2009 GovEnergy Conference, Providence, Rhode Island

# Remote Building Management:
## A Facility Manager's Perspective

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GovEnergy
www.govenergy.gov

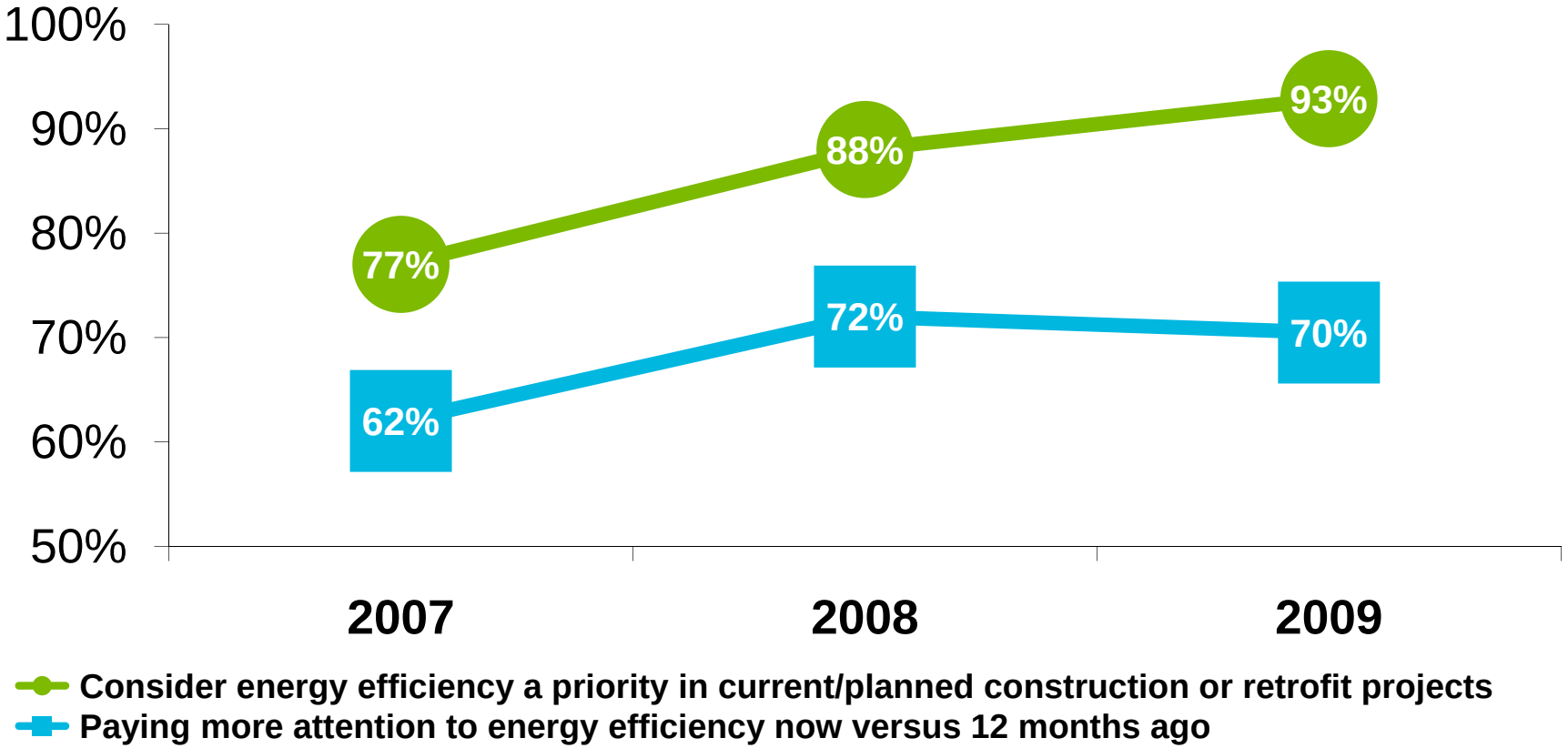
Johnson Controls

# Agenda for Today's Discussion

- Motivating Context
- Introduce the Buildings I Manage
  - Brengel: 1st LEED-EB Gold re-certified facility
  - Glendale: 1st LEED Platinum campus
- Objectives of Remote Building Management
- Remote Management for Building Performance Optimization

# The Context

Companies are paying more attention to energy efficiency and green building than ever before




*Source: 2009 Energy Efficiency Indicator Study*

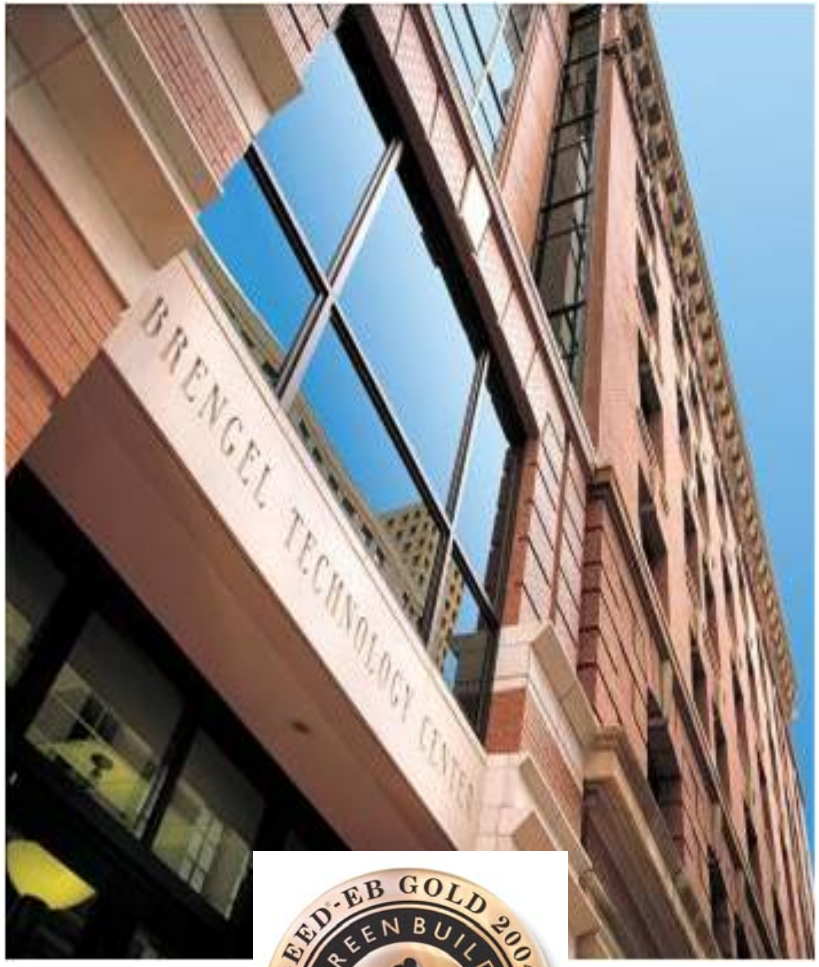
# 507 E. Michigan

Downtown Milwaukee, WI

460,000 square foot complex for Building Efficiency business, including

- Seven-story, 130,000 sf LEED Silver certified Brengel Technology Center built for $16 million in 2000

- adjacent to our 100 year-old original headquarters building



# Integrated Approach

## Sustainable Sites

## Energy & Atmosphere

## Water Efficiency

## Materials and Resources

## Indoor Environmental Quality

# Personal Environment Module

Credit 6.1-6.2
Controllability of Systems: Lighting, Temperature & Ventilation
2 points earned

PEM at each work station

Individual desktop control of

- air flow
- air temperature
- task lighting
- white noise generator

Controls under-desk VAV box

Built-in occupancy sensor turns system off and on to save energy

# Demand-Based Ventilation

Credit 1
Outdoor Air Delivery, Increased Ventilation and Carbon Dioxide (CO2) Monitoring
2 points earned

Under-floor air HVAC system

Delivers more than 90% of air to breathe zone

Feedback control on ventilation performance using $CO_2$ sensors in major air handlers and select spaces

# Building Automation System

Credit 1.1-1.10
Optimize Energy Performance
6 points earned

Building management system continuously monitors and meters

- lighting systems and controls
- electricity use (submetering)
- interior and exterior water use
- chiller efficiency
- cooling load
- economizer operation
- boiler efficiency
- VFD operation
- static pressures
- ventilation air volumes

Web-based PC/handheld portals provide worldwide access to data

Advanced reporting and alarm mgmt

*"My Xbox for green building optimization"*

# Green Bay Avenue: Raising the Bar

**Our newly renovated facility.**
**Goal is to be the first Platinum-certified LEED®**
**campus in the world.**

# LEED Platinum Glendale Campus

34 acre site, 500,000 sf total building footprint

including 6,000 sf data center, 5,000 sf dry room

**Targeting**

- 4 LEED-NC v2.2 Platinum buildings
- 1 LEED-EBOM v2.0 Platinum building
- >90th percentile EnergyStar ratings

# Glendale Sustainable Features

- 1,500 panel, 385 kW solar photovoltaic array (Wisconsin's largest)
- 1,330 sf solar thermal collectors
- 340 ton, 272 well geoexchange system
- underfloor air distribution system
- 30,000 gallon rainwater capture cistern
- 13 acres of native prairie vegetation
- section of vegetated roof
- 89% of demo "waste" diverted from landfill
- 25% of project materials locally harvested and manufactured
- 400 PHEV hookups in parking structure

