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# **T<sub>Cold</sub> RPV Upper Head Action Plan**



**Anne Demma**

MRP Program Manager, EPRI



**MRP/NRC Technical Meetings**

**June 6-10, 2011**

# Topics

- Byron 1 RV Head Inspection Summary
- MRP OE Evaluation Screening Questionnaire
- T<sub>cold</sub> RV Head Fleet Reinspection Plans
- ASME CC N-729-1 Technical Basis Documents
- Review MRP Actions

# Byron 1 RV Head Inspection Summary – March 2011

- CRDM inspections required by CC N-729-1
  - B1R17 Refuel Outage
  - UT & PT indications in penetrations 64, 76, 43 & 31
  - Indications just below & at the J-groove weld
  - “Low” susceptibility  $T_{\text{cold}}$  head  $\sim 557^{\circ}\text{F}$
- Head fabricated by B&W
- CRDM penetration tubes
  - Nominal 4” dia. x 0.625” wall
  - B&W material heats
- Previous volumetric inspection in 2005
- PWSCC assumed

# MRP OE Evaluation Screening Questionnaire

1. *Have similar indications been found previously in this generic location?*
  - Yes
  
2. *Have the likely or presumed degradation mechanisms been previously associated with this generic location?*
  - Yes – PWSCC is the likely degradation mechanism and has occurred at this location in a number of other A600 RV heads

# MRP OE Evaluation Screening Questionnaire

3. *Are the critical characteristics of the indication(s) consistent with previous operating plant experiences relative to:*
- *Indication location*
    - Yes
  - *Indication length*
    - Yes
  - *Indication depth*
    - Yes
  - *Indication orientation*
    - Yes - Indications were predominantly axial with one circ indication identified below the weld toe.
  - *Number of such indications in similar locations*
    - Yes
  - *Number of such indications in this specific location*
    - Yes
  - *Extenuating circumstances at this specific location (+ or -)*
    - This is a T<sub>cold</sub> RV head, so this represents a new but not entirely unexpected development relative to US domestic experience with this material

# MRP OE Evaluation Screening Questionnaire

4. *Is there an industry-issued management plan in place that is capable of ensuring continued safe operation of any plant by the timely identification of this class of indications in this generic location?*
- Yes – ASME CC N-729-1 as mandated by NRC Rulemaking provides guidance for inspection-based management of service-related degradation at this location.
5. *Was this indication identified as a direct result of implementing requirements of a site-specific or industry mandated management program for this generic location?*
- Yes – the required reinspection under CC N-729-1 was being implemented and led to the discovery of these indications.

# MRP OE Evaluation Screening Questionnaire

## 6. NDE

- *What methods were applied and what is the qualification status of each relative to existing qualification requirements?*
  - UT examination of this location is addressed under 10 CFR 50.55a(g)(6)(ii)(D)(4)(i) through (iv) and these exams were duly qualified
  - PT procedure qualification is addressed by the vendor's and owner's NDE special processes programs
- *Were there any unique aspects or extenuating circumstances associated with the inspections performed?*
  - No
- *Do the inspection results seem consistent with prior experience, analytical predictions, and engineering judgment?*
  - Yes – the NDE data has been reviewed by multiple experts including those at the EPRI NDE Center along with data from the 2005 exam. Some indications appeared to reflect growth from the previous 2005 exam results.

