



PWROG

PWR Owners Group

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Newly Developed Method Requirements
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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 were transmitted to JCNRM for considerations for inclusion in the next edition of the standard (i.e., through the normal consensus process by JCNRM)



Key Document

- PWROG-19027 – Revision 1
- Documents the requirements for the review of a Newly Developed Method (NDM) recommended to be added in the PRA Standard
- Revision 1 includes feedback from JCNRM (New edition of the Standard being balloted now)





Key Definitions

- Newly Developed Method
- PRA Method
- State-of-Practice
- Consensus Method/Model
- PRA Upgrade
- PRA Maintenance



NDM Technical Element

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. Sources of model uncertainties and related assumptions shall be identified
HLR-NM-E	The results of the newly developed shall be 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 NDM SRS

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 (e.g., hazards, technical elements, plant features, SRs impacted by the newly developed method) and, as appropriate, which areas of the PRA the method is not intended to be used for.	

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 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 (piloted in PWROG-19019 and 19020)

- 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**

NDM Pilot Peer Reviews

- Three recently developed methods have been peer reviewed in 2019 to pilot the NDM peer review process (developed before the NDM process and SRs)
 - **EDG failure data (PWROG)**
 - **Refined room cooling effect modeling (PWROG)**
 - **Fire in cabinets (NEI)**
- Three dedicated teams of 2/3 people each (qualifications addressed for method)
 - **Stand-alone NDM review (i.e., not within implementation in a plant PRA)**
- Lessons learned resulted in refinement/finalization of the NDM requirements and definitions in PWROG-19027
- Development of “public available appendix” for the NDM review



NDM Pilot Review #1

- The method used to estimate the EDG reliability parameters in this NDM, specifically the fail-to-load and fail-to-run failure modes, is distinct from the method used in NUREG/CR-6928 and in the USNRC Dataset (2015)
 - The USNRC data sources identify the FTLR parameter as a “per hour” failure rate
 - This NDM identified that this success data is reported by utilities to INPO as “demand” events. As a result, FTLR was calculated as a “per demand” failure rate in this NDM
- Findings were primarily related to documentation and uncertainty
 - This method was not originally intended to be reviewed as a stand-alone method
 - Scope and limitations needed to be identified
 - Assumptions and uncertainty needed to be documented and characterized



NDM Pilot Review #2

- Two methods merged together for effects of room cooling failure (screening + probability of failure beyond EQ limit)

PRA Element	Table F-3: Summary of Overall Results of the Method Review			
	Number of Supporting Requirements Meeting Each Capability Category			Total
NMA	Not Met	Met	N/A	Not Reviewed
	6	12	2	0

Table F-5: Summary of Facts & Observations for the NDM Peer Review					
Element	F&Os				Total by Element
	Findings	Suggestions	Best Practice		
NMA	13	5	0		18

- Findings associated with interface between the two methods that were merged
- Needed Clarification of method boundary/scope
- Need better documentation of technical basis for one of the screening criteria
- Need uncertainty characterization (for the failure probability method)



NDM Pilot Review #3

- Guidance on developing scenarios for in-cabinet fire damage of a Group 4 Electrical Cabinet multi-function control cabinet

Table 4-1 Summary of Overall Results of the Method Review				
PRA Element	Number of Supporting Requirements Meeting Each Capability Category			Total
	Not Met	Met	N/A	
NMA	8	16	3	27

- Reviewed against SRs updated following the first two pilot reviews
- Observations focused on:
 - Improving the documentation of the limitations and assumptions of the method
 - Improving the guidance for implementation of the method
 - Clarifying the technical basis, which in this case specifically refers to clarifications on the selection and analysis of fire events data in EPRI' Fire Events Database



Observations

- NDM peer review along with expected documentation helps clarifying and standardize the SR(s) that need to be reviewed during the implementation review
 - **Clarifies the scope**
 - **Spells out the technical SRs in the other Parts of the Standard**
- Documentation SRs in the NDM TE are geared towards two key elements
 - **Provide traceability of the work developing the method (similar to other documentation SRs)**
 - **Ensure implementation guidance is clearly documented to minimize misuse of the method**

Feedback to process

- An F&O closure can be used to close NDM F&Os, but the definition of upgrade and maintenance is slightly different for an NDM
- Examples of NDM maintenance activities
 - a **correction of an error that does not change the intent or the conclusions for the method;**
 - the **processing of more input data with the same process that does not change in the intent of the conclusion of the method;**
 - the **expansion of documentation for data and assumptions already used (but not appropriately documented in origin);**
 - **performance of more sensitivities to discuss uncertainties and or to confirm the applicability of the method within the original intended range of application;**
 - **clarification of the documentation in support to implementation of the method.**

Feedback to process

- Examples of NDM upgrade activities
 - extension/change of the scope/applicability of the method;
 - a fundamentally different way to process input/output data (beyond usage of a different tool to perform the same process function)



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Backup Slides – NDM SRS



NDM HLRs

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HLR-NM-D	Uncertainties in the newly developed method shall be characterized. Sources of model uncertainties and related assumptions shall be identified
HLR-NM-E	The results of the newly developed shall be 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.



HLR-NM-A - Scope

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 (e.g., hazards, technical elements, plant features, SRs impacted by the newly developed method) and, as appropriate, which areas of the PRA the method is not intended to be used for.	



HLR-NM-B – Technical Basis

Index No. NM-B	Capability Category I	Capability Category II
NM-B1	ESTABLISH the technical bases for the newly developed method using analysis or engineering/science 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 data which is relevant to the newly developed method. To the extent possible, ENSURE that the experimental data are shown to be repeatable.	
NM-B3	IDENTIFY assumption used to develop the technical bases of the newly developed method.	
NM-B4	JUSTIFY the rationale for the assumptions identified in NM-B3 (e.g., backed by appropriate operational experience).	

HLR-NM-C – Data

Index No. NM-C	Capability Category I	Capability Category II
NM-C1	IDENTIFY the data needed to support 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 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.	



HLR-NM-D – Uncertainty

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-D2) associated with the newly developed method; this characterization could be in the form of sensitivity studies.	



HLR-NM-E – Results

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, when possible, IDENTIFY causes for substantial differences.	
NM-E3	ENSURE uncertainties do not preclude meaningful use of the newly developed method results.	

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:	<ul style="list-style-type: none"> 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 use of the newly developed method and taking into account the purpose, scope and limitations.