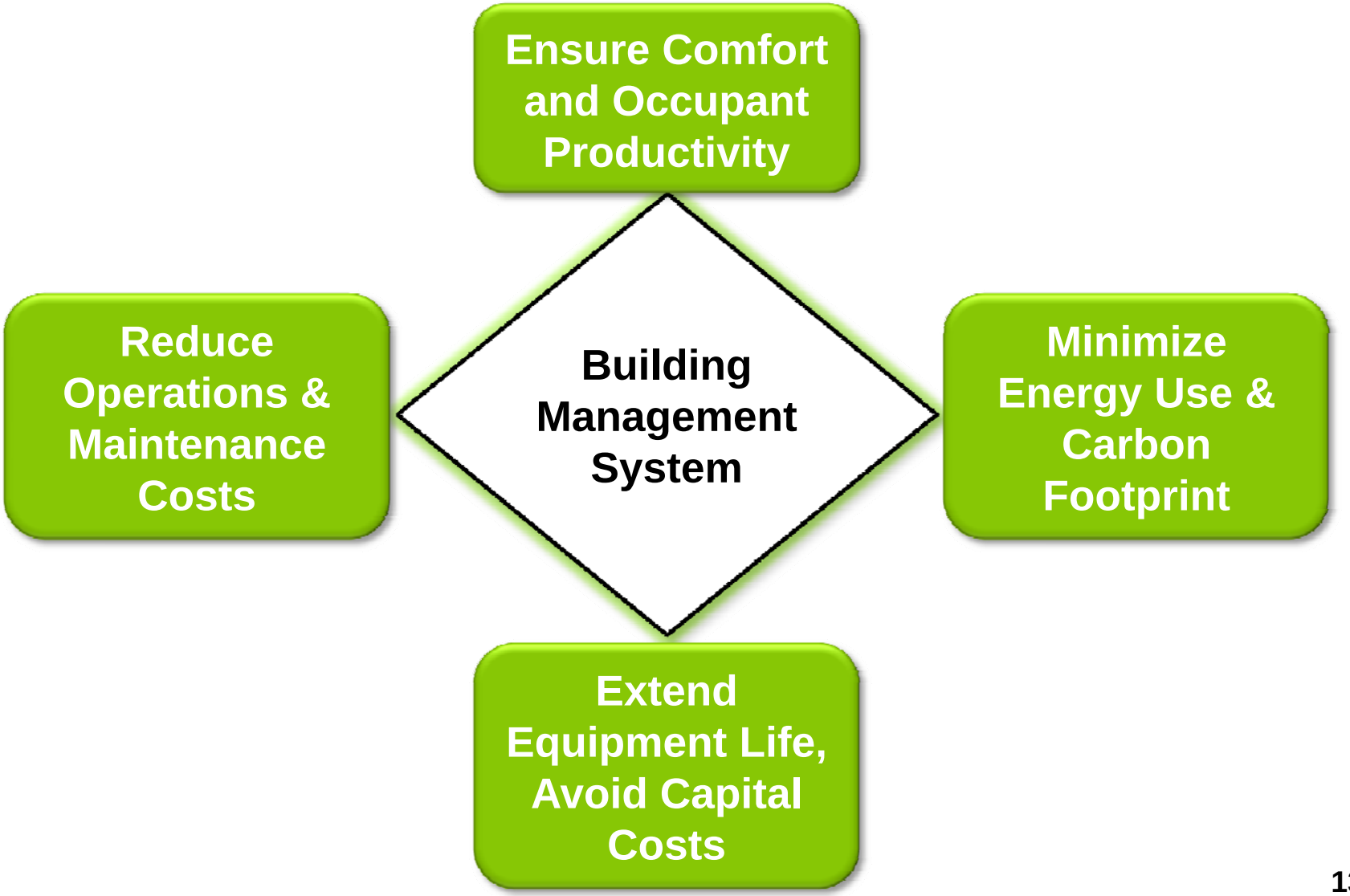
# Glendale Advanced HVAC/Controls

- Under floor air distribution system that can be quickly and easily reconfigured
- Personal environment modules
- Daylight harvesting and shade controls

  March 1st to present, 44.75MWh saved, 22.4 tons coal not burned and 42.7 tons $CO_2$ not emitted.

- BMS integration to IT monitoring system in data center
- BMS integration to work order management system

# Building Management Objectives



# The role of BMS is changing

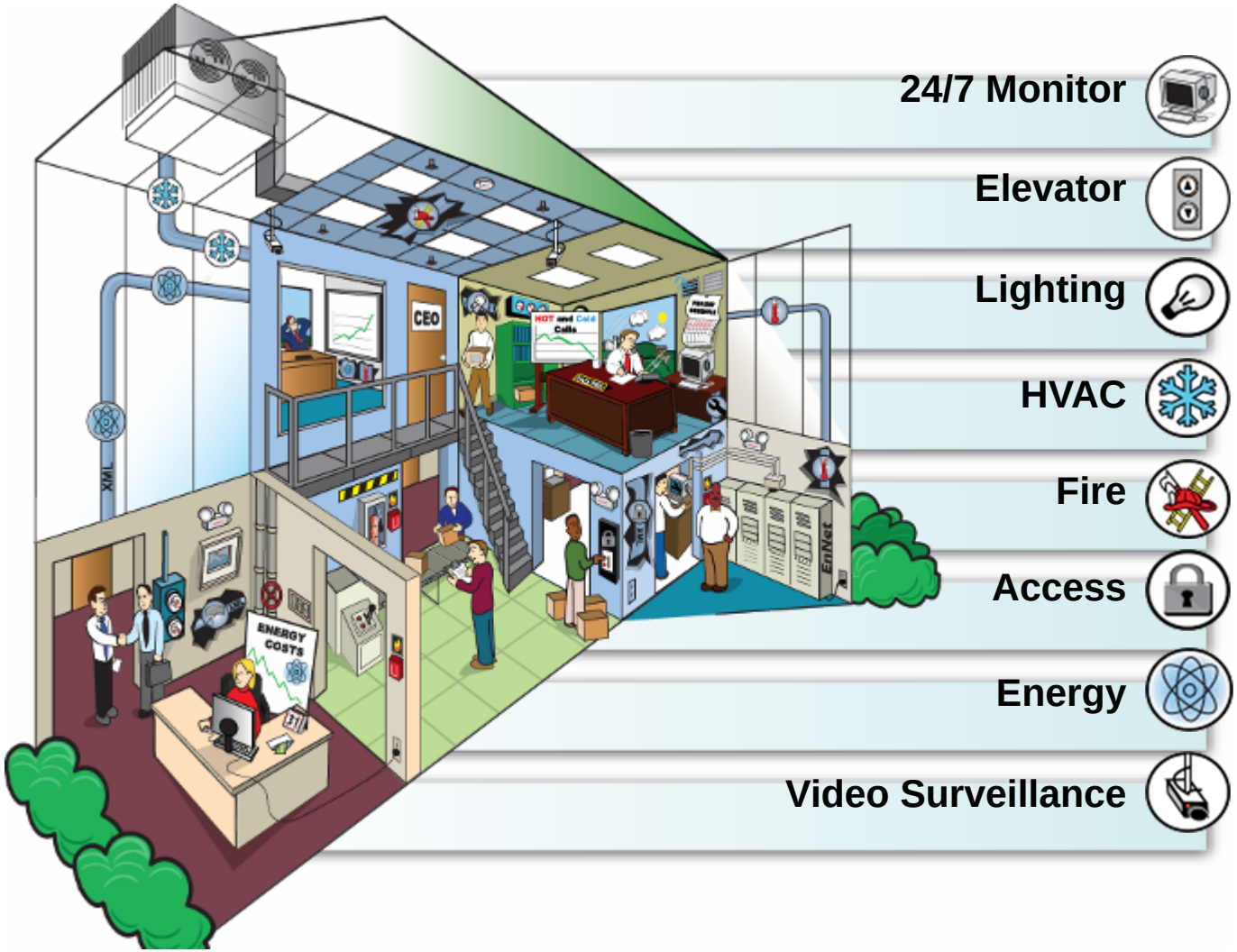
## Traditional BMS role

- Facility operations focused
- Manage occupant comfort
- Alert operators to problems
- Reduce energy usage
- Protect facility assets

## Expanding BMS role

- Business/Occupant focused
- Source of data to optimize business operations – especially utilities
- Allow control of my environment - immediately via web

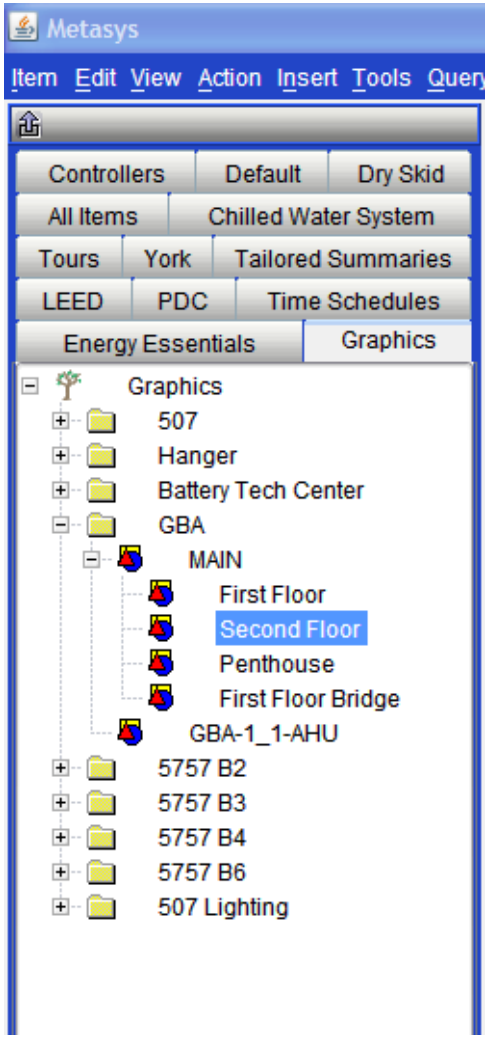
# Building System Convergence



# IT enabled BMS innovations

- Systems that communicate with each other
- Systems that talk to enterprise applications
- Systems that share data and media
- **Systems that we can access anywhere, anytime**

