SAND2014-4625P

Used Fuel Disposition Campaign

Monitoring for SCC

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June 5, 2014

How Can Monitoring Help With the Potential Dry Storage Canister SCC Problem?

- Detect if Corrosion Has Occurred
- Detect if the Environments for Corrosion are Present
- Obtain Data to Inform and Validate Models to Predict the Future

Models are being developed to answer 3 questions:

1. **Will the environment for SCC exist during the storage period?**
2. **Do the stresses needed for SCC exist?**
3. **Will the SCC propagation rate be slow enough so that penetration will not occur in the storage period?**

In-situ monitoring can help with all these except the stress measurements

Environment on Canister Surface

- For as many locations on a canister, for as many canisters, and for as many sites as possible, an integrated data set would inform or validate the models.
- To Include Site Data:
  1. Air Acid Gas Concentrations
  2. Aerosol Concentration, Composition, and Particle Sizes
  3. Ambient Temperatures and Absolute Humidities (Dew Points)
- To Include Canister Data – All Five at Many Locations:
  1. Surface Temperature
  2. Deposit Composition
  3. Deposit Particle Sizes
  4. Deposit or Chloride Mass per Area (see next slide)
  5. Evidence of Corrosion (Rusting, Pitting, SCC)
- These are all being done or are planned, but not yet integrated

Environment on Canister Surface

- **Chloride Mass per Area**
  - The idea of a practical chloride threshold for SCC is controversial
  - If deposits are not uniform, such as with large salt particles, it is the local conditions that are important
  - The only measurement method to date is the SaltSmart wet pad system, but it can not be used above 80°C and the sample size is small - limiting its use in measuring low salt concentrations.
- **The "Barnacles" Being Developed under NEUP**
  - Boxes to measure conditions including: T, RH, salt load, deliquescence, and corrosion
  - Good Idea, but conditions across canister are highly variable, so would need many per canister. Locations of most interest are those that are cool enough to support SCC, within the heat affected zones of welds.

SCC Propagation Rates

If SCC is Detected, then the Following Information Will Inform or Validate the Model

- Crack Geometry - Especially Depth
- As Much of a History of the Environment as Close to the Crack as Possible
  - Surface Temperature
  - Surface RH
  - Deposit Composition
  - Chloride Mass per Area

EPRI Is Doing Significant Work

- ***Used Fuel Dry Storage Stainless Steel Canister Stress Corrosion Cracking Susceptibility Assessment: R&D Roadmap Leading to Identification of Canisters Potentially Susceptible to Stress-Corrosion Cracking. Rev.1.*** **Submitted to NRC 4/7/2104**
- ***Failure Modes and Effects Analysis (FMEA) of Welded Stainless Steel Canisters for Dry Cask Storage Systems*****. Report Number 3002000815.**
  - **Flaw Growth and Flaw Tolerance Assessment for Dry Cask Storage Canisters (late 2014)**
- **SCC Susceptibility Assessment Criteria (mid 2015)**
  - **EPRI project to develop NDE technologies for SCC detection (through 2017)**