

# Probabilistic Risk Assessment

## Nuclear Power Plant Probabilistic Risk Assessment (PRA) and Risk-Informed Decision Making (RIDM)

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Independent Activities Period

January 16-23, 2019

# Course Objectives and Approach

- Learning Objectives:
  - Knowledge of basic probabilistic risk assessment (PRA) and risk-informed decision making (RIDM) concepts and the use environment;
  - Exposure to and limited practice with nuclear power plant (NPP) PRA: modeling approaches, elements, and mechanics; **critical thinking**
  - Awareness of PRA/RIDM history, recent developments and controversies, and future challenges
- Delivery via lectures (dual-purpose slides with some knowledge checks and thought exercises), workshops, discussion

# General Design

Day 1: PRA Overview (The Big Picture)

Day 2: Major Elements (Event Trees, Fault Trees, ...)

Day 3: Dependencies (Risk Drivers)

Break

Day 4: Special Topics (Precursors, Case Studies, Infrastructure, Communication)

Day 5: The Frontier (Challenges, R&D)

# Schedule

	Wednesday 1/16	Thursday 1/17	Friday 1/18	Tuesday 1/22	Wednesday 1/23
Module	1: Introduction	3: Characterizing Uncertainty	5: Basic Events	7: Learning from Operational Events	9: The PRA Frontier
9:00-9:45	L1-1: What is RIDM?	L3-1: Probabilistic modeling for NPP PRA	L5-1: Evidence and estimation	L7-1: Retrospective PRA	L9-1: Challenges for NPP PRA
9:45-10:00	Break	Break	Break	Break	Break
10:00-11:00	L1-2: RIDM in the nuclear industry	L3-2: Uncertainty and uncertainties	L5-2: Human Reliability Analysis (HRA)	L7-2: Notable events and lessons for PRA	L9-2: Improved PRA using existing technology
11:00-12:00	W1: Risk-informed thinking	W2: Characterizing uncertainties	W4: Bayesian estimation	W6: Retrospective Analysis	L9-3: The frontier: grand challenges and advanced methods
12:00-1:30	Lunch	Lunch	Lunch	Lunch	Lunch
Module	2: PRA Overview	4: Accident Sequence Modeling	6: Special Technical Topics	8: Applications and Challenges	10: Recap
1:30-2:15	L2-1: NPP PRA and RIDM: early history	L4-1: Initiating events	L6-1: Dependent failures	L8-1: Risk-informed regulatory applications L8-2: PRA and RIDM infrastructure	L10-1: Summary and closing remarks
2:15-2:30	Break	Break	Break	Break	
2:30-3:30	L2-2: NPP PRA models and results	L4-2: Modeling plant and system response	L6-2: Spatial hazards and dependencies	L8-3: Risk-informed fire protection	Discussion: course feedback
3:30-4:30	L2-3: PRA and RIDM: point-counterpoint	W3: Plant systems modeling	L6-3: Other operational modes L6-4: Level 2/3 PRA: beyond core damage	L8-4: Risk communication	Open Discussion
4:30-4:45	Break	Break	Break	Break	
4:45-5:30	Open Discussion	W3: Plant systems modeling (cont.)	W5: External Hazards modeling	Open Discussion	
5:30-6:00		Open Discussion	Open Discussion		

## Resources

- Key and enrichment documents cited for each lecture
- Many available through:
  - public document collections accessible through the NRC website (<http://www.nrc.gov/reading-rm/doc-collections/>)
  - NRC's Agencywide Document Access and Management System (ADAMS) (<http://www.nrc.gov/reading-rm/adams.html>)
- Citations are based on personal knowledge and represent a limited sample of the voluminous literature

# Acknowledgments

## PRA Education and Philosophy

George Apostolakis

Norman C. Rasmussen

B. John Garrick

### Lecture Materials

Keith Compton

Susan Cooper

Kevin Coyne

Karl Fleming

Mardy Kazarians

John Lane

Nick Melly

Ali Mosleh

Curtis Smith

Tom Wellock

Jing Xing

Electric Power Research Institute

U.S. Nuclear Regulatory Commission

### Formative Discussions

Harold Blackman

Kevin Coyne

Dana Kelly

Ali Mosleh

Gareth Parry

John Stetkar

and many other  
colleagues...

### Project Initiation and Support

George Apostolakis

Michael Cheok

Michael Golay

Mark Thaggard

Diane Siu



# Disclaimer

The views expressed in these lectures are my own and do not necessarily represent those of the U.S. Nuclear Regulatory Commission.

