AP1000 Advanced Control Room

Daryl Harmon

Westinghouse Electric Co.

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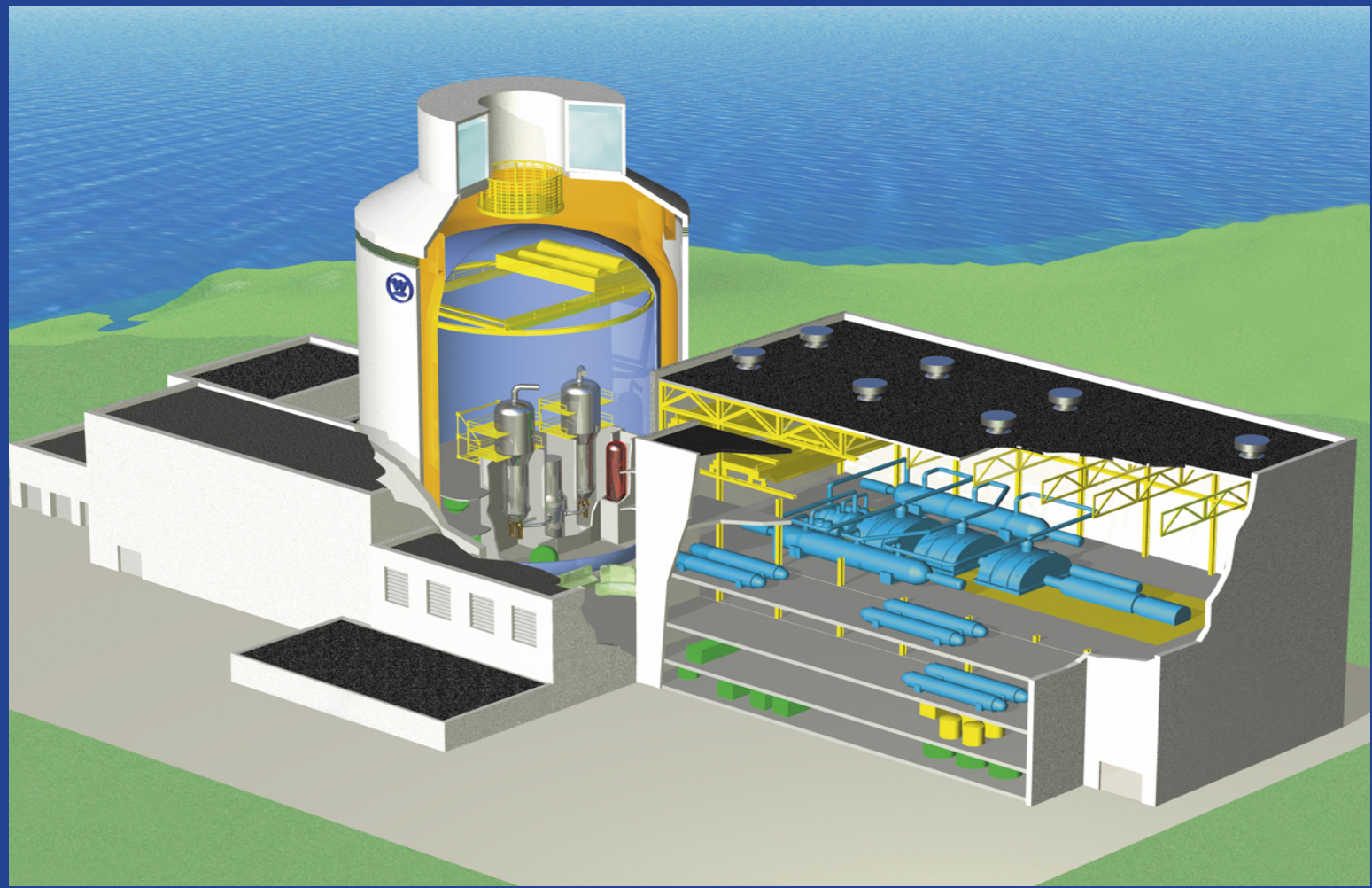
AP1000 Advanced Control Room Presentation Outline

