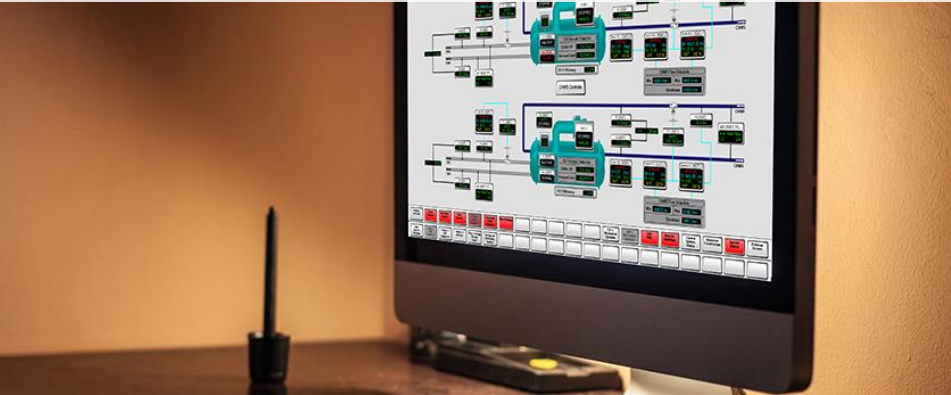




THERMO SYSTEMS
INDUSTRIAL AUTOMATION & INFORMATION

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.



Authors:

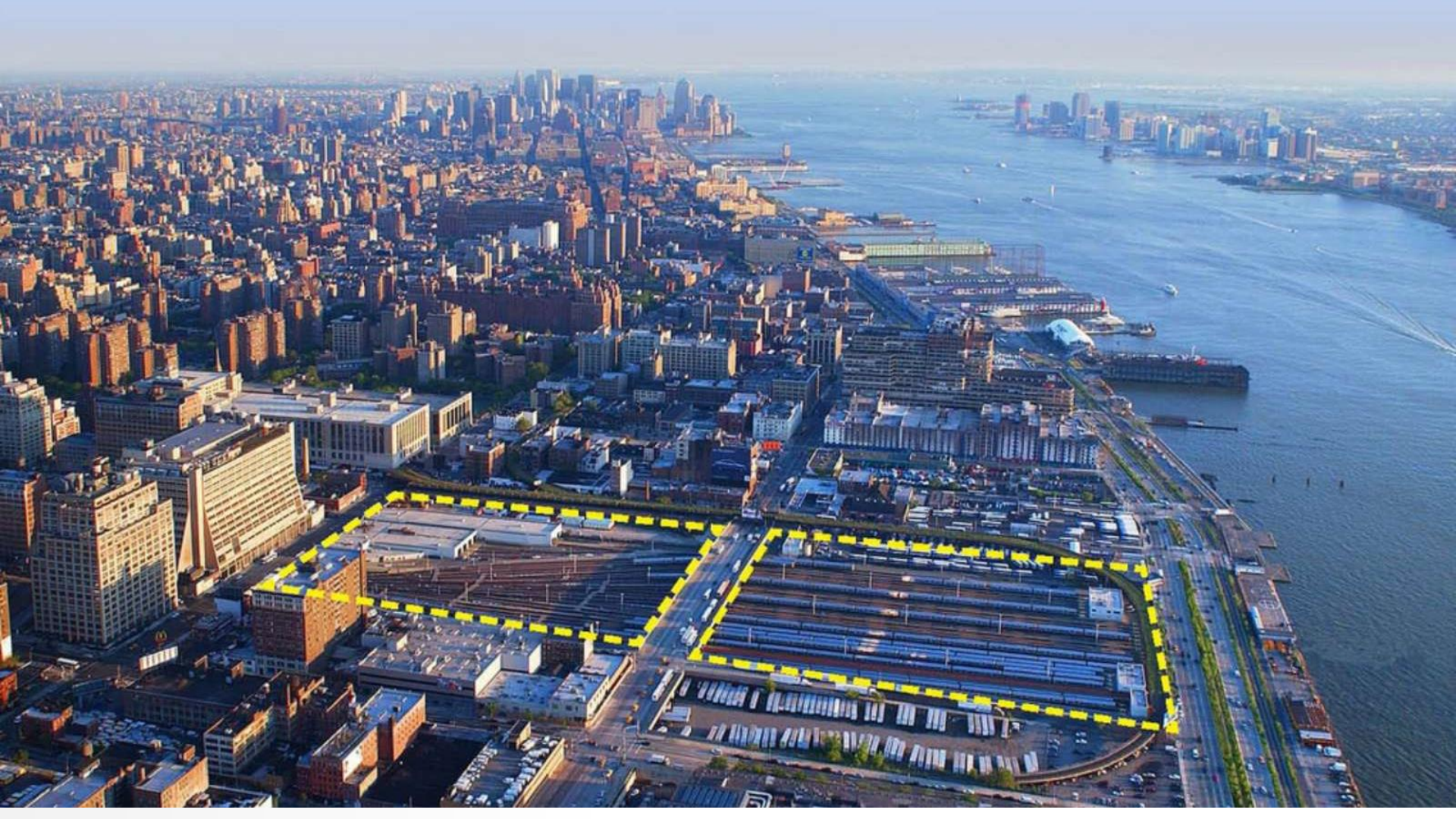
Jason Wittkamp, P.E. - Director

Eric Silk, CEM - Business Team Manager

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









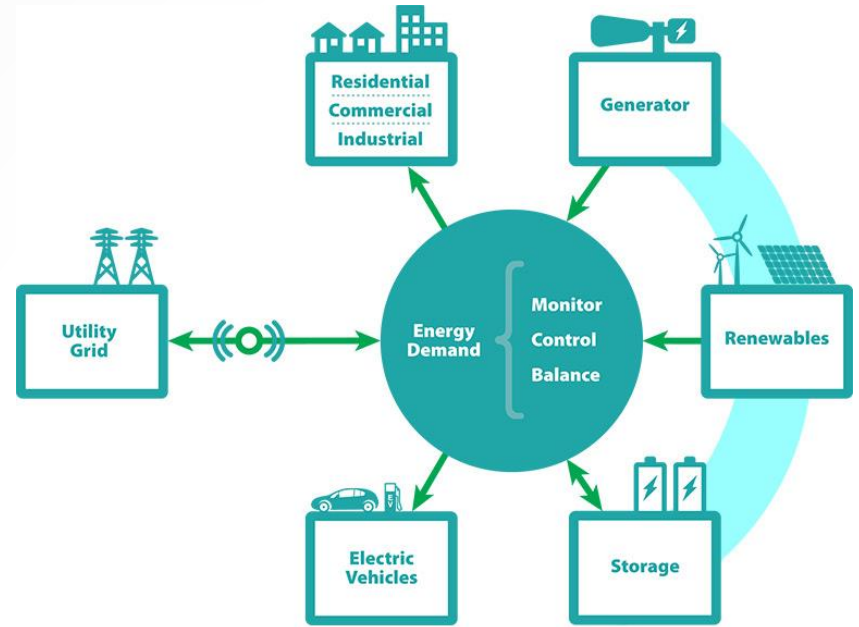




What is a microgrid?

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*)



© Center for Sustainable Energy

Graphic Reference:

<https://energycenter.org/self-generation-incentive-program/business/technologies/microgrid>

Microgrid Benefits

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



Image Reference:

http://www.edwardtdodge.com/wp-content/uploads/2014/12/2014_10_19_NYU-Blackout-Sandy.png

