



# **REACTOR SAFETY AND LICENSING ACTIVITIES**

**Office of Nuclear Reactor  
Regulation  
December 9, 2004**

# ACRONYMS

- **ANS:** American Nuclear Society
- **BWR:** Boiling-water reactor
- **CFR:** Code of Federal Regulations
- **EPU:** Extended power uprate
- **FERC:** Federal Energy Regulatory Commission
- **GSI:** Generic Safety Issue
- **ISO:** Independent system operator
- **MSPI:** Mitigating Systems Performance Index
- **NEI:** Nuclear Energy Institute
- **NERC:** North American Electric Reliability Council
- **PRA:** Probabilistic risk assessment
- **PWR:** Pressurized-water reactor
- **RES:** Office of Nuclear Regulatory Research
- **RS:** Review Standard
- **SDP:** Significance determination process
- **SE:** Safety evaluation

# **AGENDA**

- **Overview - J. Dyer**
- **Emerging Technical Issues - B. Sheron**
  - **Power Upstate-Related Technical Issues**
  - **Generic Safety Issue – 191**
  - **Electric Grid Reliability**
  - **Buried, Medium Energy Cables**
- **Fire Protection - J. Hannon**
- **Reactor Oversight Process - S. Richards**

# **EMERGING TECHNICAL ISSUES**

**Dr. Brian W. Sheron**

# **ADVERSE FLOW EFFECTS FROM POWER UPRATES**

- **Some plants experiencing adverse flow effects during extended power uprate (EPU) operation**
- **Higher steam and feedwater flow causing vibration and acoustic loading**

# **ADVERSE FLOW EFFECTS**

- **Safety concern is failure of steam dryer that can result in loose parts in primary system**
- **Boiling-water reactors (BWRs) with “square hood” steam dryer and high steam velocity currently considered most susceptible**
- **EPU flow-induced vibrations have also caused failures of feedwater probes and safety-related valves**

# **INDUSTRY ACTIVITIES**

- **Two units have reduced power to pre-EPU levels and are replacing the steam dryers**
- **BWR licensees are monitoring and inspecting for signs of dryer degradation**
- **BWR Owners' Group leading industry activities to resolve issues**

# **STAFF ACTIVITIES**

- **Evaluating plant-specific response to adverse flow effects**
- **Carefully reviewing current power uprate requests for consideration of flow effects**
- **Office of Nuclear Regulatory Research (RES) activities to understand adverse flow effects**
- **Developing criteria for determining the acceptability of future power uprate requests**



# **FUTURE PLANS**

- **Review licensee justifications for**
  - returning most susceptible units to EPU operation**
  - Continued operation at EPU levels for two other susceptible units**
- **Review two current requests for EPU operation**
- **Monitor/review BWR Owners' Group actions and determine need for generic communication**

# **GENERIC SAFETY ISSUE (GSI) - 191**

- **Post accident debris accumulation on pressurized-water reactor (PWR) sump screens may lead to inadequate long-term core cooling.**
- **Bulletin 2003-01**
- **Generic Letter 2004-02**

# **STATUS**

- **Nuclear Energy Institute,  
NEI 04-07, “PWR Containment  
Sump Evaluation Methodology”**
- **Staff responded to the Advisory  
Committee on Reactor Safeguards  
comments on NEI evaluation  
methodology and staff safety  
evaluation (SE)**
- **SE on the evaluation methodology**

# **STATUS (Continued)**

- **Public meetings and NEI workshop  
December 2004**
- **Chemical precipitation effects  
testing November 2004**
- **Downstream effects to be  
evaluated when performing overall  
evaluation methodology**

# **CONCLUSIONS**

- **The SE and NEI Guidance document provide a conservative and acceptable evaluation methodology**
- **The staff intends to proceed such that this issue can be closed on schedule - December 2007**

# **GRID RELIABILITY**

- **August 14, 2003 Blackout Event raised concerns regarding the reliability of offsite power**
- **Risk insights pointed to the following:**
  - **Long duration Loss of Offsite Power events are safety significant**
  - **Risk increases due to online equipment outages**
  - **Grid is less reliable during the Summer period**

# **STAFF ACTIVITIES**

- **Staff raised awareness by issuing Regulatory Issue Summary 2004-05**
- **Staff issued Temporary Instruction 2515/156, “Offsite Power System Operational Readiness”**
- **NRC entered into memoranda of agreements with NERC and FERC**
- **RES Reports**

