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Fukushima Daiichi
What have we learned?

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EPRI Fukushima Research and Development

- **Immediate Response**
  - Water Treatment and Radiological Control
  - Spent Fuel Pool Analyses
- **Short Term Actions**
  - Severe Accident Management
  - Radiological Release Mitigation Strategies
  - Flooding and Portable Mitigation Equipment
  - Accelerated Seismic Research
- **Long Term Understanding**
  - Fukushima Technical Evaluation
  - Modular Accident Analysis Program (MAAP)
  - External Hazard Research
  - Other Accident Issues
  - Accident Tolerant Fuel

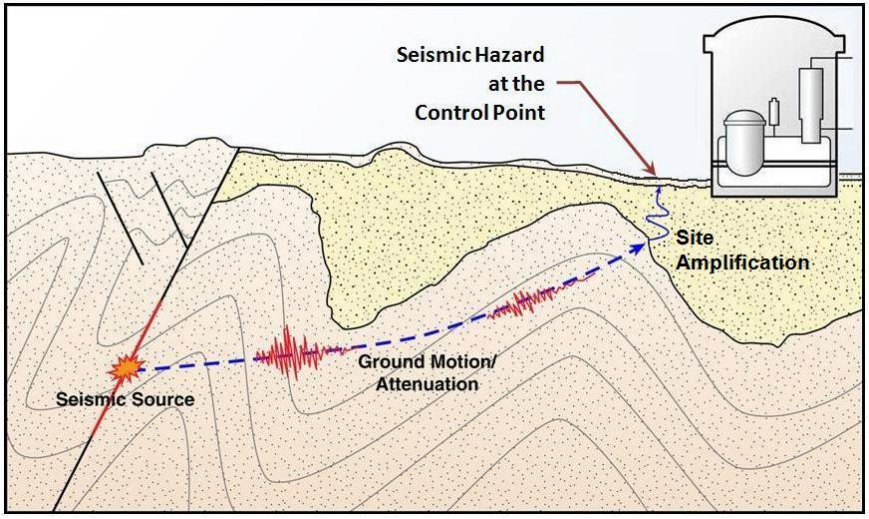
Accelerated and Long Term Seismic Research

Seismic Risk Research

- Better understanding of seismic hazard
- Improved assessment of structural response
- Improved analysis of failure potential for structures and components (“fragility”)
- Better modeling of impacts in risk assessments

Post-Fukushima Research

- Improved ground-motion models
- Extensive testing of components for sensitivity to high-frequency motion
- Evaluation of operating experience to inform seismic fragilities
- Probabilistic Risk Assessment (PRA) modeling of seismic effects and human reliability



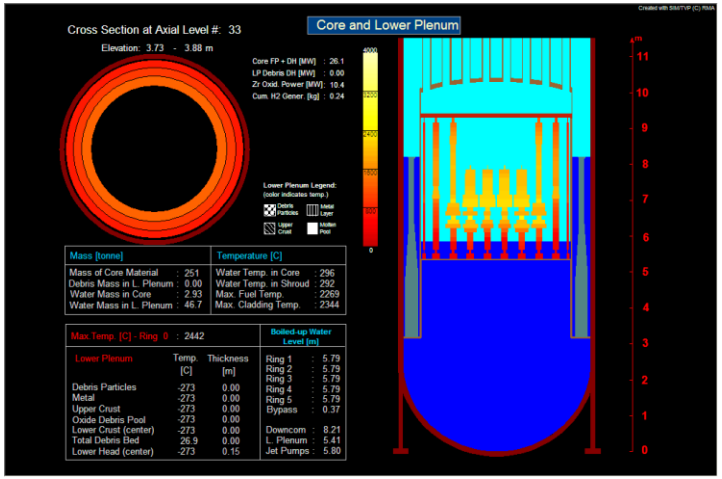
Fukushima Technical Evaluation

Objectives

- In-depth technical understanding of accident
- Sound basis for longer-term industry decisions
  - Enhanced analytical models for subsequent analyses
  - International benchmarking and gap analyses

Tasks underway

- Confirm and document event progression
- Compile and assess radiological transport and contamination data
- International benchmarking



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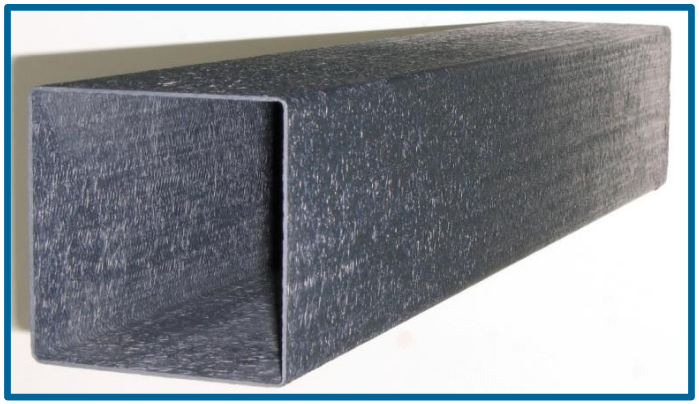
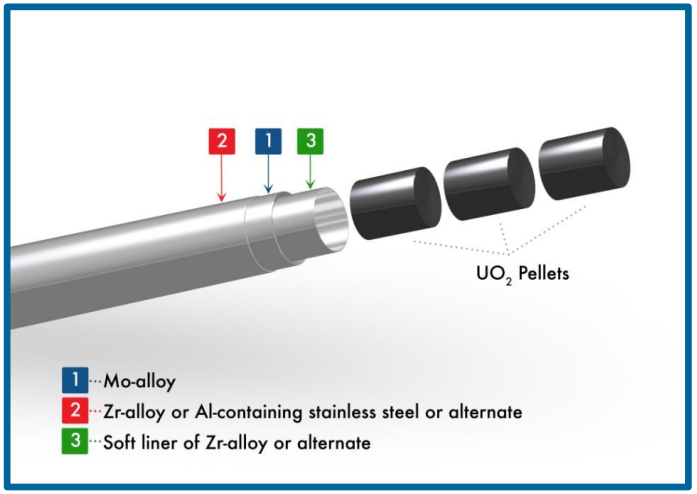
Accident Tolerant Fuel

- **Question:** what if there was no zirconium in the core?
  - Lower hydrogen production
  - Longer mitigation time
- **Research task:** evaluate the feasibility of concepts for fuel and core structures
  - Silicon Carbide BWR fuel channels
  - Molybdenum fuel cladding concepts
- **EPRI's role:** assist global collaboration to accelerate development



BWR Silicon Carbide Composite Channel



Molybdenum Alloy Fuel Cladding

Summary

- **A significant body of research and development has been completed in response to Fukushima**
- Key long term research and development activities
  - Severe accidents – continue to learn from Fukushima to
    - Inform the global understanding of severe-accident management
    - Improve the ability to predict outcomes to aid in event response
  - External events – continue developing methods for assessing external hazards to better understand and manage risks
  - Other areas – continue to developed a better understanding of
    - Interactions for events affecting multiple units at a site
    - Accidents that persist and evolve over longer periods
    - Human response and reliability

Much has been learned and implemented: the global nuclear industry is safer as a result

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