Attachment 3: August 30, 2011 Presentation Slides (Redacted Version)

generation

mPower

B&W mPower™ Software Process/Procedure Update and Human Factors Engineering Program Plan Overview

August 2011

generation

mPower

August 30th Meeting Topics/Schedule

- Introduction
- Overview of Software Procedure
        Update
- Conclusion
- Lunch
- Introduction
- HFE Program Plan Overview
- Conclusion

generation mPower

B&W mPower Software Process/ Procedure Update

3

generation

mPower

Regulatory Requirements/Software Procedures Review

- Based on feedback from the staff, Northrop Grumman is conducting a review of baseline set of software procedures

[

] [CCI per Affidavit 4(a)-(d)]

"Heading Check" for adequacy of baseline process

Northrop Grumman Heritage of Process Improvement

[

]

[CCI per Affidavit 4(a)-(d)]

5

generation *mPower*

Essential Elements of NGC SW Development Process

[

]

[CCI per Affidavit 4(a)-(d)]

Northrop Grumman SW Integration Procedure

[

] [CCI per Affidavit 4(a)-(d)]

Note: each of the 5 pages of the above document
contains NGC CCI information

generation

*m**Power***

Next Steps

- Complete traceability matrix of regulatory requirements to baseline procedures.

- Assess any gaps with respect to Regulations

- Provide traceability matrix and associated baseline set of procedures to the staff.

- Schedule meeting with staff to discuss and review our existing processes and procedures.

8

generation
mPower

Attachment 1

Example Northrop Grumman [   ] [CCI per Affidavit 4(a)-(d)]Procedure, [

               ]. [CCI per Affidavit 4(a)-(d)]

Attachment to Slide Package

This procedure contains CCI per Affidavit 4(a)-(d). [

.

]

This procedure contains CCI per Affidavit 4(a)-(d). [

]

This procedure contains CCI per Affidavit 4(a)-(d). [

]

This procedure contains CCI per Affidavit 4(a)-(d). [

]

This procedure contains CCI per Affidavit 4(a)-(d). [

]

generation
mPower

Conclusion

generation mPower

Human Factors Engineering Program Plan Overview

11

generation

mPower

Meeting Objectives

- Expand NRC understanding of our HFE design team composition, responsibilities, authority, and placement within the organization
- Explain how the project is developing and implementing an effective HFE process
- Discuss planned submittals
- Outline design process and how it is compliant with NUREG 0711 review criteria
- Describe initial concepts, design, and assessment process which incorporate innovative technologies and concepts (ref. ACRS letter)
- Share early concepts related to proposed staffing

generation mPower

mPower Engineering Organization

[

]

[CCI per Affidavit 4(a)-(d)]

