

US NRC PRA Use and Development: 2020 Update

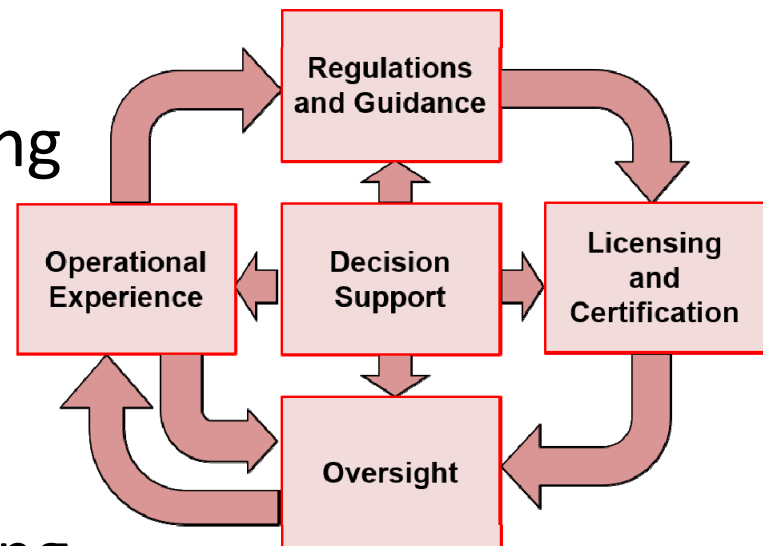
WGRISK Annual Meeting
February 26-28, 2020

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NRC Regulatory Process and Integrated Risk-Informed Decision-Making (RIDM)

- NRC Regulatory Process components:
 - Regulatory Guidance
 - Licensing, Decommissioning and Certification
 - Oversight
 - Operational Experience
 - Support for decision-making



Regulatory Guides and ASME/ANS PRA Standards

2020	2021
RG 1.200 Rev. 3	RG 1.200 Rev. 4
ASME/ANS-RA-1.1, Level 1/LERF	ASME/ANS RA-S-1.3, Level 3
ASME/ANS RA-S-1.2, Level 2	ASME/ANS RA-S-1.4, Non LWRs
	ASME/ANS RA-S 1.5, ALWR (for trial use)
	ANS 58.22, LPSD

Regulatory Activities: Operating Reactors/ Risk Informed Licensing

- Risk-Informed Technical Specifications Completion Times
 - Risk-Informed Technical Specifications (TS) extended completion times issued Revision 2 to TSTF 505 (ADAMS Accession No. [ML18310A171](#), December 2018)
 - 11 operating units have received approval to implement the program
 - Other applications under review
 - RG 1.177 to address Technical Specification Completion Times and limit to a maximum of 90 days
- 10 CFR 50.69: Risk-Informed Categorization and Treatment of Structures, Systems and Components
 - Issued the SE for approval of the first non-pilot 50.69 application.
 - Issued SEs approving the program for 25 operating units; other applications under review

Regulatory Activities: Operating Reactors / New and Advanced Reactors

- NRC and industry workshop on 50.69/4b lessons learned on January 30-31, 2019.
 - Incorporating lessons learned is improving the quality of submittals and efficiency of reviews

New/ Advanced Reactors

- NRC preparing to review the non-LWR standard in 2020.
- Draft Regulatory Guide - DG 1353, “Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications and Approvals for Non-Light Water Reactors” – Published for public comment May 2019.

Research Activities PRA and OpE

- SAPHIRE and SPAR
 - Continue to expand SPAR model capabilities (e.g., FLEX, IDHEAS-G ECA, etc.)
 - Continue to expand detail of generic SPAR models
- Accident Sequence Precursor Program
 - Exploring use of data analytics
 - Data visualization dashboard using MS Power BI
 - Use case for screening Licensee Event Reports
 - NUREG/KM on Event Assessment
- Operating Experience
 - Feasibility study on predictive maintenance

Research Activities: PFHA

- Develop tools and guidance to risk-inform new and advanced reactor design basis as well as licensing and oversight of operating reactors
- Collaborations
 - Federal agencies (e.g., DOE Laboratories, USGS, USACE, NOAA)
 - International (e.g., IRSN, NEA/WGEV)
 - Industry (e.g., EPRI)
- 5th Annual PFHA Research Workshop
 - February 19-21, 2020 @ NRC HQ (Rockville, MD)
- New initiatives in 2020:
 - Pilot Studies of Methods to develop full flood hazard curves
 - Site-scale flooding
 - Riverine flooding
 - Coastal flooding

