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Palo Verde 1, 2 & 3
Constellation Energy Group
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Dominion Kewaunee
Dominion Nuclear Connecticut
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Entergy Nuclear Northeast
Indian Point 2 & 3
Entergy Nuclear South
ANO 2
Waterford 3
Exelon Generation Company LLC
Braidwood 1 & 2
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FirstEnergy Nuclear Operating Co.
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FPL Group
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Seabrook
Turkey Point 3 & 4
Nuclear Management Co.
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Point Beach 1 & 2
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Pacific Gas & Electric Co.
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Progress Energy
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Comanche Peak 1 & 2
Wolf Creek Nuclear Operating Corp.
Wolf Creek

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Kansai Electric Power Co.
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Ulchin 3 - 6
Yonggwang 1 - 6
NEK
Krško
NOK
Kernkraftwerk Beznau
Ringhals AB
Ringhals 2 – 4
Spanish Utilities
Asco 1 & 2
Vandellos 2
Almaraz 1 & 2
Taiwan Power Co.
Maanshan 1 & 2

WCAP-15981-NP, Rev 0 (Non-Proprietary)
Project No. 694

August 10, 2006

OG-06-259

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Pressurized Water Reactor Owners Group

Additional Revisions to WCAP-15981-NP, "Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants," (LSC-0072 R1/MUHP-3038)

References:

1. WOG Letter, F. Schiffley to Document Control Desk, "Transmittal of WCAP-15981-NP (Non-Proprietary), Rev. 0, "Post Accident Monitoring Instrumentation Redefinition for Westinghouse NSSS Plants," WOG-02-474, September 17, 2004.

2. NRC E-Mail, G. Shukla to S. DiTommaso, "RAIs on WCAP-15981 - Post Accident Monitoring Instrumentation Re-Definition," April 11, 2005.

3. NRC E-Mail, G. Shukla to S. DiTommaso, "I&C RAIs on WCAP-15981, "Post Accident Monitoring Instrumentation Re-definition for Westinghouse NSSS Plants," May 16, 2005.

4. NRC E-Mail, G. Shukla to S. DiTommaso, "RAIs on WCAP-15981, Post Accident Monitoring Instrumentation Redefinition," May 26, 2005.

5. WOG Letter, F. Schiffley to Document Control Desk, "Responses to the NRC Request for Additional Information (RAI) Regarding the Review of WCAP-15981-NP, "Post Accident Monitoring Instrumentation Re-Definition for Westinghouse NSSS Plants," WOG-06-104, March 20, 2006.

6. NRC E-Mail, R. Palla to R. Lutz, "WCAP-15981 (PAM)," May 10, 2006.

In September 2004, the Pressurized Water Reactor Owners Group (PWROG) submitted WCAP-15981-NP (Non-Proprietary), Rev. 0, "Post Accident Monitoring Instrumentation Redefinition for Westinghouse NSSS Plants," for NRC review and approval (Ref. 1). In April 2005 and May 2005, the NRC provided Requests for Additional Information (RAIs) on WCAP-15981 (Ref. 2, 3 and 4). Responses to the RAIs and WCAP mark-ups were transmitted to the NRC on March 20, 2006 (Ref. 5).

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Enclosure 1 to this letter provides additional revisions as mark-ups to WCAP-15981-NP that address the additional items contained in Ref. 6, that were discussed during a telecon held on May 25th, 2006 between Bob Palla (NRC) and Bob Lutz and Jim Andrachek (Westinghouse). Please provide these WCAP revisions to Bob Palla.

Following receipt of the Safety Evaluation for WCAP-15981, the WCAP changes contained in Enclosure 1 will be incorporated into the approved version and will be issued as WCAP-15981-NP-A, Revision 1.

If you have any questions concerning this matter, please feel free to call Tom Laubham at 412-374-6788.

