

# **NTTF 2.1 Spent Fuel Pool Evaluations Status**

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**NRC Meeting on Recommendation 2.1  
July 15, 2015**



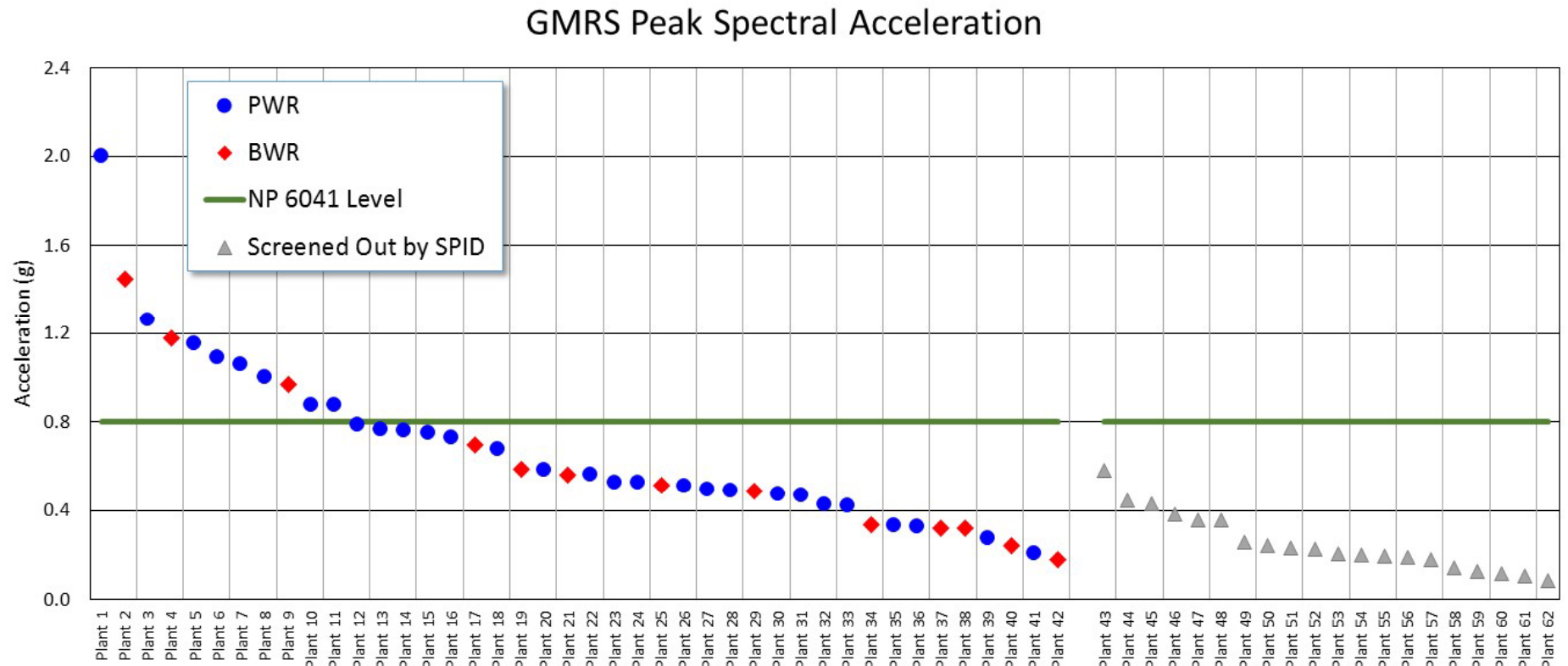
# Presentation Outline

- Project Status
- Treatment of Low/Moderate GMRS Sites
  - Structural Review Based on EPRI NP-6041
    - Draft White Paper Completed
  - Treatment of Non-Structural Considerations
- Next Steps