- Background
- Operations and Control Centers
- Human-machine Interface Features
- Human Factors Engineering Program
- Conclusion

AP1000 Background

- AP1000
  - An Advanced Light Water Reactor
  - Meets requirements of EPRI's Utility Requirements Document
  - Designed using passive safety features
- AP600 USNRC Design Certification in 1999
- AP1000 USNRC Final Design Approval issued in Fall 2004
- HFE Program and Human Machine Interface (HMI) design process submitted and reviewed
- Latest HMI technology being used to complete the detailed design for 1st plant construction

AP1000 Passive Plant Design



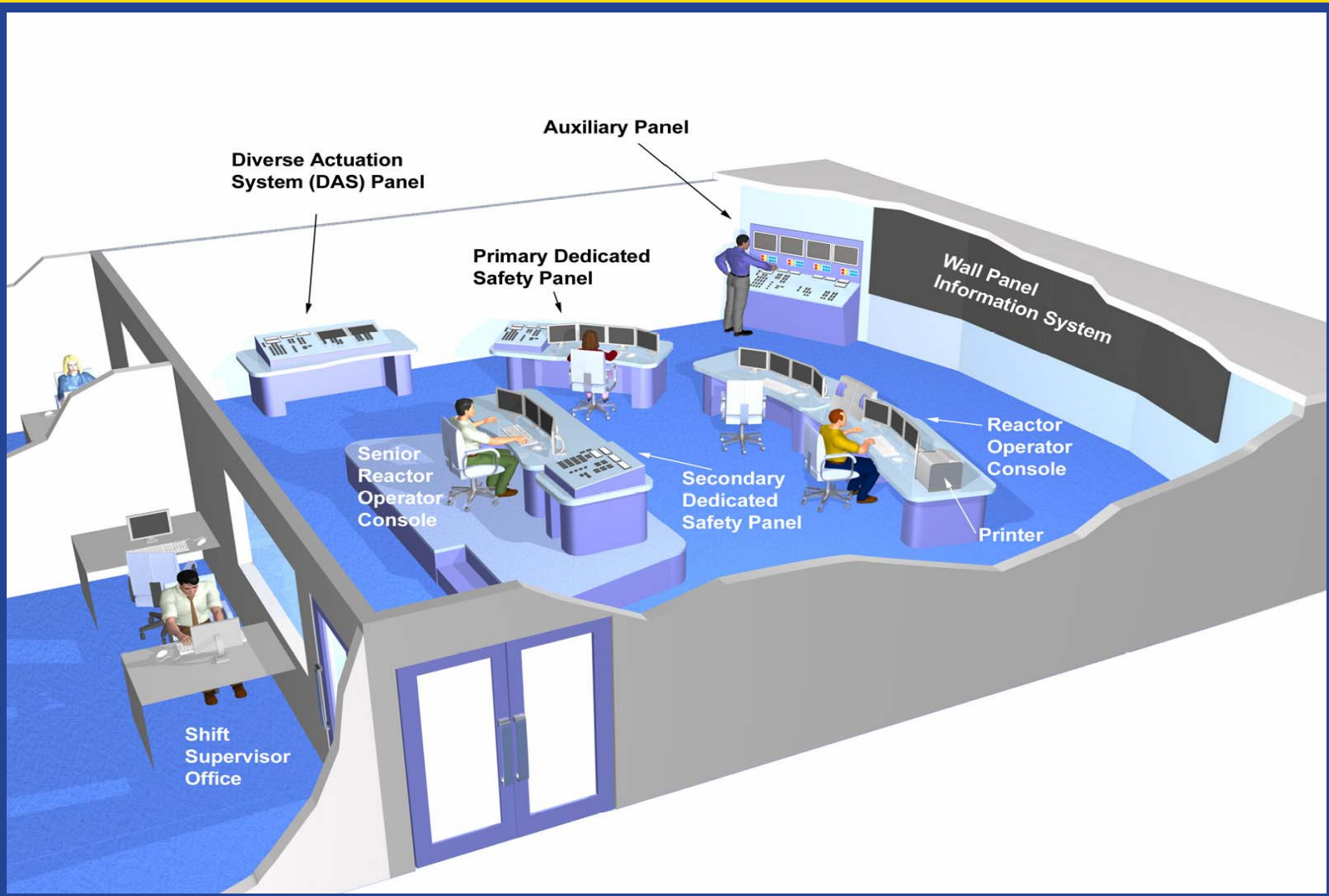
AP1000 Near-Term Opportunities

- Westinghouse is proposing AP1000 for new units in China; proposal evaluation in progress
  - Sanmen
  - Yangjiang
- Westinghouse working with NuStart Energy Consortium on detailed design for new units in the US
  - Currently performing detailed engineering
    - Control room, HMI and HFE program
    - I&C system designs
  - Combined License application to USNRC planned in 2007
- Recent announcements by Owner/operators of intent to submit AP1000 Combined License applications

AP1000 Operations and Control Centers

- Main control room
  - Main controlling area
  - Shift supervisor's and clerk's offices
  - Switching and tagging area
  - Kitchen/restroom facilities
- Remote shutdown room
- Technical support center
- Operations support center
- Emergency operations facility
- Local control stations

AP1000 Compact Control Room



AP1000 Control Room Features

- **RO Console:** Four identical work positions available
  - Designed to be manned by one operator normally
- **SRO Console:** Two identical work positions available
  - Designed to be manned by one operator normally
- **Primary Dedicated Safety Panel**
  - Two Qualified Data Processing System FPDs for PAMS
  - Two associated Class 1E FPDs for safety related soft control and monitoring
  - Minimum Inventory fixed-position control switches
- **Secondary Dedicated Safety Panel**
  - Redundant switches for onerous condition actuations
- **DAS Panel: Diverse manual actuations and monitoring**

