

Path Forward for Implementing Gross Rupture Expert Panel

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Workshop on Spent Fuel Performance Margins

July 28, 2020



Prior Workshop Discussions

- 01/21/20 Workshop:
 - Thermal/Decay Heat Modeling and Fuel/Cladding Performance PIRT results
 - Recommendation by PIRT expert panel for Gross Rupture PIRT
- 03/25/20 Workshop:
 - DOE/PNNL perspectives on Thermal Modeling of Commercial Spent Fuel
- 04/16/20 Workshop:
 - Technical Interpretation of Gross Rupture – Historical Perspectives
- 06/11/20 Workshop:
 - Roadmaps and NRC perspectives and safety objective of gross ruptures
- 06/23/20 Workshop:
 - Thermal Margins RIRP Crosswalk, Prioritization, and Links to PIRTs

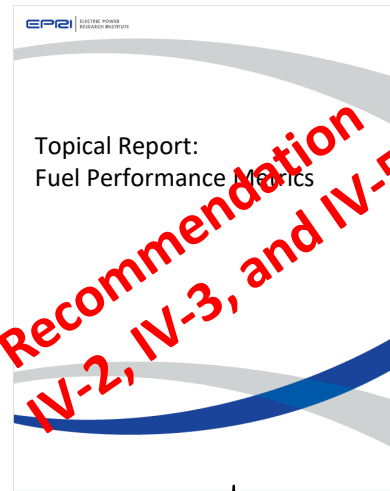
PIRT Expert Panel Process

- **Preparation – Form Steering Committee to:**
 - Define the problem (e.g., licensing, operational, or programmatic)
 - Define the specific objectives
 - Define the scenario(s) and evaluation criterion
 - Identify SME needs and select expert reviewers to participate on panel(s)
 - Ensures resources are available; defines schedules and oversees progress
- **Pre-elicitation – Experts Review State of Knowledge:**
 - Identify, obtain, and review open source database
 - Identify plausible phenomena and develop questionnaire to frame future discussions
- **Elicitation – Expert Ranking Process:**
 - Rank importance and provide rationales
 - Assess uncertainty for phenomenon (e.g., define gaps)
- **Documentation – Document PIRT results:**
 - Review by independent experts

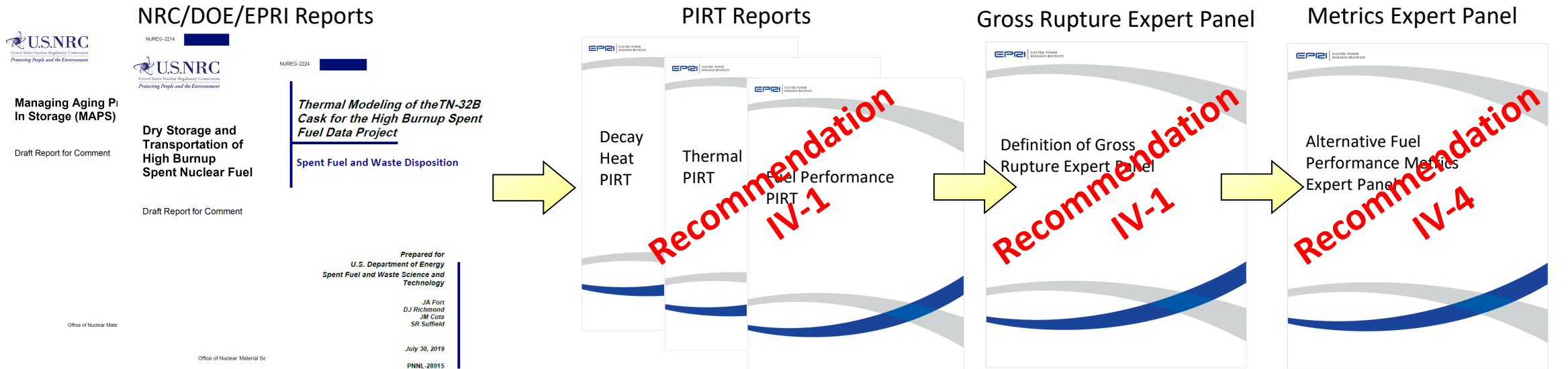
Preparation – Steering Committee

Thermal Margins RIRP: Defining the Problem

Regulatory Implementation – Topical Report



Technical Basis Documents



PIRT Expert Panels Structure

Establish Committee Scope, Leadership, and SMEs

Andrea Kock (NRC)
Ned Larson (DOE)
Sylvia Saltzstein (SNL)
Randy Stark (EPRI)
Jeremy Renshaw (EPRI)
Suzanne Leblang (Entergy Services)
Zita Martin (TVA - Holtec)
Paul Plante (3 Yankees - NAC)
Steven Edwards (Duke Energy - Orano)

