

**COMMISSION BRIEFING SLIDES/EXHIBITS**

**BRIEFING ON DIGITAL  
INSTRUMENTATION AND CONTROL**

**APRIL 7, 2008**

# **Digital Instrument & Controls Industry View**

**April 7, 2008**

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**Exelon, Senior Vice President**

**Engineering and Technical Services**



# Topics

- **Objective**
- **Goals**
- **Overview**
- **Status**
- **Conclusions**

# Objective

- **Safety-focused application of digital technology**
  - Current operating plants
  - Design certification
  - New plants
  - New fuel facilities
- **Stable, predictable, and timely licensing process with realistic guidance**
- **Enhance plant safety, availability, and reliability**

# Goals (1 of 2)

- **Short term - Interim Staff Guidance (ISG)**
  - Technically sound
  - Practical to apply
  - Appropriate detail of regulatory evaluations/reviews
  
- **Long term - Final staff guidance**
  - Incorporate ISG content into final regulatory guidance
  - Assure consistency with applicable industry codes and standards
  - Endorse related, detailed industry guidance

## **Goals (2 of 2)**

- **Overall**

- **Assure continued safe operations through each nuclear facility's digital application**
- **Change regulatory guidance to keep pace with technology developments**
- **Ensure changes to current positions are made in accordance with appropriate regulatory process and well communicated to stakeholders**

# Overview

- **Project Management**
  - **Project Plan (responsibilities, deliverables, due dates)**
  - **Pilot Project (validating ISGs, resolving issues, sharing lessons learned, revising guidance)**
  - **NRC – Industry collaboration**
  
- **Steering Committee oversight**
  - **On-going**
  - **Industry involvement and support**

# **Status (1 of 4)**

- **Continued Attention**

- **Manual Operator Actions**

- Fixed (30-minute) time period**

- versus**

- Method for determining acceptable time period**

- **Documents requested**

- **What should be submitted and when**
    - **Available vs. Reviewed vs. Docketed**

## **Status (2 of 4)**

- **Continued Attention (cont)**

- **Review level-of-detail**

- Independent design review/re-verification**

- versus**

- Reasonable assurance determination**

- **Diverse Actuation System**

- **Avoid expanding the scope to situations that do not result in a significant safety benefit**

# **Status (3 of 4)**

## **Project Schedule**

- NRC & Industry actively supporting into 2009**
  - **Oversight / Steering Committee**
  - **Resources / accountability / Task Working Groups**
  
- Project deliverables in use now**
  - **ISG-04 “Communications” used in staff review**
  - **ISG-06-draft “Licensing Process” used in listing documents for LAR**
  
- Rollover to permanent guidance started**
  - **ISG-01 “Cyber Security” is being used in draft rulemaking and Regulatory Guide**

## **Status (4 of 4)**

### **Project Progress**

- Topical areas (TWGs) 7**
- Problem Statements 25**
- Acceptably completed 3**

# Conclusions

## Project Plan

- **Continue management oversight / coordination**

## Pilot Project

- **Validate Licensing Process ISGs**
  - Highest importance and significance
- **Demonstrate effective and timely regulatory process for licensing digital upgrades**

## Guidance

- **Continue to refine and enhance regulatory guidance, as necessary**
- **Develop a stable, predictable, and timely licensing process with realistic guidance**

# Acronyms

- **ATWS**            **Anticipated Transient Without Scram**
- **BTP**             **Branch Technical Position**
- **D-3**             **Diversity & Defense-in-Depth**
- **DAS**             **Diverse Actuation System**
- **DI&C**           **Digital Instrumentation and Control**
- **ESPS**           **Engineered Safeguards Protective System**
- **ISG**             **Interim Staff Guidance**
- **ITAAC**          **Inspections, Test, Analyses, and Acceptance Criteria**
- **LAR**             **License Amendment Request**
- **NEI**             **Nuclear Energy Institute**
- **RPS**             **Reactor Protective System**
- **TWG**             **Task Working Group**

**Duke Energy**  
**Oconee RPS/ESPS Submittal**  
**April 7, 2008**

**Ron Jones**  
**Senior Vice President**  
**Nuclear Operations**



# RPS/ESPS Upgrade

- Replaces existing analog Reactor Protective System (RPS) and Engineered Safeguards Protective System (ESPS)
- New system is AREVA TELEPERM XS (TXS) digital protection system
- Currently installed in European nuclear plants
- Involves changes to the Oconee licensing basis and Technical Specifications

