Buried Pipe Program

BNE Presentation

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BNE Questions

- Overall view of your program
- What piping systems are included in the program?
- What materials are involved in the program (ss, aluminum, etc.)?
- What methods are used for inspecting the underground piping?
- What success has the program had in finding leaks or near-leaks?
- What changes have been made to the program due to recent industry events (Oyster Creek, Peach Bottom, etc.)? How is Salem and Hope Creek the same/different from the programs used at the stations that are experiencing leaks?
- What changes to the program due you expect as a result of license renewal?
- Are there any specific inspections being planned during the Salem 2 outage and the spring Hope Creek outage that are a direct result of license renewal?

Overall View Of Buried Piping Program (BPP)

- PSEG has an established Buried Piping Program
- BPP consists of corrosion control, monitoring, and mitigation elements
- BPP is comprised of other "subset" programs
  - 89-13, NJAC (Discharge Prevention and Response Program DPRP), American Nuclear Insurance
- BPP Procedures & T&RMs are in place
  - ER-AA-5400 BPP Guide
  - ER-AA-5400-1002 BPP Examination Guide
  - ER-AA-5400-1003 BPP PI's

Overall View Of Buried Piping Program (BPP) (cont'd)

- BPP Basis document, Risk Ranking, & database are in place for both Salem and Hope Creek stations
- Salem and Hope Creek have performed various non-intrusive and opportunistic visual inspections.
- Actively involved in industry:
  - PSEG is member of EPRI's Buried Piping Issues Group (BPIG)
  - INPO representatives attend BPIG meetings and provide insight/input on their focus
  - PSEG benchmarking:
    - Dresden 2008 (INPO Strength 2007)
    - Palo Verde (planned early 2010)
  - PSEG BPP process modeled after NACE RP 0502

Overall View Of Buried Piping Program (BPP) (cont'd)

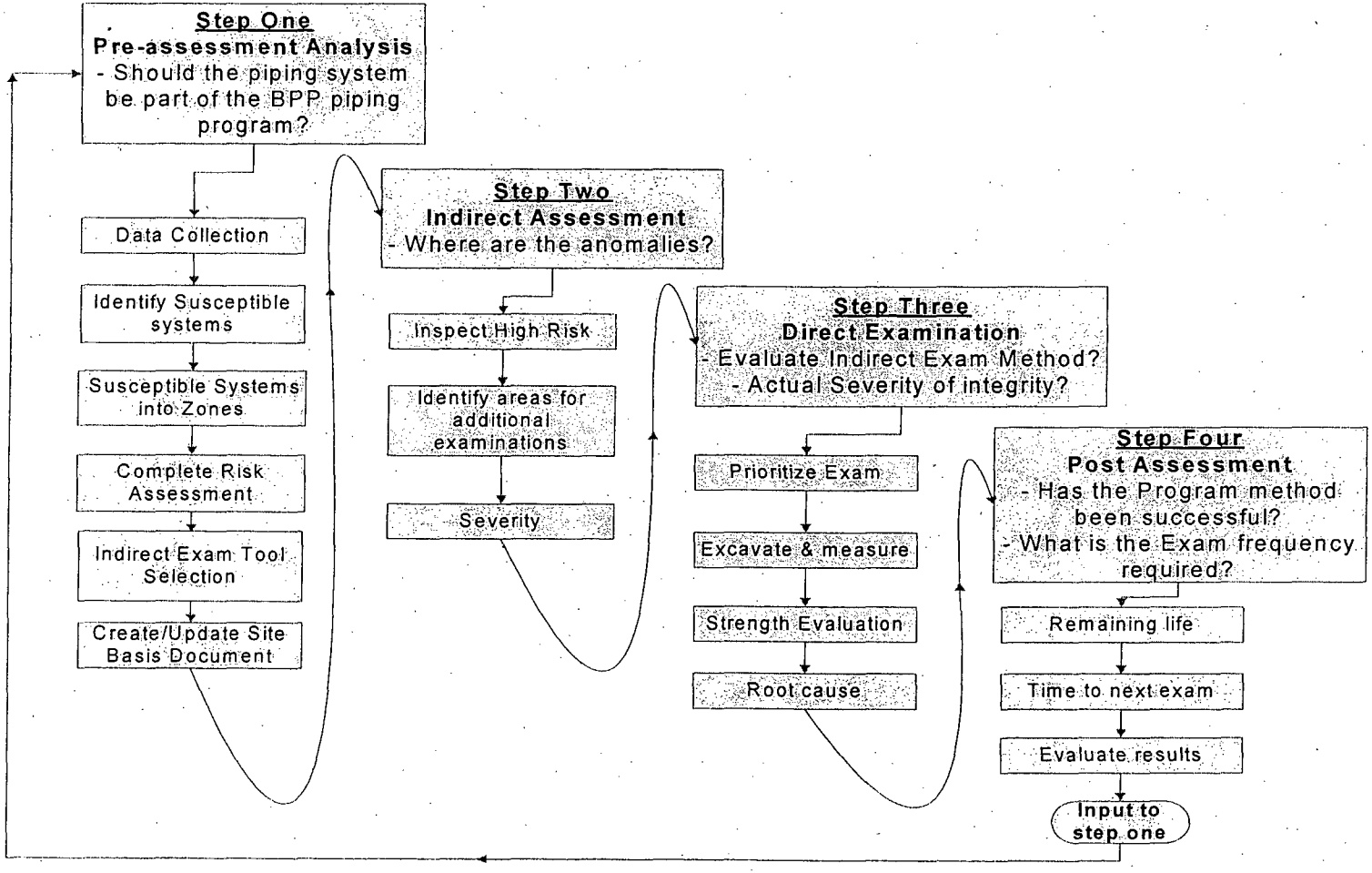
- Salem & Hope Creek BPP Managers have attended EPRI's BPP Manager training

