

PWR Owners Group RCP Shut Down Seal Program

# Reactor Coolant Pump Shut Down Seal PRA Model

WCAP-17100-P/NP

Post-Submittal Presentation to NRC

January 13, 2010

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Westinghouse Non-Proprietary Class 3

1



# AGENDA

1300	Introduction and Purpose	Jeff Stone/PWROG
1310	Topical Report Overview	Bob Lutz/WEC
1330	End of Non-Proprietary Part of Meeting	
1330	Testing	Bruce Howard/WEC Judy Hodgson/ WEC
1430	Break	
1445	Impact on Analytical Models	Bob Lutz
1500	RAI Responses	Judy Hodgson
1600	Summary	All
1615	Adjourn	

# Introduction and Purpose

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Jeff Stone

Constellation

&

Chairman, PWROG Risk Management  
Subcommittee



# Background

- Westinghouse developed a passive thermally actuated device (Shut Down Seal) to limit Westinghouse RCP seal leakage to very low rates during loss of all seal cooling event
- PWROG is sponsoring development of PRA model crediting this device in risk-informed applications, including submittal of a topical report to NRC for review and approval
- WCAP-17100-P/NP was submitted to NRC in July 2009 and included commitments to share the results of ongoing testing with NRC at a later date.
- Draft NRC RAIs were discussed via telephone conferences in September and October of 2009
- Formal RAIs were received in December 2009

# Requested Review and Approval

- PRA Model for the Westinghouse Shut Down Seal that describes its behavior under a loss of all seal cooling event
- Deterministic model for the Westinghouse Shut Down Seal that describes its behavior under a loss of all seal cooling event

# Meeting Purpose

- The purpose of this meeting is
  - Discuss additional testing completed since July 2009 submittal of WCAP-17100-P/NP and the impact on the PRA and deterministic models
  - Discuss Draft responses to NRC RAIs

# Overview of Topical Report

Bob Lutz

Risk Applications and Methods

Westinghouse

# Proprietary vs. Non-Proprietary

- WCAP-17100-P is the Westinghouse Proprietary Class 2 version of the Topical Report
  - Contains detailed performance information and PRA models that, as detailed in affidavit accompanying the report:
    - Would create value for a competitor
    - Contains testing results and interpretations
    - Is funded by only certain PWROG members with Westinghouse RCP seals
- WCAP-17100-NP is the Westinghouse Non-Proprietary version of the Topical Report
  - Identical page format with Proprietary information deleted



# Schedule

Complete Prototype / Beta Testing	April 2009
Intermediate Design Review	June 2009
Topical Report Submittal	July 2009
Complete Final Design Testing	Fall 2009
Final Design Review	Fall 2009
Topical Report Supplement for Final Testing	Jan 2010
First Plant Installation	Spring 2010

# Documentation of Additional Testing

- Originally Westinghouse proposed that additional testing of the Shut Down Seal designated as 'planned' or 'in-progress' in WCAP-1700-P/NP be provided as a Supplement to the topical report.
- In order to make the original report technically and editorially accurate and to reference to the Supplement as applicable, significant changes would be necessary
- Westinghouse now proposes to revise the original topical report to include the additional testing and provide the additional information requested in the NRC RAIs
  - A single document that includes all information to support the proposed PRA and deterministic models for the Shut Down Seal would be most useful for future reference by industry and NRC

# Documentation of Additional Testing

- Changes to the WCAP-17100-P/NP Revision 0 include:
  - Addition of descriptions and results of testing completed since July 2009
  - Editorial changes to delete 'planned' or 'in-progress' and refer to the additional tests and test results
  - Changes to discussions of O-rings based on a design change since July 2009
  - Changes to the PRA model as a result of the additional testing
  - Editorial changes for accuracy (e.g., psi to psia or psig) or clarification

# Documentation Provided

- The following information is being provided to NRC at this meeting:
  - Draft Revision 1 to WCAP-17100-P (along with a Proprietary Affidavit) in two formats:
    - 3 hardcopy versions with all changes noted using WORD 'Track Changes' feature
    - 3 hardcopy versions with all 'changes accepted'
  - Draft PWROG response to RAIs (Non-Proprietary)
- The PWROG proposes to formally submit WCAP-17100-P and NP in early February reflecting any additional NRC input from today or that provided by NRC before January 20