# Phased Approach to SFP Evaluations

- Phase 1 (2015-2016):
  - Evaluation of Low/Moderate GMRS Sites (White Paper)
    - NP 6041 evaluation of structural elements below 0.8g
    - Evaluation of non-structural considerations below 0.8g
  - Industry SFP design survey
  - Finalize benchmarking/evaluation
- Phase 2 (2016-2017):
  - Identify two representative sites for detailed evaluation
  - Perform analysis when ISRS from the two representative sites (above 0.8g) are provided from SPRA model(s)

# Distribution of SFP Seismic Reviews of US NPP Sites



# Structural Review for Low/Moderate GMRS Sites



## **Approach for NTTF 2.1 Review of Spent Fuel Pool Structure Adequacy to New Seismic Hazard**

- Alternate approach and justification for SFP structure seismic adequacy being undertaken by the industry
- Graded Approach
  - Seismic Adequacy Approach of Lower GMRS Plants (peak 5% damped spectral acceleration,  $<0.8g$ ) based on development of HCLPF on a plant specific basis
  - Assessment of Higher GMRS Plants using representative analyses to verify seismic adequacy
- EPRI is developing SFP structure white paper(s) to:
  - Present a justification for the seismic adequacy verification for those nuclear plant sites with lower GMRS (draft of structural portions available today)
  - Present a justification for the seismic adequacy verification for sites with higher GMRS
- Draft Available for Review at July 15 NRC meetings

# Non-Structural Review for Low/Moderate GMRS Sites





## Non-Structural SFP Considerations

- The SPID Section 7 identifies the following non-structural considerations that could affect the ability of spent fuel pools to maintain SFP inventory 72 hours. These are:
  - 1) Penetrations that could lead to uncovering the fuel
  - 2) SFP cooling function failures that could lead to siphoning inventory from the pool
  - 3) Sloshing losses
  - 4) Evaporative losses
- These effects will be incorporated into the low/moderate GMRS SFP seismic review white paper for NRC review



# Non-Structural Considerations

## ■ Sloshing

- Plant-specific calculations confirm low frequency (0.1-1.0 Hz)
- Several foot slosh heights based on conservative calculations
- NRC SFP Scoping Study, which had a CEUS spectral shape anchored at 0.7g PGA, indicated that sloshing amplitudes were less than 20 inches

## ■ Penetrations

- Limited number of SFPs have low piping penetrations (survey substantiates this assumption)
- Included in scope of seismic 2.3 walk-downs:
  - Interactions/corrosion/degraded conditions assessed
  - Components susceptible to rapid drain down assessed
- Detailed studies indicate small SFP displacements/distortions (NRC Scoping study)
- Piping/penetration ductility will accommodate distortions

# Non-Structural Considerations

## ■ Potential for Siphoning

- SPID Section 7.2.3 provides guidance for assessing SFP cooling function failures that could lead to siphoning inventory from the pool
- Category I SFP Cooling piping and passive valve components satisfy the 0.8g peak SA screening criteria (EPRI NP-6041)
- The SFP cooling system was assessed for corrosion, potential seismic interaction, and degraded anchorage as part of the NTTF 2.3 Seismic Walkdown effort
- Based on the above, it is judged that the risk of SFP siphoning is not significant

## ■ Evaporative Losses

- The SPID, Section 7.3.1, requires an assessment of evaporative losses for failure of piping systems connected above the top of the fuel
- Evaporation alone is not enough to uncover the fuel in 72 hours

## Next Steps

- Phase 1 (2015-2016):
  - Evaluation of Low/Moderate GMRS Sites (White Paper)
    - NP 6041 evaluation of structural elements below 0.8g
      - NRC Feedback Requested
    - Next Draft will include evaluation of non-structural considerations below 0.8g
  - Industry SFP design survey
  - Finalize benchmarking/evaluation
- Phase 2 (2016-2017):
  - Identify two representative sites for detailed evaluation
  - Perform analysis when ISRS from the two representative sites (above 0.8g) are provided from SPRA model(s)



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