NRC Commission Briefing

Digital I&C:
An Industry Perspective

November 8, 2006

Jay Thayer
Vice President Operations - NEI

Amir Shahkarami
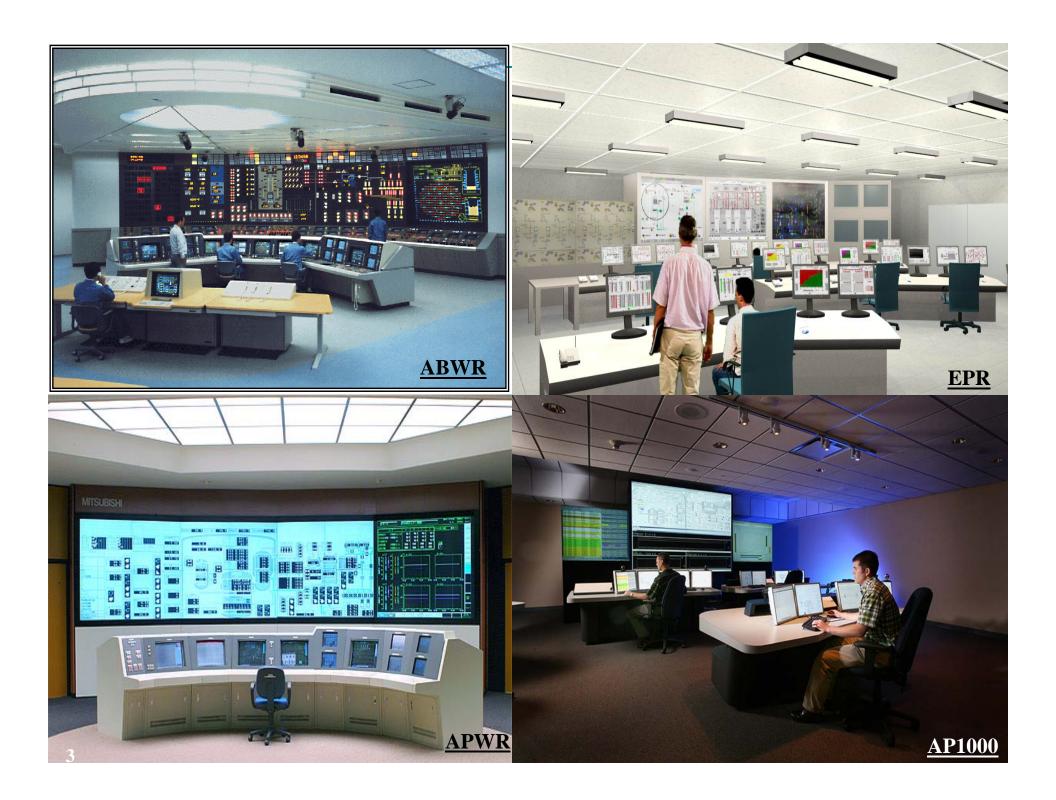**Digital I&C and Human Factors**
Working Group Chairman

Jack Bailey
New Plant Working Group

NEI

Topics

- **Application of Digital Technology**

- **Need for a Shared Vision**

- **Ongoing Activities**

- **Problem Statement**

- **Success Criteria**

- **Requested Actions**

- **Conclusions**

NEI

ABWR

EPR

APWR

AP1000

3

NEI

Digital Technology

- **Necessary for the future of the Nuclear Industry**

  - Improved reliability and performance = enhanced safety

  - Addresses obsolescence and spare/replacement parts issues

  - Reduces burden on operators (surveillances, automation)

  - New Plant I&C Systems

NEI

Digital Technology Applications

- **Not a "new" technology**

- **Embraced by other industries and countries as superior to analog technology**

    - ❑ **Energy, airline, military, aerospace and petroleum industries**

    - ❑ **Foreign nuclear power plants**

    - ❑ **U.S. nuclear power plants - Secondary Systems (Feedwater Control Systems), some Primary Systems (not fully integrated)**

NEI

Need For A Shared Vision

The safety, reliability, and efficiency improvements gained by using digital technology in U.S. nuclear power plants dictate that the behaviors and actions of both the regulator and industry embrace and encourage its timely deployment and safe implementation.

