“Which Way SPRA?”

Pre-Conference Workshop Presented at PSAM14
Luskin Conference Center, Los Angeles, California
September 16, 2018

Donald J. Wakefield
Senior Consultant
dwakefield@abs-group.com
Impacts of Seismic Motion on Response of Nuclear Plant Operators

- What does experience show concerning the impact on nuclear plant operator responses, including loss of offsite power recovery, as a function of seismic motion levels?
  - Impact of motion on human body?
  - **Are there Seismic motion levels where no actions should be credited?** Even if no structural failures? For what period of time?
  - Time-dependence of delays in recovery; minutes, hours, days? (For FLEX equipment.)
Contributors to Large, Early Release

- For higher seismic sites, what failure criteria should be assumed when evaluating potential building failures that may open up pathways to the environment that could result in large, early releases?
  - Reactor or auxiliary building failures through which many piping systems penetrate the containment walls.
  - Physical Interference between Critical Buildings

- Can we identify a reasonably complete set of systems, structures, and components that may potentially contribute to large early release frequency and that should be evaluated. This would be preferable to defining a SSC screening criterion, based on failure frequency, to assess which SSCs are to be evaluated for seismic capacity.
Computational Methods?

- The methods developed 50 years ago had to simplify the approach to seismic probabilistic risk assessment (SPRA) in order to perform the computations.
  - Can we now computationally evaluate seismic risks using simulation techniques of integrated models for seismic hazards, SSC fragilities, and plant sequence response?
  - Why parameterize instead of solving many seismic motion time-history samples beginning to end?
  - If necessary, could we perform the seismic motion simulations for a reduced set of limiting structures, systems, and components (SSCs)?
  - Are we overstating the risks and/or understating the uncertainties by evaluating the problem in stages that require the results at the end of each stage to be simplified?
More SPRA Topics

- Importance of Modeling Correlation between Identical or Dissimilar SSCs
- Enhance Structure and Equipment Screening Criteria for Higher Seismic Sites; i.e., enhance Tables 2-3 and 2-4 of EPRI NP-6041-SLR1 (1991)
- Formulate Less Man-Hour Intensive Approaches to Relay Chatter Screening
- Identify Multi-unit Factors on Operator Responses
- Standardize Appropriate Levels for Truncation of Fragility Curves at low acceleration Levels