NRR-DRMAPEm Resource

From: Miller, Ed
Sent: Wednesday, August 21, 2019 7:34 AM
To: Miller, Ed
Subject: Westinghouse Slides for Aug 21, 2019, public meeting
Attachments: PA-RMSC-1647 - August 2019 NRC public meeting - Part I.pptx; PA-RMSC-1647 - August 2019 NRC public meeting - Part II.pptx

Attached are the Westinghouse slides for the August 21, 2019, public meeting on newly developed methods

Hearing Identifier: NRR_DRMA
Email Number: 187

Mail Envelope Properties (BYAPR09MB27597304B32D53AB1B8CD3C0E9AA0)

Subject: Westinghouse Slides for Aug 21, 2019, public meeting
Sent Date: 8/21/2019 7:33:49 AM
Received Date: 8/21/2019 7:33:52 AM
From: Miller, Ed

Created By: Ed.Miller@nrc.gov

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"Miller, Ed" <Ed.Miller@nrc.gov>
Tracking Status: None

Post Office: BYAPR09MB2759.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
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PA-RMSC-1647 - August 2019 NRC public meeting - Part I.pptx	1758435	
PA-RMSC-1647 - August 2019 NRC public meeting - Part II.pptx	1361030	

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Newly Developed Methods

NRC Public Meeting

Date: August 21, 2019

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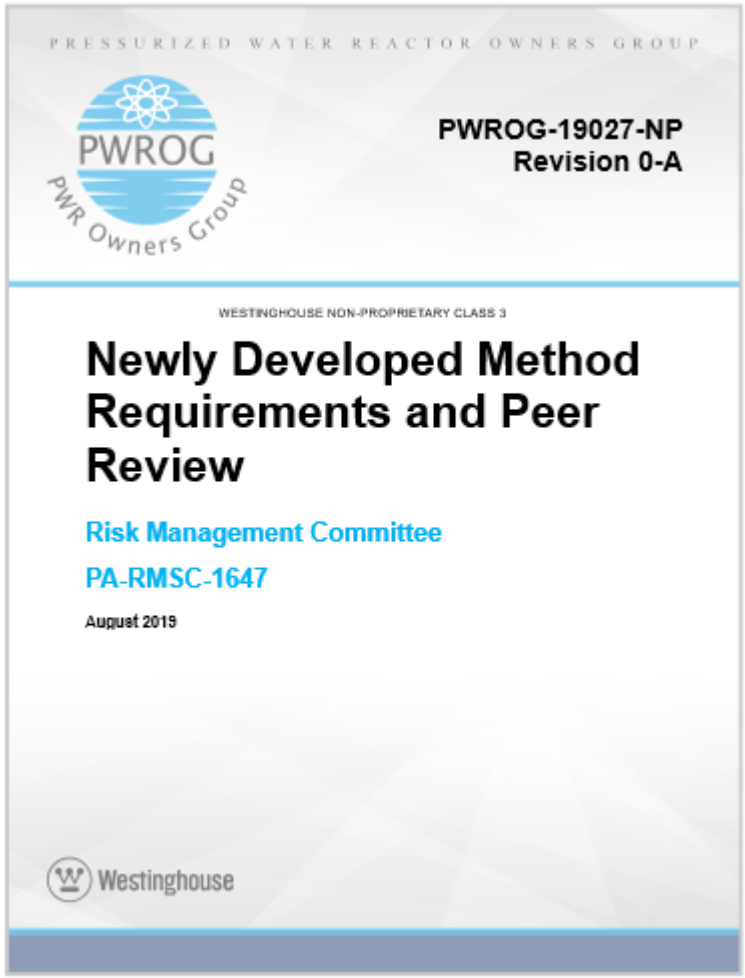
Background/Purpose

- Develop process/requirements that allows the technical adequacy of a newly developed method to be accepted through the PRA Peer Review Process.
- Definitions, requirements and peer review process developed during multiple dedicated workshops (PWROG, BWROG, NEI, JCNRM, NRC)
- Three peer review pilots informed the final draft wording (requirements, report content, etc.)
- Results of the workshops are being transmitted to JCNRM for considerations for inclusion in the next edition of the standard (i.e., through the normal consensus process by JCNRM)

Products

- PWROG-19027 – Revision 0-A
  - Dedicated to the NDM definitions, requirements and peer review process
- Revision 0
  - Expected after this public meeting