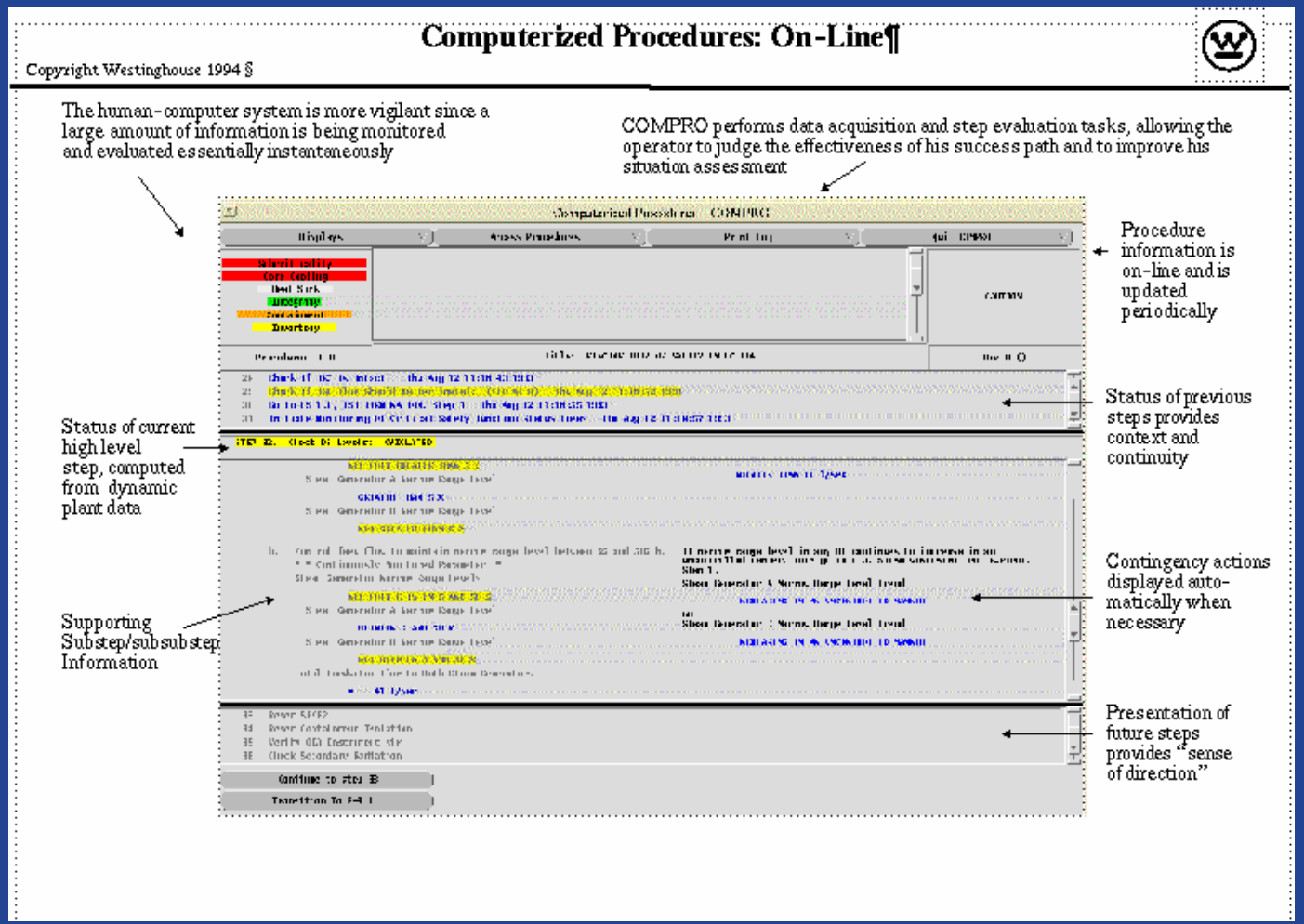
Westinghouse Standard I&C/HMI Platforms

- Common Q for safety-related systems
  - ABB's AC 160 processors
  - ABB's AF100 network and high speed link communications
  - Qualified FPDs (6" to 18" diagonal) with PC Nodebox processors
  - Class 1E power supply
  - Common Q equipment and applications to safety-related systems have been licensed by USNRC in Safety Evaluation Report
- Ovation DCS for non-safety systems
  - Controllers and computational servers provide processing for all control and plant computer-type functions
  - Redundant network communications with safety system gateways and datalink servers to foreign systems
  - Operator stations with full-function FPD interfaces
  - Wall Panel Information System large screen displays

AP1000 HMI Resources

- **Soft control**
  - All non-safety components controlled through Ovation FPDs
  - Safety components controlled by either:
    - Universal soft control through non-safety Ovation FPDs
    - Approved by NRC in Common Q Safety Evaluation Report
    - Manual system-level ESF actuations
- **Computerized procedures**
  - DCS application program for all types of operating procedures, including Emergency Operating Procedures
  - Significant operational benefit compared to paper procedures
  - CPS Editor provided for procedure development, maintenance, configuration control and automatic generation of paper back-up procedures

