SIMPSON GUMPERTZ & HEGER

Engineering of Structures and Building Enclosures

NRC Commission Briefing

Japan Near-Term Task Force Recommendation 2.1 for Seismic Hazard Evaluations

October 7, 2014

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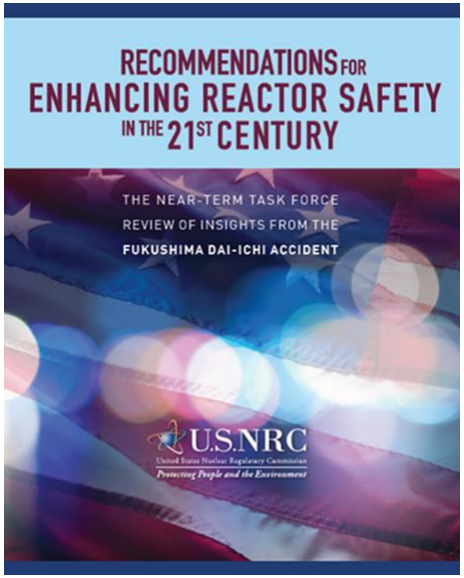
Commission Requested Discussion Topic

Improvements and Challenges Related to NTTF 2.1 Seismic

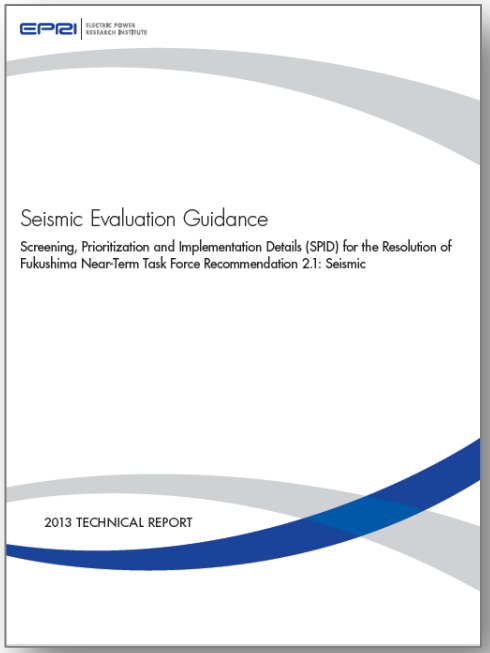


- **Improvements**
  - Guidance Documents for 2.1
  - Results from EPRI Research Tasks
  - Training for Industry and Regulators
- **Challenges**
  - Aggressive Schedule
  - Limited Technical Expertise (Industry and NRC)
  - Changing Technical Environment vs. Regulatory Stability

Seismic Evaluation Guidance "SPID"

EPRI Report 1025287, *Seismic Evaluation Guidance:*
***S**creening, **P**rioritization and **I**mplementation **D**etails (SPID)*
February 2013

- Seismic Hazard Development
- GMRS Comparisons
- Screening
- Prioritization (Schedule)
- Seismic Risk Evaluation



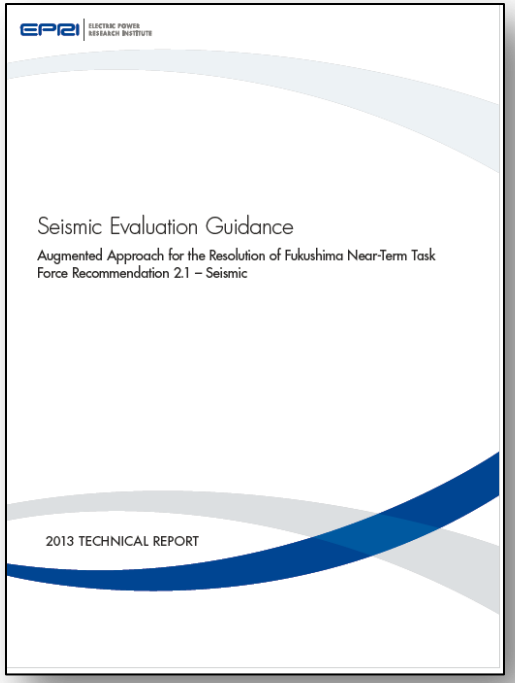
Seismic Evaluation Guidance

Expedited Seismic Evaluation Program (ESEP)

