Microgrid Electrical Control Design & Deployment at Hudson Yards
Topics of Discussion

• Introductions
• Hudson Yards development project
• What is a microgrid & what are its benefits?
• Hudson Yards microgrid case study
• Q & A
Introduction

Thermo Systems is a national, full-service control systems integration partner with a focus on serving the Energy and Consumer markets.

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Other Microgrid/CHP Successes

- NYU Warren Weaver Cogen
- NYU Langone Medical Center Cogen
- Molycorp Minerals
- Princeton University
- University of Minnesota
- DC Water Waste Gas
- Hyperion Waste Gas
- University of New Mexico
- FDA White Plains
- University of California Santa Cruz
- University of Colorado Cogen
- Rutgers University Cogen (New Brunswick)
- DCO Energy MTCC
- Orange County CUF
- Philadelphia Navy Yard
- UTMB West Plant
- Wilmington WWTP CHP Plant
- USAA
- Dartmouth Power
- University of Oklahoma UP#4

THERMO SYSTEMS
www.thermosystems.com
A group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the grid.

- Able to disconnect from grid (*island mode*)
- Able to parallel with the grid (*parallel mode*)

Microgrid Benefits

• Flexibility
• Energy Price Control
• Generate Revenue
• Power Quality
• Uptime

Image Reference:
Microgrid Control System

- Remote control and monitoring of loads, breakers, and equipment
- Supervisory Control and Data Acquisition System
  - Visualization
  - Dashboards
  - Historian
  - Trending
  - Reporting
  - Alarming (remote & local)
- Utility company interface – Transfer/Trip, RTU
- Energy Metering
- Automatic Load Shedding
- Automatic Load Restoring
Microgrid Control System Cont.

- Demand Response
- Frequency Response
- Import/Export Control
- Time Synchronization
- Sequence of Events (SOE) Forensics
- Safety Interlocks
- Economic Dispatch
Microgrid Control System Architecture

- Smart Power Meters and Relays (Switchgear Manufacturer)
- Generator Local Controller (Vendors)
- Microgrid or Power Management System (PMS) Controller (Controls Contractor)
- Operator Interface (Controls Contractor)
- Data Collection and Historian Servers (Controls Contractor)
- Utility Company Control System or SCADA
- All Rockwell?
Hudson Yards’ Microgrid Details:

- Energy producers – CHP Plant, Four natural gas reciprocating engine generators ~ 3MW each coupled with four absorption chillers to maximize efficiency
- Energy consumers – Residential, office and commercial space at Hudson Yards
- Controls
  - Balance of Plant (BOP) controller (thermal) - chilled water, hot water, condenser water, fuel gas, etc..
  - Power Management System (PMS) controller (electric) – electrical breaker control, generator speed, etc..
- Microgrid breakers, collector bus, power distribution
Case Study: Hudson Yards

- Utility Breakers
- Ring Bus
- Generators
Case Study: Hudson Yards

Microgrid Control System Overview:

- Redundant ControlLogix PLC panel in cogeneration plant
- Three remote IO panels located at separate 480V distribution locations
- Fiber optic device level ring
- ~800 hardwired IO
- 26 Power Relays in electrical gear communicating Modbus
- FactoryTalk SCADA
- Panelview
Case Study: Hudson Yards

Microgrid Control System Functions:
• Con Edison Monitoring and Control Interface Point – DNP3
• Load Shed/Restore at 480V breaker level
• Load lockout
• Breaker monitoring and control
• Modes of operation
  • Utility Parallel
  • Island
  • Stand Alone
  • Blackstart
Case Study: Hudson Yards

Thermo Systems’ role in project: Controls Contractor

- Provided turnkey solution
- Project management capabilities
- System Life Cycle Service Contract
- Capable of integrating CHP functions and MG functions into one comprehensive control system
- Brought application expertise to project team
Case Study: Hudson Yards

Challenges

• Complex ancillary systems serving CHP
• Varying heat load
• High profile tenants
• Multiple remote distribution bus
• ConEd requirements for remote monitoring and supervisory control
• Load balancing of REG
• System life cycle cost

Solutions

• Deliver one fully integrated control system tightly integrating together all MG & CHP functions & sub-systems.
  • Benefits: operators single interface (look & feel), cost effective, single supplier.
• Absorption chillers & multiple thermal modes SOO, REG
• Build resilient MG system based on Rockwell Automation technology
• Expanded RIO architecture for fast load shed of 480V breakers
• Implement dedicated RTU PLC with DNP3.0 protocol for interfacing with ConEd
• Utilize PLC based Power Management System to drive speed setpoints to REG
• Emerson life cycle cost > Rockwell life cycle cost
Case Study: Hudson Yards

Benefits that Related received from this solution:

• Flexibility in development
• Price stability
• Continuous supply
• Saves money, generates revenue
• Increased power quality
• Single integrated control system
  • Utilize PLC based solution which offers scalability & flexibility
  • Lower life cycle cost for owner vs other technology providers
  • Tightly integrated CHP and MG
Main Takeaways

• Why microgrid ➔ Flexible, resilient grid technology to maximize system uptime.

• Why CHP ➔ Highly efficient, economical, sustainable, resilient source for power and thermal loads.

• Why Thermo/RA ➔ Select a solution provider and non-proprietary technology that is capable of deploying a flexible control system solution that tightly integrates all functions and systems associated with CHP Plant & the MG.