13

HFE Program Scope of Responsibility

- Develop and Implement an iterative HFE process
- Submit HFE program implementation plans to the NRC, resolve and incorporate RAIs for submitted Topical Reports
- Develop "Concept of Operations" and "Human System Interface Concept" (DCS requirements)
- Integrate HFE with other design activities
- Ensure that subcontractor engineering processes include HFE program requirements
- Identify and Inform the design for areas that have the potential to improve human performance
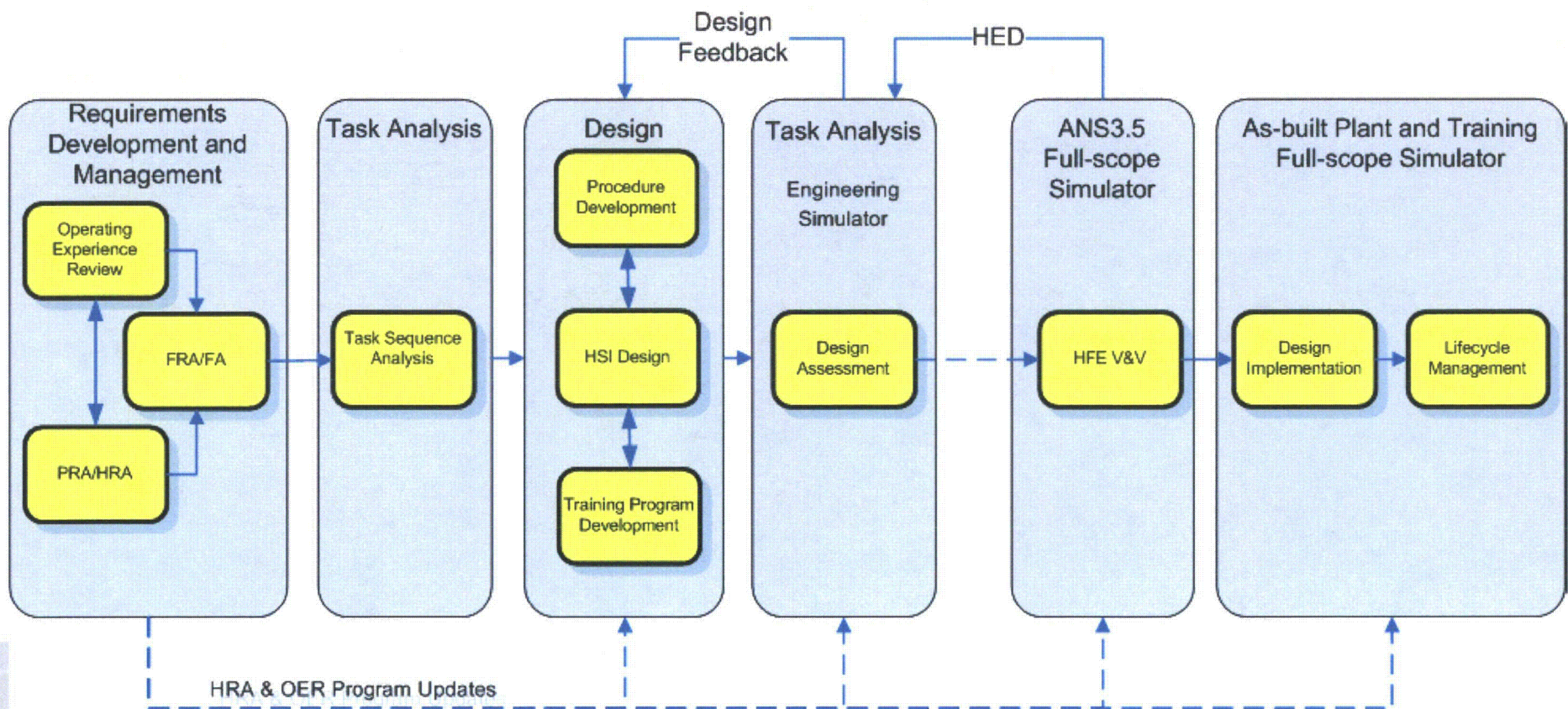
generation
mPower

HFE Design Team Plant Design Accomplishments

[

]   [CCI per Affidavit 4(a)-(d)]

generation
mPower

Proposed Submittals Discussion

mPower HFE Program Overview

generation

mPower

Design Philosophy

- Optimize the number of components and systems required to operate (not fail) to perform a given plant function.
- Capture and integrate user needs in design.
- Use a top-down requirements-based design process.
- Leverage design team experience to improve HRA critical shaping factors beginning in concept phase.
- Maintain an iterative design process.
- Consider entire design lifecycle including: development, validation, implementation, testing, operation, maintenance, and obsolescence.

generation

mPower

[

]

[CCI per Affidavit 4(a)-(d)]   19

generation
mPower

Credited Safety Systems

[

] [CCI per Affidavit 4(a)-(d)]

generation _mPower_
Systems Included in the Initial Scope of HFE Program

[

]

[CCI per Affidavit 4(a)-(d)]

Systems Designed Using HFE Best Practices

[

]

[CCI per Affidavit 4(a)-(d)]

generation

mPower

[ ] DCS and HSI Architecture

[

[

23

generation
mPower

Functional Control Room Layout

[

]

[CCI per Affidavit 4(a)-(d)]

24

B&W mPower Main Control Room Concept

[

]