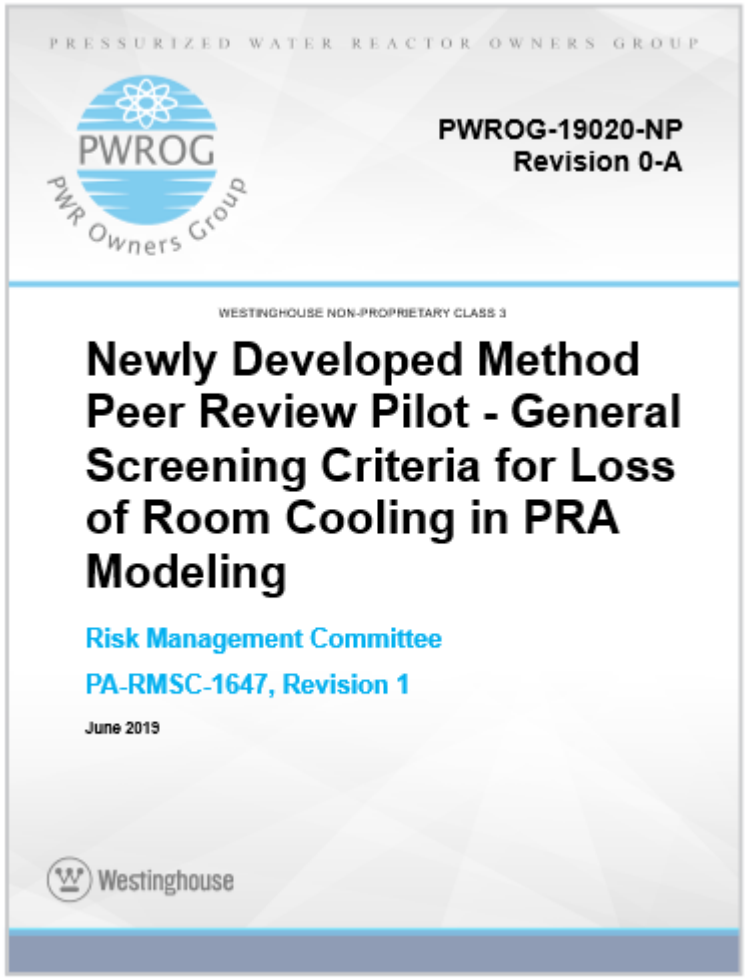


Products

- PWROG-19019 – Revision 0-A
  - Pilot peer review report for a NDM
  - Documents the review of the EDG components Reliability Data method from PWROG-18026-P, Revision 0-B including tentative met/not met SRs and associated F&Os
  - Documents the feedback for the process (captured in PWROG-19027-NP)
  - Waiting for NRC comments
- Revision 0
  - Expected after this public meeting

Products

- PWROG-19020 – Revision 0-A
  - Pilot peer review report for a NDM
  - Documents the review of the Room Cooling Screening Criteria Method from PWROG-18027-NP, Revision 0-B
  - Documents the feedback for the process (captured in PWROG-19027-NP)
  - Waiting for NRC comments
- Revision 0
  - Expected after this public meeting



Newly Developed Methods

- Definition

Newly Developed Method: A newly developed method has either been developed separately from a state-of-practice method or is one that involves a fundamental change to a state-of-practice method. A newly developed method is not a state-of practice or a consensus method.

