

RCS Leakage

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Agenda

- ◆ Introduction
- ◆ Issue Description
- ◆ Presentations
 - WOG
 - BWROG
- ◆ Closing

NRR letter sent to NEI in July 2005

- Subject: Actions Taken In Response To Reactor Coolant System Leakage
 - Discuss typical plant actions taken in response to unidentified leakage (e.g., action levels and response),
 - Discuss actions the industry is currently taking, or is planning to take, to standardize and improve plant-specific leakage monitoring programs in light of the safety issues discussed, and
 - Discuss the schedule for these activities.
- Response: Informational meeting September 2005



Reactor Coolant System Leakage Monitoring *BWR Perspective*

Industry Meeting with NRC

September 29, 2005

White Flint

Tom Veitch (First Energy Corp)

Chairman, BWROG RCS Committee

BWROG

AGENDA

- Current BWROG RCS Leakage Committee Activities.
- BWR Drywell Leakage Definitions.
- BWR RCS Leakage Design Bases.
- Typical BWR Plant Action Response to Unidentified Drywell Leakage.
- Planned BWROG Actions.

BWROG

INTRODUCTION

- **BWROG formed a Generic RCS Committee in 2004.**
- **Objectives:**
 - Develop Best Practices for monitoring and managing BWR RCS leakage.
 - Support industry efforts to provide BWR perspective on any RCS leakage-related initiatives.
- **Work Tasks:**
 - Assess current BWR RCS leakage monitoring capability
 - Monitor industry RCS activities
 - Participated in WOG RCS Workshop: June 2004

BWR DRYWELL LEAKAGE DEFINITIONS

- **Identified Drywell Leakage:**
 - Leakage from specific components (e.g., pump seals, valve packing) captured and conducted to a dedicated sump or collection tank (e.g., equipment drain sump).
- **Unidentified Drywell Leakage:**
 - Leakage captured by an alternate sump (e.g., floor drain)
 - This includes leakage from both RCS and non-RCS sources in the drywell.

BWR RCS Leakage Design Bases

- Zero Reactor Coolant Pressure Boundary (RCPB) leakage.
- TS RCS unidentified leakage limit (5 gpm) reflects a small fraction of calculated flow from critical pipe break.
 - Based on “leak before break” assumptions.
 - Designed to allow sufficient time to act prior to critical crack propagation.
- Improved TS include unidentified leakage criteria
 - An “increase > 2 gpm within 24-hour period” condition.
 - Ensures further evaluation of potential accelerated flaw propagation.
- BWR RCS is not borated and not susceptible to boric acid corrosion.
- Mass balance calculations are not applicable to BWRs.

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BWR PLANT ACTIONS-DRYWELL UNIDENTIFIED LEAKAGE

- BWRs have programs that require monitoring and trending of unidentified drywell leakage.
- BWR action plans have administrative limits.
 - Plant specific thresholds and actions vary.

BWR PLANT ACTIONS-DRYWELL UNIDENTIFIED LEAKAGE

- **Typical activities in the plant response to reaching an administrative limit:**
 - Increase monitoring and trending of leakage rate.
 - Review plant history and recent evolutions for “suspect” sources.
 - Review other leakage detection information.
 - Perform chemistry/atmospheric analyses.
 - Remove systems from service (or reduce flow) to assess impact on leakage rate.
 - Develop plant response for anticipated shutdown and drywell entry.
 - Initiate a Condition Report.

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BWR PLANT ACTIONS-DRYWELL UNIDENTIFIED LEAKAGE

(Continued)

- **Typical BWR action plans include:**
 - Management review.
 - Contingency actions for increased leakage.
 - Identification and resolution of the source of increased leakage.
- **Actions are initiated at leakage rates well below Tech Spec limits.**

BWROG

PLANNED BWROG ACTIONS

- **BWROG is developing a best practices document that will:**
 - Capture strong elements from existing BWR programs.
 - Be shared with PWRs and refined based on knowledge of any PWR effort.
 - Be available to all members to refine existing BWR programs.
 - Be completed in 2006 (projected).
- **BWROG will continue to coordinate with WOG activities.**

Westinghouse Owners Group (WOG) RCS Leak Rate Programs

Industry Meeting with NRC

September 29, 2005

White Flint – Rockville, MD

Cal Walrath (Exelon – WOG)

Howard Crawford (Exelon – B&WOG)