# Overview of Topical Report

Judy Hodgson

Rotating Equipment Services

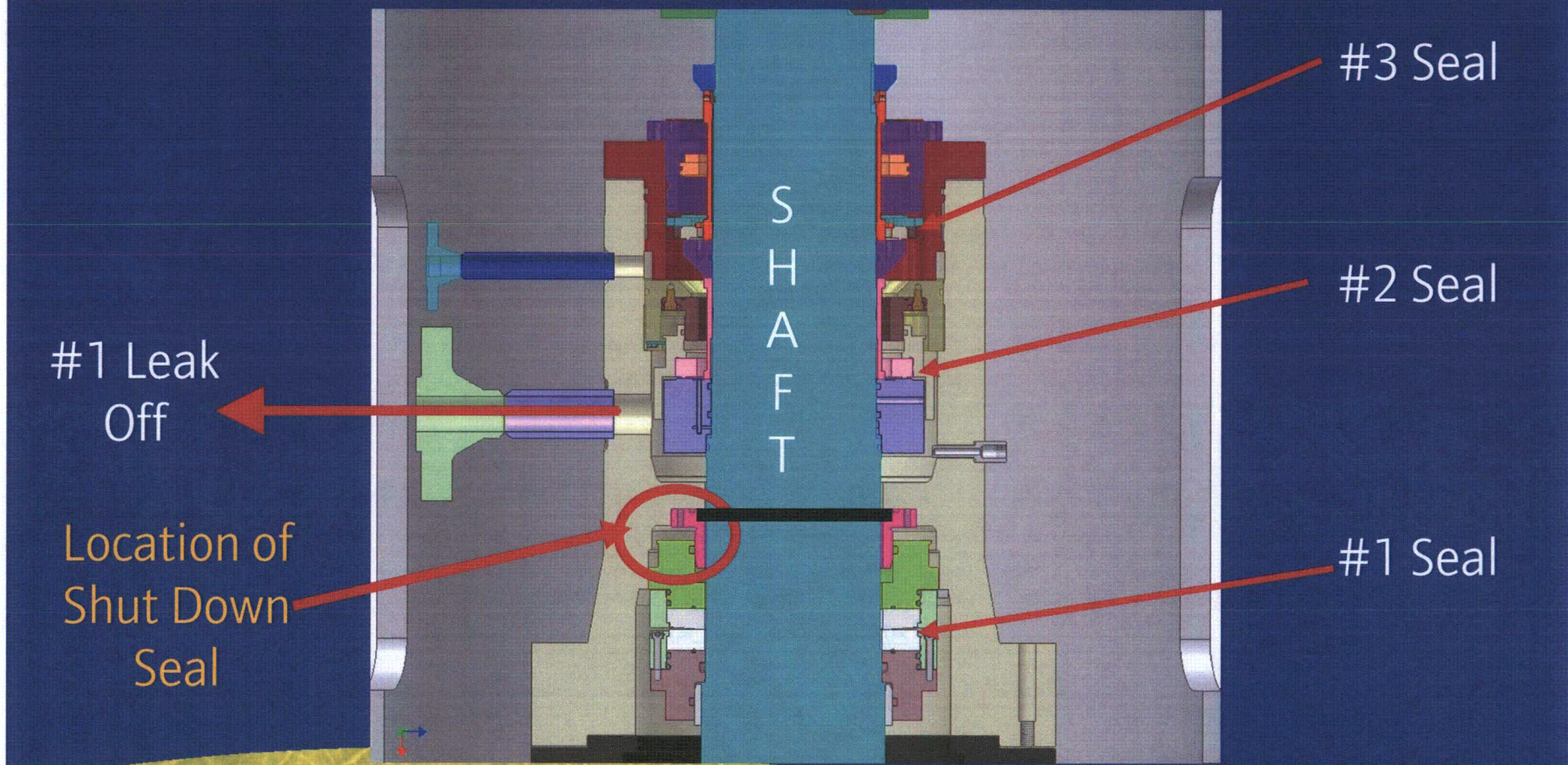
Westinghouse

(for information if requested)