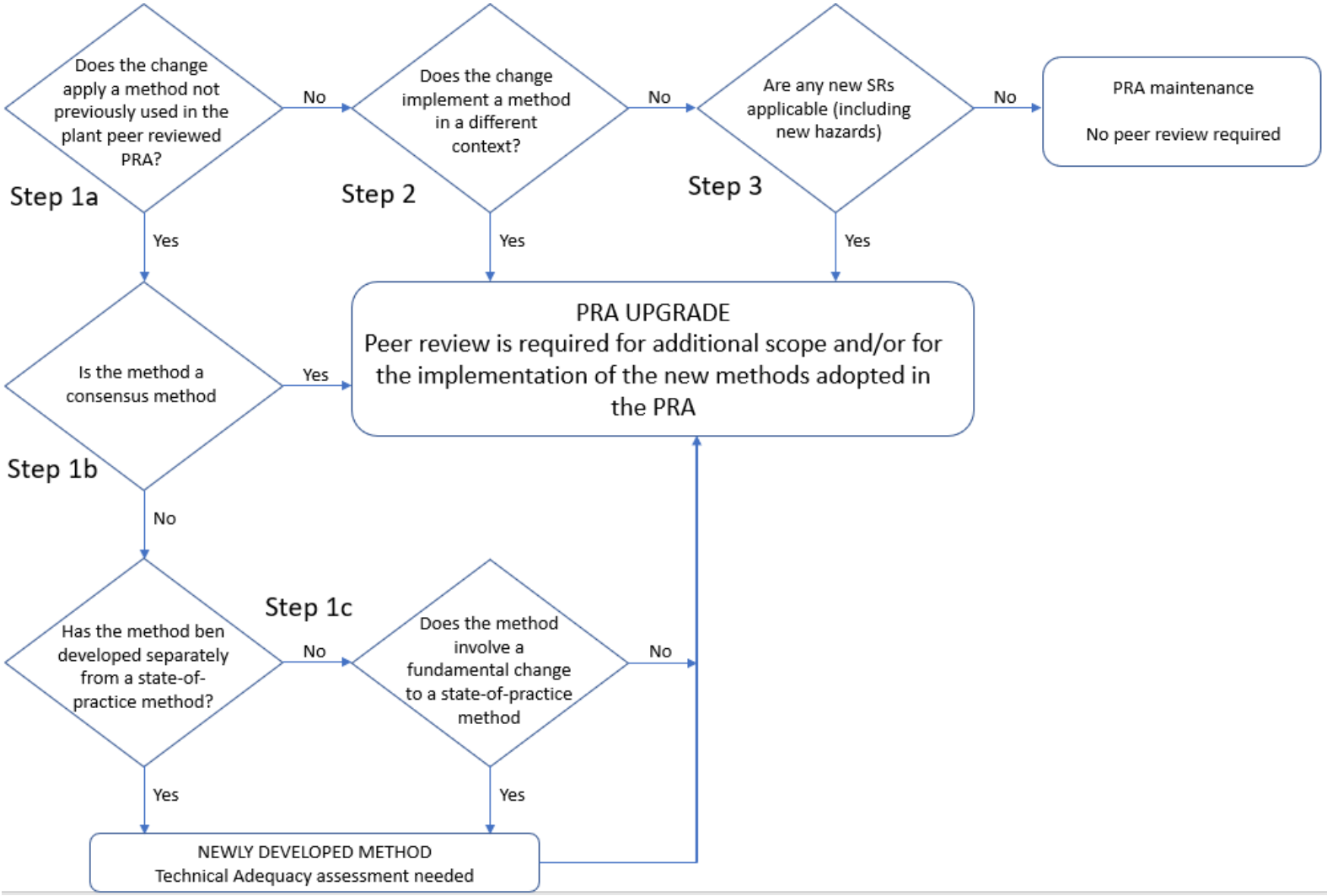
- Supporting definitions

PRA Method: An analytical approach used to satisfy a supporting requirement or collection thereof in the PRA. An analytical approach is generally a compilation of the analyses, tools, assumptions, and data used to develop a model.

State-of–Practice: Those practices that are widely accepted and implemented throughout the industry, have been shown to be technically acceptable in documented analyses or engineering assessments, and have been shown to be acceptable in the context of the intended application.

Consensus Method/Model: A method/model that the USNRC has used or accepted for the specific risk-informed application for which it is proposed.

Newly Developed Methods in the PRA Update Process



NDM Peer Review Process

- NEI 17-07 explicitly addresses NDM peer review
  - Dedicated team with pre-requisites
    - NDM review can be done together a PRA model review (where the NDM is implemented) or before implementation
  - Not a spot-check but a detailed review
  - Explicit statement on technical adequacy
  - Minimal set of information available of a method that went through the NDM review process
- Review is performed against a new set of SRs that will be added to the Standard

New Standard Section1-7 and the NM Technical Element

- Section 1-7 will be dedicated to new methods

Table 1-7.2-1 High Level Requirements for PRA Newly Developed Methods (NM)

Designator	Requirement
HLR-NM-A	The purpose and scope of the newly developed method shall be clearly demonstrated.
HLR-NM-B	The newly developed method shall be based on sound engineering and science relevant to its purpose and scope.
HLR-NM-C	The data (note that data can be numeric or non-numeric in nature) shall be relevant to the newly developed method, technically sound, and properly analyzed and applied.
HLR-NM-D	Uncertainties in the newly developed method shall be characterized and their potential impact on the newly developed method understood.
HLR-NM-E	The results of the newly developed shall be reviewed for robustness and are understandable and reasonable given the assumptions and data, and given the purpose and scope of the newly developed method.
HLR-NM-F	The documentation of the newly developed method shall provide traceability of the work and facilitate incorporation of the newly developed method in a PRA model.