25

Operating Experience Review Process

OEPC
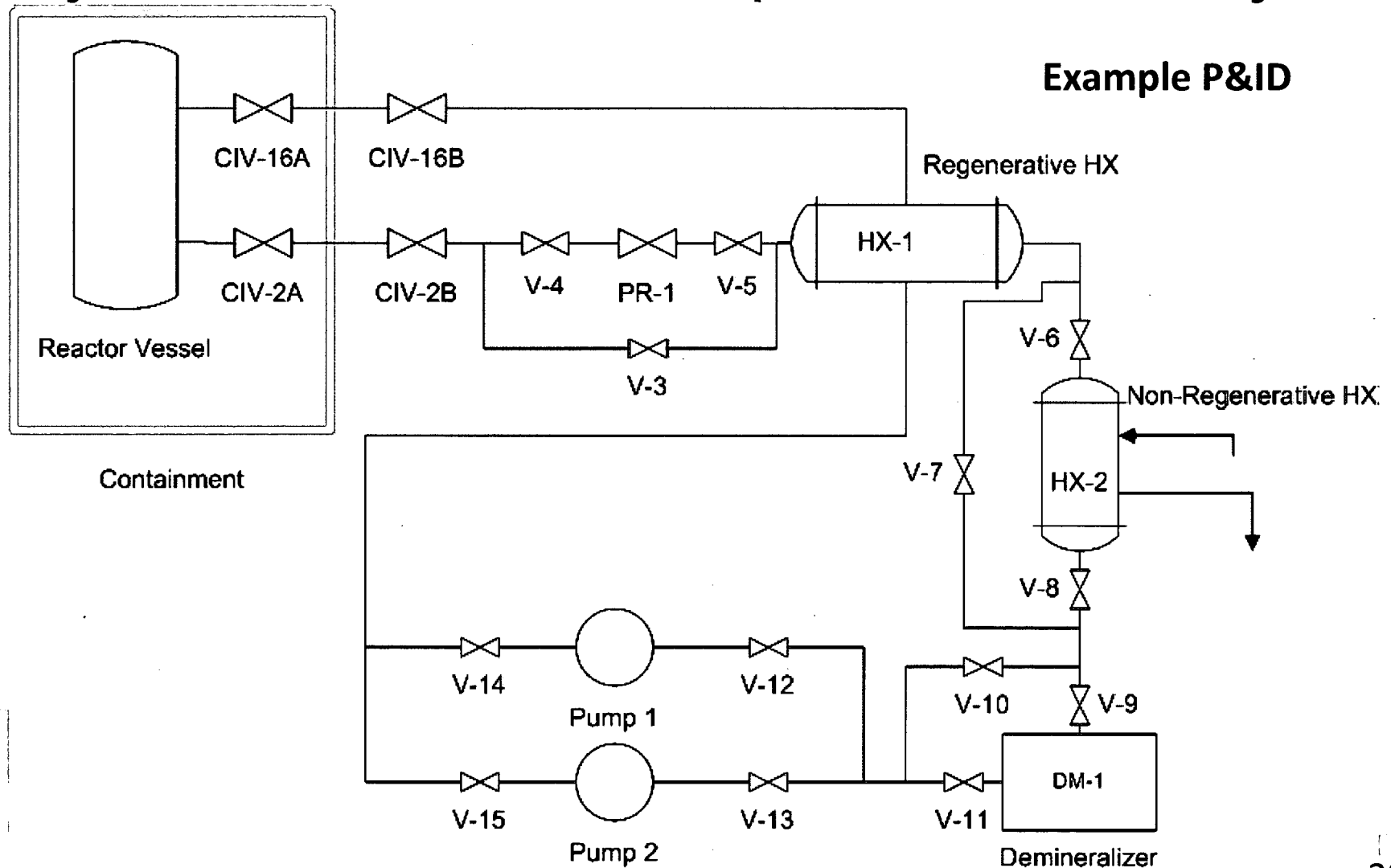
- Pull OE from sources → Screen OER for relevance → HFE or system Related?
  - **NO** → Place in OER Database with correct coding. → Send to appropriate Discipline for incorporation of OE into respective designs
  - **YES** → (down to HFE RE section)
- Document design changes in relation to OE → Compile system summary
- Collect system summaries → Compile complete summary report

HFE RE

- Retrieve applicable HFE OE
- Perform Ops Analysis for HFE → Integration into HFE process
  - **YES** → Does this require follow-up?
    - **NO** → (to Document design changes in relation to OE)
    - **YES** → (down to Responsible System Engineer section)
  - **NO** → (down)

Responsible System Engineer

- Pull OE from sources for system or component data → Screen OER for relevance → Compile all OE inputs from other sources → Does it require follow-up?
  - **NO** → (up)
  - **YES** → Document open items for systems reviews (HFE ITS) → Perform System review boards with multi-discipline team for open item resolution.

Human Reliability Assessment (HRA)

[

]

[CCI per Affidavit 4(a)-(d)]

27

System Functional Requirements Analysis

Example P&ID

Regenerative HX

CIV-16A   CIV-16B

CIV-2A   CIV-2B   V-4   PR-1   V-5   HX-1

V-3

Reactor Vessel

V-6

Non-Regenerative HX

Containment

V-7   HX-2

V-8

V-14   Pump 1   V-12   V-10   V-9

V-15   V-13   V-11   DM-1

Pump 2   Demineralizer

28

generation
mPower

Example SFRA Function Tree

[

]

[CCI per Affidavit 4(a)-(d)]

29

generation
mPower

Example SFRA

[

]