Steering Committee
NRC/DOE/EPRI/
Stakeholders

Roles & Responsibilities
Define the problem (e.g., licensing, operational, or programmatic)
Define the specific objectives
Define the hardware and scenario
Define the evaluation criterion
Ensure resources are available - experts and expert reviewers to participate on panel(s)

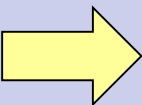
Project Management

Project Manager(s)
Al Csontos (EPRI)?

Roles & Responsibilities
Project management of the expert panelists, observers, and facilitators
Coordinate SME resources with stakeholder organizations
Define schedules and oversees progress
Organize PIRT in-person and/or virtual meetings
Collect references and document open source information
Optimize expert panel resources with PIRT report facilitator

SME Develop PIRTs, Analyses, & Report

Gross Rupture
PIRT Expert Panel
Keith Waldrop (EPRI)?



Alternate Fuel
Performance Metrics
PIRT Expert Panel
Keith Waldrop (EPRI)?

Roles & Responsibilities
Identify plausible phenomena
Identify & review available tech data
Rank importance and rationales
Assess phenomenon uncertainty
Develop Independent PIRT report


Gross Rupture PIRT Expert Panel: Specific Objectives



Recommendation IV-1

- Prevent: :
 - Input to Alternate Fuel Performance Metrics PIRT
 - Establish clarity through durable and up-to-date fuel performance metrics to meet NRC regulations requiring protection of cladding from gross ruptures
- Address:
 - Provide clarity to regulatory expectations prior to loading and for unexpected contingencies during short term operations (e.g. IN 2018-01) to minimize operational impacts from potential fuel leaks
- Risk-inform:
 - Risk and/or consequence analyses to frame and assist justification for new definition(s)/metric(s) that meets with the historical intent of the regulations

Gross Rupture PIRT Expert Panel: High-Level Scenario(s)

- Dry storage (10 CFR 72)
 - Short term operations (loading and drying)
 - Initial storage (up to 20/40 years)
 - Extended storage (renewals > 60 years)
 - Transportation (10 CFR 71)
 - Normal Conditions of Transport
 - Hypothetical Accident Conditions
 - Others (disposal, etc.)?
 - Scenario dependent assumptions:
 - Intact and/or damaged canister
 - Repackaging and/or reflooding
- 
- Systematic and detailed consideration to specific scenario(s) and assumption(s)
 - Different safety impacts and/or risk-informed considerations to address specific scenario(s) and assumption(s)

Gross Rupture PIRT Expert Panel: Evaluation Criterion

- NRC Gross Rupture Safety Objective:
 - “Per the prior qualitative assessment, the staff developed the following Safety Objective for the prevention of gross ruptures: Gross ruptures should be prevented to avoid releases of particulate material that result in doses exceeding limits or safety concerns during *eventual* reflooding/repackaging.”
- Comment resolution for NUREG-1927 Rev. 1:
 - “The staff notes that the use of a spent fuel pool is just one approach a licensee may take to address a canister breach. Some additional options may include: (1) conducting in-situ canister repairs, (2) creating a secondary confinement boundary, or nesting the breached canister within a new, larger confinement vessel, or (3) replacing the breached canister with a new canister, but engineering a shielded confinement structure to safely repack the fuel rather than using a pool.”