Sincerely yours,

Thomas J. Laubham for

Frederick P. "Ted" Schiffley, II, Chairman
Pressurized Water Reactor Owners Group

FPS:TJL:mjl

Enclosure

cc: Licensing Subcommittee
Steering Committee
S. Peters, NRC (via FedEx)
Bob Palla, NRC
J. D. Andrachek
K. J. Vavrek
R. J. Lutz
C. B. Brinkman
J. A. Gresham
PMO

CDF (a Level 1 PRA), as well as early fission product releases (a LERF assessment). A ~~and at least a~~ qualitative assessment of late containment failures, and core damage risks from seismic, fire and ~~shutdown~~ other important external initiating events should also be performed for any PAM instrument proposed to be relocated from the Technical Specifications. The qualitative assessment of external events ~~and shutdown~~ risks will generally result in a more conservative approach in determining the safety significance of components, compared to a quantitative PRA assessment. A review of the important operator actions from several Westinghouse NSSS plants with a fully quantified external events PRA, as discussed in Appendix A, 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 from the internal events PRA.

3.2 METHODOLOGY

The overall methodology used for assessing the importance of instrumentation to be included in the PAM Technical Specification is similar to the methodology (Reference 10) developed and used in the successful elimination of Post Accident Sampling System (PASS) requirements that specifically addressed offsite emergency radiological protection aspects important to safety.

Although the approach used in this report uses the results of PRA assessments, it is not a risk-informed application in accordance with Regulatory Guide 1.174. Rather than focusing on the five elements of a risk informed approach as specified in Regulatory Guide 1.174, this approach directly assesses the importance of instrumentation with respect to the Criteria of 10 CFR 50.36 (c)(2)(ii). This direct assessment uses the plant DBA analyses, PRA, EOPs, SAMG and EPIP as the basis for assigning importance to the instrumentation. Therefore, the methodology used in this report is more prescriptive than a risk informed approach.

PAM instrumentation is intended to provide indications of plant parameters that are the basis for important operator actions to bring the plant to a safe stable state in the event of an accident. The information available to make this determination includes:

- Design Basis Accidents – While most DBAs rely on instrumentation that provides a signal to automatically initiate systems and components to bring the plant to a safe stable state, there are also several key operator actions assumed in the DBA analyses.
- Probabilistic Risk Assessment – The PRA models a number of operator actions to bring the plant to a safe stable state and prevent core damage.
- Emergency Operating Procedures – The EOPs provide guidance for the operator response to an accident, based on instrumentation indications of plant parameters. The EOPs are the basis for the PRA and DBA operator action modeling.

8 IMPLEMENTATION

The plant specific implementation of this methodology contained in this report requires a plant specific evaluation of the accident management application of PAM instrumentation contained in the: 1) Design Basis Accidents, 2) Emergency Operating Procedures, 3) Probabilistic Risk Assessment, 4) Severe Accident Management Guidelines, and 5) Emergency Plan as discussed in this report.

The generic list of PAM instrumentation proposed to be included in Technical Specification 3.3.3 of NUREG-1431, and those instruments proposed to be relocated from the plant specific Technical Specifications to LCDs must be confirmed on a plant specific basis by reviewing the plant specific DBA analyses, PRA, EOPs, SAMGs, and EPIP.

The overall process to be used by licensees to identify the PAM instrumentation that should be included in the Technical Specifications is discussed in Table 14 and shown ~~provided~~ in Figure 2. This process is identical to that described in this report, except that plant specific information would be used in place of generic information to determine the PAM instrumentation to be included in the plant specific PAM Technical Specifications. As discussed in Section 3.2, this is not a risk informed application to be evaluated using the guidance in Regulatory Guide 1.174. The methodology directly assesses the importance of instrumentation with respect to the criteria of 10 CFR 50.36 (c)(2)(ii) rather than focusing on the five elements of a risk informed approach as specified in Regulatory Guide 1.174. The methodology uses risk assessment as one element of the overall method to determine the instrumentation to be included in the PAM Technical Specification.

The first step in the process (Step 1 in Table 14) is to identify the operator actions that are assumed in DBA analyses using the criteria in Table 5. These operator actions satisfy Criterion 3 of 10 CFR 50.36 because no automatic actuation of equipment is included in the plant design for these actions.

The next steps are to identify the risk important operator actions from the plant PRA using the criteria in Table 5. This part has two distinct steps: a) verification of the PRA technical adequacy for this application (Step 2 in Table 14), and b) use of the PRA information to identify operator actions based on instrumentation that satisfies Criterion 4 of 10 CFR 50.36 (Step 3 in Table 14).