# MRP OE Evaluation Screening Questionnaire

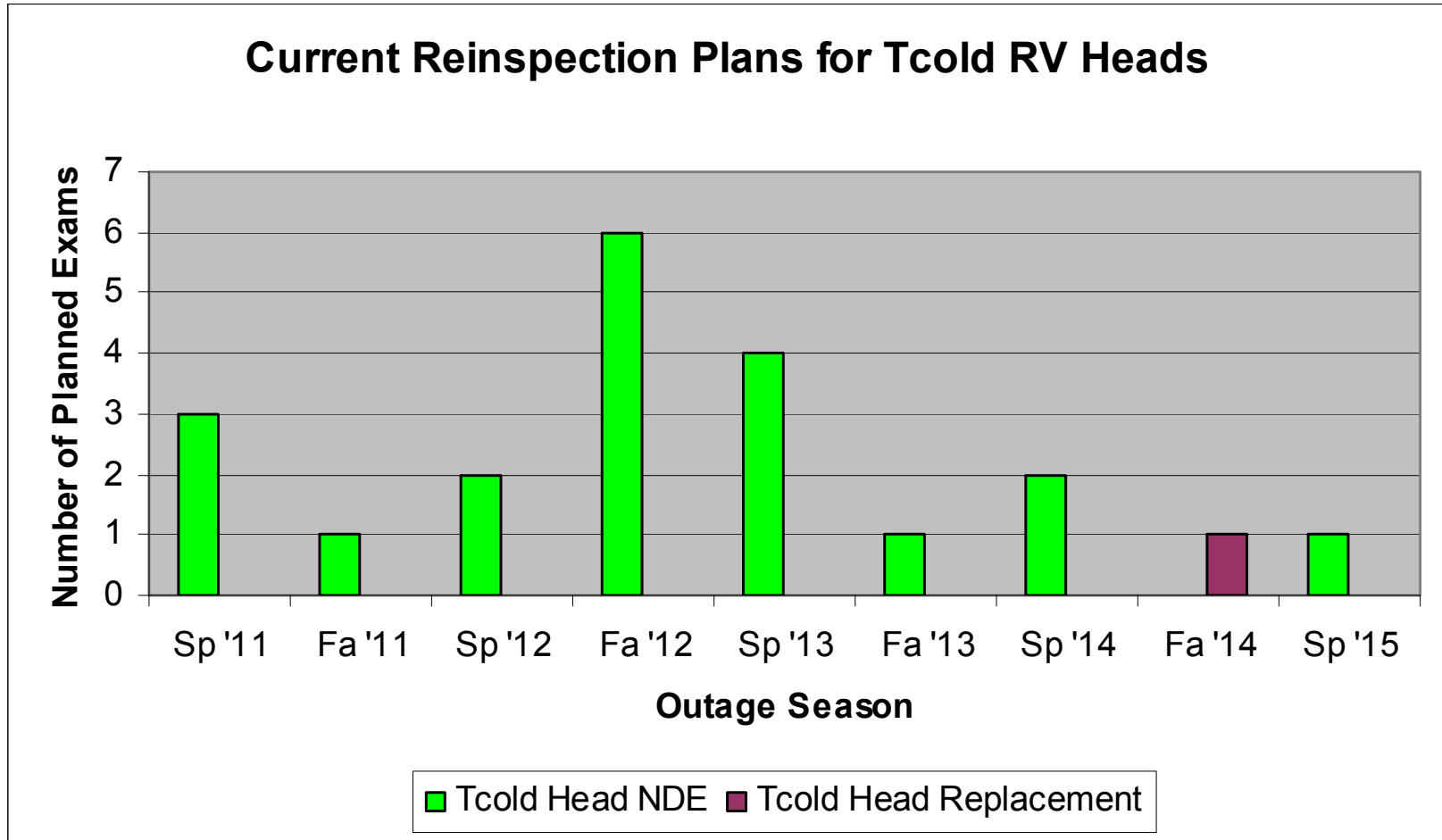
7. *Is this indication or set of indications clearly bounded in a robust manner by existing site-specific or generic industry analyses?*
- Yes
8. *Is there anything about this indication that would suggest it appropriate to re-evaluate any program requirements, previous inspection results, or upcoming inspection plans?*
- Initial qualitative assessment indicates that Code Case N-729-1 remains acceptable.
  - Although the indications were not safety significant in their orientation, did not challenge structural integrity of the penetration, and did not leak, the timing of identification of PWSCC in a  $T_{\text{cold}}$  RV head was sooner than may have been expected.
  - MRP will review the inspection program technical basis in light of this event.



# US PWR RV Head Inspections

- Baseline volumetric exams
  - Completed for US PWR fleet in accordance with NRC First Revised Order EA-03-009
  - Completed in 2008
- Re-inspections for  $T_{\text{cold}}$  RV heads
  - Order replaced by CC N-729-1
  - Lesser of 2.25 RIY or eight calendar years
  - First volumetric re-inspections of  $T_{\text{cold}}$  RV heads just beginning
  - Temporal distribution of upcoming inspections presented in next slide

# T<sub>cold</sub> Head Reinspection Plans



# Inspection Plan Technical Basis

## ASME CC N-729-1

- Code Case initially developed from MRP-117
- Technical basis resides within a set of MRP Reports including:
  - MRP-110
  - MRP-103
  - MRP-104
  - MRP-105

# Inspection Plan Technical Basis Review

- Complete a review of the technical basis for ASME CC N-729-1
  - Qualitative/semi-quantitative
  - Address potential impact of OE on underlying analyses and conclusions
- Substantiate the continued validity of  $T_{\text{cold}}$  head inspection requirements

# Bottom Mounted Nozzle Implication Evaluation

- The implications of all CRDM conclusions reached will be reviewed relative to the current BMN inspection requirements (CC N-722) and susceptibility to PWSCC.

# Inspection OE Review

- The role of inspection requirements, procedures, and personnel in cases of OE are routinely reviewed for lessons learned
  - Inspection process observations from Byron 1 have been reviewed
  - Process improvement opportunities will be communicated to licensees and inspection vendors as appropriate

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