NEI

Ongoing Activities

- **New plant guidance is being developed**

  - ❑ **Draft Regulatory Guide (DG-1145)**

  - ❑ **Standard Review Plan updates**

- **NRC Staff is still forming opinions on several key issues**

  - ❑ **Adequate diversity in digital applications (BTP-19)**

  - ❑ **Risk informing reviews**

  - ❑ **Inter-channel communications**

NEI

Ongoing Activities (Continued)

- **Research efforts are ongoing to support advanced technologies and control rooms**
  - **Expected to result in changes to existing guidance and new guidance being developed**

NEI

Obstacles Exist

- **Regulatory Guidance Issues**

  - **Current guidance / regulations being updated**

    - **New plant design certifications have been and are based on existing guidance**

  - **In some cases current guidance does not reflect changes in staff positions**

- **Technical Issues Need To Be Addressed**

  - **Duke Energy submittal review identified potential generic technical issues and apparent changes to existing guidance (BTP-19)**

  - **Recent new plant discussions indicate technical issues will need to be addressed – some generically**

  - **No criteria for incorporating risk insights into digital applications**

Obstacles Exist (Continued)

- **Process**
  - **Many issues cross multiple organizations and disciplines, leading to coordination issues and untimely resolution**
  - **Lack clear guidance for amendment submittal content / timing**

NEI

Problem Statement

- **In spite of recent activities, there is <u>no clear success path</u> for resolving long-standing technical and process issues, causing...**

  - **Existing plants to delay and/or change plans for digital upgrades**

  - **Issue resolution in the I&C and human factors areas are a critical path activity for new plants**

  - **Potential removal of important features from or addition of unnecessary complexity to the I&C systems**

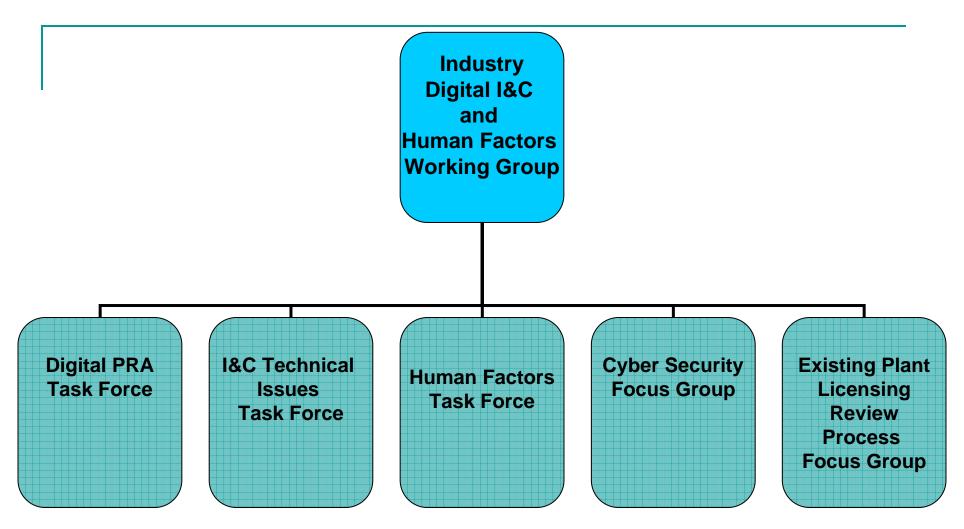**NEI**

We All Need…

- **A stable, predictable, and timely licensing process for both new and existing plants, evidenced by:**

    - Timely, generic resolution of emerging issues

    - Submittal of high quality license amendment requests, standardized to the extent possible

    - Using the right process when there is a need to take positions contrary to existing published guidance

    - Understanding that the application of mechanical system or analog design concepts to digital technology may not be the appropriate model

NEI

We All Need…

- **Integration of activities in and across multiple areas and organizations**
    - Human factors, I&C, cyber security, PRA, research
    - Industry, NRC, standards organizations, international organizations

- **Use of risk insights to help us better understand system vulnerabilities and develop safer and more reliable digital designs**