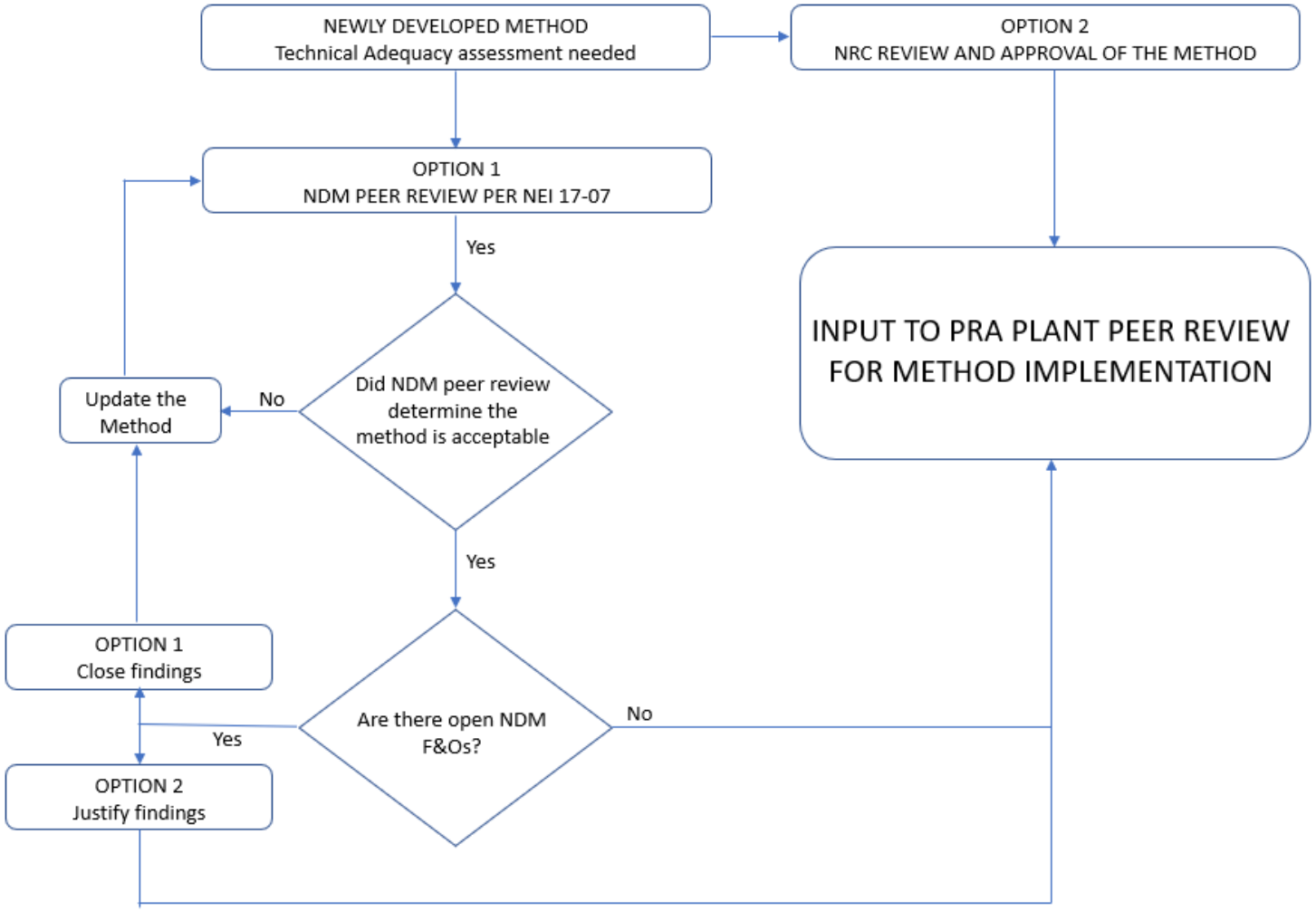
New NM SRs

Table 1-7.2-2 Supporting Requirements for HLR-NM-A

The purpose and scope of the newly developed method shall be clearly demonstrated (HLR-NM-A).

Index No. NM-A	Capability Category I	Capability Category II
NM-A1	ENSURE that the stated purpose of the newly developed method (i.e., what is being achieved by the newly developed method) is consistent with the scope (established boundary) of the newly developed method.	
NM-A2	ENSURE the applicability and limitations of the newly developed method are consistent with the purpose and scope in NM-A1.	
NM-A3	Based on the limitations and applicability of the newly developed method, IDENTIFY which areas of the PRA the newly developed method is intended to be used for, or is specifically not intended for (e.g., hazards, technical elements, plant features, SRs impacted by the newly developed method).	

NDM Peer Review Outcome



NDM with open F&Os

- Not ideal situation, but a method with open F&O can be used
  - It takes away to the efficiency of the process
- Open F&Os should be dispositioned by the plant implementing the method
  - Conceptually this is nothing different that everybody should be already doing when confirming applicability of a specific method to your own plant model
- Examples
  - F&O is only a suggestion or on the documentation of the method
  - F&O is on a part of the method that the plant has not used
  - F&O is on a range of applicability of the method that is not the one used by the plant (e.g., F&O says “this method is no good after 170F” and the plant only uses it up to 130F).