EPRI Report 3002000704, *Seismic Evaluation Guidance*

- **May 2013**

1. Screening
2. Equipment Selection
3. Seismic Capacity Criteria
4. Modification Criteria

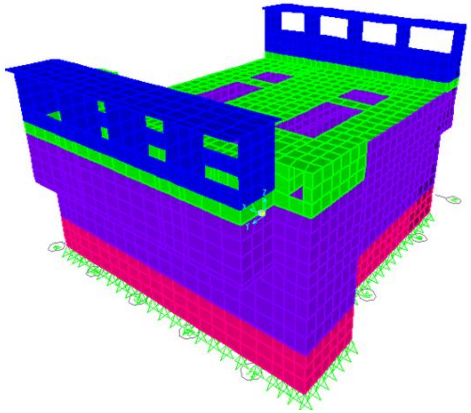


Research Innovations and Improvements

- Methods developed for use of Finite Element and Lumped Mass Stick Models
- High frequency testing
- Seismic fragility based on earthquake and test experience data
- State of the art seismic hazard development
- Research on seismic capacity for deeply embedded bolts

Finite Element vs. Lumped Mass Structure Models

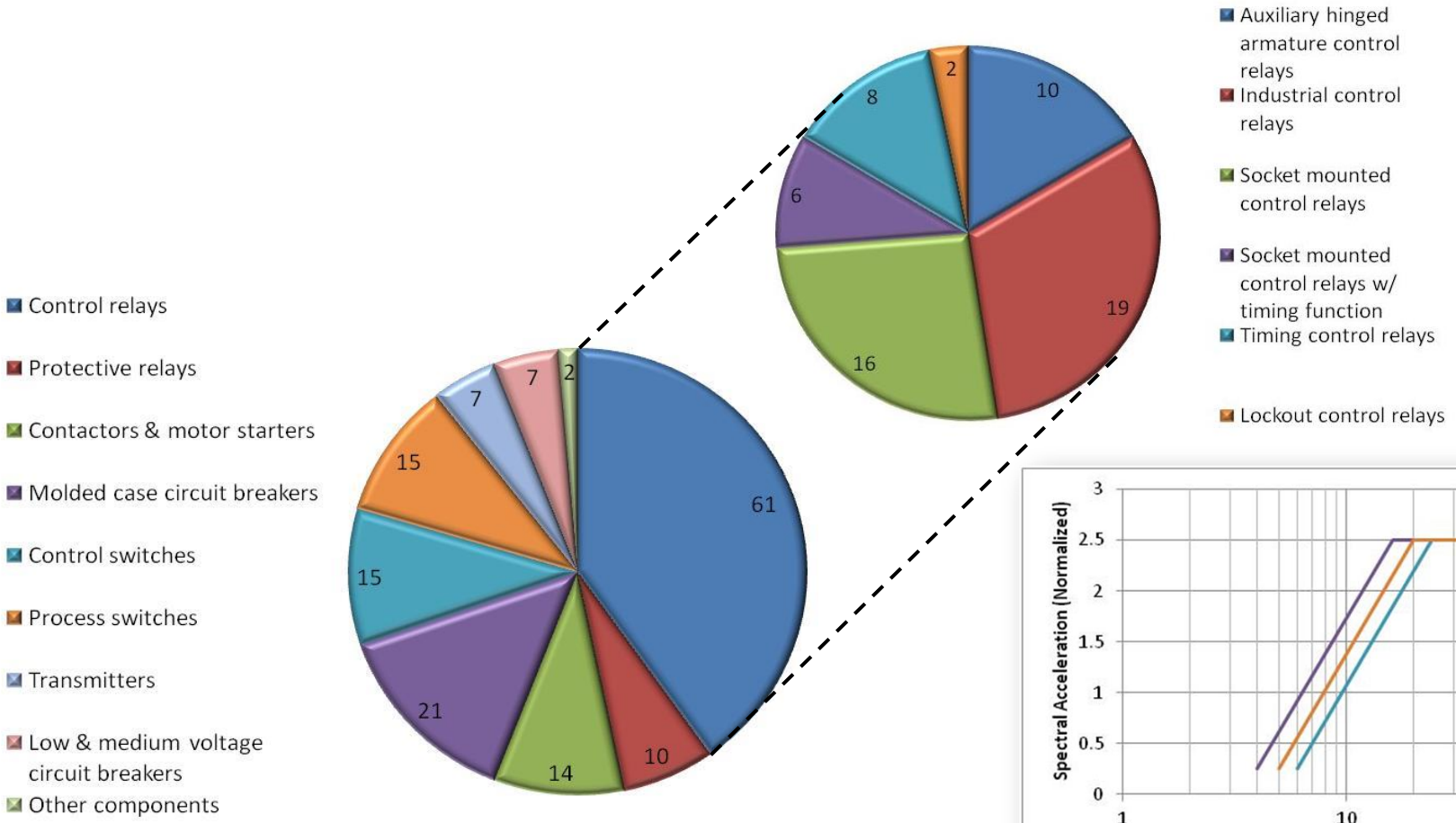
- Seismic Risk Assessments require ***Adequate*** Structure Models to develop Seismic Response
- Existing Nuclear Power Plants (NPPs) typically have lumped mass stick models (LMSM)
- EPRI Report Late 2014