- **Understanding of, agreement on, and, to extent possible, collaboration on research initiatives**

NEI

```
                        ┌─────────────────┐
                        │    Industry     │
                        │   Digital I&C   │
                        │      and        │
                        │  Human Factors  │
                        │  Working Group  │
                        └─────────────────┘
```

| Digital PRA Task Force | I&C Technical Issues Task Force | Human Factors Task Force | Cyber Security Focus Group | Existing Plant Licensing Review Process Focus Group |

The Industry Digital I&C and Human Factors Working Group, along with its associated Task Forces and Focus Groups, provides an infrastructure for industry and vendors to effectively interface with NRC and address potential generic issues that arise from the implementation of digital technology.

NEI

Digital PRA Task Force	**Coordinates industry efforts relative to the use of risk insights associated with digital technology for both existing and new plants. The group also reviews NRC research activities associated with digital applications.**
I&C Technical Issues Task Force	**Coordinates industry efforts relative to I&C technical issues associated with the application of digital technology for both existing and new plants.**
Human Factors Task Force	**Coordinates human factors and control room design issues associated with use of digital technology for both existing and new plants.**
Focus Groups	**Coordinate with existing NEI task forces to address issues related to cyber security and the licensing process.**

NEI

Moving Forward

- **A commitment of resources (Industry & NRC) is needed to <u>develop action plans and coordinate issue resolution</u> in a timely, efficient manner**

  - Industry has developed an infrastructure to move digital I&C forward from a regulatory perspective

  - Commission/Senior NRC Management attention is needed to help ensure consistency and coordination between multiple NRC offices (NRR-NRO-RES-NSIR)

Requested Actions

- **Develop an interaction protocol that will capitalize on previous successful initiatives**
    - Apply <u>License Renewal Model</u> for interactions

- **In concert with stakeholders, develop an integrated plan to address issues with a well-defined scope and schedule for deliverables**
    - Include a mechanism for getting "unstuck" on technical issues
    - Ensure changes to current positions are made in accordance with appropriate regulatory process and well communicated to stakeholders

NEI

Requested Actions

- **Endorse the application of risk <u>insights</u> into digital applications and reviews**

- **Direct the staff to work more closely with stakeholders to clearly define acceptance criteria in guidance documents (e.g. BTP-19)**

- **Conduct a near-term briefing so that both NRC and Industry can develop a full understanding of the implications research activities might have on both new and existing plants**

NEI

Requested Actions

- **Issue a policy statement to capture these thoughts that can be used to:**

  - ❑ **Instill a sense of urgency on this effort**

  - ❑ **Acknowledge that the use of proven digital technologies will enhance safety, reliability, and efficiency at our nuclear power plants**

NEI

Conclusions

- **Business as usual will not result in success**

- **Both parties need:**
  - **A common Vision**
  - **An effective, efficient method for interacting and resolving issues**
  - **A clearly defined plan for moving forward**
  - **To regularly monitor progress**

- **It is imperative that we act now**

NEI

List of Acronyms

- **ABWR: Advanced Boiling Water Reactor**
- **APWR: Advanced Pressurized Water Reactor**
- **BTP: Branch Technical Position**
- **DG: Draft Regulatory Guide**
- **EPR: Evolutionary Power Reactor**
- **I&C: Instrumentation and Controls**
- **NEI: Nuclear Energy Institute**
- **NRC: Nuclear Regulatory Commission**
- **NRO: Office of New Reactors**
- **NRR: Office of Nuclear Reactor Regulation**
- **NSIR: Office of Nuclear Security & Incident Response**
- **PRA: Probabilistic Risk Assessment**
- **RES: Office of Research**

License Renewal Model Applied to Digital I&C

- **Develop a Digital I&C / Human Factors Steering Committee comprised of senior management (Deputy Office Director and above) from:**
  - **NRR**
  - **NRO**
  - **RES**
  - **NSIR**

- **Hold quarterly meetings with industry working group**

- **Hold frequent meetings with NRC technical staff and industry task forces / other stakeholders**

- **Conduct periodic Commission briefings**

NEI