- Across the web
- Over the enterprise network
- To our portable devices
- In a format we can use



Metasys - Microsoft Internet Explorer

Item Edit View Action Insert Tools Query Help Logout Exit

All Items

- Calendar1
- N2 Trunk1
  - UNT1
    - Parameters
      - Discharge Setpo
      - Modes
      - Mixed Air Setpoir
      - Economizer Setp
      - Damper Setpoin
      - Cooling Valve
      - Static Pressure S
      - Supply Fan Setp
    - Analog Inputs
      - ZT
      - OA-T
      - MA-T
      - DA-T
      - RAT
      - S-SP
    - Binary Outputs
      - SF-C
      - C-VLV-OP
      - C-VLV-CL
    - Binary Inputs
    - Analog Outputs
- Graphics
  - AHUnit 1
  - Johnson Medical Cente
- Programming
  - Floor1 Temp Select

Johnson Medical Center

Normal

Graphic Focus

Edit 41.88%

Johnson Medical Center

Schedule1

Normal

Schedule Focus

Edit Effective Period Weekly Schedule Exception Schedule

| | 00:00 | 06:00 | 12:00 |
|---|---|---|---|
| *Monday* | On | | |
| Tuesday | On | | |
| Wednesday | On | | |
| Thursday | On | | |
| Friday | On | | |
| Saturday | On | | |
| Sunday | | | |

AHUnit 1

Normal

Graphic Focus

Edit 37.68%

Air Handling Unit 1

Floor1 Temp Select

Normal

Logic Focus

42.03%

Server: 2/3/03 11:33:54 PM UTC

Metasys - Microsoft Internet Explorer

Item Edit View Action Insert Tools Query Help Logout Exit

All Items | Medical Center 1

- WeCare4U
  - User Navigation Trees
  - NAE 1
    - Energy
    - Programming
      - Floor 1 Selectors
    - Schedule
      - Summer Schedule
      - Weekly Schedule
    - N2 Trunk1
      - UNT1
        - Analog Inputs
          - OA-T
          - MA-T
          - DA-T
          - RAT
          - S-SP
          - ZT
        - Binary Inputs
        - Analog Outputs
        - Binary Outputs
        - Parameters
    - Notification1
    - Trending
    - Graphics
      - AHUnit 1
    - User Defined Points
      - Zone Temp 1-2
      - Zone Temp 1-3
      - Zone Temp 1-4
      - Zone Temp 1-5

AHUnit 1

Normal

Graphic | Focus

100%

Main | Back

## Acute Care AHU 1

JOHNSON CONTROLS

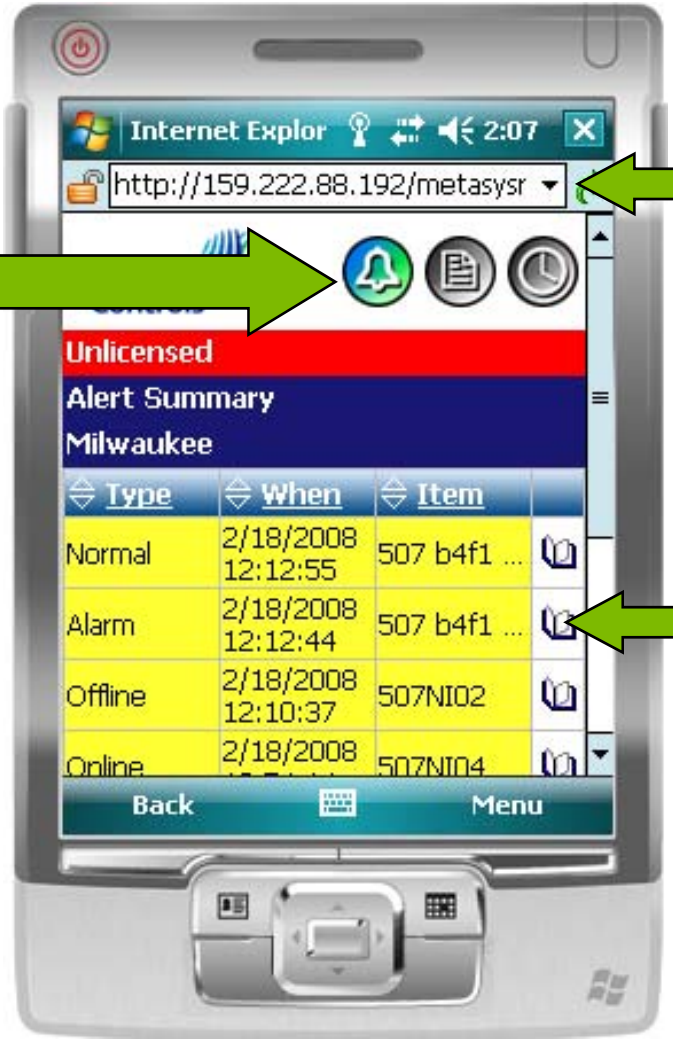
| | |
|---|---|
| Sup Air Setpoint | 57.0 |
| Static Press Setpoint | 1.0 |
| Econ Setpoint | 68.0 |
| Ret Air Temp | 81.3 |
| Exhaust Air | |
| Return Air | |
| OA Temp | 61.7 |
| Dpr Cmd | 100.0 |
| MA Temp | 63.6 |
| Cmd | On |
| Sts | False |
| Spd Out | 0.0 |
| Disch Temp | 55.4 |
| Sup Air Press | 3.0 |
| Outside Air | |
| Supply Air | |
| Clg Cmd | 1.0 |
| Min Pos Setpoint | 15.0 |
| Zone Temp | 73.8 |

Chiller | Boiler | VAV

Server: 1/8/03 8:30:14 PM UTC

# Monitor and control building via a PDA

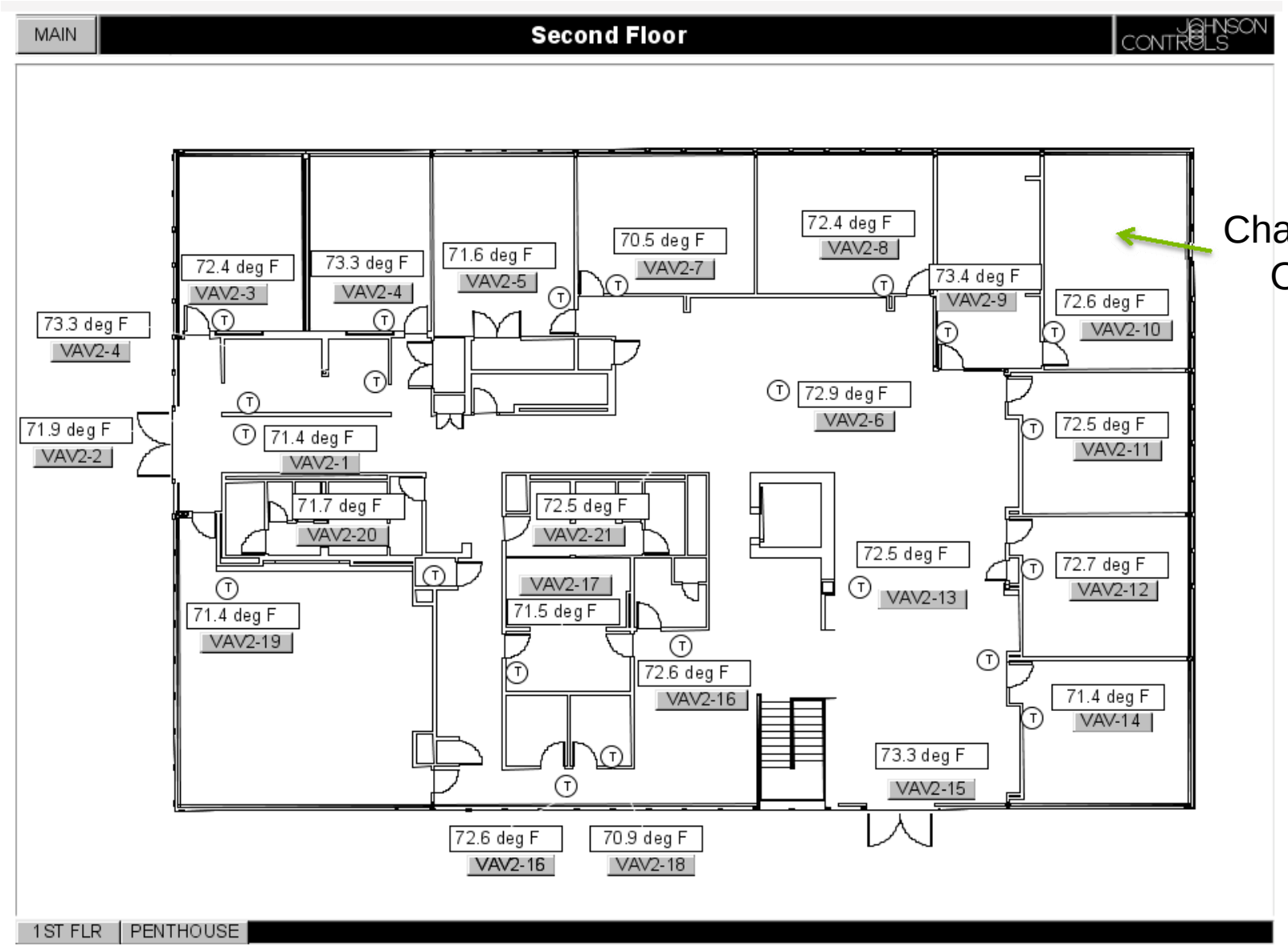
Select Alert View
Summary
Schedule
(Alert view shown)




