WOG - NRC Meeting

NRC Requests for Additional Information Associated with Plant-Specific Applications of WCAP-14572 Rev. 1-NP-A

May 14, 2003

Agenda

- Objectives
- Background
- Summary of Requests for Additional Information (RAIs)
  - Multiple Pipe Size Segments
  - Expert Panel Justification
- Proposed Resolution of RAIs

Objectives

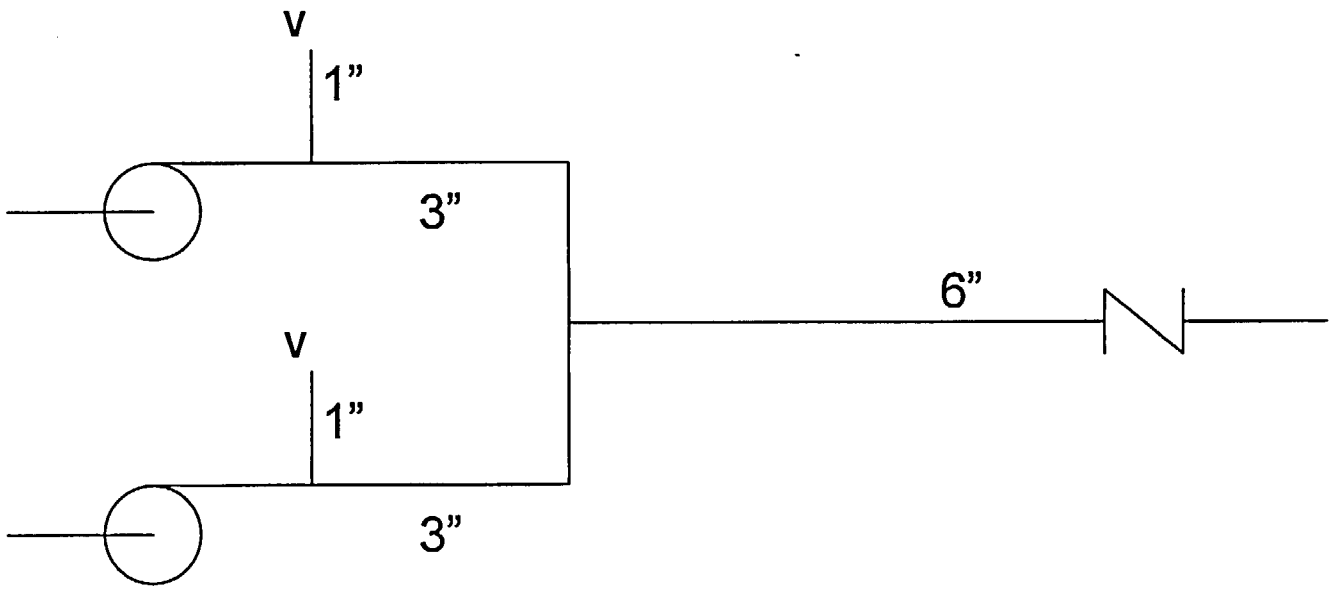
- Discuss NRC RAIs on plant-specific implementations of WCAP-14572 Rev. 1-NP-A
- Propose resolution of RAIs

Background

- NRC issued a Safety Evaluation Report for WCAP-14572 in December 1998
- Four licensees received similar RAIs on plant-specific applications of the WCAP-14572 methodology
- Plant specific responses will lead to additional examinations that incur radiation exposures and have an insignificant impact on safety
- WOG letter WOG-03-218 dated April 21, 2003 summarizes WOG / NRC interactions and technical issues

Multiple Pipe Size Segment RAI

Example of a Segment with Multiple Pipe Sizes



Multiple Pipe Size Segment RAI

Structural Reliability and Risk Assessment (SRRA) Inputs

Parameter Inputs

- Nominal pipe size
- Thickness to O.D. ratio
- Type of piping material
- Crack inspection interval
- Crack inspection accuracy
- Temperature at pipe weld
- Initial flaw conditions
- System disabling leak
- Minimum detectable leak

Degradation Inputs

- Normal operating pressure
- Residual stress level
- DW & thermal stress level
- Stress corrosion potential
- Material wastage potential
- Vibratory stress range
- Fatigue stress range
- Low cycle fatigue frequency
- Design limiting stress

Multiple Pipe Size Segment RAI

NRC RAI

- Place all degradation mechanisms in the segment on a single weld
- If results are overly conservative, split the segment

Response to RAI

- Calculate failure probability for each pipe size
- Inputs to the failure probability based on the realistic limiting inputs associated with the entire segment or pipe size
- Select the highest failure probability to represent the segment
- Dividing these segments is considered multiple times

Multiple Pipe Size Segment RAI

Technical Impacts

- Potential Difference in High Safety Significant (HSS) Segments
  - For a HSS segment, additional examinations would result in a minimal risk benefit if the segment is split, since a minimum of 1 examination is conducted per HSS segment (1 examination per sub-segment versus 1 examination per segment)

Multiple Pipe Size Segment RAI

Technical Impacts (cont.)

