk implications.

3.3.2.4 Conclusion Regarding Use of PRA in the Re-Definition of PAM Instrumentation

Based on the information contained in TR WCAP-15981-NP and in the RAI responses, the NRC staff concludes that:

- The guidance regarding PRA technical adequacy sufficiently addresses those aspects of the PRA most important to this application, specifically, the completeness of the PRA with regard to important operator actions, the adequacy of the PRA and HRA treatment of those actions, and the impact of any related peer review comments.

- The guidance regarding the use of the PRA to identify important operator actions is reasonable, specifically, the consideration of operator actions important to CDF as well as LERF, the use of both the RAW and FV importance measures, and the specified screening criteria for these metrics.

- The inclusion of a final verification step, through its focus on the specific instrumentation proposed for relocation and on the treatment of the associated operator actions in the HRA, provides added assurance that risk-significant instrumentation is not inadvertently relocated from the PAM TS.

Although the guidance on the use of PRA for this application may be less rigorous than what might be expected if this were a risk-informed application (in which the instrumentation to be retained within the PAM TS hinged on the use of PRA), it is considered adequate given that the instrumentation importance in PRA is just one of several considerations in the methodology, and that any instrumentation removed from the PAM TS would be relocated to licensee controlled documents and not removed from the plant. The latter constraint provides additional assurance that the risk implications of the methodology would be minimal, and that adequate protection would not be called into question as a result of implementation. Accordingly, treatment of TR WCAP-15981-NP as a non-risk-informed application is reasonable.

4.0 LIMITATIONS AND CONDITIONS

The NRC staff has placed the following conditions and limitations on use of TR WCAP-15981-NP:

- Licensees that submit license amendment requests (LARs) based on TR WCAP-15981-NP must confirm the applicability of this TR to their plant, complete all parts of the stated methodology, and provide the information identified in Section 4.1 below.

- TR WCAP-15981-NP provides justification for various Other RG 1.97 Category 2 and Category 3 variables and non-RG 1.97 variables that do not need to be included in the PAM TS. The NRC staff agrees that since these variables (as listed in Section 3.2.20 of this SE) do not satisfy either Criterion 3 or Criterion 4 of 10 CFR 50.36(c)(2)(ii), they do not need to be included in the PAM TS. However, if for a plant-specific application one of these variables is classified as a Type A variable, that variable would satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) and should be included in the PAM TS.

- As discussed in Section 3.2.21 of this SE, TR WCAP-15981-NP recommends the use of generically applicable alternate instrumentation for various PAM instrumentation. The NRC staff does not agree with the proposed use of alternate instrumentation on a generic basis. The use of instruments as alternates should continue to be reviewed on a plant-specific basis. Specifically with regard to the Core Exit Temperature Channels, the NRC staff does not agree with the proposed change for the number of required channels for Core Exit Temperature in NUREG-1431.

4.1 Plant-Specific Items to be Submitted by Licensees

Licensees that submit an LAR based on TR WCAP-15981-NP need to submit the following plant-specific information:

1. A general description of the PRA, including the scope of the analyses, PRA update history (including version peer reviewed, version(s) in which peer review comments were addressed, and version used for PAM application), and the licensee's PRA updating and quality assurance process.

2. A description of the most relevant peer reviews, a characterization of the peer review findings, a summary of the status of resolution of the peer review comments, and a listing of all unresolved facts and observations that potentially impact the application of TR WCAP-15981-NP.

3. A conclusion regarding PRA quality assessment for the PAM TS application, and verification that the quality is acceptable for the application. This should include confirmation that the PRA reflects the as-built, as-operated design, and that any recent plant modifications and operational changes not reflected in the PRA do not impact the plant-specific PAM application; all peer review comments have been resolved or don't impact plant-specific PAM application; the PRA and HRA is sufficiently complete and applicable for evaluating the risk associated with the PAM application.

4. Listings of the important operator actions identified based on RAW and FV importance values for CDF and for LERF, along with these values.

5. Additions to the list of important operator actions based on review of results from the plant-specific external event assessments, or verification that the plant-specific risk assessments do not result in identification of additional risk-significant operator actions or variables/instruments.

6. A listing of variables/instruments related to the important operator actions. This should indicate how each variable/instrument considered in the methodology application was related to or mapped to a PRA model element or operator action.

7. Summary tables showing important indications for accident management, and the context in which they are important (e.g., DBA analysis, DBA, EOPs, SAMGs, PRA, EP (similar to Tables 7 and 8 in TR WCAP-15981-NP)).

8. A summary table describing variables/instruments added to or relocated from the technical specifications, and the specific bases for each change.

9. For any variables/instruments to be deleted from the TSs based on their lack of risk significance, the results of the focused evaluation of the adequacy of the PRA and HRA treatment (or lack of treatment) of operator actions associated with those variables/instruments.

10. For any variables/instruments to be deleted from the TSs based on their lack of risk significance, a discussion of how the reliability and availability of these instruments will be monitored and assessed (e.g., under the maintenance rule, other licensee program, or performance measurement strategy).