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



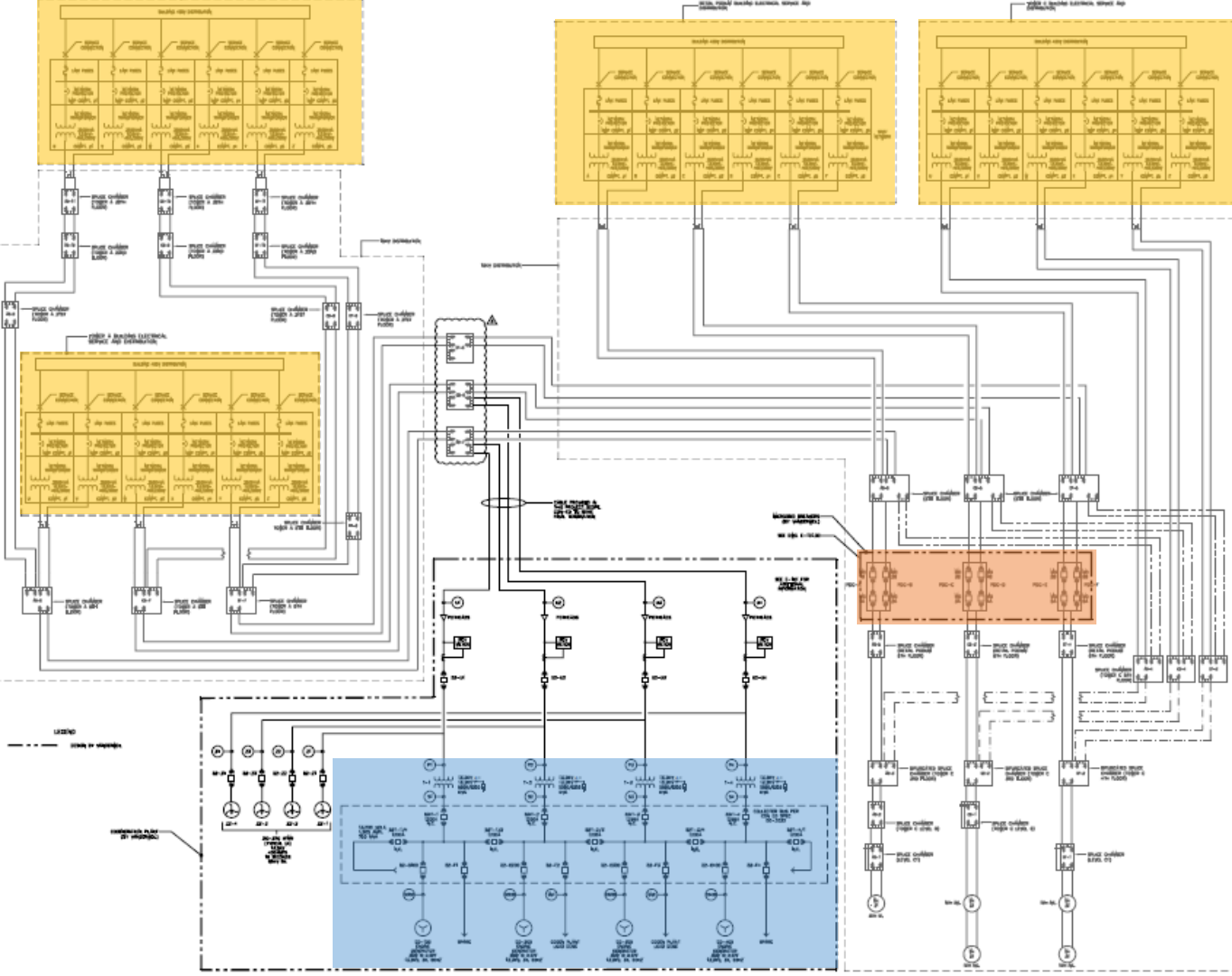
Microgrid Control System Architecture

- 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?