Select server IP location

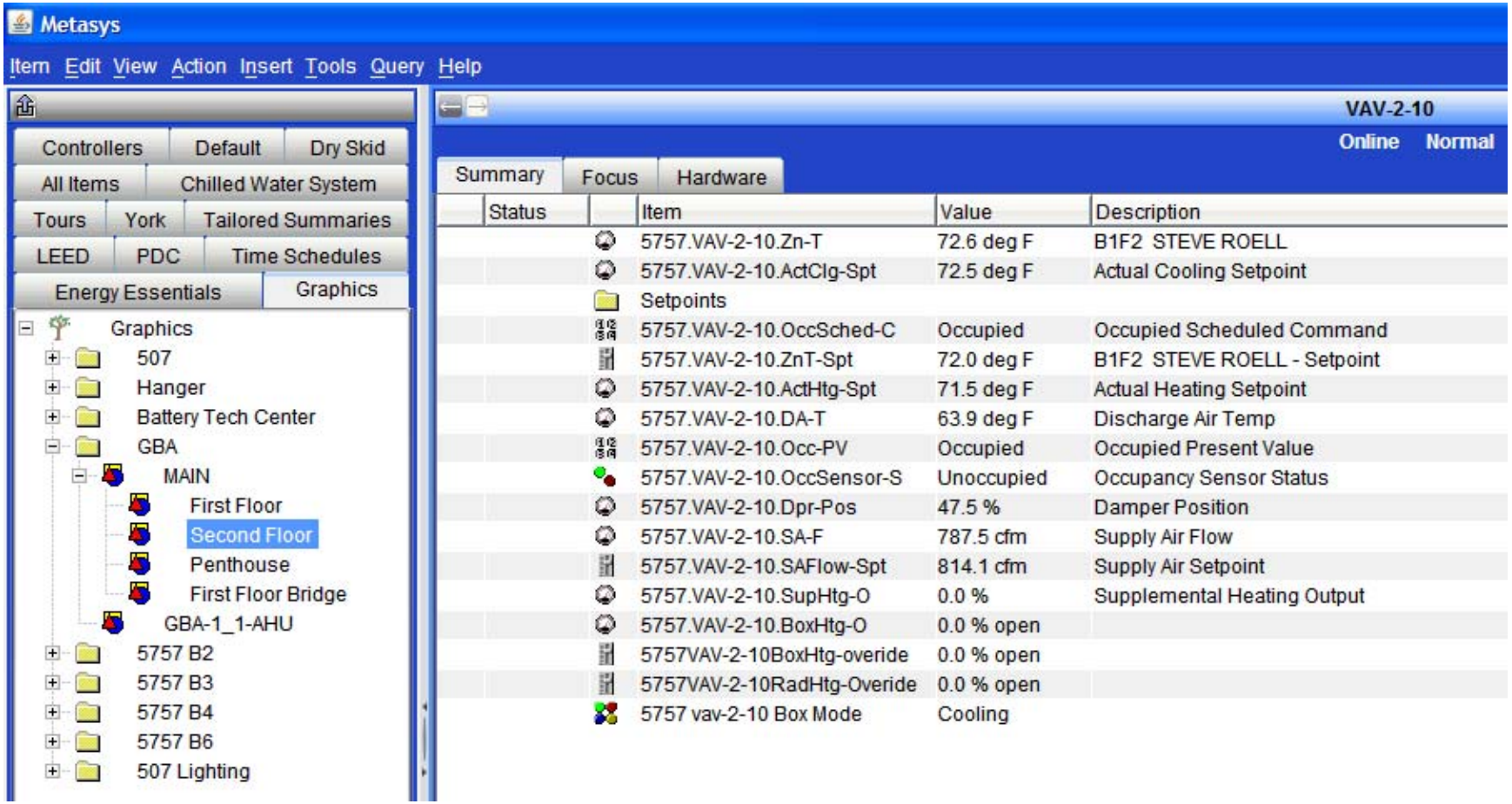
Click for details and actionable commands