Finite Element Model

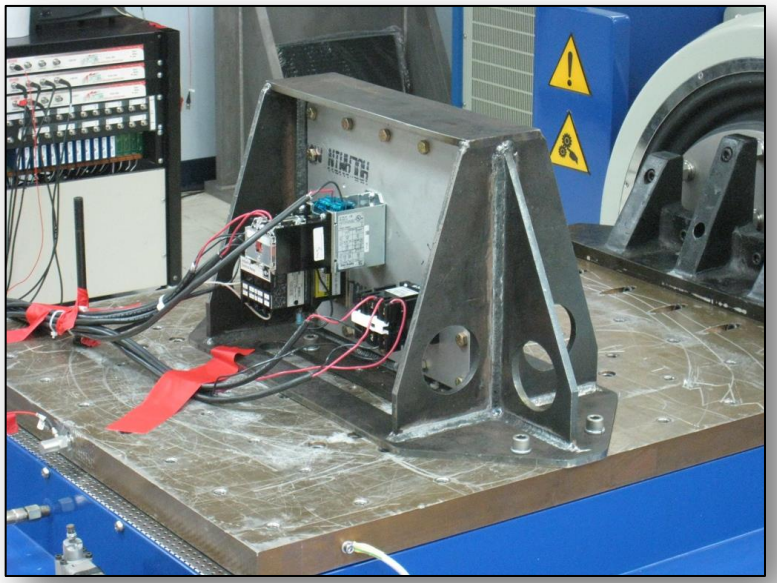
Lumped Mass Stick Model

High Frequency Program
152 Tests Conducted



HF Program Milestones and Remaining Challenges

- EPRI Test Summary Report
  - Issued Sept 15, 2014
- Majority of items are inherently rugged
- SPRA Fragility guidance
- In-structure and in-cabinet response
- Complete application guidance to be reviewed by NRC prior to publishing



Training to Support NTTF 2.1 Seismic

- Training to supports NTTF 2.1 Seismic
  - Technical Methods
  - Consistency in Submittals
- Two Seismic hazard workshops (2013-2014)
- HCLPF Training to Support Expedited Seismic Program
- Seismic PRA Methodology Courses
- Early SPRA Practitioners Workshops