As discussed in Section 3.1, the licensee should ensure that the internal events PRA is technically adequate for this application. PRA technical adequacy of the internal events PRA for risk informed applications is typically addressed through the PRA peer reviews and self assessments using a variety of guidance, including the American Society of Mechanical Engineers (ASME) PRA Standard (Reference 7), Nuclear Energy Institute (NEI) PRA Peer Review Process Guidance (Reference 8) and/or Regulatory Guide 1.200 (Reference 9). Since this is not a risk informed application as described in Regulatory Guide 1.174, only a limited assessment of the ~~The more extensive~~ PRA technical

adequacy is required for this ~~requirements contained in References 7 and 9, while assuring a more robust PRA, are not required for this applicatio~~application. The limited assessment of the PRA technical adequacy only needs to consider the areas of the accident sequence analysis and the human reliability analysis to assure that treatment of operator actions based on plant instrumentation is appropriate. In particular, 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.

~~n since the determination of the PAM Technical Specification instrumentation does not rely solely on the PRA and the CDF and LERF values determined from the PRA model.~~

~~The first step in the process is to identify all operator actions that are assumed in DBA analyses using the criteria in Table 5. These operator actions satisfy Criterion 3 of 10 CFR 50.46 in that no automatic actuation of equipment is included in the plant design for these actions.~~

~~The next step is to identify the risk important operator actions from the plant PRA using the criteria in Table 5.~~ The RAW and F-V risk importance measures ~~with appropriate numerical values are~~can be used to identify the risk important operator actions for both core damage frequency and large early release frequency. For consideration of external events (e.g., fire and seismic initiating events), if a quantitative PRA is available, the risk importance of operator actions can be identified as in the internal events PRA. For qualitative external events risk assessments, the results of the assessments can also be used to identify important operator actions by identifying operator actions required for risk important external events ~~or safe shutdown equipment lists~~. As noted in Section 3.2 of this report, the evaluation of external initiating events should be limited to ensuring that instrumentation proposed to be relocated from the PAM Technical Specifications is not used for important operator actions to respond to those external initiating events. As discussed in Appendix A of this report, the risk important operator actions are expected to be identified from the at-power, internal events PRA. The risk important operator actions can be identified from the RAW and F-V values. As discussed in Section A.4 of this report, a RAW value greater than 2.0 or an F-V value greater than 0.05 should be used to define risk important operator actions for both core damage frequency and large early release frequency.

~~The next step is to identify the instrumentation associated with the important design basis and PRA operator actions. This step establishes the relationship between the instrument and the associated human actions. This would typically involve the use of the plant emergency and off normal / abnormal procedures to identify any instrumentation cues for initiating these actions, as well as instrumentation cues used to confirm that the operator action has been successfully completed.~~

The instrumentation required to support operator actions from the SAMG and the E-Plan would be identified separately since neither the SAMG nor the E-Plan is typically modeled in the PRA using the criteria in Table 5 of this report. This is shown as Step 4 in Table 14. As discussed in earlier in this report, the instrumentation used to support critical SAMG operator actions are those that identify challenges to the containment fission product boundaries. From the E-Plan, the Core Damage Assessment is important because it is used to project offsite doses from an accident and instrumentation used to provide the core damage assessment or the dose projections are important. The EALs are important because they support notification of the offsite authorities and provide a uniform method of ranking the severity of the accident; only the instrumentation that supports the declaration of a General Emergency is considered to be risk important. The generic determination for the Core Damage Assessment determination in this report was based on the use of the approved methodology in WCAP-14696-A. If a licensee has used a different methodology then an assessment of the key indications that support the core damage assessment should be performed based on the actual methodology used.

The next step in the process (Step 5 in Table 14) is to identify the instrumentation associated with the important design basis, PRA or accident management operator actions. This step establishes the relationship between the instrument and the associated operator actions. This would typically involve the use of the plant emergency procedures to identify any instrumentation that provides a cue for initiating these actions, as well as instrumentation used to confirm that the operator action has been successfully completed. Also included in this step is the identification of the minimum set of instrumentation that supports the important actions identified in the previous steps. In some cases, such as steam generator level, some actions can be cued from more than one variable (PAM function), while others can only be cued from a specific variable (PAM function). This step would therefore focus on the minimum set required to support the key operator actions.