# Implementation

- Target implementation dates are:
  - Fall 2009      Oconee Unit 1
  - Fall 2010      Oconee Unit 3
  - Fall 2011      Oconee Unit 2
- Unit 1 TXS System is designed and fabricated
- Factory Acceptance Testing will occur in 4<sup>th</sup> Qtr 2008 with site delivery in early 2009

# Rationale for I&C Upgrade

- Duke is improving key I&C systems by adopting digital technology
- Duke faced with decisions to either re-engineer existing systems or move to modern digital technology
- Duke decided to upgrade RPS/ESPS in order to enhance nuclear safety and operational reliability

# Digital Licensing Submittal

- Duke developing programs to address the technical, quality, and regulatory requirements of digital technology
- Duke and AREVA worked diligently to prepare a licensing submittal responsive to the NRC guidance
- Advanced system features have been a challenge to existing regulatory guidance

# Licensing Process

- Duke appreciates the efforts by the NRC and NEI to address technology issues in licensing digital upgrades
- Duke submittal should benefit from the Communications and Cyber Security ISGs and hopefully the Licensing Process ISG
- A stable, timely and predictable digital licensing process is essential to industry confidence in upgrading I&C systems



**Luminant**

# **Digital I & C New Plant Perspective**

April 7, 2008

Mitch Lucas

Vice President- Luminant Power  
Nuclear Engineering & Support

# New Plant Feedback

- Improved regulatory guidance should
  - Result in stable, predictable and timely licensing process
  - Provide clarity in areas such as Human Factors, D3, Cyber Security, Communications
  - Provide clarity when using Standard Review Plan – for both, NRC and Industry
  - Help ensure consistencies in interpretations and timely reviews

# New Plant Feedback (cont.)

- Clear understanding of NRC expectations will help new plant designs & licensing efforts
- In general, to-date, new plants have not identified conflicts with issued guidance
- Manual Operator Actions Methodology endorsement by US NRC staff (alternative to the 30 minute criterion) (*on-going*)
- Need clarity on DI&C submittals vs. audits for ITAAC closure

# New Plant Feedback (cont.)

- For the next 2+ years, Industry feedback mechanism to the DI&C Steering Committee is recommended
  - Where issued guidance appears to require additional clarifications regarding consistency in interpretation
  - When new issues are identified needing clarifications
- Pilot projects to validate effectiveness of issued guidance and help build confidence in the process

# Summary

- Digital I&C will enhance safety, reliability and human performance in new plants
- Joint NRC/Industry efforts will result in a stable, predictable and timely licensing process for new plants
- Improved guidance with consistent interpretation will result in efficiencies in terms of resources and time for both, new plants and NRC



# **Briefing on Digital Instrumentation and Controls**

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**April 07, 2008**

# **Agenda**

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**Introduction**

**J. Grobe**

**Review of Issued**

**R. Croteau**

**Interim Staff Guidance**

**Use of Interim Staff Guidance**

**P. Hiland**

**and Operating Experience**

**Review of Ongoing Efforts**

**M. Mayfield**

**Path Forward**

**J. Grobe**

# **Digital Instrumentation and Controls Steering Committee**

- **Task Working Groups**

- **Group 1: Cyber Security**
- **Group 2: Diversity and Defense in Depth**
- **Group 3: Risk-Informed Digital Instrumentation and Control**
- **Group 4: Highly-Integrated Control Room – Communications**
- **Group 5: Highly-Integrated Control Room – Human Factors**
- **Group 6: Licensing Process**
- **Group 7: Fuel Cycle Facilities**

# **Digital Instrumentation and Controls Steering Committee**

- **Activities Since July 2007**
  - **Human Capital Investment**
    - **Hiring**
    - **Training**
    - **Graduate Fellowship Program**

# **Digital Instrumentation and Controls Steering Committee**

- **Activities Since July 2007 (cont.)**
  - **Task Working Group Accomplishments**
    - **32 Public Meetings**
    - **4 Interim Staff Guidance Documents Issued**
    - **Fuel Cycle Task Working Group Established**
  - **Project Plan Revised**
  - **4 Industry White Papers Received**

