PSA Applications: Risk-Informed In-Service Inspection (RI-ISI) for Turkey Point NPP

International Workshop
on
Use of PSA in Operation of NPPs and in Regulatory Decision-Making

May 17 - 21, 2004
Kyiv, Ukraine

RI-ISI at Turkey Point NPP

- Turkey Point's application of RI-ISI was limited to Class 1 piping inside containment.
- The purpose of in-service inspection is to identify conditions, such as flaw indications, that are precursors to leaks and ruptures which violate pressure boundary integrity principles.
- In-service inspection (ISI) activities include ultrasonic testing, surface testing, and liquid penetrant testing.

RI-ISI (cont.)

- Support activities include scaffold construction, insulation removal, and buffing and grinding of welds.
- In-service inspections are performed every outage (18 months).

Objectives

- Prioritize Turkey Point's ISI Activities by Risk
  - Decrease cost of outage inspections, and
  - Decrease personnel radiation exposure during outage inspections,
    while
    - » increasing or maintaining personnel safety
    - » increasing or maintaining unit reliability

Piping Segment Definition

- Segment
  - Section of pipe for which a failure at any point has the same consequences
  - 228 individual segments

Piping Failure Probability

- SRRA Code used to predict piping failure probability
- Factors used in SRRA Piping Failure Probability Calculation
  - Pipe Segment Dimensions
  - Material Stresses
  - Pressure, Temperature

Consequences Evaluation

- Calculated using the Turkey Point Probabilistic Safety Assessment (PSA).
- Postulated different size breaks in each segment.
- Calculated Conditional Core Damage Probability (CCDP) and Large Early Release Probability (LERP) for each segment and break size.

Risk Evaluation

- Combined SRRA piping failure probabilities with results of consequence evaluation.
- Calculated Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) due to a leak/break for each pipe segment.
- Calculated risk importance measures for each segment.
- Assigned a preliminary risk category to each segment based on these results.

Expert Panel

- Convened a panel of experts from ISI/NDE, Plant Engineering, PSA, Operations, Maintenance, etc.
- Provided each Expert Panel member with all of the risk-related and other information calculated and/or collected for each pipe segment.
- Reviewed, discussed, and eventually assigned a final risk category to each pipe segment.
- Documented the basis of the determination.

Results

- Weld Inspection Reduction

  84%

- Radiation Dose Reduction

  20 man-rem

- Saved Money ($)

Other Benefits

- Avoidance of potential personnel injury by reduction of:
  - Scaffold Construction
  - Asbestos Removal
  - Insulation Removal
  - Weld Grinding and Buffing

Questions?