# Detailed Remote Monitoring Capability

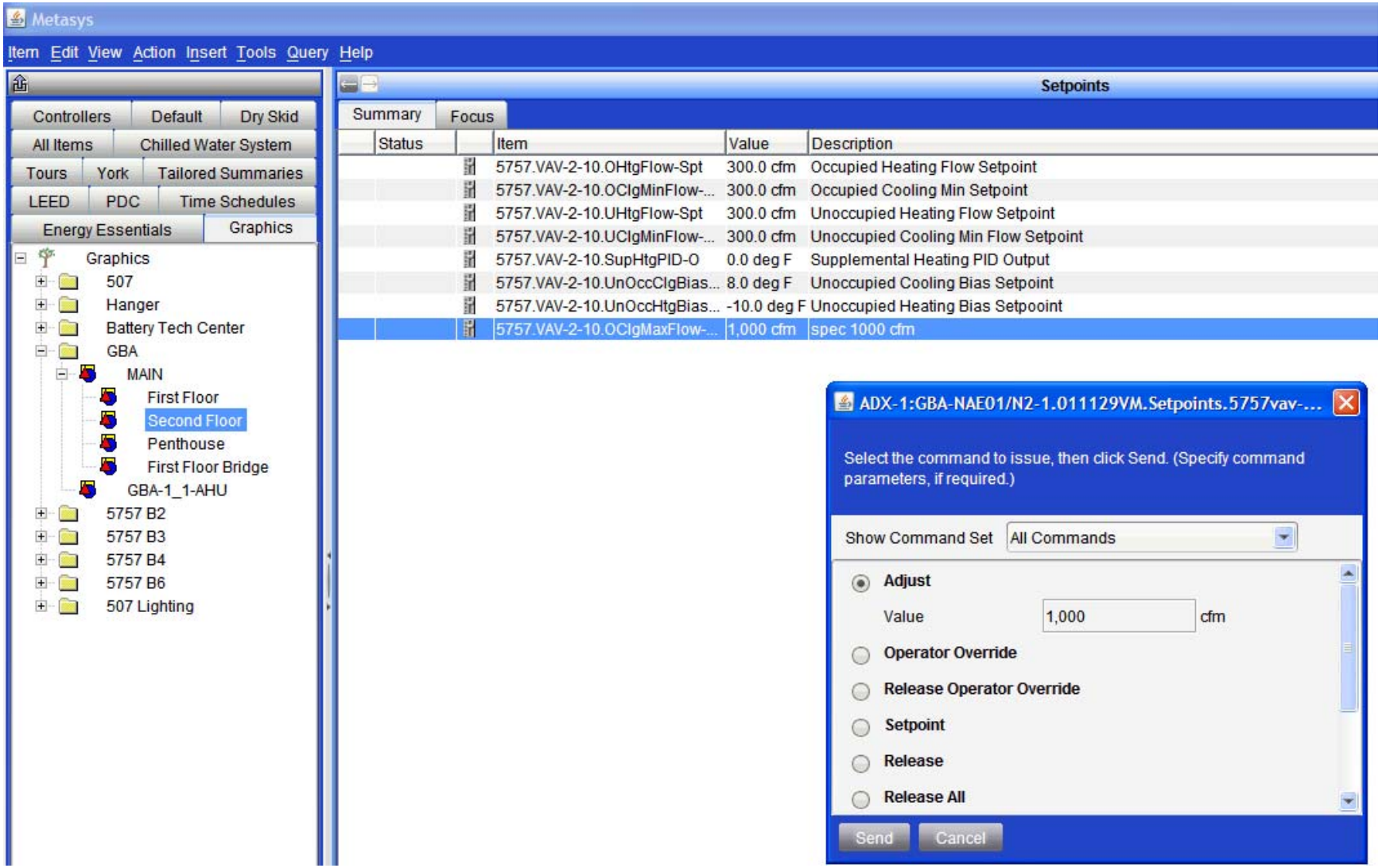



Chairman's Office

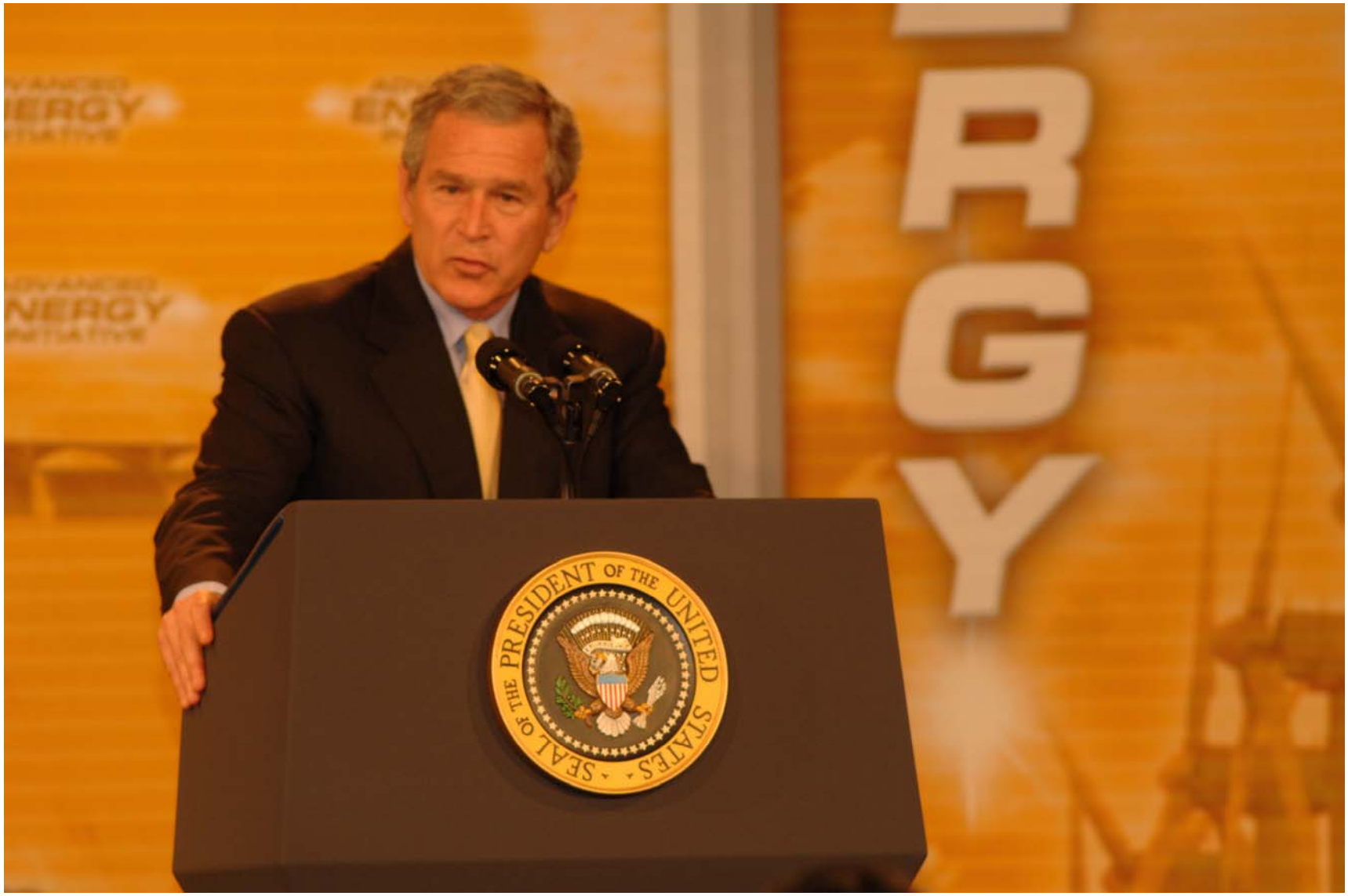
# Detailed Remote Monitoring Capability



# Detailed Remote Monitoring Capability

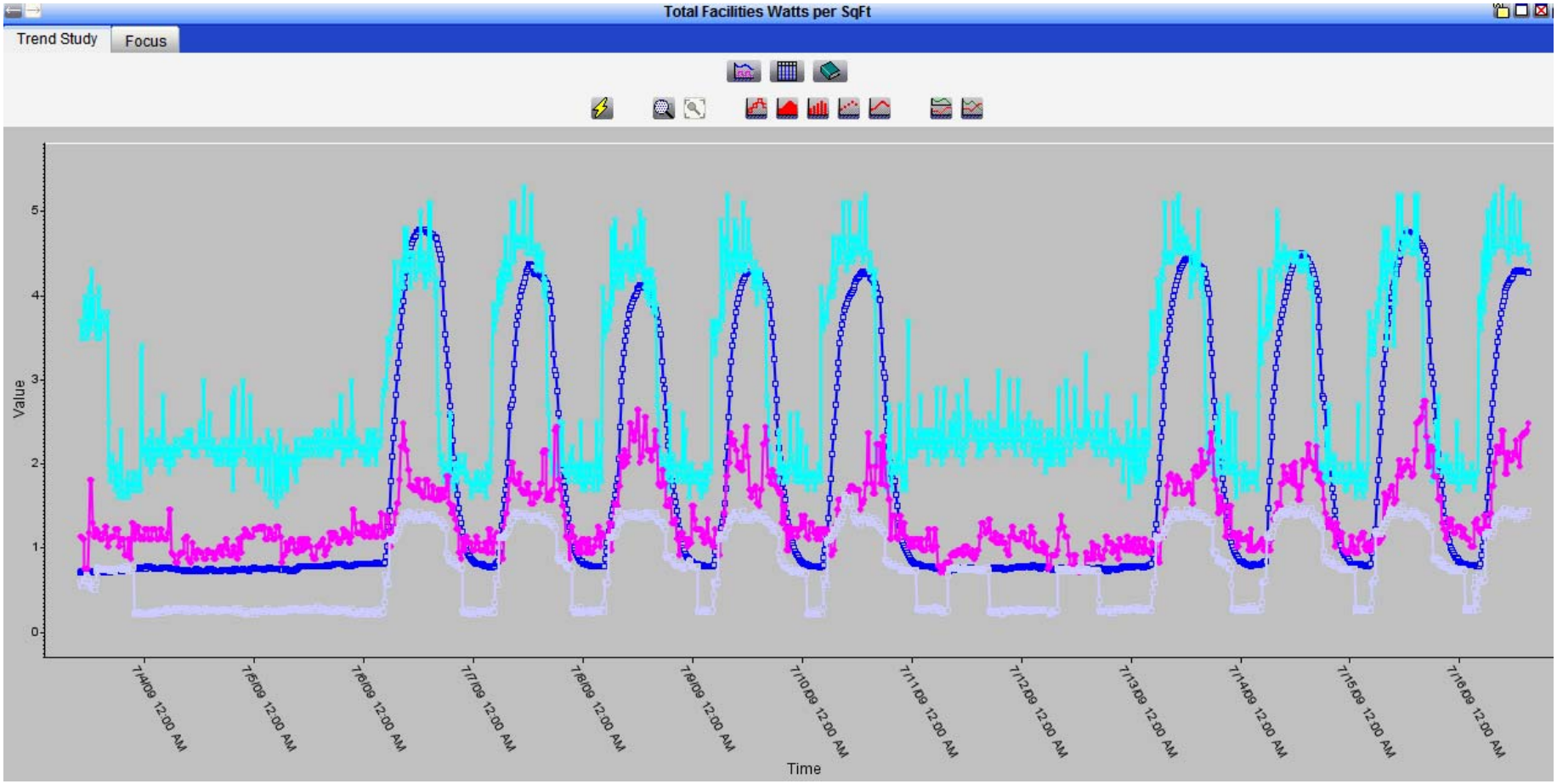


# Real Time Smart Building Control



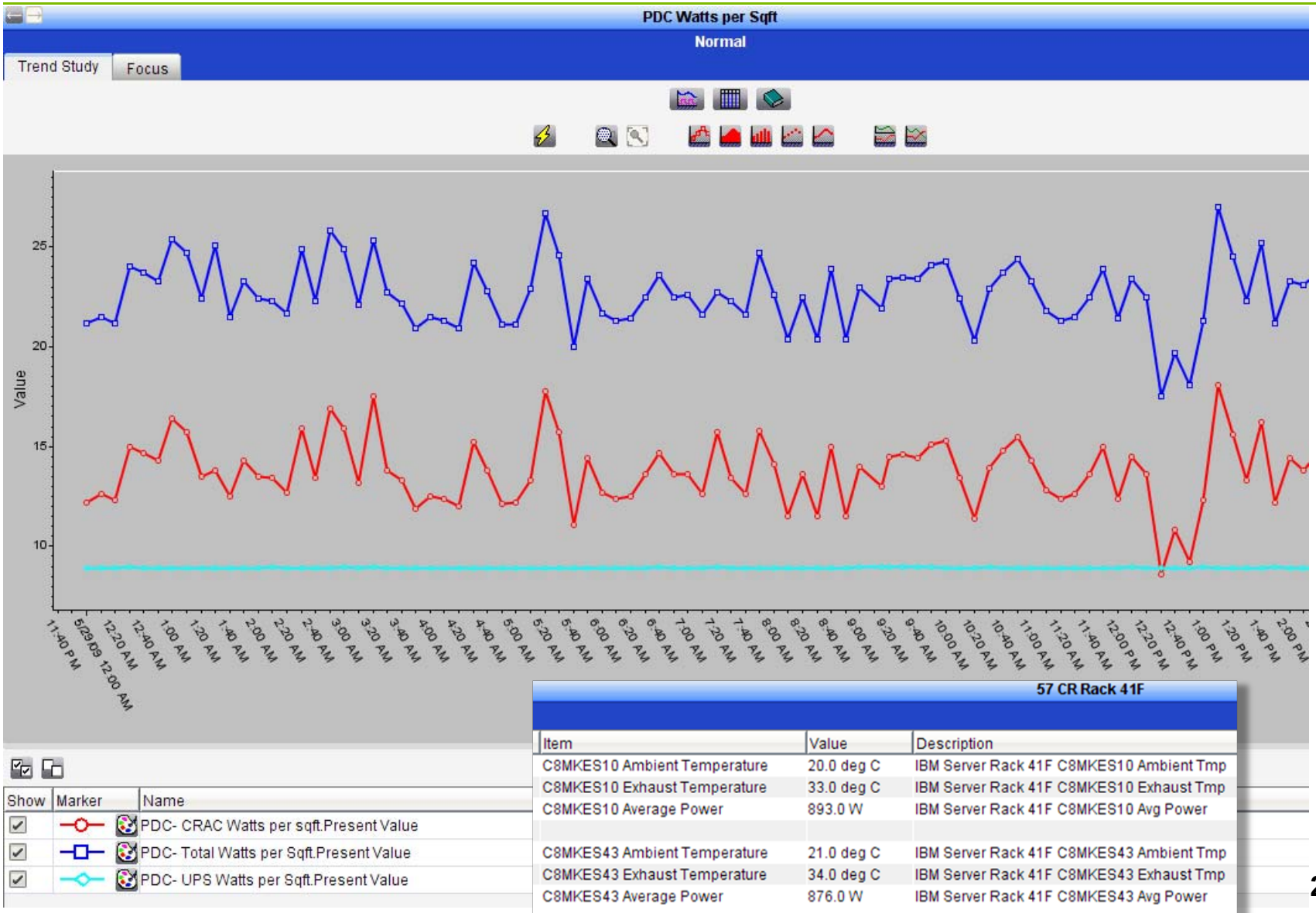
# A Powerful Energy Management Tool

## Energy demand per square foot, by JCI site

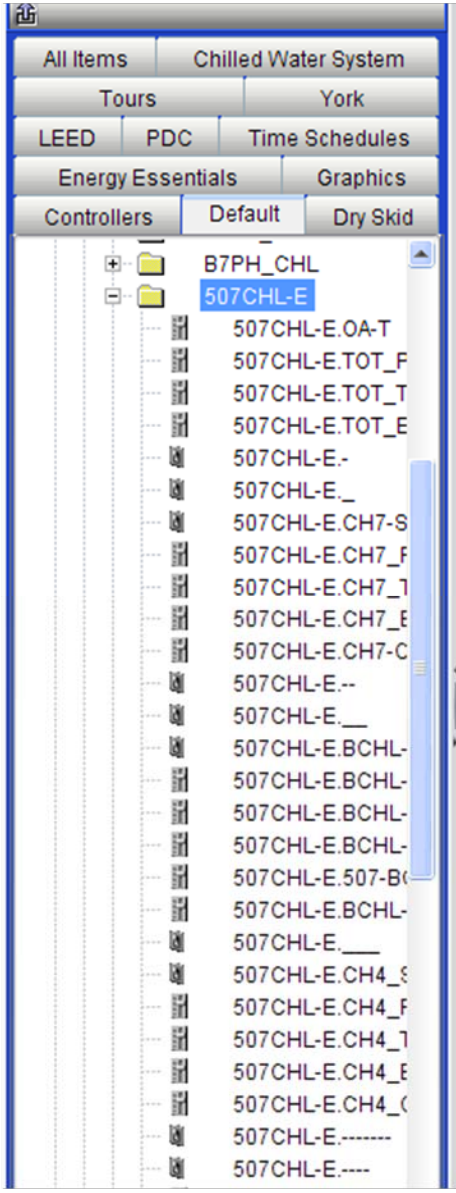



- York Campus
- Brengel Center
- Original Milwaukee HQ Building B1
- Glendale B1

# Data Center Power Use, Air Temps



# Chiller Efficiency for Optimal Loading

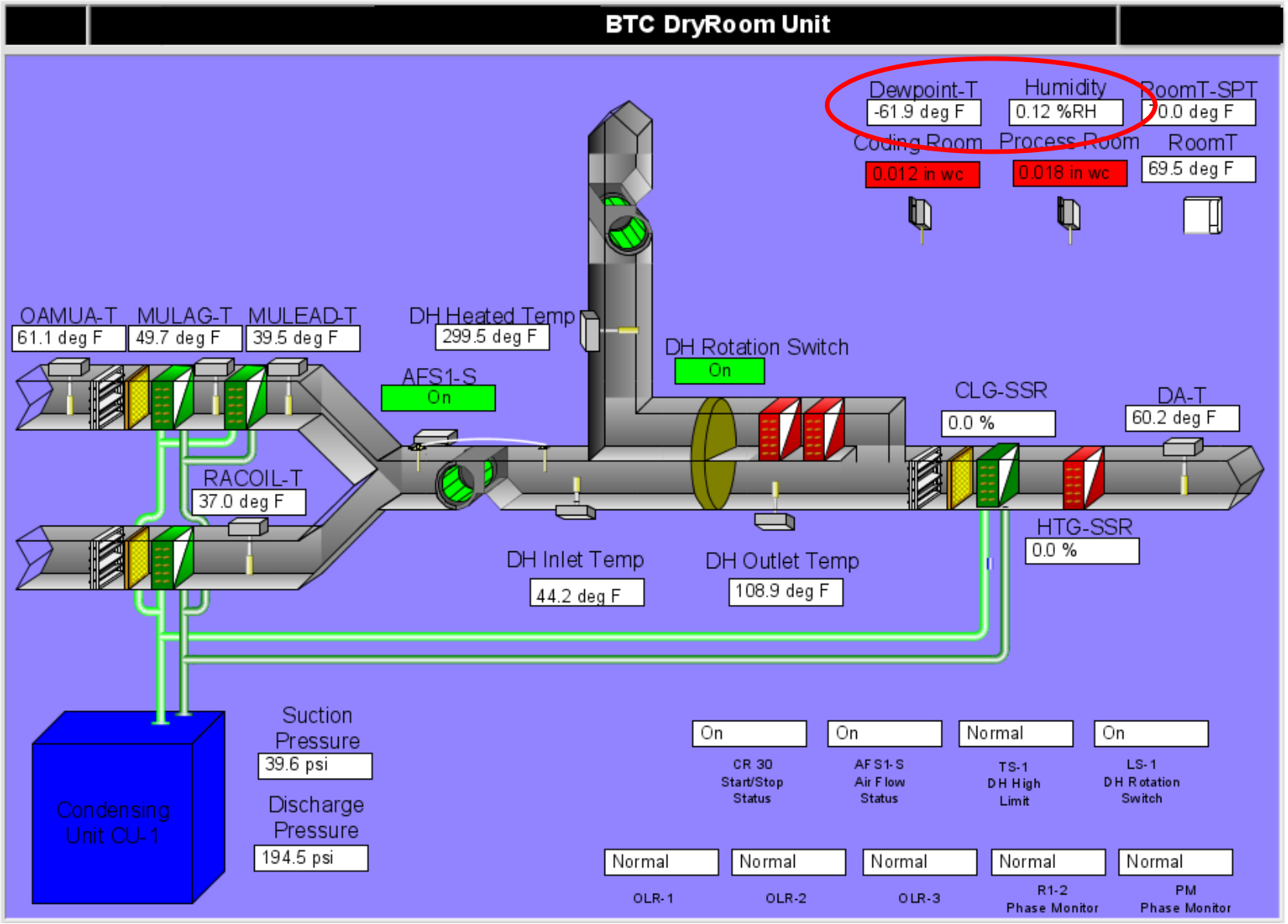



507CHL-E

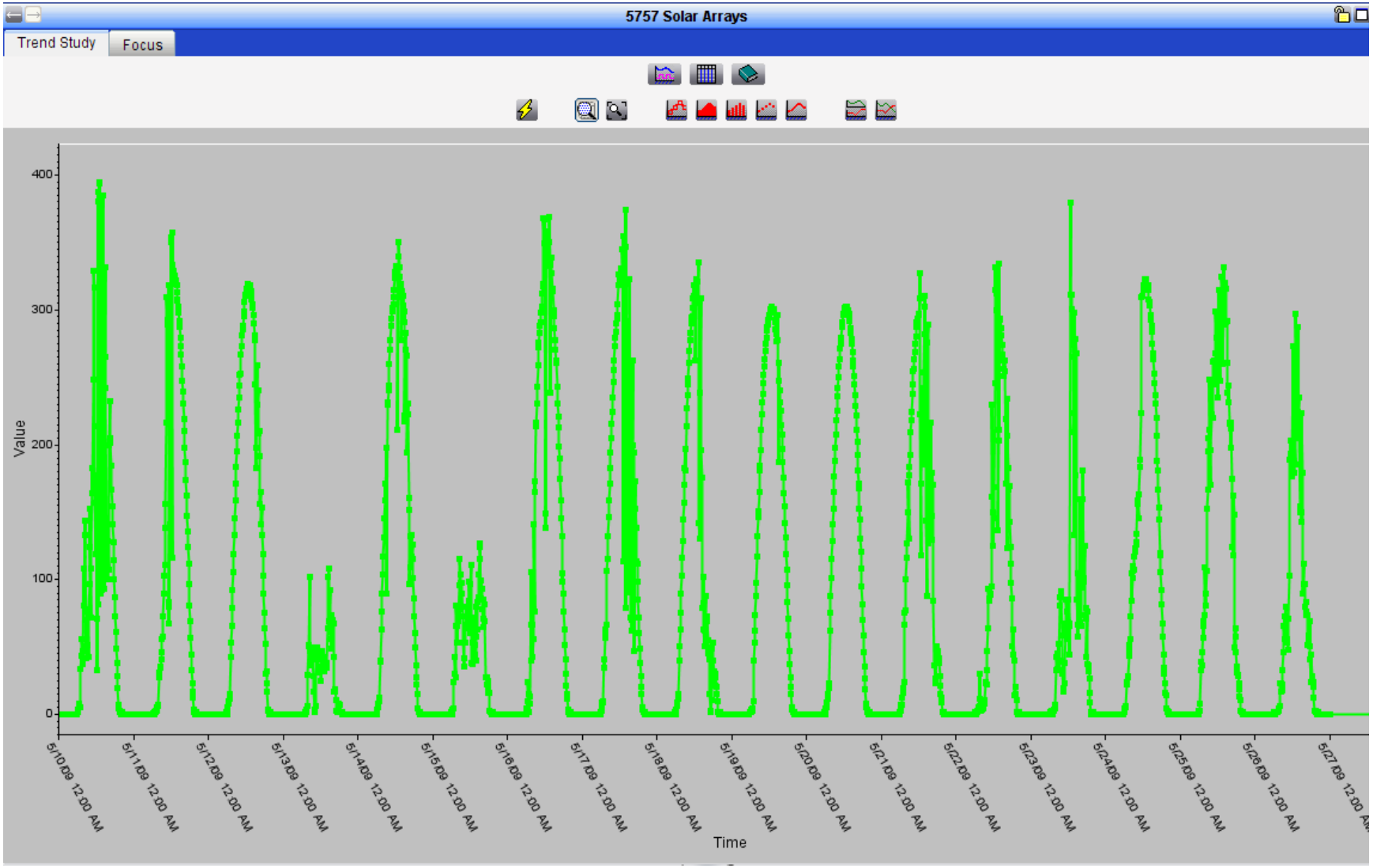
Summary

| Status | Item | Value | Description |