Also as part of Step 5, the specific instrumentation for some operator actions that are important to risk can not be identified (as discussed in Appendix A). Examples include operator actions to restore AC power for a station blackout event, operator actions to restore service water, component cooling water and instrument air. In these cases, there are a wide range of symptoms indicating the need for the operator action and no specific instrumentation is relied upon to cue these actions. Therefore, when sufficient cues exist from multiple sources to prompt operator actions that are important to risk, no instrumentation needs to be identified for inclusion in the PAM Technical Specification.

The final step (Step 6 in Table 14) is to identify the instrumentation ~~to identify the minimum set of instrumentation that supports the important actions identified in the previous steps. In some cases, such as steam generator level, some actions can be cued from more than one set of instrumentation, while others can only be cued from specific instrumentation. This step would therefore focus on the minimum set required to support the key operator actions.~~that can be relocated from the PAM technical specifications to

licensee controlled documents. Any instrumentation that does not satisfy Criterion 3 or 4 of 10 CFR 50.36 (c)(2)(ii), as determined using the process discussed in detail in this report, can be relocated from the PAM Technical Specification to a licensee controlled document. At this point, the external initiating events risk assessment should be reviewed to determine that none of the instrumentation proposed to be relocated from the PAM Technical Specification supports a risk important the operator action. The PAM Technical Specification requirements proposed to be relocated by this change will be relocated to licensee controlled documents that are incorporated by reference in the Updated Final Safety Analysis Report (UFSAR) and therefore, all changes to the relocated instrumentation requirements will be controlled by the 10 CFR 50.59 process.

The proposed change revises the Regulatory Guide 1.97 instrumentation contained in the PAM Technical Specification to be consistent with the technical basis for accident monitoring instrumentation identified in WCAP-15981. This change includes evaluating the current Regulatory Guide 1.97 classification of the affected instrumentation with respect to its function as a post accident monitoring instrument based on WCAP-15981. The results of the WCAP-15981 evaluations performed are for the sole purpose of determining the most appropriate instrumentation to be included in the PAM Technical Specification. The current plant specific response to Regulatory Guide 1.97 (including the instrument type and category classifications) will not be changed as a result of the plant specific implementation of this change. Therefore, there are no changes to the plant specific response to Regulatory Guide 1.97 or the plant design associated with the plant specific implementation of this change.

Table 14 Process to Determine Instrumentation to be Included in the PAM Technical Specification		
Step	**Description**	**Details**
1	Identification of operator actions in the design basis accident analyses	• Operator actions based on a review of the design basis accident analyses o Operator actions for which no automatic actuation of equipment is provided
2	PRA technical adequacy	• Summary of PRA o Scope (Level 1, LERF, external events) o Peer reviews o Update history o PRA updating process • PRA reflects as-built, as-operated design o Recent plant modifications and operational changes not reflected in the PRA do not impact the plant-specific PAM implementation • PRA accident sequence and human reliability assessment is technically adequate for evaluating the risk associated with the PAM implementation • Peer review comments resolved or do not impact plant-specific PAM implementation (limited to accident sequence and human reliability elements)
3	Identification of important operator actions identified in the risk assessments	• Operator action Risk Achievement Worth (RAW) and Fussell-Vesely (FV) importance values for CDF and LERF from the quantitative internal events PRA • Important operator actions based on review of results from the external event assessments (qualitative or quantitative PRA)
4	Identification of important operator actions identified in the accident management	• Important operator actions based on a review of results from the E-Plan, including the EALs, CDA and ODCM • Important operator actions based on a review of the SAMG
5	Identification of variables and associated instrumentation for the *important operator actions* identified in Steps 1, 3 and 4	• Identification of important operator actions to the variables and associated instrumentation that cue or verify the operator action • Identify minimum set of instrumentation to support important operator actions • Verify that any instrumentation proposed for relocation from the PAM Technical Specification does not cue an operator action important to risk for external initiating events
6	Identification of instrumentation to be included or relocated from the PAM Technical Specification	• Focused evaluation of the adequacy of the PRA and HRA treatment of operator actions associated with any variables (instrumentation) to be relocated from the PAM Technical Specification • Identify appropriate changes to the Regulatory Guide 1.97 classifications to be consistent with the inclusion *in, or relocation from, the PAM Technical Specification*