[CCI per Affidavit 4(a)-(d)]

System Function Verses Plant Mode Table

[

]

[CCI per Affidavit 4(a)-(d)]

generation
mPower
Configuration Change Table

[

]

[CCI per Affidavit 4(a)-(d)]   32

generation
mPower

Functional Configuration Change Table

[

]

[CCI per Affidavit 4(a)-(d)]

generation
mPower

Component Configuration Change Table

[

] [CCI per Affidavit 4(a)-(d)]

[

]

[CCI per Affidavit 4(a)-(d)]

34

generation

mPower

[

]

[CCI per Affidavit 4(a)-(d)]   35

generation
mPower

[

]

[CCI per Affidavit 4(a)-(d)]

generation

mPower

Additional Task Analysis Fields

[

]

[CCI per Affidavit 4(a)-(d)]

37

Areas of Design Assessment Focus

[

] [CCI per Affidavit 4(a)-(d)]

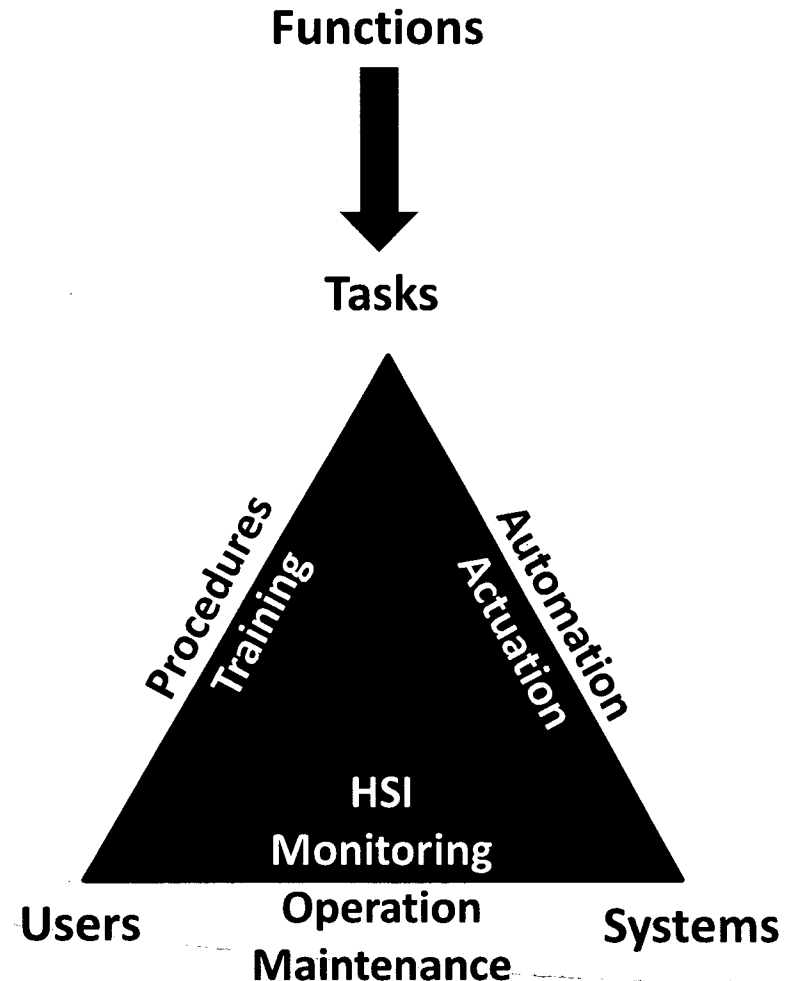# generation
mPower

Design Assessment

[

] [CCI per Affidavit 4(a)-(d)]

generation
mPower

Concept of Operation

- Functions are defined
- Tasks are developed to support functional requirements
- Functions/Tasks are allocated to man and/or machine to optimize reliability
- Knowledge and abilities, training objectives, and user guidance is provided for tasks allocated to man
- Prerequisites, interlocks, sequence, and success criteria are provided to control systems
- Guidance provided to user is compatible with requirements provided to control systems

Functions

↓

Tasks

Procedures
Training

Automation
Actuation

HSI
Monitoring
Operation
Maintenance

Users   **Systems**

Top-down and Based on Required Functions

generation

mPower

Initial HFE Design Considerations

[

] [CCI per Affidavit 4(a)-(d)]

41

generation *mPower*

[

]

generation
mPower

[

] [CCI per Affidavit 4(a)-(d)]

generation
mPower

[

] [CCI per Affidavit 4(a)-(d)]