Proposed Gross Rupture Expert Panel Composition

- Proposed SME's need vetting by steering committee to confirm competency and ensure objectiveness to PIRT objective
- Consensus composition of gross rupture expert panel:
 - Radiological/Dose Assessment
 - Materials (fuels)
 - Thermal (limited)
 - Criticality
 - Containment/Confinement
 - Structural (limited)
- Potential for SME with risk-informed system level considerations:
 - Risk/consequence analysts would provide connection to safety objective
 - Risk-informed approach depends on scenario(s)/assumption(s)
- Near-term action: identify experts for steering committee review

Pre-elicitation – Experts Review State of Knowledge

Pre-Elicitation: Lessons Learned from Prior PIRTs

- Scenario(s):
 - Conditions with assumptions where phenomena will be evaluated
- Figures of Merit:
 - Should be tied to the overall safety objective
 - However, this is dependent on the specific technical review discipline
- Phenomena/Parameter:
 - Affect ability to satisfy figures of merit
- Importance:
 - Ranking effect of phenomena/parameter to achieve figures of merit
- Knowledge Base / Data Adequacy:
 - Data: Pedigree, accuracy, uncertainty, relevance, multiple sources
 - Models: Accuracy, uncertainties, comparison to measured data and validation

Pre-Elicitation: Activities to Support Effective PIRT

- Collect/store available references for expert evaluation
- Historical and current regulatory perspectives:
 - NRC reexamine intent and considerations of regulations addressing fuel integrity (proposed next steps from 6/11/20 R. Torres presentation)
- Historical industry operating experience:
 - Industry to provide historical operating experience related to “breached fuel” (NRC proposed next steps from 6/11/20 R. Torres presentation)
 - More clarification needed on definition of “breached fuel”:
 - Loading of damaged and failed fuel in damaged fuel cans
 - Intact fuel with breaches during loading operations
 - Case study examples demonstrating minimal safety impacts

Pre-Elicitation: Activities to Support Effective PIRT

- Risk-informing and Recent Aging Management Innovations:
 - Identify PRA/consequence analyses to assist gross rupture definition:
 - Holistic consideration of technical considerations to safety objectives
 - Identify alternatives to traditional reflooding/repackaging operations:
 - Aging management: inspection, repair, mitigation, etc.
- Develop questionnaire for the expert panel members:
 - Questions with the intent to focus expert panel responses to identify key parameters/phenomena/etc. that impact the PIRT to the safety objective
 - Expectation that expert panelists respond in writing or with a presentation
 - Observers may be asked questions or requested to make presentations:
 - Clarifications to operations and operational experience

Elicitation – Expert Ranking Process

Elicitation: Experts Review Phenomena and State of Knowledge

- Virtual technical workshop(s) with experts assessing:
 - Scenario(s)
 - Phenomena/Parameters
 - Knowledge Base and Model/Data Adequacy
 - Figures of Merit:
 - Importance/Ranking to Figures of Merit
- Rank Importance and Provide Rationale:
 - PIRT lead to facilitate ranking discussion
 - Ranking importance relative to the evaluation criteria
 - Expert panel provide insight to the phenomenon to the evaluation criteria
- Assess knowledge or uncertainty for each phenomenon
 - Identify knowledge gaps associated with each phenomenon
 - Identify the extent of the knowledge gaps

Documentation – Document PIRT Results

Documentation: PIRT Report

- EPRI to assist development of the gross rupture PIRT report with an independent facilitator to reduce burden on the experts:
 - Optimize resources for stakeholder organizations
 - Similar approach to previous PIRT reports
- Results documented in the PIRT expert panel report:
 - Scenarios and phenomena considered to the safety objective
 - Results of the applicability assessments for the PIRT
- Report reviews to ensure expert positions accurately documented
- Goal to obtain consensus, but consensus is not necessary:
 - Similar approach to previous PIRT reports

Summary: Path Forward

- **Preparation – Steering Committee:**
 - Establish the objectives, scenarios, and evaluation criterion
 - Identify expert panelists by technical discipline
 - Document in the PIRT Charter
- **Pre-elicitation – Review State of Knowledge:**
 - Develop workshops to discuss the following information:
 - Historical and current regulatory perspectives
 - Historical industry operating experience
 - Risk-informing and Recent Aging Management Innovations
 - Document as part of the expert panel questionnaire
- **Elicitation – Expert Ranking Process:**
 - EPRI to host virtual PIRT expert panel meetings
- **Documentation – Document PIRT results:**
 - Develop and review report by expert panel

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