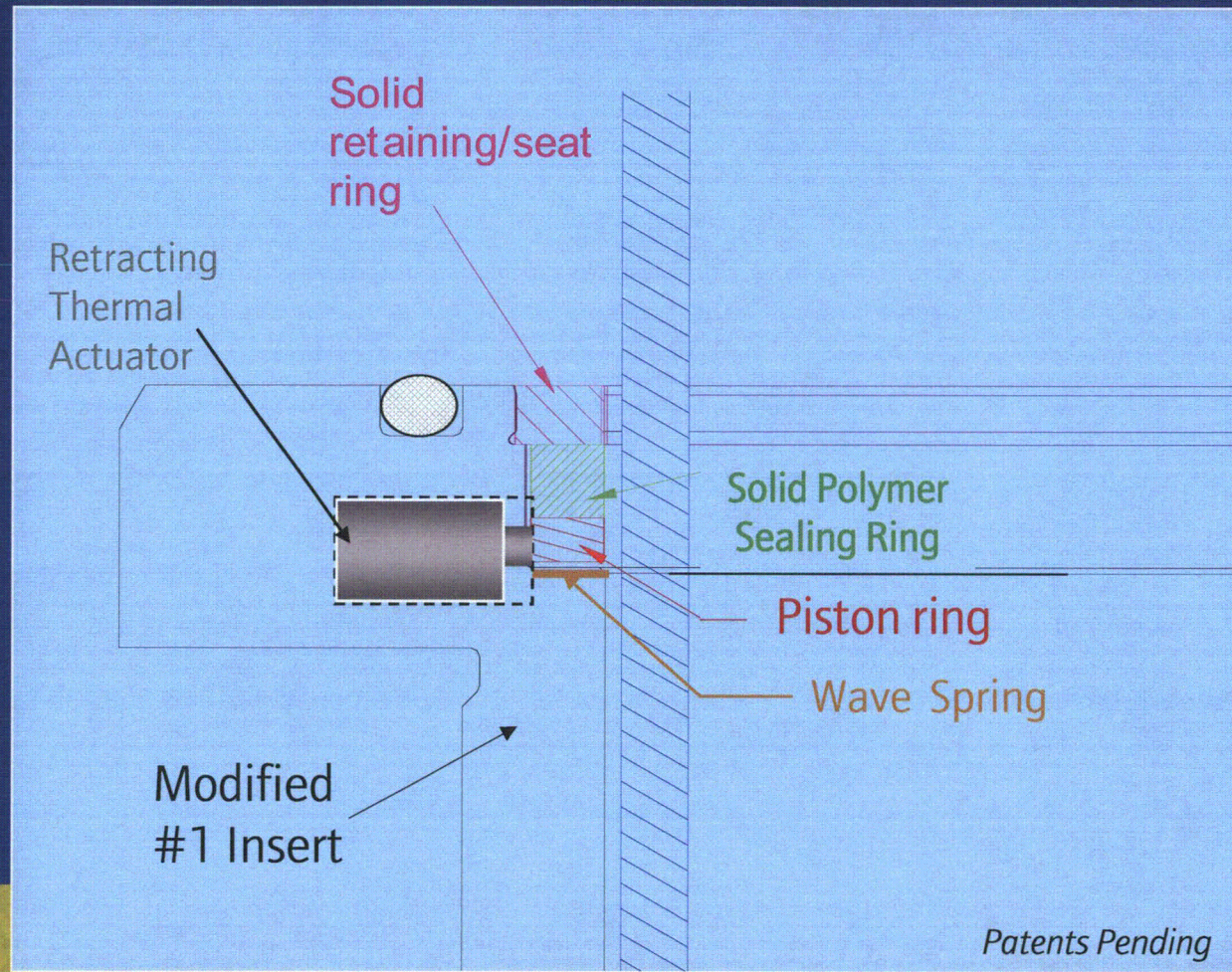


# Reminder: How Shut Down Seal Works





# Shut Down Seal





# Functional Specification

- <1 gpm
- 28 hr SBO conditions 570°F/2350 psia
- 44 hr RHR conditions 350°F/375 psia
  - Drop T within 1.5 hour
- 72 hr protection of Core
- Actuate between 250°F - 290°F



# Basis for Analysis and Testing

- Detailed, comprehensive Failure Modes and Effects Analysis (FMEA) guided development program
- Key Failure modes addressed:
  - Inadvertent actuation for at-power condition
  - Failure to actuate
  - Failure to seal tight when actuated
  - Failure to maintain tight seal once initially sealed
    - Failure to withstand long-term exposure to hot RCS fluid
    - Failure to withstand RCS cooldown
    - Failure to withstand pump shaft rotation

# Testing Philosophy

- Testing is expensive, but is needed to support reliability targets and PRA model
- Westinghouse solution: test key SDS components to establish a statistical basis for PRA model
  - Thermal piston
  - Retracting Actuator
  - Piston ring / Polymer ring / Retaining ring
- Limited testing of complete SDS installed in overall seal package

# QUESTIONS

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END OF NON-PROPRIETARY SESSION