Research Activities: Fire PRA

- Electrical Cabinet HRRs and Fire Modeling
 - NUREG-2178 vol. 1 (April 2016) & vol. 2 (mid-2020)
- Electrical Cabinet Fire Growth, Detection and Suppression Improvements- mid-2020
- Transient Fuel Package HRRs and Fire Growth
 - NUREG-2232 Data Report - planned completion early 2020
 - NUREG-2232 PRA Method – planned completion late 2020
- High Energy Fault (HEAF) testing
 - NRC-RES working with EPRI to update HEAF Fire PRA guidance
 - Full Scale Phase II OECD/NEA testing will take place 2019-2021

Research Activities: HRA

- The NRC has published RIL-2020-02 – IDHEAS for Event and Condition Assessment HRA method and has developed its software tool.
 - IDHEAS-ECA is a human-centered HRA method that was specifically built to model the use of FLEX equipment and to be able to replace the agency's SPAR-H method.
 - The method is also capable for use in non-power reactor applications including spent fuel storage and transportation, fuel cycle facilities, nuclear medicine applications, etc.
 - The IDHEAS-ECA software is available free of charge for public use
- The NRC is working with the NEA/WGHOF to develop a new task on HRA data. It is the intent of the NRC to use data to inform and update its HRA methods (i.e. IDHEAS).
- EPRI and NRC-RES have collaborated to expand upon the Fire HRA Guidelines (NUREG-1921) to address main control room abandonment (MCRA) scenarios in fire events (published by EPRI in June 2019)
- MCRA HRA guidance:
 - Supplement 2: HRA Quantification for MCRA (published in 2019)

Research Activities: Level 3 PRA Status Dashboard (Updated Jan/2020)

	Level 1	Level 2	Level 3
Reactor, at-power, internal events	Complete	Complete	Phase 2 L3PRA management review
Reactor, at-power, internal floods	Complete		
Reactor, at-power, internal fires	Phase 2 Internal technical review	Phase 2 Revised model/documentation	Phase 1 Initial model/documentation
Reactor, at-power, seismic events	Phase 2 Internal technical review	Phase 2 Revised model/documentation	Phase 1 Initial model/documentation
Reactor, at-power, high winds	Complete	Phase 2 Revised model/documentation	Phase 1 Initial model/documentation
Reactor, at-power, other hazards	Complete	N/A	
Reactor, LPSP, internal events	Phase 2 Revised model/documentation	Phase 1 TAG review	Phase 1 Initial model/documentation
Spent fuel pool (all hazards)	Phase 1 Initial model/documentation		Task has not yet begun
Dry cask storage (all hazards)	Phase 1 L3PRA management review		
Integrated site risk (all hazards)	Phase 1 Initial model/documentation		

Phase 1		Phase 2	
	Initial model/documentation		Revised model/documentation
	Internal technical review		Internal technical review
	L3PRA management review		L3PRA management review
	TAG/PWROG review		Model/documentation complete

Backup Slides

Regulatory Guides and ASME/ANS PRA Standards

- [Regulatory Guide \(RG\) 1.174 Rev. 3](#), “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis“, January 2018
 - Other RGs currently being revised for consistency with RG 1.174 Rev. 3.
 - [RG 1.175 Rev. 0](#) “An Approach for Plant-Specific, Risk-Informed Decisionmaking: Inservice Testing”
 - [RG 1.177 Rev. 1](#) “An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications”
 - [RG 1.178 Rev. 1](#) “An Approach for Plant-Specific Risk-Informed Decisionmaking for Inservice Inspection of Piping”

SPAR Model Status

	# of Models
Low Power Shut Down	8
All Hazards	23
High Winds	18
Seismic	53
Level 2	2
FLEX	66
Total of Number of Models	75

Additional Risk-Informed Activities

- Other risk-informed activities
 - Ongoing work to develop risk tools for dry cask storage licensing
 - Ongoing work to risk-inform digital I&C
 - [2020 Regulatory Information Conference](#)
- Risk Informed awareness workshop, seminars and committees
 - Conducted Dynamic PSA Seminar – November 2019
 - Risk management team
 - Risk informed steering committee