|---|---|---|---|
| | 507CHL-E.OA-T | 61.3 deg F | |
| | 507CHL-E.TOT_PWR | 332.1 kW | TOTAL SYSTEM WIDE POWER |
| | 507CHL-E.TOT_TNS | 350.2 tons | TOTAL TONS BCHL+CH7+CH4 |
| | 507CHL-E.TOT_EFF | 0.948 | TOTAL SYSTEM EFFICIENCY - KW/TON |
| | 507CHL-E.- | Off | ---------- |
| | 507CHL-E._ | Off | -- BRENGEL CHILLER -- |
| | 507CHL-E.CH7-STS | On | - OFF.ON |
| | 507CHL-E.CH7_PWR | 163.8 kW | INPUT POWER |
| | 507CHL-E.CH7_TNS | 181.2 tons | TONNAGE |
| | 507CHL-E.CH7_EFF | 0.904 | SYSTEM EFFICIENCY - KW/TON |
| | 507CHL-E.CH7-CEFF | 0.518 | CHILLER EFFICIENCY - KW/TON |
| | 507CHL-E.-- | Off | ---------- |
| | 507CHL-E.__ | Off | - B1 BASEMENT CHILLER - |
| | 507CHL-E.BCHL-STS | On | - OFF.ON |
| | 507CHL-E.BCHL-PWR | 138.0 kW | |
| | 507CHL-E.BCHL-TNS | 169.0 tons | TONNAGE |