NDM Peer Review Report

- Similar in structure to a normal Peer Review Report (SR assessment, F&Os)
- Main differences
  - Explicit global assessment of the method ➔ Thumbs up/down from the review team
  - Non proprietary appendix with minimal key information for public availability (e.g., on a method developer web site, in ADAMS, etc…)

NDM Peer Review Report Non Proprietary Appendix

- Minimal set of information that can be shared to confirm that the method went through the NDM review process (and be referenced in future implementations of the method)
- Basic information
  - Unique identification of the method
  - Team composition
  - SR met/not met
  - F&O listing
  - List of SRs to be peer reviewed in a plant PRA focused scope review following method implementation
  - Explicit technical adequacy statement

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Backup Slides

New Standard Section1-7 and the NM Technical Element

Section 1-7
Newly Developed Methods

1-7.1 INTRODUCTION

This Section states requirements for newly developed methods explicitly developed for use in PRA to support risk-informed decisions for nuclear power plants. The high level and supporting requirements for the Newly Developed Methods are contained in Tables 1-7.2-1 through 1-7.2-7. A discussion of the requirements is presented below.

1-7.2 OBJECTIVE

The objective of the newly developed method requirements is to ensure that a newly developed method is technically adequate and are as follows:

a) The newly developed method has clearly defined scope and limitations
b) The newly developed method is based on sound engineering and relevant science
c) The newly developed method has proper treatment of assumptions and uncertainties
d) The newly developed method is based on appropriate and well understood data
e) The newly developed method produces results that are consistent with expectations
f) The newly developed method is clearly documented in such a way that knowledgeable personnel can understand them without ambiguity and that there is enough documentation so that it can be peer reviewed.

New Standard Section1-7 and the NM Technical Element

Table 1-7.2-1 High Level Requirements for PRA Newly Developed Methods (NM)

Designator	Requirement
HLR-NM-A	The purpose and scope of the newly developed method shall be clearly demonstrated.
HLR-NM-B	The newly developed method shall be based on sound engineering and science relevant to its purpose and scope.
HLR-NM-C	The data (note that data can be numeric or non-numeric in nature) shall be relevant to the newly developed method, technically sound, and properly analyzed and applied.
HLR-NM-D	Uncertainties in the newly developed method shall be characterized and their potential impact on the newly developed method understood.
HLR-NM-E	The results of the newly developed shall be reviewed for robustness and are understandable and reasonable given the assumptions and data, and given the purpose and scope of the newly developed method.
HLR-NM-F	The documentation of the newly developed method shall provide traceability of the work and facilitate incorporation of the newly developed method in a PRA model.

New NM SRs

Table 1-7.2-2 Supporting Requirements for HLR-NM-A

The purpose and scope of the newly developed method shall be clearly demonstrated (HLR-NM-A).

Index No. NM-A	Capability Category I	Capability Category II
NM-A1	ENSURE that the stated purpose of the newly developed method (i.e., what is being achieved by the newly developed method) is consistent with the scope (established boundary) of the newly developed method.	
NM-A2	ENSURE the applicability and limitations of the newly developed method are consistent with the purpose and scope in NM-A1.	
NM-A3	Based on the limitations and applicability of the newly developed method, IDENTIFY which areas of the PRA the newly developed method is intended to be used for, or is specifically not intended for (e.g., hazards, technical elements, plant features, SRs impacted by the newly developed method).	

New NM SRs

Table 1-7.2-3 Supporting Requirements for HLR-NM-B

The newly developed method shall be based on sound engineering and science relevant to its purpose and scope (HLR-NM-B).

Index No. NM-B	Capability Category I	Capability Category II
NM-B1	BASE the technical bases for the newly developed method on appropriate analysis or engineering/science which are founded on established mathematical and/or engineering and/or science principles (e.g., established through operating experience, tests, benchmarking, or acceptance by the scientific community).	
NM-B2	ENSURE that if empirical models are used, they are supported by sufficient experimental data which is relevant to the newly developed method. To the extent possible, the experimental data are shown to be repeatable.	
NM-B3	IDENTIFY each assumption used to develop the technical bases of the newly developed method.	
NM-B4	ENSURE assumptions have a valid rationale (e.g., are backed by appropriate operational experience).	

New NM SRs

Table 1-7.2-4 Supporting Requirements for HLR-NM-C

The data (note that data can be numeric or non-numeric in nature) shall be relevant to the newly developed method, technically sound, and properly analyzed and applied (HLR-NM-C).

Index No. NM-C	Capability Category I	Capability Category II
NM-C1	IDENTIFY the data needed in the development of the newly developed method (e.g., relevant plant-specific data, industry-wide current operating experience and data, or experimental or test data).	
NM-C2	COLLECT relevant data following a documented process appropriate for the newly developed method and consistent with current technical state-of-practice.	
NM-C3	DEMONSTRATE that the data used, including experimental data or test data, is relevant to and supports the technical basis of the newly developed method.	
NM-C4	PROVIDE basis for exclusion of data identified in NM-C1.	
NM-C5	ANALYZE data (e.g., modifications to the data, use of data in a different context or beyond the original ranges, statistical analysis) using technically sound basis or criteria.	
NM-C6	ENSURE that data is applied consistent with the purpose and scope of the newly developed method.	

