

International District Energy Association

University of Michigan: Central Plant Distributed Control System Upgrades

Presented by

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Agenda

- Background
- Predesign Phase
- Design Development
- Construction Document
- Bid/Award Phase
- Construction Phase
- Commissioning Phase



Background

- Central Power Plant Components
 - Five Multi-Burner Dual Fuel Gas Boilers
 - Two Combustion Turbines with HRSGs
 - Three Turbine Generators

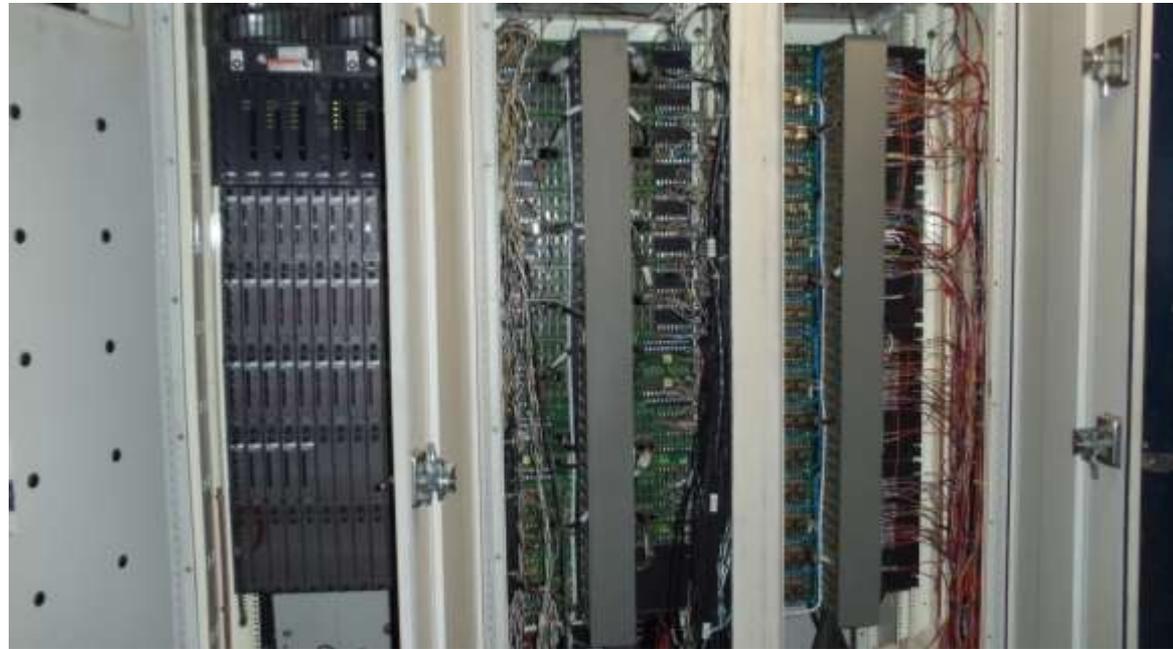


Background (continued)

- Existing DCS
 - ABB Infi90 DCS Installed in 1990s
 - ABB Letter – Intent to Phase-Out Infi90 DCS
- University of Michigan
 - Evaluated Control System Platforms and Chose Emerson Delta V (Competitive Bid)

Background (continued)

- University of Michigan Upgrade – 2006
 - Delta V Connect
 - PCU 9
 - PCU 19



Background (continued)

- Control System Goals
 - Interface with Smart Field Devices
 - Redundancy and Reliability
 - Partitioning Equipment
 - Power Supply Redundancy
 - Open Source Communication Standards
 - Incorporate Redundant Plant Master Controllers and Individual Boiler Master Station



Background (continued)

- Project Goals
 - Project Schedule - Complete Project in Two Years (Design and Construction)
 - Adhere to Planned Maintenance Schedule
 - Increase Redundancy and Reliability
 - Implement Project through Three Contracts
 - Electrical Installation
 - DCS Procurement – Include Start-Up
 - Control Room Upgrade

Predesign Phase

- Design Intent Document
 - Held with “Key” Decision-Makers
 - Project Scope and Goals
 - Schedule and Phasing
 - Identification of Problem Areas
 - Identify Critical Issues
 - Identify Key Personnel
- Field Survey



Design Development

- Develop Preliminary Documents and Construction Documents
 - Location Plans
 - Cable Schedules
 - Panel Arrangement Drawings
 - As-Built I/O Listing
 - Construction Specifications
 - Network Diagrams



Design Development (continued)

- NFPA 85 Audit
 - Compliance Reports
 - Single Burner Dual Fuel Boilers
 - Multi-Burner Dual Fuel Burners
 - HRSG
 - FM Global Requirements
 - Michigan State Inspector