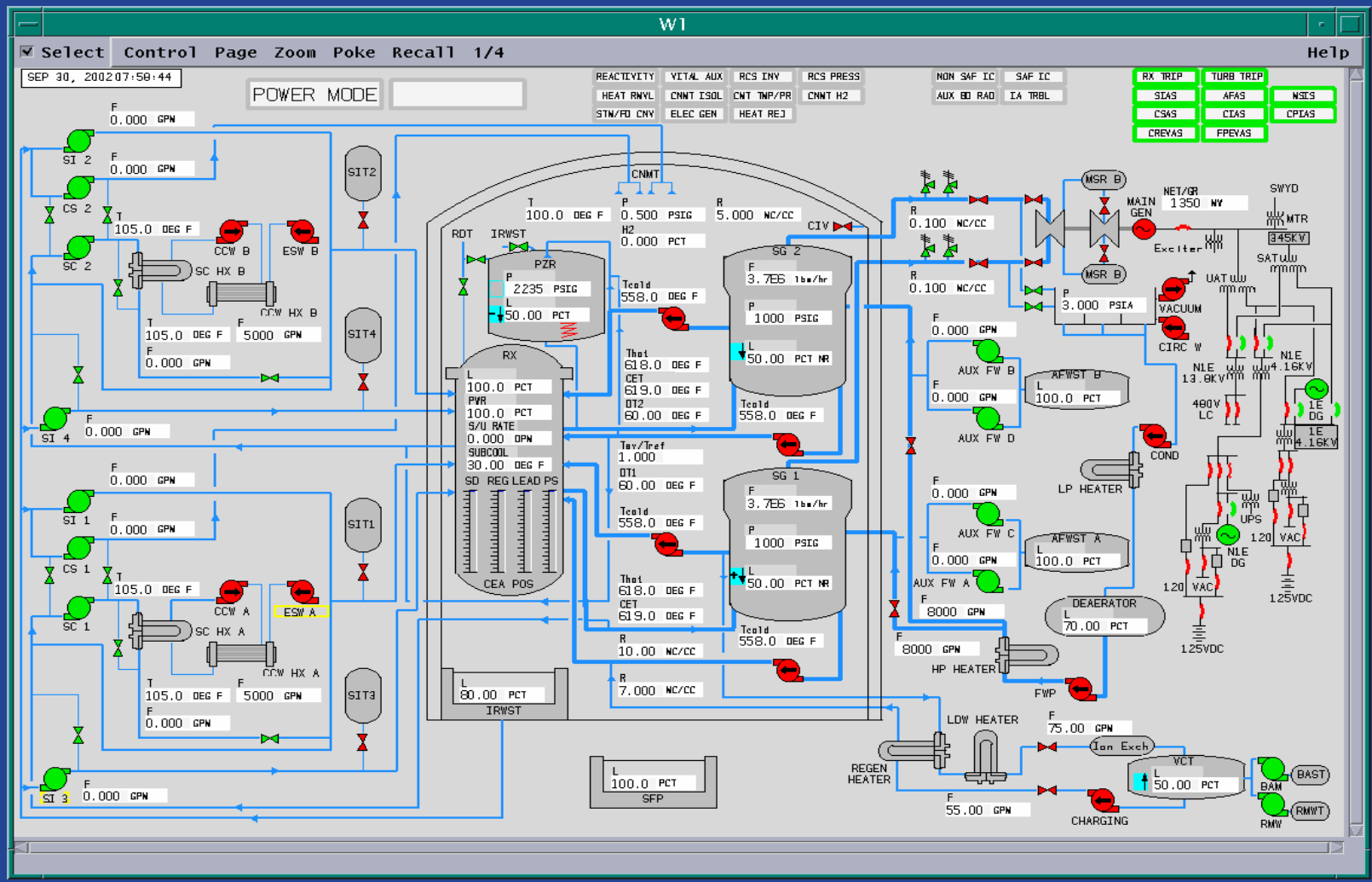
AP1000 HMI Resources
Computerized Procedure System