New NM SRs

Table 1-7.2-5 Supporting Requirements for HLR-NM-D

Uncertainties in the newly developed method shall be characterized and their potential impact on the newly developed method understood (HLR-NM-D).

Index No. NM-D	Capability Category I	Capability Category II
NM-D1	CHARACTERIZE the parameter uncertainties associated with the newly developed method; this characterization could include, for example, specifying the uncertainty range, qualitatively discussing the uncertainty range, or identifying the parameter estimate as conservative or bounding.	
NM-D2	IDENTIFY the sources of model uncertainty associated with assumptions identified in NM-B3.	
NM-D3	CHARACTERIZE the model uncertainties (identified in NM-D1) associated with the newly developed method; this characterization could be in the form of sensitivity studies.	

New NM SRs

Table 1-7.2-6 Supporting Requirements for HLR-NM-E

The results of the newly developed shall be reviewed for robustness and are understandable and reasonable given the assumptions and data, and given the purpose and scope of the newly developed method (HLR-NM-E).

Index No. NM-E	Capability Category I	Capability Category II
NM-E1	REVIEW the results from the newly developed method to determine that they are reasonable and understandable.	
NM-E2	COMPARE the results of the newly developed method with existing methods and IDENTIFY causes for differences.	
NM-E3	ENSURE that uncertainties are not so large that the results cannot be used in a meaningful manner.	
NM-E4	DEMONSTRATE the completeness and consistency of the newly developed method (e.g., by conducting sensitivity studies).	

New NM SRs

Table 1-7.2-7 Supporting Requirements for HLR-NM-F

The documentation of the newly developed method shall provide traceability of the work and facilitate incorporation of the newly developed method in a PRA model (HLR-NM-F).

Index No. NM-F	Capability Category I	Capability Category II
NM-F1	DOCUMENT the newly developed method specifying what is used as input, the technical basis and the implementation expectations and limitations. ADDRESS the following, as well as other details needed to fully document how the set of the NM SRs are satisfied: (a) the purpose and scope of the newly developed method (b) the intended use of the newly developed method (c) the limitations of the newly developed method (d) the detailed technical basis for the newly developed method (e) the data source, collection process and data manipulation performed in support of the newly developed method (f) the assumptions and uncertainties associated with the newly developed method (g) the interpretation of the results of the newly developed method in the framework of the intended use and application	
NM-F2	DOCUMENT the process by which the newly developed method can be applied to a PRA model consistently with the intended used of the newly developed method and taking into account the purpose, scope and limitations.	

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Other PRA Standard Recommendations

NRC Public Meeting

Date: August 21, 2019

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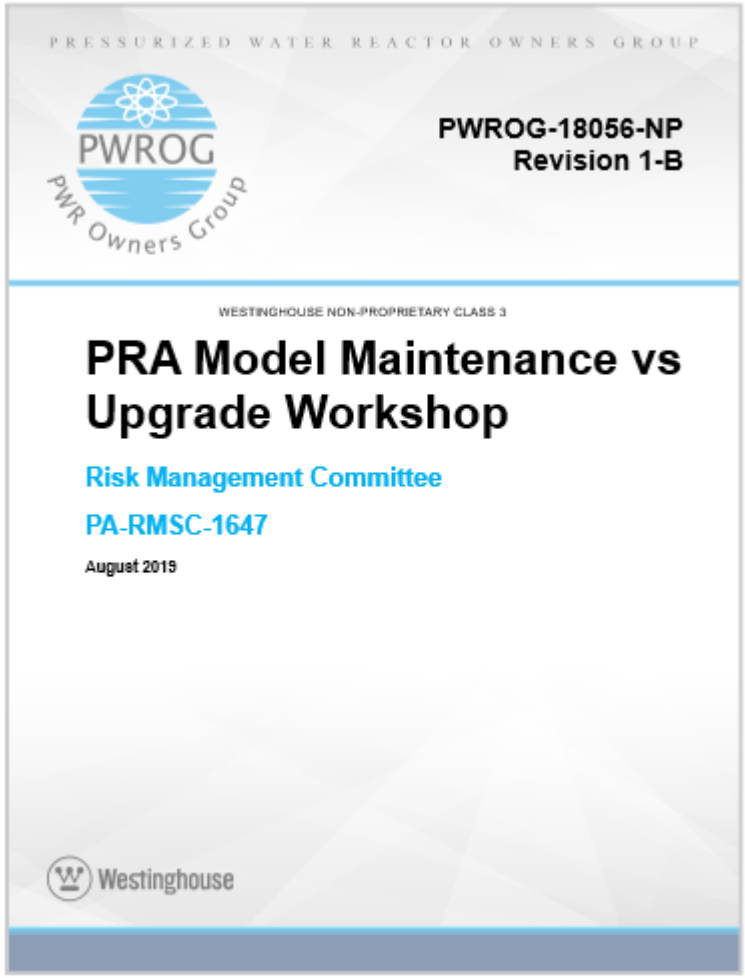
Background/Purpose