44

generation

mPower

[

[CCI per Affidavit 4(a)-(d)]

]

45

generation
mPower

[

]

46

generation
mPower
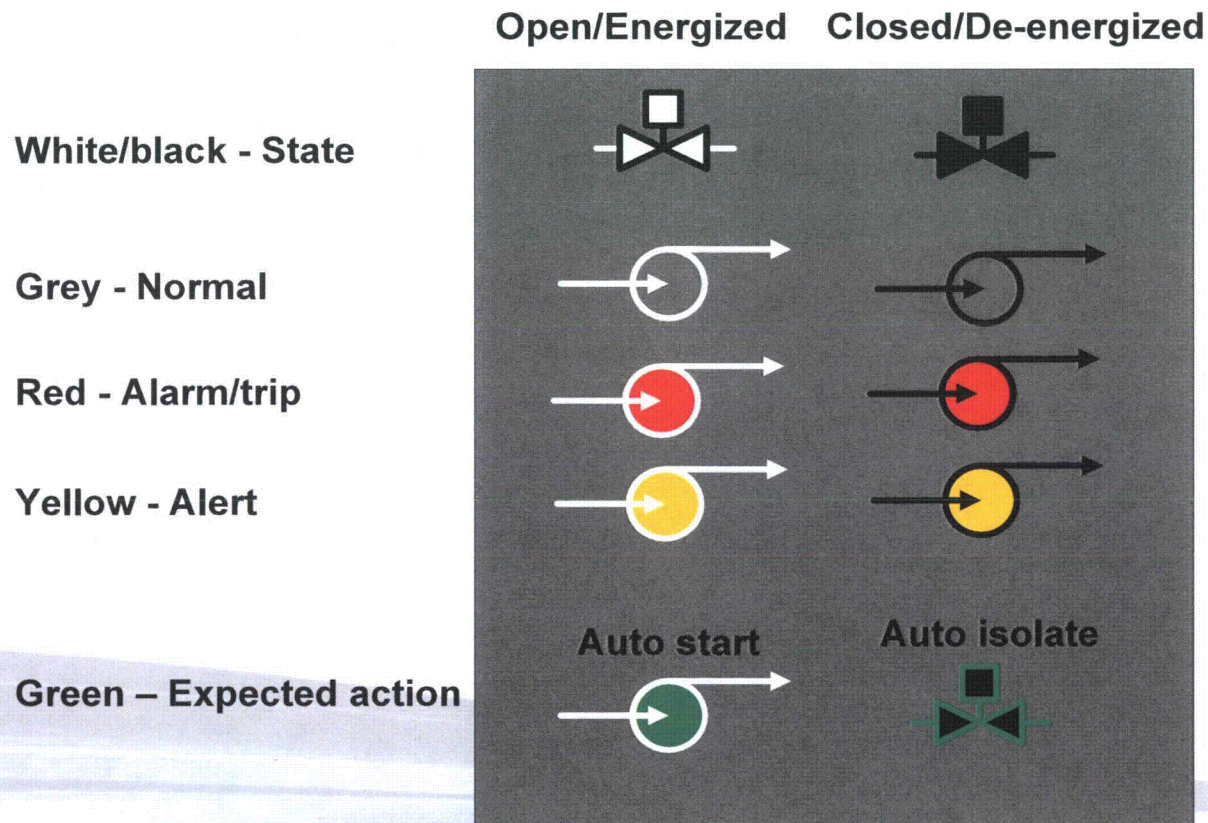
Home/Plant Overview Concept

[

]

generation
mPower

[

] [CCI per Affidavit 4(a)-(d)]

Use of Color

- Monochromatic for normal operation

- Color used to indicate off-normal or changing condition

49

generation
mPower

[

]

Procedures Embedded in DCS

Improve Situational Awareness and Human Reliability

Bounding Principles:

- Minimize the opportunity for error
- Maintain user's awareness of plant mode, configuration, and operational goals
- Detect and mitigate errors before adverse consequence
- Maintain awareness of safety function status

generation

mPower

DCS Illustrative Example

[

]

[CCI per Affidavit 4(a)-(d)]

generation
mPower

[

]

[CCI per Affidavit 4(a)-(d)]

generation
mPower

[

]

[CCI per Affidavit 4(a)-(d)]

generation
mPower
Post Accident Monitoring

[

]

[CCI per Affidavit 4(a)-(d)]

generation
mPower

Discussion

- Submittal Timeline
- Future Meetings:
    - Dates
    - Location
    - Topics
- Questions and Parking Lot Items

generation
mPower

Conclusion