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Risk Ranking for Buried Pipe and EPRI BPWORKS™ Software

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What is Risk Ranking?

- Risk Ranking is a method to assess the likelihood and consequence of postulated failures of scoped components
- Result is an importance determination which enable appropriate resources to be applied commensurate with the determined importance
- American Society of Mechanical Engineers (ASME) has developed specific procedures and processes for using a Risk Informed approach

Risk Ranking Process

- Risk ranking process for the Buried Piping Integrity Initiative needs to meet the intent of the EPRI guideline (“Recommendations for an Effective Program to Control the Degradation of Buried Pipe”)
- Utility responsibility to evaluate the tool and the results
- NEI 09-14 guidance will be clarified
- Risk ranking software is only one of the tools used to establish inspection priority
- BPIG venue for comparing experience
- INPO evaluations
 - Focus area on buried piping programs

Insights for Buried Pipe Risk Ranking

- Widespread, random or low value excavations and inspections of buried pipe can damage other buried commodities and create more consequential hazards
- Inspection of pipe underneath or nearby buildings can impact safe plant operations and maintenance
- Inspections should be chosen predicated on overall plant safety
 - **Value of Inspection verses Risk of Inspection**
- Low value excavations and inspections can result in:
 - Inadvertent damage to plant equipment
 - Impact to safe plant operations and maintenance
 - Increases in outage durations

Risk Informed Ranking for Class 1 Welds

- Risk Ranking is recognized in ASME Code Case N-560-2 for selection of ASME Class 1 piping welds for examination
 - Evaluate probability and consequences of failure, focus on elements in the highest risk group
 - Probability considers relevant degradation mechanisms
 - Consequence considers break size and operating mode with highest impact on plant safety

CC N-560-2 Risk Matrix

Table I-8
RISK MATRIX FOR PIPE SEGMENTS

RISK GROUPS HIGH – CAT 1,2 &3 MEDIUM – CAT 4 & 5 LOW – CAT 6 & 7		CONSEQUENCE CATEGORY			
		NONE	LOW	MEDIUM	HIGH
FAILURE POTENTIAL	HIGH	CATEGORY 7	CATEGORY 5	CATEGORY 3	CATEGORY 1
	MEDIUM	CATEGORY 7	CATEGORY 6	CATEGORY 5	CATEGORY 2
	LOW	CATEGORY 7	CATEGORY 7	CATEGORY 6	CATEGORY 4

Risk Ranking for Buried Pipe

- Philosophy is similar to Code Case N-560-2
 - Degradation mechanisms typically different than primary piping
 - Since most buried pipes do not have a high impact on plant safety, other consequences also considered
- An important factor is that Risk Ranking is only one of many tools to assist in the inspection planning process and does not specifically identify inspection locations
- Priority for inspection increases when two or more of the tools identify the same location to have a heightened risk of unacceptable degradation

Other Tools for the Plant Owner

- Pipe-to-soil potential measurements of the Cathodic Protection system show a location to be outside NACE recommended criteria
- Over-the-Line surveys (e.g., DCVG, ACCA) identify a location that may have significant degradation to the coating
- Plant experiences (internal and external)
- Trending of past inspection results
- Areas that industry experience has found to be of higher risk (e.g., locations where the pipe enters or exits the soil)
- Results of guided wave ultrasonic examinations
- Results of ID visual examinations (crawlers, boroscopes - for cases where ID degradation is a significant concern)

BPWORKS™

- BPWORKS™ is one of the tools developed to Risk Rank Buried Piping segments
 - BPWORKS™ developed and supported by EPRI
 - Version 1.0 released December 2008
 - Version 2.0 to be released in November 2010
- Determines Likelihood versus Consequences matrices

	No Consequence	Low Consequence	Medium Consequence	High Consequence
High Likelihood	Green	Yellow	Red	Red
Medium Likelihood	Green	Green	Yellow	Red
Low Likelihood	Green	Green	Green	Yellow