- Station BPP Health Reports/PI's
  - Trial issuance 3rd Qtr 2009
  - Official issuance 4th Qtr 2009

- BPP Manager Cert Guide (Qual Card) issuance 4Q09

Overall View Of Buried Piping Program (BPP) (cont'd)

PSEG Program Process



(NACE Recommended Practice 0502-2002)

Piping systems in the program

Hope Creek:

Auxiliary Boiler FO Storage, Aux Steam, Building Sewage, Chemical Waste, CW Acid Injection, CW Hypo chlorination, CW, CST, Cooling Tower Blow down Dechlorination, Cooling Tower Blow down, Demin Water Make-up/Storage & Transfer, DFO Storage & Transfer, Domestic Water, FP, FW, Hydrogen/Oxygen Water Chemistry, Control Air, Normal Drains, Oily Waste, Process Radiation Monitoring, Service Compressed Air, Service Gases, SW, SW Dechlorination, Storm Drainage

Piping systems in the program (Cont'd)

Salem:

CW, SW, FW, Storm Drains, FP, Demineralized Water, Condensate Polishing, Station Air, Control Air, Fuel Oil (Gas Turbine, House Heating Boilers, TSC Emergency Diesel Generator, Emergency Diesel Generators, Fire Pump Diesels, Circulating Water Intake Heating Boiler, & Service Water Intake Hot Air Furnace), Hypo Chlorination, Liquid Waste, Potable Water, Fresh Water, Auxiliary Feed water, Sanitary Drains (Non-Rad Drains)

Materials involved in the program

Hope Creek:

- Carbon Steel, Cast Iron, Cement Lined Ductile Iron, Cement Lined Carbon Steel, Copper, Fiberglass, Plastic, Pre-stressed Concrete, Pre-stressed Concrete Embedded Cylinder, Reinforced Concrete, and Stainless Steel

Salem:

- Carbon Steel, Cast Iron, Cast Steel, Cement Lined Ductile Iron, Cement Lined Carbon Steel, Copper, PVC, Pre-stressed Concrete, Pre-stressed Concrete Embedded Cylinder, and Stainless Steel

Methods used for inspecting the underground piping

- Opportunistic & Focused both used
- Current InDirect Methods available
  - Guided Wave*, C-Scan*, DCVG*, ACVG
- Current Direct methods available
  - UT*, RFTC*, LFET, Magnetic Flux Leakage, Tethered Pig, BEM*, Visual*
- Other Assessment techniques
  - Tracer Gas, Acoustic Monitoring, Sahara, Gravity Drop Test*, N2 Pressure Decay*, Leak Rate*, GPR* Fiberscope*

* Has been used at PSEG

What success has the program had in finding leaks or near-leaks?