| | 507CHL-E.BCHL-EFF | 0.817 | SYSTEM EFFICIENCY - KW/TON |
| | 507CHL-E.507-BCEF | 0.567 | CHILLER EFFICIENCY - KW/TON |
| | 507CHL-E.BCHL-BTU | 2.028 MBtu | |
| | 507CHL-E.___ | Off | - CH4 ROOFTOP CHILLER - |
| | 507CHL-E.CH4_STS | Off | - OFF.ON |
| | 507CHL-E.CH4_PWR | 0.0 kW | INPUT POWER |
| | 507CHL-E.CH4_TNS | 0.0 tons | TONNAGE |
| | 507CHL-E.CH4_EFF | 0.000 | SYSTEM EFFICIENCY - KW/TON |
| | 507CHL-E.CH4_CEFF | 0.000 | CHILLER EFFICIENCY - KW/TON |
| | 507CHL-E.------- | Off | ---------- |
| | 507CHL-E.---- | Off | -SECONDARY SYSTEMS |
| | 507CHL-E.B1-FLOW | 152.6 gpm | |
| | 507CHL-E.B3-FLOW | 933.5 gpm | |
| | 507CHL-E.B7-FLOW | 158.1 gpm | |
| | 507CHL-E.P3-PWR | 0.0 kW | |
| | 507CHL-E.P4-PWR | 23.5 kW | |
| | 507CHL-E.P8-PWR | 6.8 kW | |