# **NEXT STEPS**

- **The staff is considering a generic communication to address:**
  - **Agreements between the plant and independent system operator (ISO)**
  - **Ensure plant voltage needs against grid voltage predictions**
- **Staff may reevaluate regulatory requirements**



# **BURIED CABLE FAILURES**

- **22 reported buried cable failures**
  - **Failed cables were not qualified for moist environment**
  - **Most failed cables were within 10 to 20 years of service life**
- **Increased number of failures are expected to occur as plants age**
- **Failure of certain buried cables could lead to loss of a train or safety function**

# **REGULATORY ACTIONS**

- **Staff sent a letter to industry on February 5, 2004 and held a public meeting on June 2, 2004**
- **Staff awaiting industry white paper on issue**
- **Staff is evaluating options**

# **FIRE PROTECTION**

**John Hannon**

# **CLOSURE OF LONG-STANDING ISSUES**

- **Risk-informed performance-based rule, circuit analysis, and operator manual actions rulemaking**
- **Management of emerging issues**
- **Use of state of the art tools**

# **RISK-INFORMED PERFORMANCED BASED RULEMAKING**

- **Rule & Enforcement Policy issued June 2004**
- **Draft Regulatory Guide issued for comment in September 2004**
- **Endorsement of industry guidance on implementation**

# **CIRCUIT ANALYSIS**

- **Issued Regulatory Issue Summary 2004-03 in March 2004**
- **Circuit analysis inspection resumes January 2005**
- **Generic communication in early 2005 on compliance expectations with Appendix R to 10 CFR Part 50**

# **OPERATOR MANUAL ACTIONS RULEMAKING**

- **Public meetings on acceptance criteria (November 2003 and June 2004)**
- **Proposed rule and draft regulatory guide to Commission in December 2004**

# **EMERGING ISSUES**

- **Protocol for resolution of emerging fire protection issues exists between industry and NRC for low risk items.**



# **REGULATORY TOOLS**

- **Revised fire protection significance determination process (May 2004)**
- **Fire Dynamics Tools (November 2004)**
- **Fire probabilistic risk assessment (PRA) Requantification Study and Fire Modeling Verification & Validation supported by RES**
- **American Nuclear Society (ANS) Fire PRA Standard (early 2005)**

# **REACTOR OVERSIGHT PROCESS ISSUES**

**Stu Richards**

# **FY 2003 INDUSTRY TRENDS RESULTS**

- **No statistically significant adverse industry trends in safety performance identified**
- **Three “Early Warning” prediction limits were crossed**

# **FY 2004 INDUSTRY TRENDS PRELIMINARY RESULTS**

- **Data through June 2004**
  - **All Industry Trend Indicators  
below “early warning” prediction  
limits**
- **Final data available January**

# **MITIGATING SYSTEMS PERFORMANCE INDEX (MSPI) ACTIVITIES**

- **One year pilot of MSPI completed in early 2004**
- **Significant issues resolved**
- **Target implementation date for early 2006**

# **MSPI ACTIVITIES**

## **(continued)**

- **Staff-industry PRA task force created**
- **Implementation details under development**
- **MSPI to be implemented at all sites at the same time**

# **SIGNIFICANCE DETERMINATION PROCESS (SDP) TIMELINESS**

- **Goal: 85 percent of findings  
dispositioned in < 90 days**
- **Current SDP timeliness about  
70 percent**
- **Fire protection and unique issues  
have been particularly challenging**

# **CONSIDERATIONS TO IMPROVE SDP TIMELINESS**

- **Use modified SDP Phase 2 result as preliminary risk estimate**
- **Develop qualitative criteria for findings not amenable to SDP**
- **Adhere to strict time lines**
- **Use new information to revisit previously evaluated findings**



# **STATUS OF DESIGN/ENGINEERING PILOT PROGRAM**

- **Vermont Yankee pilot inspection completed**
  - **no risk significant issues identified (eight green issues)**
  - **suggest the need to assess aspects of current inspection program (power uprate/generic issues)**

# **STATUS OF DESIGN/ENGINEERING PILOT PROGRAM (Continued)**

- **VC Summer inspection complete**
- **Diablo Canyon and Kewaunee  
scheduled for early 2005**

# CONCLUSIONS