- No leaks have been identified since inception of BPP
- 89-13 program has noted ID degradation of Nuclear header Bell & Spigot (B&S) joints via visual exams & NDE (Salem & Hope Creek)
- Installed WEKO seals in 3 of 4 Salem Nuclear Supply Headers B&S joints
- Cleaned and Epoxy Coated Salem Unit 2 SW Nuclear Discharge Header B&S Joints
- SW manned visual inspections have revealed Salem TGA header ID lining degradation
- Hope Creek Buried CW to Cooling Tower lines
  - RFTC completed, degradation assessment complete
  - Repair priorities established, options presented, repairs scheduled

What success has the program had in finding leaks or near-leaks? (Cont'd)

Inspections completed to date

- Opportunistic:
  - Inspections completed at both Salem and Hope Creek
    - Salem — FO (SW/CW Boilers), Control Air, Liquid Waste, Dewatering line, FP, SW External (12 Nuc Header)
    - Hope Creek — FP, Domestic Water, Building Sewage
- Focused (As a result of Risk Ranking/BPP implementation):
  - GUL (aka Guided Wave) completed on Hope Creek CST 2/4/8/12/20" stainless steel lines, 4" DFO (coated carbon steel), Rad Waste (3" stainless steel)
  - C-Scan completed on Hope Creek 4" DFO line (coated carbon steel), 4"/6" FP (Ductile Iron), 6" Domestic Water (mortar lined ductile iron), 18" Oily Waste (cement-lined ductile iron)
  - RFTC Of Hope Creek CW Buried PCCP

What changes have been made to the program due to recent industry events?

- More thorough and detailed prejob briefs & walk downs with inspectors
  - Detailed drawing reviews with inspectors
  - Field walk downs with inspectors
- Closer contact with industry peers
- Added requirement in all excavation orders to:
  - Contact Buried Piping program manager for inspection of excavated piping – gives us an engineer with “Eyes On”
  - Perform soil sampling on all excavations involving buried piping
- Exercising more rigor in post inspection analysis related to Guided Wave

How is Salem and Hope Creek the same/different from the programs used at the stations that are experiencing leaks?

Deltas - Leaking OC CST Lines	**Oyster Creek**	**Hope Creek**
Material	Carbon Steel (Coated) Aluminum	Stainless Steel
Piping Protection	Coal tar coating	Corrosion resistant material Portions encapsulated with foam & secondary piping
Pipe Age	Installed 1969	1981
Fill	Unknown – Excavated many times	Engineered (easy drainage, non-wicking)
Inspection Technology	Older Generation G-Wave, 8 channel	Newer Gen GUL Enhanced Circumferential Resolution Guided wave, (16 channel)
Inspection details	Vague or inaccurate detailed discussions on drawing details	Detailed piping details provided, onsite walk downs conducted with inspectors

How is Salem and Hope Creek the same/different from the programs used at the stations that are experiencing leaks? (Cont'd)

Deltas - Leaking Indian Point 2 AFST Line	**Indian Point**	**Salem**
Material	Carbon Steel (Coated)	Carbon Steel (Coated)
Piping Protection	Coal tar coating	Coal tar coating
Leakage/Inspection	Yes – due to coating failure and subsequent metal degradation	No identified leakage. Salem Unit 2 Aux Feed lines excavated in 1994 – piping in excellent condition
Fill	Poor – Fill contained foreign material, weld rod, metal pieces	Engineered

How is Salem and Hope Creek the same/different from the programs used at the stations that are experiencing leaks? (Cont'd)

- The elements of the program that select the buried piping scope and perform the risk ranking are essentially the same
- The indirect inspection techniques are currently available to anyone in the industry from a variety of sources, however:
  - PSEG:
    - Conducts up to date reviews of Guided Wave Technology prior to each inspection as GUL technology is an emerging technology
    - Conducts reviews of proposed NDE vendors to evaluate their performance at other utilities prior to issuance of a contract
    - PSEG conducts onsite prejob planning using familiarization and walk downs prior to conducting these inspections
    - Guided Wave companies now asked to have results reviewed & validated by independent Level 2 Guided Wave analyst

What changes to the program due you expect as a result of License Renewal?

- The Buried & Buried Non-Steel Piping inspection program will be enhanced to include:
  - Adding at least one opportunistic or focused excavation and inspection for inspection of specific piping materials (as well as the Salem buried piping SS bellows between the containment and FHB) within a span of 10 years prior to period of extended operation (PEO) as well as within the first 10 years of operation after the PEO.
  - Guidance for inspection of concrete aging affects
- Salem U2 and HC are currently not within the 10 years to PEO

Are there any specific inspections being planned during 2R17 & RF16 that are a direct result of License Renewal (LR)?

- Salem Unit 2 and Hope Creek are not within the 10 years of the PEO, therefore no LR related inspections are scheduled for 2R17 or RF16 as a direct result of LR

- Focused inspections are scheduled in 2R18, 1R20 & RF16 as a result of the BPP implementation based on risk ranking