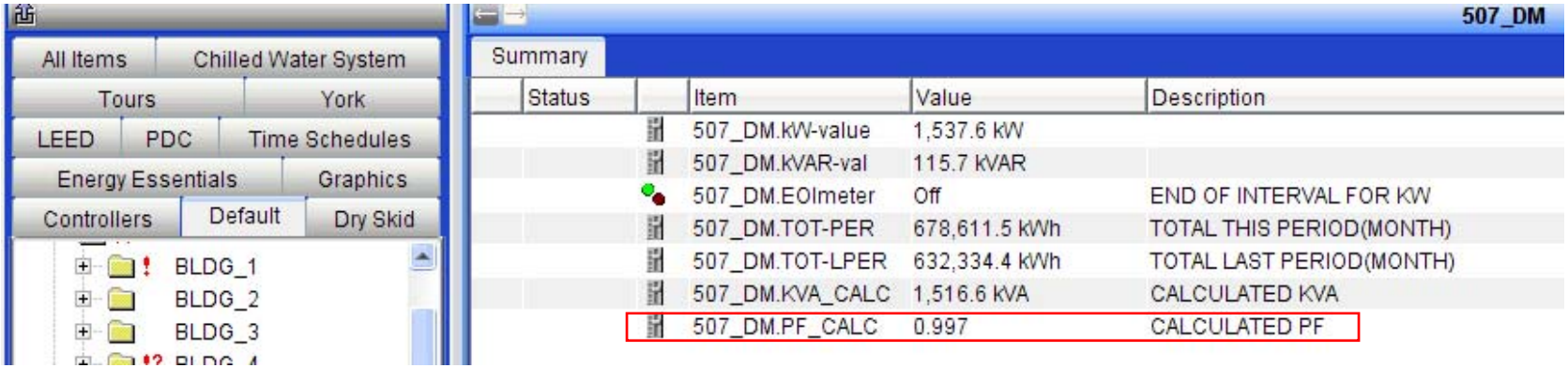
# Critical Condition Monitoring

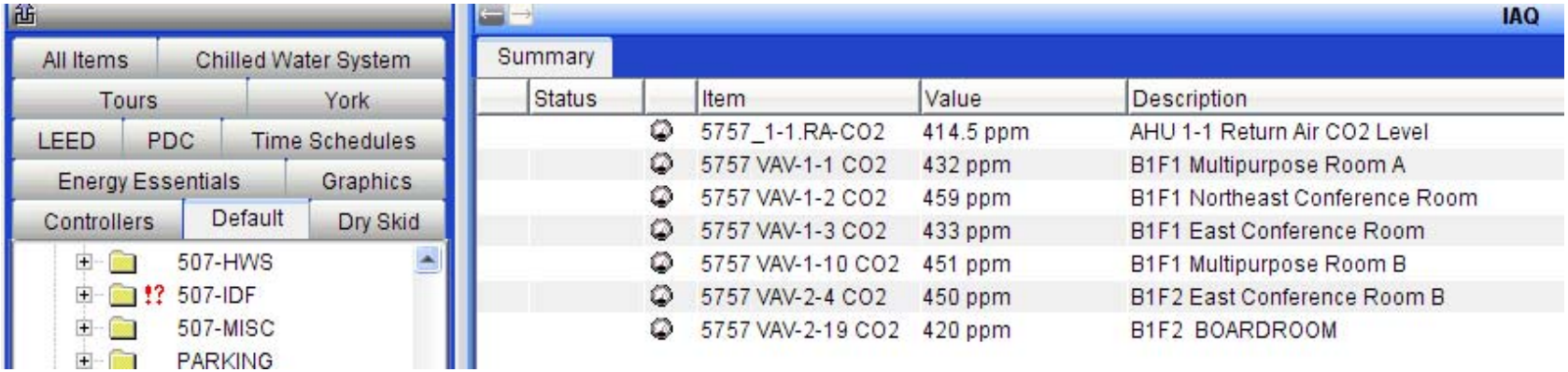


# Solar Photovoltaics Output

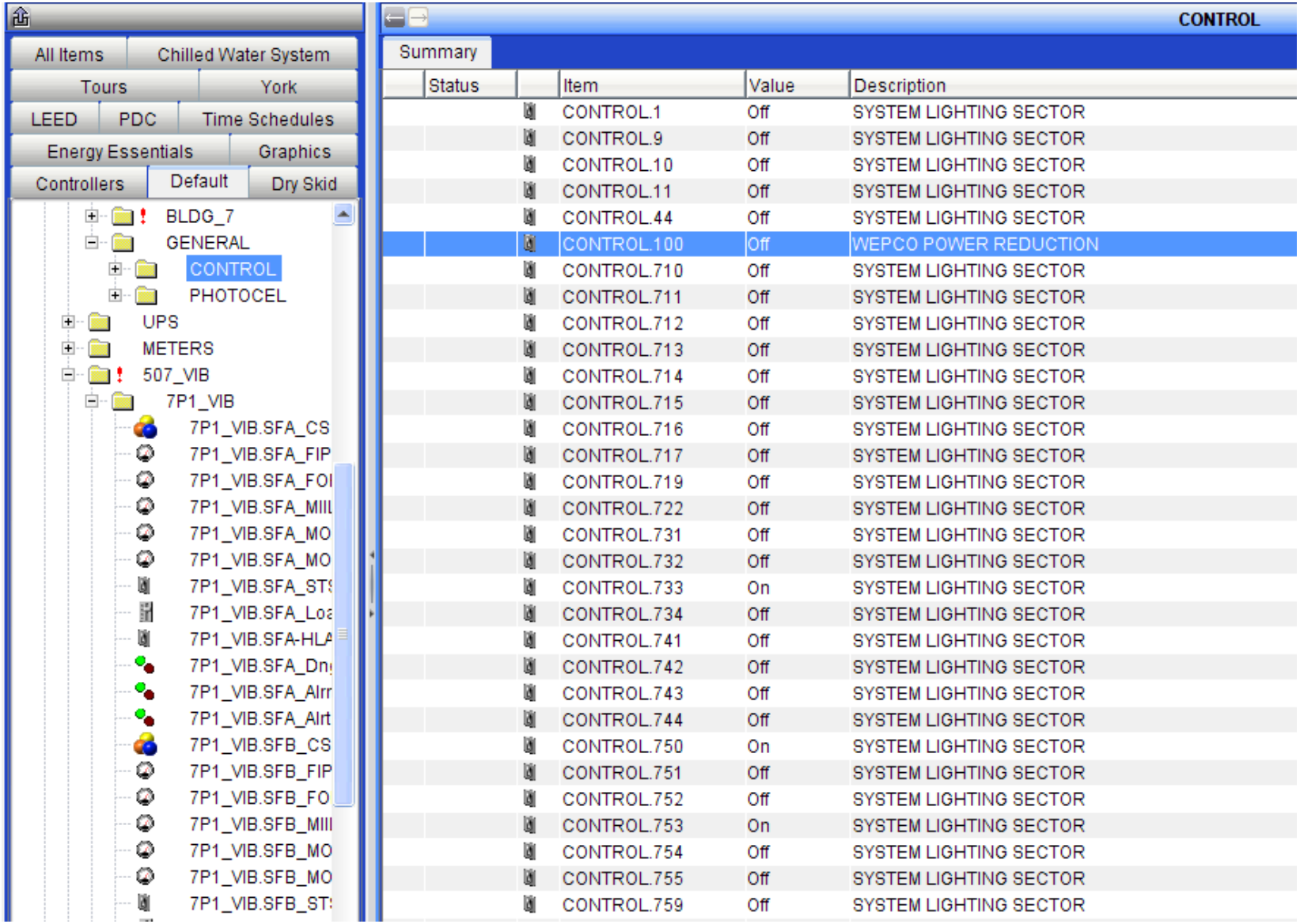


# Power Factor, Ventilation Monitoring



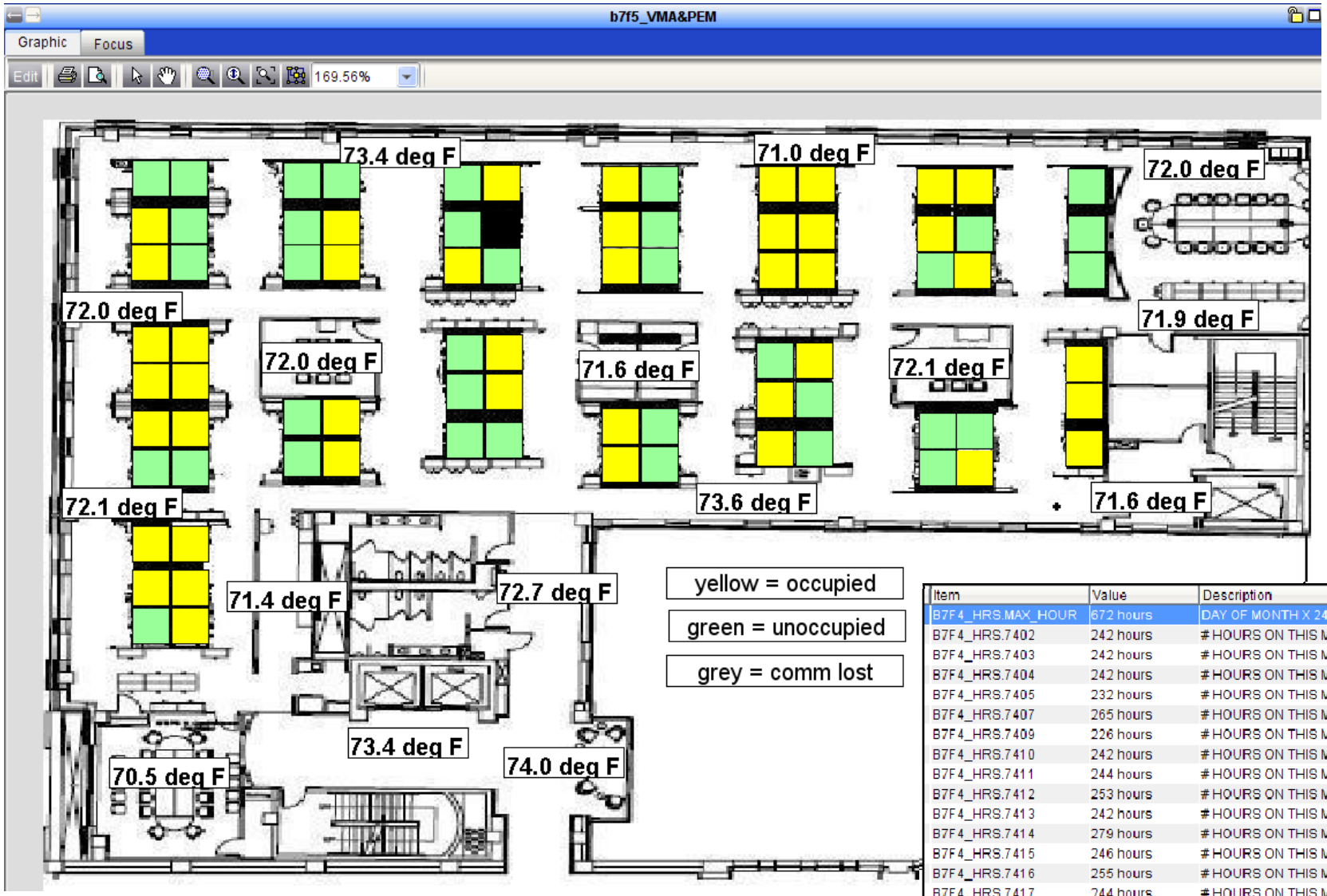



# Lighting Control for Demand Response




| Status | Item | Value | Description |
|---|---|---|---|
| | CONTROL.1 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.9 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.10 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.11 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.44 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.100 | Off | WEPCO POWER REDUCTION |
| | CONTROL.710 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.711 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.712 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.713 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.714 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.715 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.716 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.717 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.719 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.722 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.731 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.732 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.733 | On | SYSTEM LIGHTING SECTOR |
| | CONTROL.734 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.741 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.742 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.743 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.744 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.750 | On | SYSTEM LIGHTING SECTOR |
| | CONTROL.751 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.752 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.753 | On | SYSTEM LIGHTING SECTOR |
| | CONTROL.754 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.755 | Off | SYSTEM LIGHTING SECTOR |
| | CONTROL.759 | Off | SYSTEM LIGHTING SECTOR |

# Lighting and Occupancy Monitoring




| Item | Value | Description |
|---|---|---|
| B7F4_HRS.MAX_HOUR | 672 hours | DAY OF MONTH X 24 HRS |
| B7F4_HRS.7402 | 242 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7403 | 242 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7404 | 242 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7405 | 232 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7407 | 265 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7409 | 226 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7410 | 242 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7411 | 244 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7412 | 253 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7413 | 242 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7414 | 279 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7415 | 246 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7416 | 255 hours | # HOURS ON THIS MONTH |
| B7F4_HRS.7417 | 244 hours | # HOURS ON THIS MONTH |

# Occupant Requests

Johnson Controls

Online Service Center

Home | Help | Contact Us | Logout

Service Requests | Reports | Profile

My Service Requests
Create New Request
All Service Requests

## Service Requests

### Create New Service Request

Johnson Controls

For Emergency or Urgent Work Orders, please contact Johnson Controls at 888-539-1126.

* indicates required fields

Edit

| Service Request Number | Requestor | Phone | Fax |
|---|---|---|---|
| | Komorowski, Ward | 414-524-4499 | |
| **Date of Request** | **Pager** | **Cell** | **Email** |
| 7/16/2009 | | 414-870-1591 | Ward.P.Komorowski@jci.com |

### Request Basics

* Description: (max. 254 characters)

Additional detail can be added in the "Detailed Description" textbox below

* Problem Location: PLEASE MAKE SURE YOUR LOCATION SELECTION IS AT A SPECIFIC SITE!

1000-1 , Michigan Street - Bldg 1 Location

JFM

JFM-USA

* Cost Center

Service Type

# LIVE DEMO

# Questions & Answers

Ward Komorowski