

# NRC Activities

Matthew McConnell  
Senior Electrical Engineer  
Office of Nuclear Reactor Regulation

# Agenda

- Nuclear Power Plant Reviews
- Inspection News
- Regulatory Guide News
- Research Activities
- IEC/IEEE Joint EQ Standard



# Nuclear Power Plant Reviews

- License Amendment Requests (LAR)
  - Power Uprates
    - Design changes associated with power uprate need to be complete prior to submitting the LAR
    - Provide pre- and post-power uprate environmental data and qualification limits for Radiation, Temperature, Pressure, and humidity
  - Alternate Source Term
    - Review the environmental changes to specific areas and electrical equipment being credited such as fans
  - High Energy Line Break (HELB) Reconstitution
    - Review to ensure EQ rule satisfied for applicable components



# Nuclear Power Plant Reviews (Cont.)

- License Renewal
  - Nuclear power plants starting to enter beyond 40-year life period
  - EQ evaluations must be completed and documentation updated
  - EQ components not qualified for current license term must be refurbished, replaced, or have qualification extended prior to reaching limits
  
- Nuclear Power Plant Construction Activities
  - Watts Bar Nuclear Unit 2
    - Performed initial EQ inspection in Spring 2011
    - All NRC EQ inspections to be completed prior to fuel load
    - NRC Inspection Procedure 51080 recently approved



# Inspection News

- EQ Inspection Issues
  - HELB EQ
  - Penetration Assemblies
  - Rosemount Transmitters
  - Motor Operated Valves
  - Replacement of Reactor Pressure Vessel Relief Valves
    - 10 CFR 50.49 Upgrade Requirements
    - CAT 2 to CAT 1 to CAT 2



# Regulatory Guide News

- Regulatory Guide 1.89, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants”
  - In process of revising to endorse IEEE Std. 323-2003
- Regulatory Guide 1.183, “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors”
  - DG-1199 published in October 2009
  - Currently in comment resolution phase
- Regulatory Guide 1.218, “Condition Monitoring Techniques for Electric Cables Used in Nuclear Power Plants (NPPs)”
  - Expected to be published by end of 2011

# Research Activities

- Sandia National Laboratory
  - EQ Considerations
    - High Dose Rate vs. Low Dose Rate
      - Homogeneous degradation in operational aging may occur only in dose rates less than 100 Gy/hr in most polymers
  - Oxygen Deprived Chamber
    - Limits degradation to outer surface and stops further degradation
  - Testing Sequence
    - Concurrent temperature and radiation aging could result in significant damage to cables
  - Use of non-conservative activation values
    - Choice of activation energy values needs to be appropriate to the operating temperature

# Research Activities (Cont.)

- Sandia National Laboratory
  - Inverse Temperature Effects
    - Cables are exhibiting degradation at lower temperatures.
    - Cross-linked polyolefin (XLPO) does not follow Arrhenius methodology. Conclusions from accelerated aging needs further verification
  - The review of relevant documents to confirm that adequate margin is available for the current and renewed license periods in the qualification of electrical equipment.
    - Based on the re-examination of existing cable aging test results, recalculate the margin for equivalent aging conditions in light of the known uncertainties.
    - This DRAFT project report recommends confirmatory testing to quantify margins to address uncertainties.
    - This verification is essential for considering further extension to service life.



# Research Activities (Cont.)

- Next Steps
  - Plan to obtain cable samples from the Zion plant and the current operating fleet
  - Plan to perform confirmatory testing to include pre-aging, condition monitoring, and LOCA testing
- Expanded Materials Degradation Assessment
  - Collaboration with NRC, DOE, and EPRI to develop a comprehensive analysis of degradation modes for cable insulation to provide a technical basis for regulatory decisions related to extended operation
  - Document similar to NUREG 6923, “Expert Panel Report on Proactive Materials Degradation Assessment,” expected to be published in Spring 2012

# IEC/IEEE Joint EQ Standard

- Draft harmonized standard developed
  - IEEE Std. 323-2003 used as template
- Input provided from various countries
- Draft standard will be reviewed/discussed during IEEE SC-2 meeting November 7-9, 2011 – Orlando, FL



# QUESTIONS???