- Purpose
  - Facilitate reaching an agreement on those topics
    - Upgrade vs. Maintenance
    - Screening requirements
    - Use of the concept of risk-significance
    - External hazards
    - Assumptions and uncertainties
- Series of workshop between PWROG, NRC and other key stakeholders (BWROG, NEI, JCNRM) to address a number of topics related to the next edition of the PRA Standard
- Plan to submit the results of the workshops to JCNRM for considerations to be included in the next edition of the standard (i.e., through the normal consensus process by JCNRM)

Product

- PWROG-18056-NP – Revision 1-B
  - Grand collection of all the workshop material on all the topics
  - Detailed feedback to JCNRM (Section 4)
  - Considerations on peer reviews (Section 5)
  - Will be shared with JCNRM for their consideration of the recommended changes (September JCNRM meeting)
- Revision 1-C and then Rev. 2
  - Expected after the October workshop



Key Definitions

- A number of key definitions have been revised (or added) in an attempt to reconcile definitions in ANS/ASME Standard, RG 1.200, NUREG-1855, ANS glossary
- Definitions for:
  - PRA
  - PRA Method
  - PRA Upgrade
  - PRA Maintenance
  - Model
  - Newly Developed Method
  - State-of-Practice
  - Consensus Method/Model
  - Assumption
  - Uncertainty
  - Key Source of Model Uncertainty/Assumption

Key Definitions

- PRA Upgrade and Maintenance re-defined in a way that is less prone to vague conclusion

PRA Upgrade: A change in the PRA that results in the applicability of one or more SRs (e.g., the addition of a new hazard model) that were not previously included within the PRA, an implementation of a PRA method in a different context, or the incorporation of a PRA method not previously used.

PRA Maintenance: A change in the PRA that does not meet the definition of PRA upgrade.

- Definition of key uncertainty/assumption in the context of application

Key Source of Model Uncertainty/Assumption: A source of model uncertainty is considered to be key to a risk-informed decision when it could impact the PRA results that are being used in a decision and, consequently, may influence the decision being made. An impact on the PRA results could include the introduction of a new functional accident sequence, or other changes to the risk profile (e.g., overall Core Damage Frequency (CDF) or Large Early Release Frequency (LERF), importance measures). Key sources of model uncertainty are identified in the context of an application (note that for certain applications the base model is used). The assumption associated with a key source of model uncertainty is a key assumption.

Screening Criteria

- Objective was consistency in screening criteria
- Part 1-1.8 of the Standard will have a section on generic screening criteria an SR will reference as appropriate with consistent text
- Cleanup of use of the word screening

Table 1-8.1.1 Generic Screening Criteria

Screening Criteria for Items Being Considered for Screening from the Model (i.e., screened from further evaluation; Screen Out)

Index No. SCR	Screening metric	Screening criterion
SCR-1	Absolute risk	Less than 1.0E-6/ry CDF Less than 1.0E-7/ry LERF
SCR-2	Relative risk	Less than 1% or 1.0E-8/ry CDF Less than 1% or 1.0E-9/ry LERF
SCR-3	Qualitative	Qualitative screening, not based on a numerical value. Demonstratively conservative assessments are allowed to show that the element screened does not impact the plant or is subsumed into a more frequent or more impactful event.

Other recommendations for JCNRM: Screening Criteria

- Individual parts will reference the Part 1 screening criteria adding specific information

Index No. IE-C	Capability Category I	Capability Category II
IE-C6	ELIMINATE individual or groups of initiating events from further evaluation via SCR-2 or SCR-3 from Section 1-1.8 by showing that: (a) the event does not lead directly to core damage (e.g., reactor pressure vessel rupture cannot be screened), is not a containment bypass (e.g., ISLOCA cannot be screened), and (b) the event has the same impact on the plant as another item that has a much higher frequency, or (c) the event does not require the plant to go to shutdown conditions until sufficient time has expired during which the initiating-event conditions, with a high degree of certainty (based on supporting calculations), are detected and corrected before normal plant operation is curtailed (either administratively or automatically) such that a complicated shutdown does not occur. JUSTIFY the use of other screening criteria.	