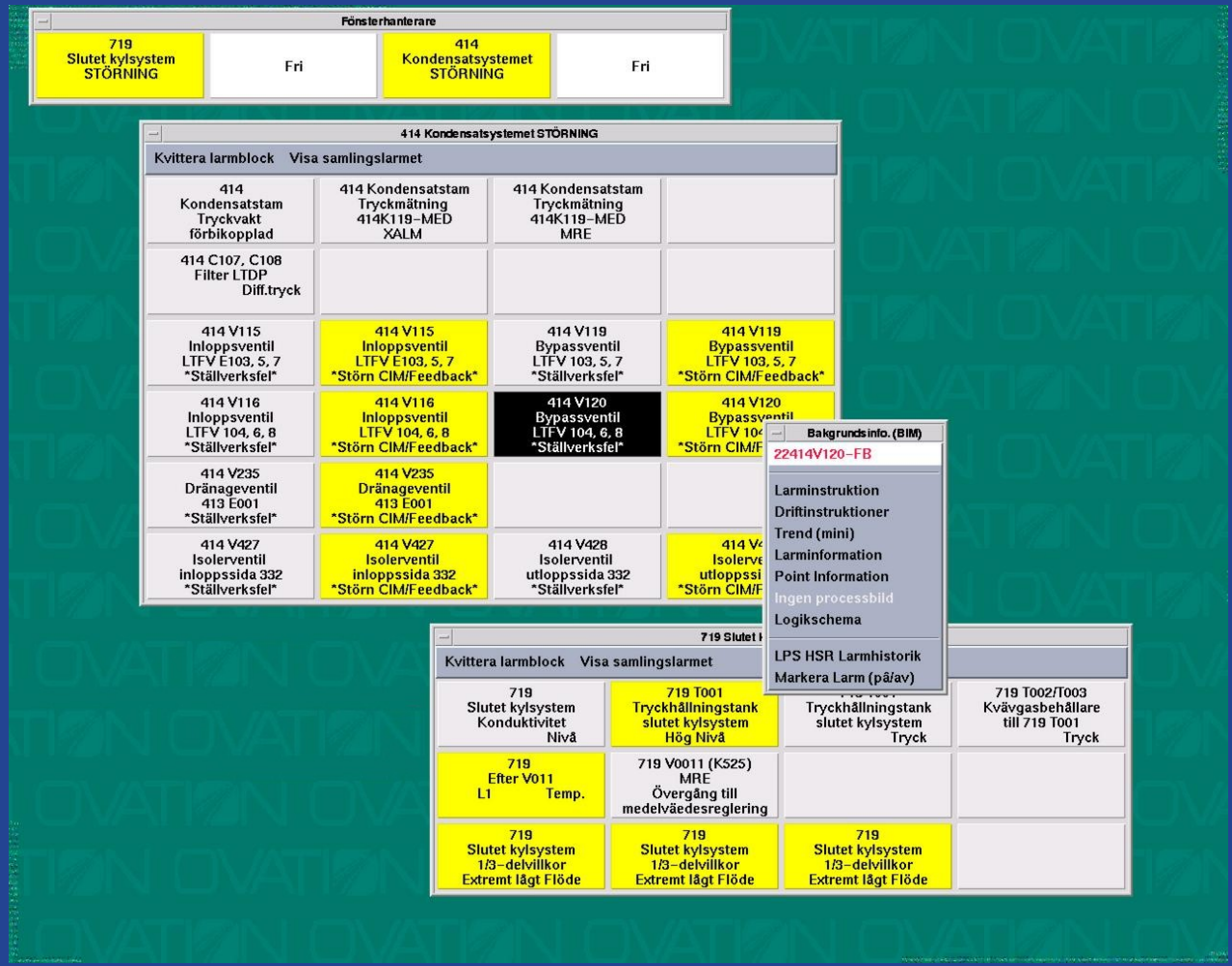
AP1000 HMI Resources

- Displays
  - Ovation provides capability for all types of displays
  - Wall Panel Information System overview display and selectable display screens
  - Limited set of safety-related displays on multi-channel FPDs and QDPS FPDs (including Reg. Guide 1.97 Category 1 PAMI)
- Alarms
  - Primarily generated/displayed through Ovation (lists or integrated with plant mimics)
  - Fixed-position alarms on either WPIS or dedicated alarm FPDs
  - Multiple alarm processing techniques enhance useability
  - Limited safety-related alarms on multi-channel FPDs for accident mitigation and safe shutdown