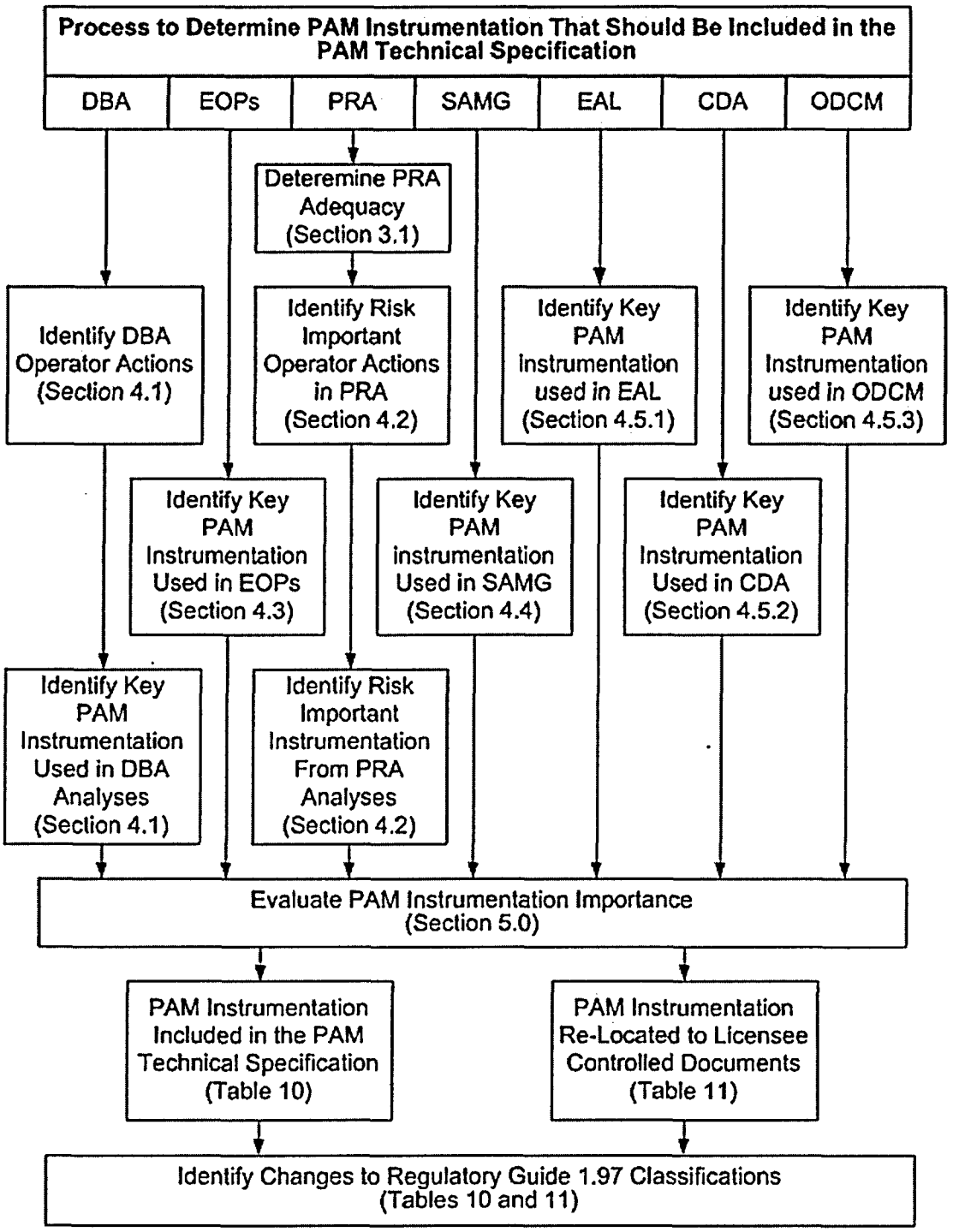

Figure 2 Process to Determine PAM Instrumentation That Should Be Included in the PAM Technical Specification