Concept of Risk Significant

- Team concluded definition of risk significant in Part 1 is appropriate
  - Risk significance in a single hazard and risk significance in overall risk profile
- A number of SRs use the definition inappropriately
- Long list of SRs with suggested re-writing

Uncertainties and Assumptions

- Team reached consensus on the structure of the SRs associated with assumptions and uncertainties
  - You made and assumption ➔ you address the uncertainty associated with that assumption
- Four step process:
  - IDENTIFY the assumption associated with a specific technical element (e.g., FSS)
  - CHARACTRIZE the assumption within that technical element
    - What is the basis
    - Are there alternatives (is it actionable)
    - How could you change the PRA to address the uncertainty associated with the assumption (e.g., what kind of sensitivities could be done, would you need to define al alternative flood propagation path, or al alternative operator action, etc…)
  - ASSESS the impact of the uncertainty on the overall plant risk profile (i.e., in CDF/LERF space) for the actionable assumptions. This is done in QU
  - IDENTIFY the assumptions that are key based on the above

Uncertainties and Assumptions

- Each technical element to ensure that there is an SR for IDENTIFY/CHARACTERIZE the assumption/uncertainties and one for DOCUMENT them
- QU has a requirement to ASSESS the impact of the assumptions/uncertainties from ALL the Technical Element in CDF/LERF perspective
- Hazard specific QU need to ASSESS the impact of the assumptions/uncertainties for that hazard (i.e., fire Technical Elements) and for the internal events model used as basis for the hazard model.
- The above is nothing different than what PRA analysts are already expected to be doing

External Hazards

- Reached consensus on the relevance of the list of external hazards in the Standard (i.e., only a starting point)
- External hazard screened quantitatively to be “retained” as documented screening value in the plant risk profile (for a specific application)

PRA Upgrade/Maintenance Examples

- General recommendation is that Non Mandatory Appendix 1-A of the Standard be removed or greatly simplified
- Examples (too vague and ambiguously written) to be eliminated and put in a separate document where more details should be provided to allow a unique interpretation
- Details still to be worked out ➔ October workshop

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Other definitions

PRA Upgrade: A change in the PRA that results in the applicability of one or more SRs (e.g., the addition of a new hazard model) that were not previously included within the PRA, an implementation of a PRA method in a different context, or the incorporation of a PRA method not previously used.

PRA Method: An analytical approach used to satisfy a supporting requirement or collection thereof in the PRA. An analytical approach is generally a compilation of the analyses, tools, assumptions, and data used to develop a model.

Model: A qualitative and/or quantitative representation that is constructed to portray the inherent characteristics and properties of what is being represented (e.g., a system, component or human performance, theory or phenomenon). A model may be in the form, for example, of a structure, schematic, equation. Method(s) are used to construct the model under consideration.

PRA: A quantitative assessment of the risk, including technical elements for modeled hazards, associated with plant operation and maintenance that is measured in terms of frequency of occurrence of risk metrics, such as core damage or a radioactive material release and its effects on the health of the public [also referred to as a probabilistic safety assessment (PSA)]

Other definitions

PRA Maintenance: A change in the PRA that does not meet the definition of PRA upgrade.

Newly Developed Method: A newly developed method has either been developed separately from a state-of-practice method or is one that involves a fundamental change to a state-of-practice method. A newly developed method is not a state-of practice or a consensus method.

State-of-Practice: Those practices that are widely accepted and implemented throughout the industry, have been shown to be technically acceptable in documented analyses or engineering assessments, and have been shown to be acceptable in the context of the intended application.

Consensus Method/Model: A method/model that the NRC has used or accepted for the specific risk-informed application for which it is proposed.

Other definitions

Assumption: A judgment that is made in the development of the PRA model either for modeling convenience or because of lack of information or state-of-knowledge. An assumption is a source of model uncertainty.

- An example of assumption used for modeling convenience is limiting the number of individual modeled components under the assumption that the consequence of any individual combination of components is the same.
- An example of assumption made for lack of information is assuming component failure due to failure of HVAC in absence of detailed room heat-up calculations.

Key Source of Model Uncertainty/Assumption: A source of model uncertainty is considered to be key to a risk-informed decision when it could impact the PRA results that are being used in a decision and, consequently, may influence the decision being made. An impact on the PRA results could include the introduction of a new functional accident sequence, or other changes to the risk profile (e.g., overall Core Damage Frequency (CDF) or Large Early Release Frequency (LERF), importance measures). Key sources of model uncertainty are identified in the context of an application (note that for certain applications the base model is used). The assumption associated with a key source of model uncertainty is a key assumption.

Uncertainty: A representation of the confidence in the information or state-of-knowledge about the parameter values and models used in constructing the PRA.