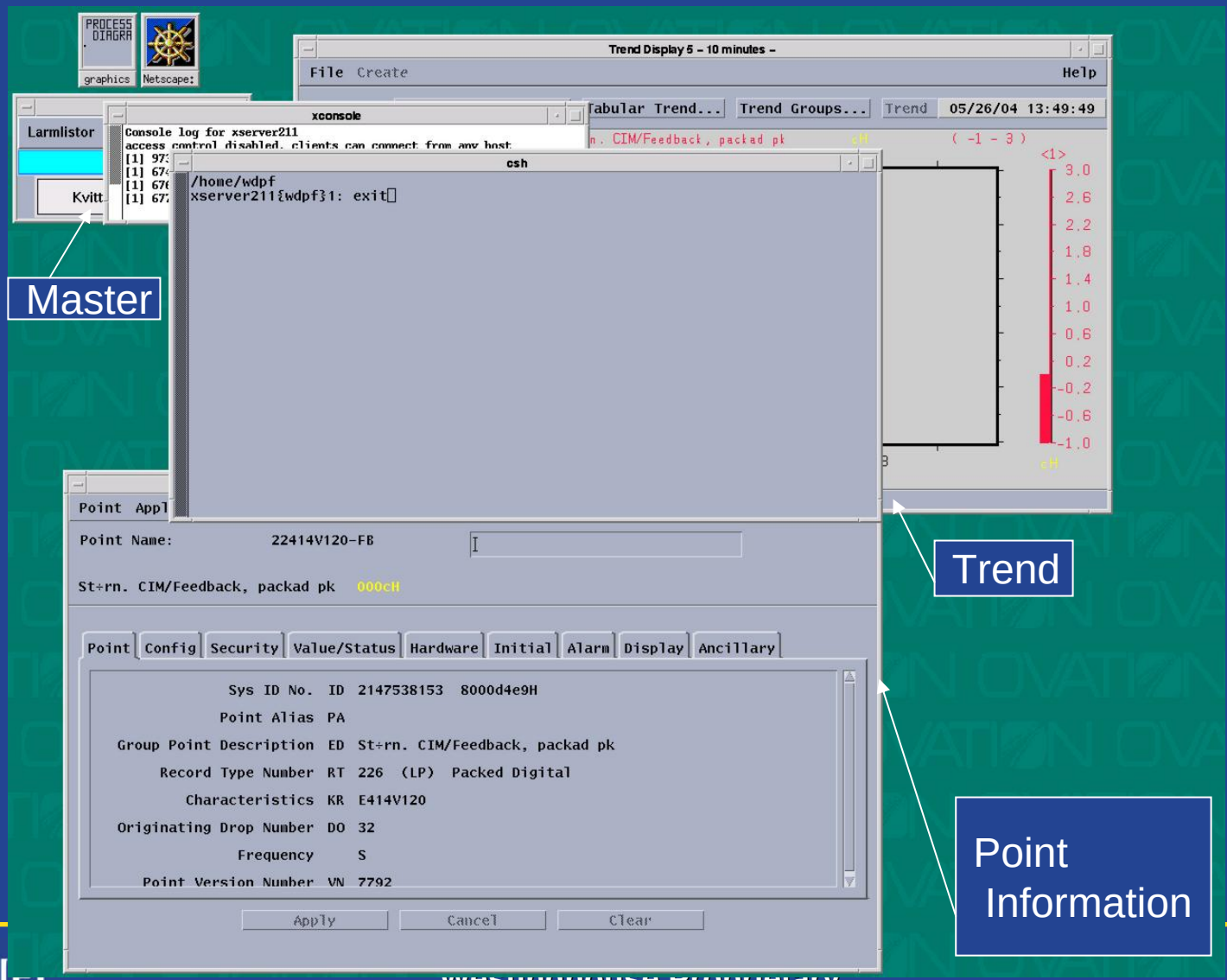
AP1000 HMI Resources
Example Overview Display