Case Study: Hudson Yards

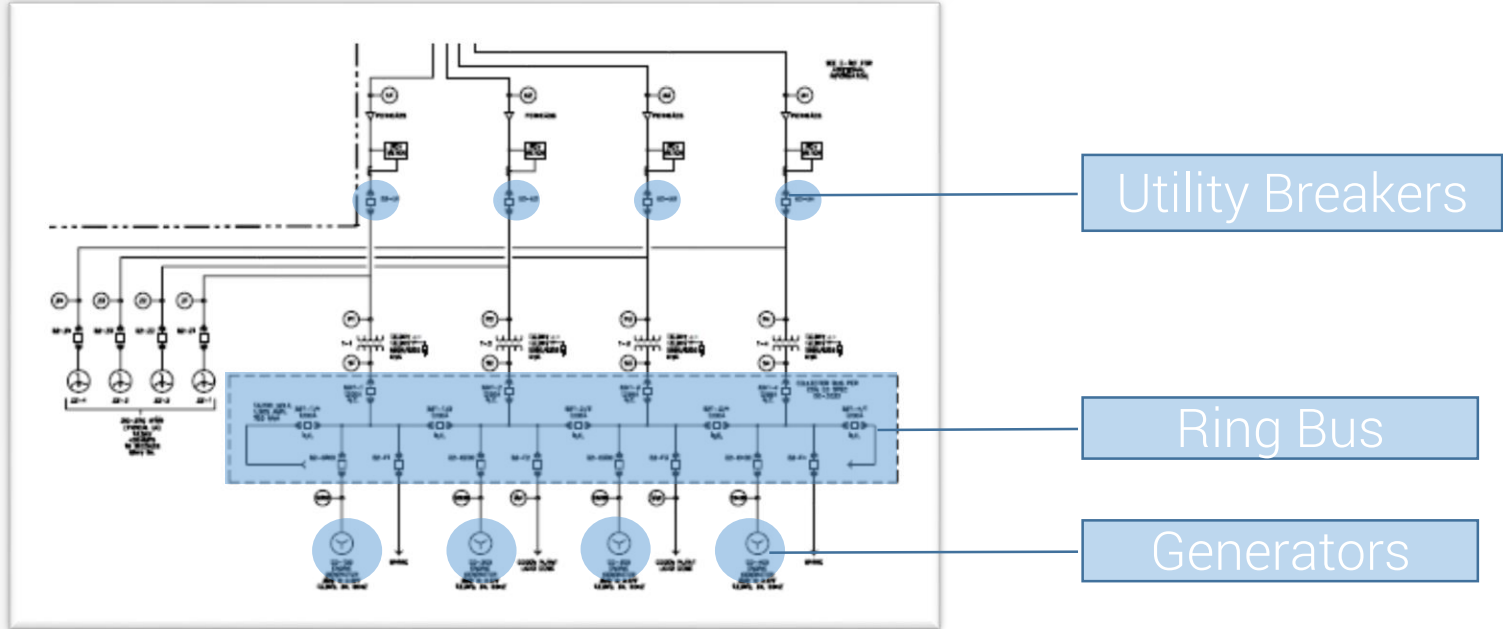
Hudson Yards' Microgrid Details:

- 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



Building Loads
MG Breaker
CHP Plant

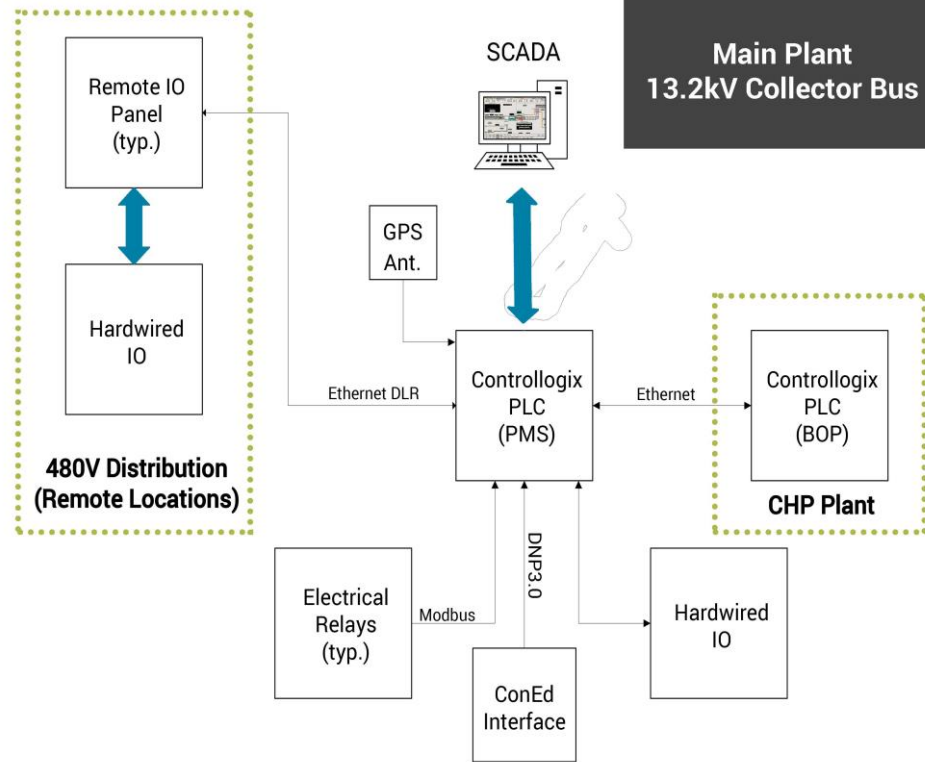
Case Study: Hudson Yards



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

Closing Message

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.