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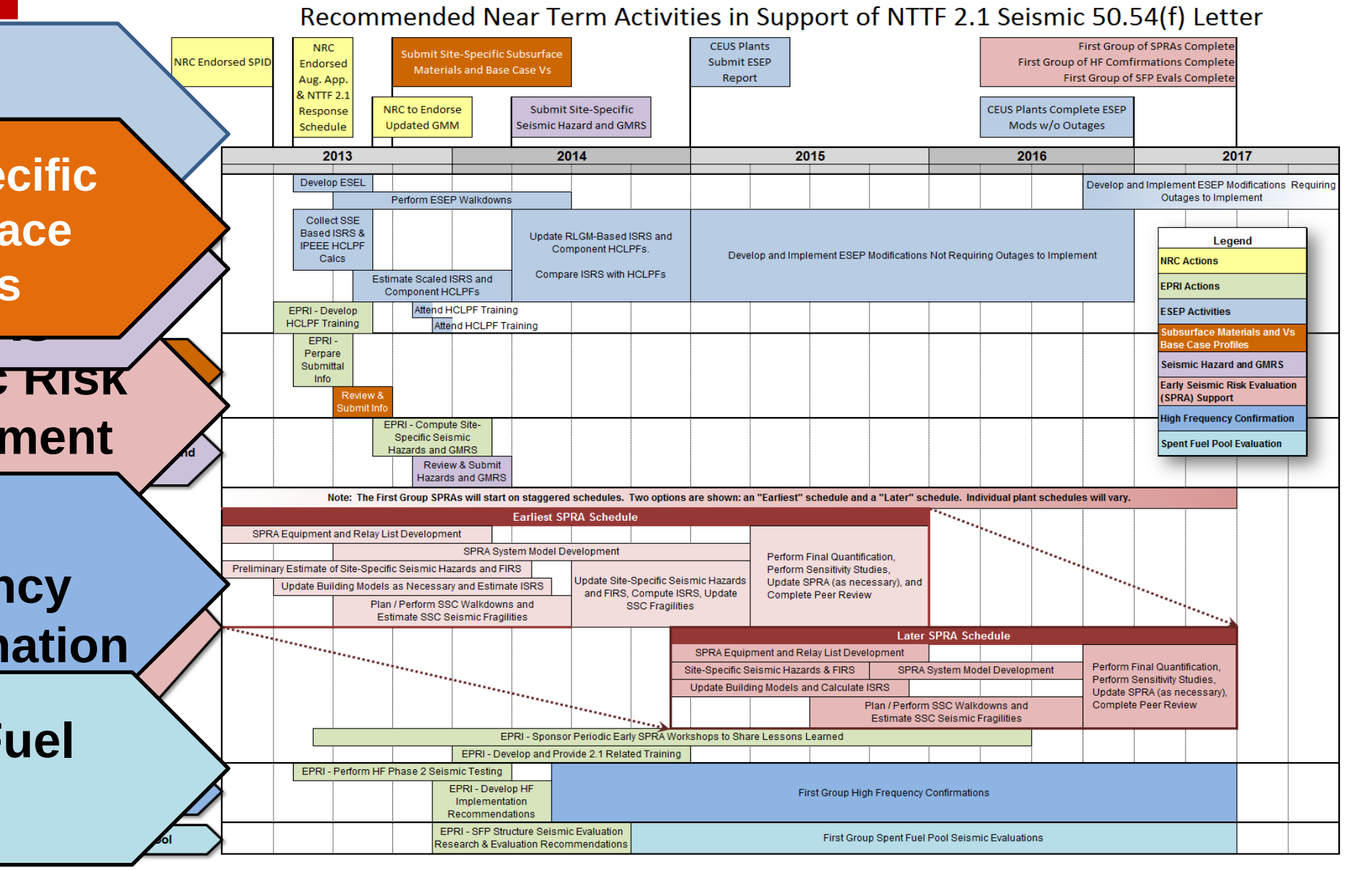
Engineering of Structures and Building Enclosures

Significant Progress Completed in Short Amount of Time ……

but considerable challenges remain

The Schedule for 2.1 Seismic Is Challenging



Remaining Challenges

- Detailed SPRAs require significant resources and schedules to complete
- Technical methods still under discussion
- Resulting seismic risk values are driven by very high uncertainties
- Changes in key elements that drive seismic risk
- Acceptable risk vs modifications vs development of more accurate seismic risk methods
- Capabilities to Support SPRA Peer Reviews
- Managing Periodic Updates of Hazard