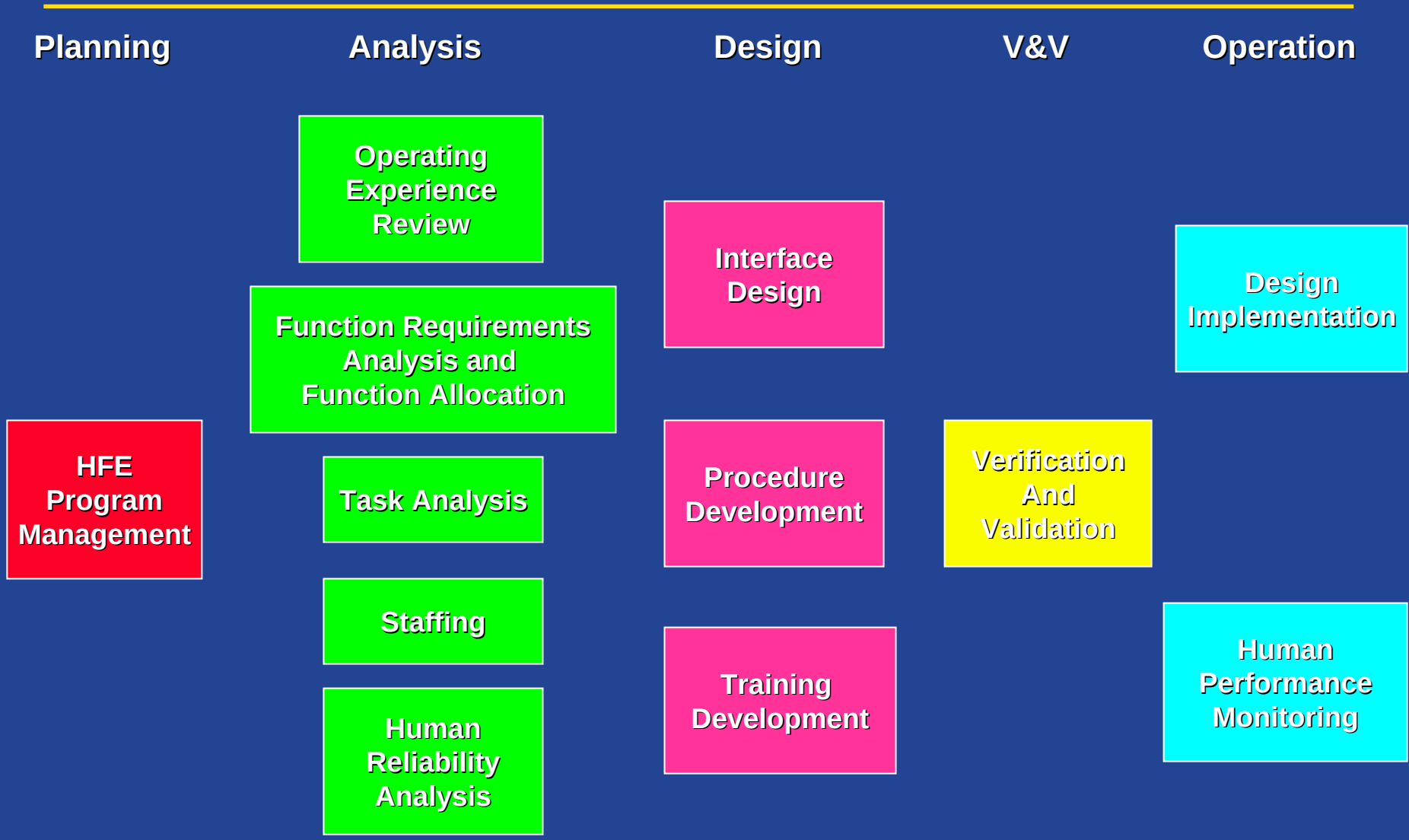
Alarm Presentation System
Example Overview Display



Alarm Presentation System
Example Support Display



AP1000 Human Factors Engineering Program



AP1000 Human Factors Engineering Program Current Progress

- Task Analysis
  - Function-based TA complete
  - Operational Sequence Analysis method established and being performed by a dedicated, international team
- MCR staffing roles and responsibilities document completed and submitted to NRC
- Human Reliability Analysis
  - Risk important operational tasks identified
  - Risk important maintenance, testing, inspection and surveillance task identification identified
  - Report submitted to NRC
- Procedure development underway

AP1000 Human Factors Engineering Program Current Progress (cont.)

- **Human Machine Interface Design**
  - Functional requirements and design specs written
  - First multi-disciplinary review completed
- **Engineering Tests**
  - Engineering test for safety soft control completed in June 2005; Report complete
  - Engineering test for HMI integration will start May 15th
  - Simulation test facility development supports tests
  - HMI resource implementation supports tests

Westinghouse AP1000 Control Room Development Facility

Conclusion

- Near term opportunities to deploy AP1000 exist in both China and the US
- AP1000's compact control room is being implemented with Common Q and Ovation video-based HMI
- A comprehensive human factors engineering program is being conducted to support COL applications
- Detailed engineering for the complete HMI is well underway