5.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the proposed changes described in TR WCAP-15981-NP, as modified in this SE and summarized in Section 3.2.22, are acceptable for Westinghouse NSSS plants in accordance with the limitations and conditions in Section 4.0. Licensees that submit license amendment requests (LAR) based on TR WCAP-15981-NP must confirm the applicability of this TR to their plant, complete all parts of the stated methodology, and provide the information identified in Section 4.1. For those items where the NRC staff was unable to conclude that the proposed change was acceptable, the PWROG may submit additional information as a revision to TR WCAP-15981-NP.

6.0 REFERENCES

1. Letter from F. P. Shiffley (WOG) to US NRC, “Transmittal of WCAP-15981-NP, Post Accident Monitoring Re-Definition for Westinghouse NSSS Plants,” September 17, 2004 (Accession No. ML042660254).

2. Letter from F. P. Schiffley (PWROG) to US NRC, “Responses to the NRC Request for Additional Information Regarding the Review of WCAP-15981-NP, Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants,” March 20, 2006 (Accession No. ML060810243).

3. Letter from F. P. Schiffley (PWROG) to US NRC, “Additional Revisions to WCAP-15981-NP, Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants,” August 10, 2006 (Accession No. ML062270035).

4. Letter from F. P. Schiffley (PWROG) to US NRC, “Response to Additional Requests for Information for WCAP-15981-NP, Post Accident Monitoring Instrumentation Re-

Definition for Westinghouse NSSS Plants," June 28, 2007 (Accession No. ML071840028).

5. U.S. Nuclear Regulatory Commission,"An Approach for using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Regulatory Guide 1.174, Revision 1, November 2002 (Accession No. ML023240437).

6. U.S. Nuclear Regulatory Commission, RG 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, May 1983 (Accession No. ML003740282).

7. U.S. Nuclear Regulatory Commission, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," June 1987.

8. U.S. Nuclear Regulatory Commission, NUREG-0800, Chapter 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, June 2007.

9. U.S. Nuclear Regulatory Commission, RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998 (Accession No. ML003740176).

10. NUREG-1431, Rev. 3, "Standard Technical Specification Westinghouse Plants," dated June 2004 (Accession No. ML041830612).

11. Letter from T. E. Murley (NRC) to W. S. Wilgus (B&W Owners Group), "NRC Staff Review of Nuclear Steam Supply System Vendor Owners Groups' Application of the Commission's Interim Policy Statement Criteria to Standard Technical Specifications," dated May 1988.

12. NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline, July 2005 (Accession No. ML052910035).

13. U.S. Nuclear Regulatory Commission, RG 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According To Their Safety Significance," May 2006 (Accession No. ML061090627).

14. Letter from F. P. Schiffley (PWROG) to US NRC, "Responses to the NRC Request for Clarification of June 28, 2007, RAI Responses for WCAP-15981-NP, Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants," August 22, 2007 (Accession No. ML072360096).

15. Letter from T.M. Mensah (NRC) to S.L. Rosenberg (NRC), "Summary of the September 20, 2007, Category 2 Public Meeting with the Pressurized Water Reactor Owners Group (PWROG) Concerning Topical Report (TR) WCAP-15981-NP, "Post Accident Monitoring Instrumentation Re-definition for Westinghouse NSSS [NUCLEAR STEAM SUPPLY SYSTEM] Plants," (Accession No. ML072750513).

16. Letter from Louis F. Liberatori Jr., (WOG) to US NRC, “Transmittal of Approved Topical Report: WCAP-14696-A, Rev. 1 (Non-Proprietary), "Westinghouse Owners Group Core Damage Assessment Guidance," November 1999,” (Accession Nos. ML993480494 and ML993490267).

Attachment: RG 1.97 Variables and WCAP-15981-NP Proposed changes

Principle Contributors: Barry Marcus

Robert Palla

Summer Sun

Date: October 22, 2007

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
Any Type A Variable	Manual Action	No automatic control	A1	Yes	-	A1	Yes	Yes
Neutron Flux (Power Range)	Reactivity Control	Function detection, Accomplishment of mitigation	B1	Yes	-	B1	Yes	Yes
Neutron Flux (Source Range)	Reactivity Control	Function detection, Accomplishment of mitigation	B1	Yes	Neutron Flux (Power Range)	B3	No	No
RCS Hot-Leg Water Temperature	Core Cooling	Function detection, Accomplishment of mitigation, Verification, Long-term surveillance	B1	Yes	Core Exit Temperature, High Head SI	B3	No	Yes
RCS Cold-Leg Water Temperature	Core Cooling	Function detection, Accomplishment of mitigation, Verification, Long-term surveillance	B1	Yes	Core Exit Temperature	B3	No	Yes
RCS Pressure	Core Cooling	Function detection, Accomplishment of mitigation, Verification, Long-term surveillance	B1	Yes	-	A1, B1	Yes	Yes

	RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
	Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
1	RCS Pressure	Maintaining RCS Integrity	Function detection, Accomplishment of mitigation	B1	Yes	-	B1	Yes	Yes
2	RCS Pressure	Reactor Coolant Pressure Boundary	Detection of potential for or actual breach, Accomplishment of mitigation, Long-term surveillance	C1	Yes	-	C1	Yes	Yes
3	RCS Pressure	Containment	Detection of potential for breach, Accomplishment of mitigation	C1	Yes	Containment Pressure	N/A	No	Yes
4	RCS Pressure	Primary Coolant System	-	-	Yes	-	D1	Yes	Yes

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
Core Exit Temperature	Core Cooling	Verification	B1	Yes	-	A1, B1	Yes	Yes
Core Exit Temperature	Fuel Cladding	Detection of potential for breach, Accomplishment of mitigation, Long-term surveillance	C1	Yes	-	C1	Yes	Yes
Core Exit Temperature	Maintaining RCS Integrity	-	-	Yes	-	B1	Yes	Yes
Core Exit Temperature	Reactor Coolant Pressure Boundary	-	-	Yes	-	C1	Yes	Yes
Core Exit Temperature	Primary Coolant System	-	-	Yes	-	D1	Yes	Yes
Reactor Vessel Water Level	Core Cooling	Verification, Accomplishment of mitigation	B1	Yes	Core Exit Temperature	B3	No	Yes

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
RCS Subcooling	Core Cooling	Verification and analysis of plant conditions	B2	No	-	B3	No	No
High Head Safety Injection Flow	Core Cooling	-	-	No	-	B1, D1	Yes	Yes
Refueling Water Storage Tank Level	Safety Injection Systems	To monitor operation	D2	No	-	A1[*1], D1, D2	Yes	Yes
Refueling Water Storage Tank Level	Core Cooling	-	-	No	-	B1	Yes	No
Containment Sump Water Level (Wide Range)	Maintaining RCS Integrity	Function detection, Accomplishment of mitigation, Verification	B1	Yes	RCS Pressure	B2	No	No

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
Containment Sump Water Level (Wide Range)	Reactor Coolant Pressure Boundary	Detection of breach, Accomplishment of mitigation, Verification, Long-term-surveillance	C1	Yes	RCS Pressure, Pressurizer Level, Steam Generator Level (Wide Range)	C3	No	Yes
Containment Pressure	Maintaining RCS Integrity	Function detection, Accomplishment of mitigation, Verification	B1	Yes	-	B1	Yes	Yes
Containment Pressure	Maintaining Containment Integrity	Function detection, Accomplishment of mitigation, Verification	B1	Yes	-	B1	Yes	Yes
Containment Pressure	Reactor Coolant Pressure Boundary	Detection of breach, Accomplishment of mitigation, Verification, Long-term surveillance	C1	Yes	-	C1	Yes	Yes

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
Containment Pressure	Containment	Detection of potential for or actual breach, Accomplishment of mitigation	C1	Yes	-	C1	Yes	Yes
Containment Isolation Valve Position	Maintaining Containment Integrity	Accomplishment of isolation	B1	Yes	-	B1	Yes	Yes
Pressurizer Level	Primary Coolant System	To ensure proper operation of the pressurizer	D1	Yes	-	A1, D1	Yes	Yes
Pressurizer Level	Reactor Coolant Pressure Boundary	-	-	Yes	-	C1	Yes	Yes
Steam Generator Level (Wide Range)	Secondary System	To monitor operation	D1	Yes	-	A1, D1	Yes	Yes

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
Steam Generator Level (Wide Range)	Reactor Coolant Pressure Boundary	-	-	Yes	-	C1	Yes	Yes
Steam Generator Pressure	Secondary System	To monitor operation	D2	No	-	A1, D2	Yes	Yes
Auxiliary Feedwater Flow	Auxiliary Feedwater System	To monitor operation	D2	Yes	-	B1, D2	Yes	Yes
Condensate Storage Tank Water Level	Auxiliary Feedwater System	To ensure water supply for auxiliary feedwater	D1	Yes	Auxiliary Feedwater Flow, Steam Generator Level (Wide Range)	B2, D3	No	Yes

RG 1.97 Variables and TR WCAP-15981-NP Proposed Changes								
Variable	RG 1.97 Function	RG 1.97 Purpose	Current Type and Category	Current TS Inclusion	Proposed Alternate Variable	Proposed Type and Category	Proposed TS Inclusion	Accepted By NRC
Containment Area Radiation (High Range)	Containment Radiation	Detection of significant releases, Release assessment, Long-term surveillance, Emergency plan actuation	E1	Yes	-	E1	Yes	Yes
Containment Area Radiation (High Range)	Reactor Coolant Pressure Boundary	-	-	No	-	C1	Yes	Yes

[1] If switchover to ECCS recirculation is based on RWST Level indication rather than the RWST level alarm, RWST Level indication should be classified as a Type A variable rather than a Type D variable.