

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 4th 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

April 07, 2008

Agenda

Introduction

J. Grobe

Review of Issued

R. Croteau

Interim Staff Guidance

**Use of Interim Staff Guidance
and Operating Experience**

P. Hiland

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

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