Joe Congdon (W – WOG)



WOG RCS Leak Rate Programs

Agenda

- Background
- Typical PWR Action Levels and Response
- Current WOG Programs
 - Standardize RCS Leak Rate Calculation
 - Standardize RCS Leakage Action Levels and Response Guidelines
- Schedule



WOG RCS Leak Rate Programs Background

- Typical PWR TS Limits:
 - 10 gpm Identified RCS Leakage, 1 gpm Unidentified RCS Leakage
 - Zero Reactor Coolant Pressure Boundary (RCPB) leakage.
- PWR Industry Activities (post Davis-Besse)
 - Inventory balance sensitivity
 - Uniform industry guidance for action levels and responses
 - Early detection capabilities



WOG RCS Leak Rate Programs Background

- WOG Activities
 - WOG RCS Leak Rate Workshop, June 2004
 - Workshop Action Items:
 - Standardize RCS leak rate calculation
 - Standardize Action Levels and Response to elevated leak rates
 - Improve other leak detection and monitoring techniques
 - Standard RCS Leak Rate Calculation Guidelines project authorized in October 2004 and started in January 2005
 - Standard RCS leakage Action Levels and Guidelines project authorized in June 2005 and started in July 2005



WOG RCS Leak Rate Programs

Typical PWR Action Levels and Response

- Plants have administrative limits, however thresholds and actions vary.
 - Typically the response is progressive: from low levels up to the TS limit
 - Typical thresholds are on the order of 0.1 to 0.2 gpm increasing unidentified leakage or deviation from baseline unidentified leakage.
- Plants have action plans and/or Abnormal Operating Procedures.
 - Formal plans are proceduralized.
 - Informal plans are based on Corrective Action Program or troubleshooting procedures.



WOG RCS Leak Rate Programs

Typical PWR Action Levels and Response

- Typical plant response to reaching an administrative limit include:
 - Increased monitoring (run confirmatory leak rate calculation).
 - Review recent plant evolutions to determine any “suspect” source(s).
 - Evaluate other leakage detection indications.
 - Initiate a Condition Report.
 - Initiate leak investigation including walk-downs of various portions of potentially affected systems.
 - Notify cognizant system engineers to obtain their input/help.



WOG RCS Leak Rate Programs

Current WOG Programs – Part 1

PWR Standard RCS Leak Rate Guidelines

- Purpose and Objectives:
 - Establish a standard Inventory Balance calculation and technical bases.
 - Provide a consistent industry position on relevant issues.
 - Provide industry ‘best practices’.
 - Provide guidelines that can be used as a tool to help plants evaluate and improve their current program.
 - Consistent and statistically valid results.



WOG RCS Leak Rate Programs

Current WOG Programs – Part 1

Key improvements resulting from project:

- Standardizes validity checks to ensure plant stability throughout calculation interval.
- Standardizes Reporting Temperature.
- Establishes Standard Definitions for leakage terms.
- Establishes rules for addressing leak rate results.
- Defines and describes how to determine ‘Limit of Detectability’.
- Defines Historical Baseline.
- Describes the use of various statistical methods and provides a technical basis.



WOG RCS Leak Rate Programs

Current WOG Programs – Part 2

PWR Standard RCS Leakage Action Levels and Response Guidelines

- Develop standard action levels for:
 - Unidentified and identified leakage as monitored by the RCS Inventory Balance.
 - Containment sump (level or discharge flow) monitor.
 - Containment atmosphere radioactivity monitoring.
 - Containment air cooler condensate flow rate monitor.
- Evaluate proposed standard Action Level Criteria against industry experience (actual RCS leakage events).
- Develop standard guidance for conducting a RCS Leakage Investigation.



WOG RCS Leak Rate Programs

Current WOG Programs – Part 2

Potential action levels:

- Unidentified leak rate based on inventory balance results
 - An absolute value (plant specific)
 - Deviation from mean or historical baseline
 - Accumulated leakage value



WOG RCS Leak Rate Programs Projected Schedule

- November 2005 – Complete final draft of Standard RCS Leak Rate Guidelines.
- April 2006 – Issue draft RCS Leakage Action Levels and Response Guidelines.
- June 2006 – Complete evaluation of Guidelines at pilot plants.
- September 2006 – Issue final Standard Methodology and Leak Rate Guidelines.
- September 2006 – Issue final RCS Leakage Action Levels and Response Guidelines.