# **Digital Instrumentation and Controls Steering Committee**

- **Issued Interim Staff Guidance Documents**
  - **September 2007: Diversity & Defense In Depth**
  - **September 2007: Highly Integrated Control Room – Communications**
  - **September 2007: Highly Integrated Control Room – Human Factors**
  - **December 2007: Cyber Security**

# **Digital Instrumentation and Controls Steering Committee**

- **Remaining Interim Staff Guidance Documents**
  - **2008: Probabilistic Risk Assessments**  
**Licensing Process**  
**Manual Operator Actions**  
**Fuel Cycle Facilities**
  - **2009: Licensing Process With Cyber Security**

# **Digital Instrumentation and Controls Steering Committee**

- **Interfaces**
  - **ACRS**
  - **Other Agencies and Industries**
  - **International Organizations**

# **Issued Interim Staff Guidance: Diversity and Defense-in-Depth**

- **Protection Against Common-Cause Failures**
- **Software Error may Affect all Divisions**

# **Issued Interim Staff Guidance: Diversity and Defense-in-Depth**

- **Applicant Should Perform Analysis**
- **Backup Capability**
  - **Diverse Actuation System**
  - **Manual Actions**

# **Issued Interim Staff Guidance: Highly-Integrated Control Room Communications**

- **Describes Acceptable Approach:**
  - **Interdivisional Communications**
  - **Multidivisional Control and Display Stations**
  - **Command Prioritization for Safety over Non-Safety Functions**

# **Issued Interim Staff Guidance: Highly-Integrated Control Room - Human Factors**

- **Computer-Based Procedures**
  - **Backup Procedure**
  - **Operator Should Always be in Control**
- **Minimum Inventory**

# **Issued Interim Staff Guidance: Cyber Security**

- **Regulatory Guide - Safety Systems**
- **NEI Guidance - All Plant Systems**
- **Table Correlating NEI Guidance with  
the RG**
- **Either Acceptable**

# **Use of Interim Staff Guidance**

## **ISG-04: Communications**

- **Using for Prioritization and Control Module Topical Report Review**
- **Interim Staff Guidance is Providing a Clear Roadmap**

# **Use of Interim Staff Guidance Oconee Application**

- **Digital Reactor Trip System and Engineered Safety Feature Actuation System Modification**
- **Review Design Features Using ISGs**
- **Pilot Draft ISG-06: Licensing Process**
- **Developing Inspection Procedure**

# **Operating Experience**

- **National and International Data Bases**
- **CCFs are a Valid Concern**
- **Limited Level of Detail**
- **Continuing Review of Nuclear and Non-Nuclear Data**

# **Operating Experience DI&C Events**

- **Domestic Power Reactor – Failed Feedwater Control System Complications During Recovery**
- **Domestic Fuel Cycle Facility – Digital Control System Re-Initialization of System Configuration**
- **Foreign Power Reactor – Digital Relays Delay in Disconnecting Main Generator**

# Ongoing Efforts

- **Risk Informing Digital I&C**
  - **New Reactor Digital I&C PRA ISG is Near Completion**
  - **Plan for Risk Insights**
  - **Active Interactions with Industry**

# Ongoing Efforts

- **Alternative Process to 30 Minute Criteria**
  - **Operator Action to Cope with Common Cause Failures**
  - **Human Factors TWG**
  - **Issue ISG in 2008**

# **Ongoing Efforts**

- **Fuel Cycle Facilities**
  - **Project Plan has been Developed**
  - **Interacting with the Industry to Develop Guidance**

# **Path Forward**

- **Issue Interim Staff Guidance Documents**
- **Revise Interim Staff Guidance as Needed**
- **Address Long Term Actions to Update Regulatory Infrastructure**

# Acronyms

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<b>ACRS</b>	<b>Advisory Committee on Reactor Safeguards</b>
<b>CCF</b>	<b>Common Cause Failure</b>
<b>DI&amp;C</b>	<b>Digital Instrumentation and Control</b>
<b>ISG</b>	<b>Interim Staff Guidance</b>
<b>NEI</b>	<b>Nuclear Energy Institute</b>
<b>PRA</b>	<b>Probabilistic Risk Assessment</b>
<b>QA</b>	<b>Quality Assurance</b>
<b>RG</b>	<b>Regulatory Guide</b>
<b>TWG</b>	<b>Task Working Group</b>