



RIC 2013 PWROG Program to Address NRC GSI-191

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The PWR Owners Group



PWROG In-vessel Fiber Program Overview

- Program Objective
- Organization and Program Development
- Technical Program
- Plant Data and Assumptions
- Program Status
- Expectations
- Schedule

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The PWR Owners Group



Program Objective

- Establish defensible acceptance criteria to ensure long term core cooling
 - PWROG GSI-191 deterministic in-vessel fiber program supports resolution of the in-vessel issues for Option 2 plants
 - Program results will provide higher limits than WCAP 16793, R2
 - Limits applicable to groups of plants as opposed to a single bounding limit
 - Higher limits will minimize insulation modifications and will provide margins for future operability issues

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Organization and Program Development

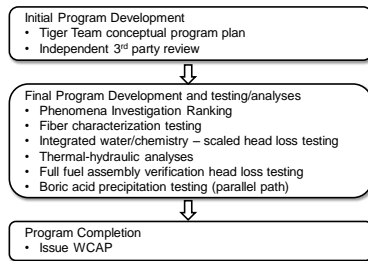
- Revised program initiated as a result of PWROG Executive Management Group direction
- Technical oversight (Tiger Team) formed and conceptual program developed
- PWROG sponsored programs for testing / analysis
- Program includes diverse expert review and assessment
- Industry collaboration and NRC communication

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Technical Program

• Overview



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Technical Program (continued)

- Fiber characterization testing
 - Program objective is to establish representative fiber length distribution for input to FA head loss testing
 - Test results representative of full range of screen designs
 - Test to establish dependence on geometry, flow, chemistry
 - Nukon, mineral wool, ceramic fiber, and Temp-mat
 - Initial preparation using NEI methodology

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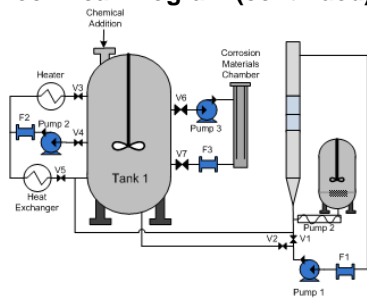
Technical Program (continued)

- Integrated water / chemistry tests and scaled head loss testing
 - Plant survey data identified that plants are much more diverse, leading to smaller bins and more groups of plants to consider
 - Program refinements
 - Expansion of autoclave testing to identify problematic sump fluid chemistry
 - Incorporation of high temperature scaled head loss testing
 - Parallel expansion of flow loop to permit concurrent testing
 - Head loss validation testing in full scale FA test loop

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Technical Program (continued)



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Technical Program (continued)

- Thermal-hydraulic analyses
 - LOCA analysis objective is to determine effects of core inlet blockage on the ECCS core cooling function and to inform FA testing program
 - Analyses to be completed representing appropriately grouped system designs
 - Model includes alternate core bypass flow paths and / or steam generator spillover (hot-leg breaks)
 - Analyses predicated on conservative assumptions and initial conditions

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Program Status

- Fiber characterization testing
 - Testing on-going
 - First test matrix results are being evaluated
- Integrated water/chemistry and head loss program
 - Autoclave tests in process
 - Initial autoclave test results under review
 - High temperature flow loop design review in progress

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Program Status (continued)

- Thermal-hydraulic analyses
 - B&W plant design – Alternate flow paths are a viable option if core inlet is blocked
 - W plant designs w/ up-flow baffles – Analysis results are promising that most plants will be able to demonstrate alternate flow paths are viable as well
 - W plants w/ down-flow baffles – Analyses in progress
 - CE plants may be more challenging
 - W (COBRA-TRAC) and AREVA (RELAP) methods are showing similar results

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Expectations

- Thermal hydraulic analyses indicate that significantly lower core flows needed for core cooling
- In-situ corrosion product formation expected to demonstrate prototypical materials
- Test program will produce defensible results based on appropriate technical development
- All plant groups are expected to realize increased allowable in-vessel fiber load

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Schedule

Milestone	Start	Completion
NRC Status	March, 2013	
PIRT	On-going	March, 2013
Fiber Characterization	On-going	April, 2013
Thermal-hydraulics	On-going	July, 2013
Autoclave Testing	On-going	June, 2013
Integrated Testing	June, 2013	January, 2014
Confirmatory Testing	January, 2014	February, 2014
Boric Acid Precipitation (Design)	On-going	April, 2013