- Additional Considerations
  - Pipe segments with active degradation and moderate-to-high safety consequences are properly identified in plant-specific applications
  - Potential differences in the number of examinations are associated with structural elements where there is no expected active degradation mechanism
  - Both approaches must satisfy the Perdue acceptance criterion of a 95% confidence level that the current target leak rates will not be exceeded
  - Limiting location in segment

Multiple Pipe Size Segment RAI

Technical Impacts (cont.)

- Potential Difference in Low Safety Significant (LSS) Segments
  - For LSS segments where each size has an ASME Section XI examination and the segment is split by size, the change-in-risk criteria may not be met (additional examinations may be needed to meet the change-in-risk criteria)

Multiple Pipe Size Segment RAI

Technical Impacts (cont.)

- Additional Considerations
  - LSS segments would not have a significant impact on the change-in-risk calculations
  - Conservatism is built into the change-in-risk calculation
  - Inconsistency could occur in accounting for ASME Section XI examinations

Multiple Pipe Size Segment RAI

Plant-Specific Example No. 1

- One HSS multiple pipe size segment with different SRRA inputs - if split there could be one additional examination
- Change-in-risk was recalculated
  - Assuming all LSS multiple pipe size segments with an ASME Section XI examination on each size were split into separate segments
  - The change-in-risk criteria is still met - no additional examinations
- Net effect - potentially 1 additional examination

Multiple Pipe Size Segment RAI

Plant-Specific Example No. 2

- 46 HSS multiple pipe size segments
  - 17 segments where the only difference in SRRA inputs is associated with pipe size - prior agreement that these segments do not need to be split
  - 19 segments where the only difference in SRRA inputs is between the pipe sizes with socket welds and the pipe sizes with butt welds
    - No outside diameter initiated degradation mechanism associated with socket welds
    - If segments are split based on the differences, no additional examinations

Multiple Pipe Size Segment RAI

Plant-Specific Example No. 2 (cont.)

- 10 segments with different SRRA inputs
  - For 7 segments the differences are associated with parameter inputs
    - Segments should not be split
  - The remaining 3 segments have different degradation inputs (pressure differences in 2 segments and wastage difference in 1 segment)
    - If split there could be 3 additional examinations

- Change-in-risk was recalculated
  - Conservatively assuming all LSS multiple pipe size segments have an ASME Section XI examination on each size
  - The change-in-risk criteria is still met - no additional examinations
- Net effect - potentially 3 additional examinations

Multiple Pipe Size Segment RAI

- Additional General Considerations
  - Majority of multiple pipe size segments are associated with small bore piping, as required by WCAP-14572
  - Loss of inventory concept significantly increases the small bore piping evaluated
  - A Risk-Informed ISI (RI-ISI) program should address the areas of highest risk rather than the specific number of examinations
  - No formal benchmarking of the WCAP-14572 RI-ISI methodology to the other NRC approved methodologies to demonstrate that different methodologies would produce the same number of examinations or same levels of risk

Expert Panel Justification RAI

Issue

- Expert panel justification for re-categorizing a HSS segment to LSS [1 or more Risk Reduction Worth (RRWs) $\geq$ 1.005]

Expert Panel Justification RAI

NRC RAI

- Justification Should Include
  - Identification of the procedure containing the required action
  - The indications available to the operators to identify the specific action
  - The location of the action
  - The time available to perform the action
  - The time required to perform the action
  - Identification and characterization of the performance shaping factors that might influence the ability of the operators to accomplish the task
  - An integrated discussion of the above information justifying that the failure of the operator to perform the action is of such a low likelihood that without operator action the RRW may be discarded

Expert Panel Justification RAI

Response to RAI

- Justification Provided
  - Relatively simple operator actions contained in procedures (actions not contained in procedures require additional justification)
  - Sufficient indication and instrumentation available to identify the failure, accounting for other actions being taken
  - Sufficient time is available to perform the action
  - Ability to perform the action can be done with equipment that is functional

Expert Panel Justification RAI

Response (cont.)

- Additional Considerations
  - Some cases will involve engineering judgement to determine if sufficient indication and time are available
  - Expert panel contains the necessary expertise to make the appropriate engineering judgement
  - The majority of other situations should be included in a revised risk evaluation

Impact of RAIs on Additional Examinations

Plant	Initial Submittal	Added Exams due to Both RAIs	Potential Added Exams After Further Evaluation of Multiple Pipe Size RAI	
			HSS	Delta Risk
1	0	-	1	0
2	0	~ 70	3	0
Generic	0	15 – 70* / unit	-	-

* Estimated

Plant Impact of Additional Examinations due to RAIs

Plant	Additional Exams	Estimated Additional Exposure (rem)	Additional Review Time
1	-	-	6 months
2	~ 70	113	9 months
Generic	15 – 70*/unit	35 – 170 for all units	-

* Estimated

Proposed Resolution of RAIs

- Short term
  - Discuss how the WCAP-14572 methodology was implemented in plant-specific submittals pending approval
- Long term
  - Submit supplement to WCAP-14572 for NRC review and approval - 1st quarter 2004
- Revise template submittal as required