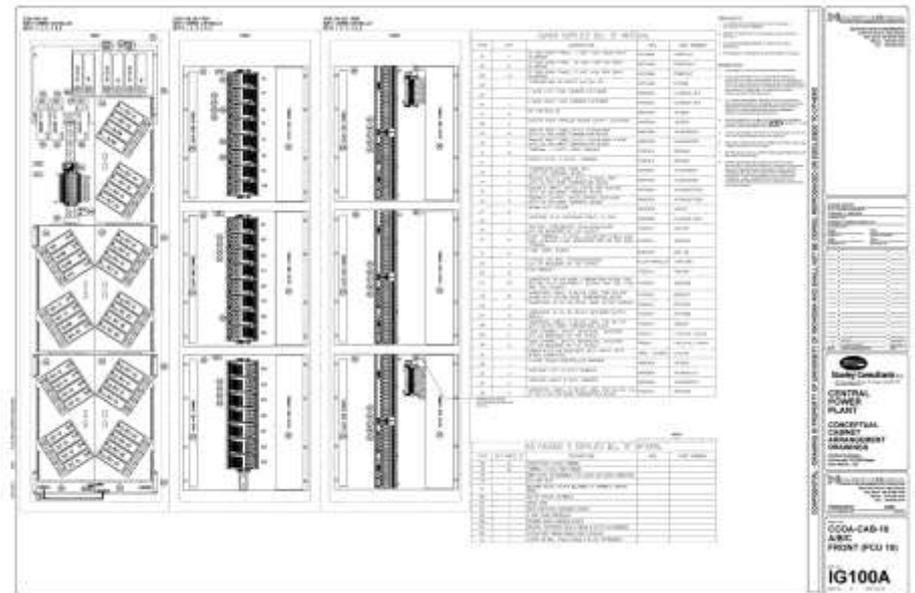
Design Development - Keys

- Complete Field Survey
- Accurate I/O Listing
- Accurate Network Diagram
 - Existing and New
- Keep Design Intent Current
- Identify Project Schedule Issues
- Cost Estimate
- Board of Regents Approval Package



Construction Document

- Finalize Design Development Documents
 - Detailed Delta V Panel Layout
 - Wiring Diagrams
 - Cable Schedule
 - I/O Listing
 - Specifications
- Project Schedule



Construction Document – Keys

- Close Coordination with Project Team
- Accurate Project Schedule
 - Phasing Plan
 - Week 1 – Demo
 - Week 2 – Installation
 - Week 3 – Loop Checks
 - Week 4 – Start-Up and Commissioning



Construction Document – Schedule/ Phasing

- Construction Execution Plan
 - Identification of Key Resources
 - Loop Checkout Teams
 - Number of Operators
 - Commissioning Team
- DCS Cabinet Procurement Phases
 - Remove Delta V Connect Blocks
 - Remove ABB Configurations
 - Update Graphics-Remove Custom



Bid/Award Phase

- Prior to Issuing Bids
 - Prequalify Acceptable Bidders
 - Interview Potential Candidates
- Prebid Meeting
 - Emphasis on Key Design Features in Contract
 - Control Narratives
 - Importance of Central Power Plant



Construction Phase – Goals

- Maintain Schedule
- “Finger on the Pulse”
- Flexibility with Central Plant Operations



Construction Phase

- Phase 1 –
 - Partitioning Equipment among BOP Cabinets
 - PCU 10 to PCU 9 and 19
 - Required to Turn Off PCU 10 and Still Run the Plant
 - Procure PCU 10 Cabinet Hardware
 - Factory Acceptance Test
 - PCU 10, 9, and 19
 - Software Acceptance Test
 - PCU 10, 9, and 19



Construction Phase (continued)

- Hardware Group 2
 - Completed Parallel with Phase 1
 - Shop Drawing Submittals and Review
 - Procurement and Hardware Assembly
 - Hardware Factory Acceptance Test
 - Ship Hardware Group 2
 - Software Acceptance Test – Held On-Site



Construction Phase (continued)

- Phase 2 – Boiler 4
- Phase 3 – Boiler 3
- Phase 4 – Turbine Generator 1
- Phase 5 – Turbine Generator 7



Construction Phase (continued)

- Hardware Group 3
 - Completed Parallel with Phases 2 through 5
 - Shop Drawing Submittals and Review
 - Procurement and Hardware Assembly
 - Hardware Factory Acceptance Test
 - Ship Hardware Group 3 to Site to Support Next
 - Software Acceptance Test – Held On-Site



Construction Phase (continued)

- Phase 6 – Turbine Generator 8
- Phase 7 – Boilers 1 and 2
- Phase 8 – CT9 and Boiler 7
- Phase 9 – CT10 and Boiler 8
- Phase 10 – Boiler 6



Construction Phase (continued)

- Hardware Group 4
 - Completed Parallel with Phases 6 through 10
 - Shop Drawing Submittals and Review
 - Procurement and Hardware Assembly
 - Hardware Factory Acceptance Test
 - Ship Hardware Group 4
 - Software Acceptance Test – Held On-Site



Construction Phase (continued)

- Phase 11 – Plant Master A
- Phase 12 – Plant Master B
- Phase 13 – Data Links
- Phase 14 – Control Room



Construction Phase – Schedule

	September '12	October '12	November '12	December '12	January '13	February '13	March'13	April'13	May'13	June'13	July'13
PCU 10											
DCS Boiler 1	Completed 9/17/2012										
DCS Boiler 2						PM	Completed 3/12/13 PM				
DCS Boiler 3							Completed 3/08/13				
DCS Boiler 4											
DCS Boiler 6 PM											
Boiler 6 DCS Boiler 7 PM		PM Completed 10/26/12									
Boiler 7 DCS T/G 9 PM											
T/G 9 DCS Boiler 8 PM											
Boiler 8 DCS T/G 10 PM											
T/G 10 DCS T/G 1											
DCS T/G 7											
DCS T/G 8											
DCS											

Construction Phase – Challenges

- Combustion Turbine Outage
 - Moved Up in Schedule
- Dedicated Loop Check Teams



Construction Phase – Control Room Upgrades

- New Versus Retrofit
 - New – Evans Consoles
 - Retrofit – University of Michigan Cabinet Shop
- Static Ground Carpet
- Quad-Monitor Workstations
- Two 60-Inch Monitors



Commissioning Phase

- Independent Commissioning
 - Participated in Each Phase
 - Provided Documentation



Project Keys

- Identifying Project Goals Upfront – Design Intent
- Accurate Demolition Drawings
- Prequalifying DCS Contractors
- Factory Acceptance Testing



Project Keys

- Bi-Weekly Project Meetings
- Team Environment
 - Design Team and University
- Plant Support





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Thank you