

NS2024

APRIL 15 - 17 | ANAHEIM, CA

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University of Kentucky 20 Year Growth on a Large Multi-Vendor Niagara System

Bobbie Tinch
Utilities Systems Manager
University of Kentucky

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University of Kentucky Campus 2004 - 2024

- *Integration in 2004*
 - Medical Center & Hospital
 - 3.7 Million Square Feet
 - 38 Buildings
- *Integration in 2024*
 - Medical Center, 3 Hospitals, Research Buildings, Athletics, Community Clinics/Pharmacies, Student Classrooms/Student Centers, Food Services and Resident Halls
- *18,609,640 Square Feet*
- *Approximately 400 Buildings*

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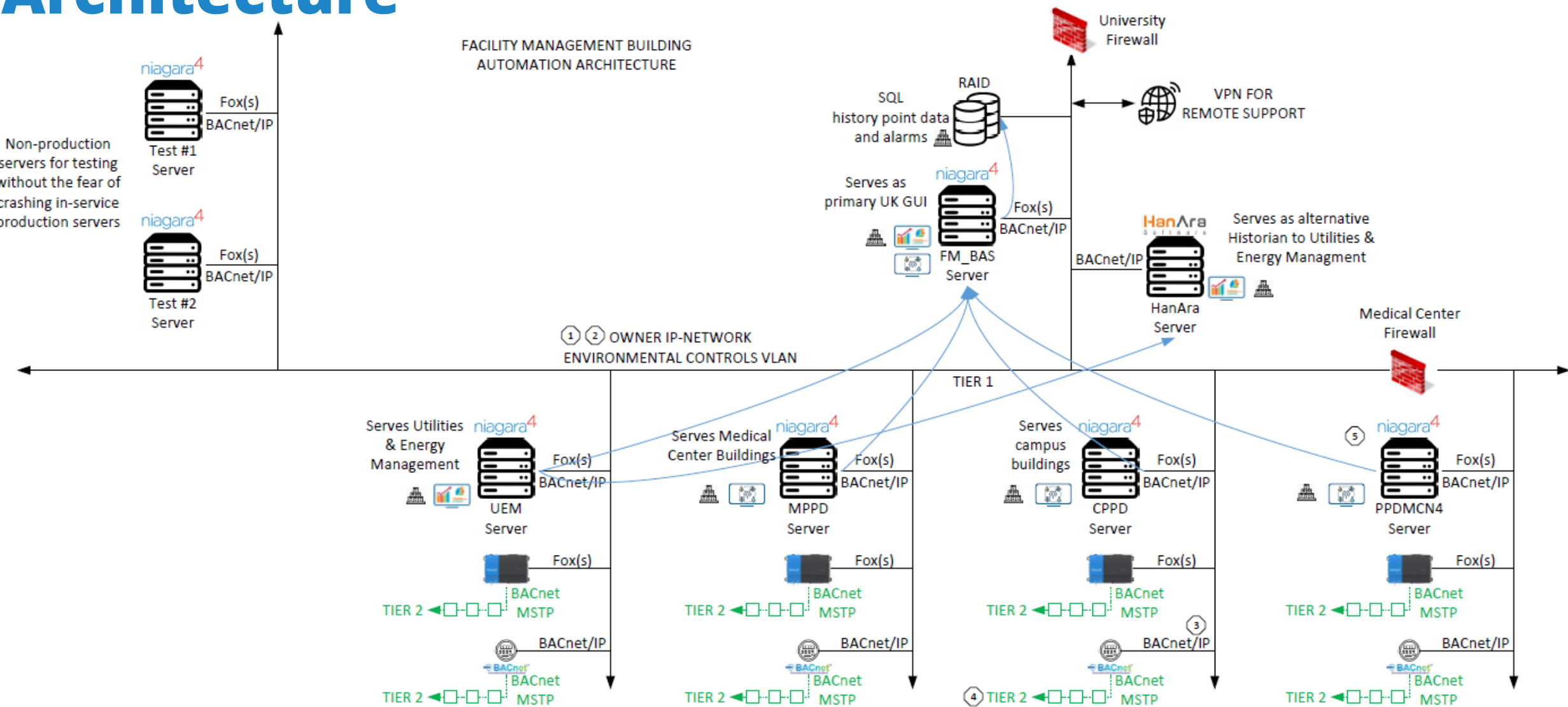
Current Campus Automation Integration

- **Total of 5 Tridium Supervisors**
 - **2004: Approximately 35,000 points**
 - **2024: Approximately 400,000 points**
- **Approximately 900 JACEs**
- **BACnet Systems**
 - **Honeywell, JCI, Siemens, Automated Logic, Distech, Schneider Electric,**
 - **Alerton, Beacon Medaes, Carel, Daikin, Eaton, Emerson, Fieldserver,**
 - **Lutron, Notifier, Onicon, Phoenix Controls, Samsung, TAC, Square D,**
 - **Thyssen Krupp, Liebert, Advantage Controls, IDEC Corp, LG, KMC,**
 - **Red Lion, MCS, Sierra Monitor, Vertiv, Simplex, Flexim, Acuity,**
 - **ABB, Beckhoff, Viconics, ICC and more**

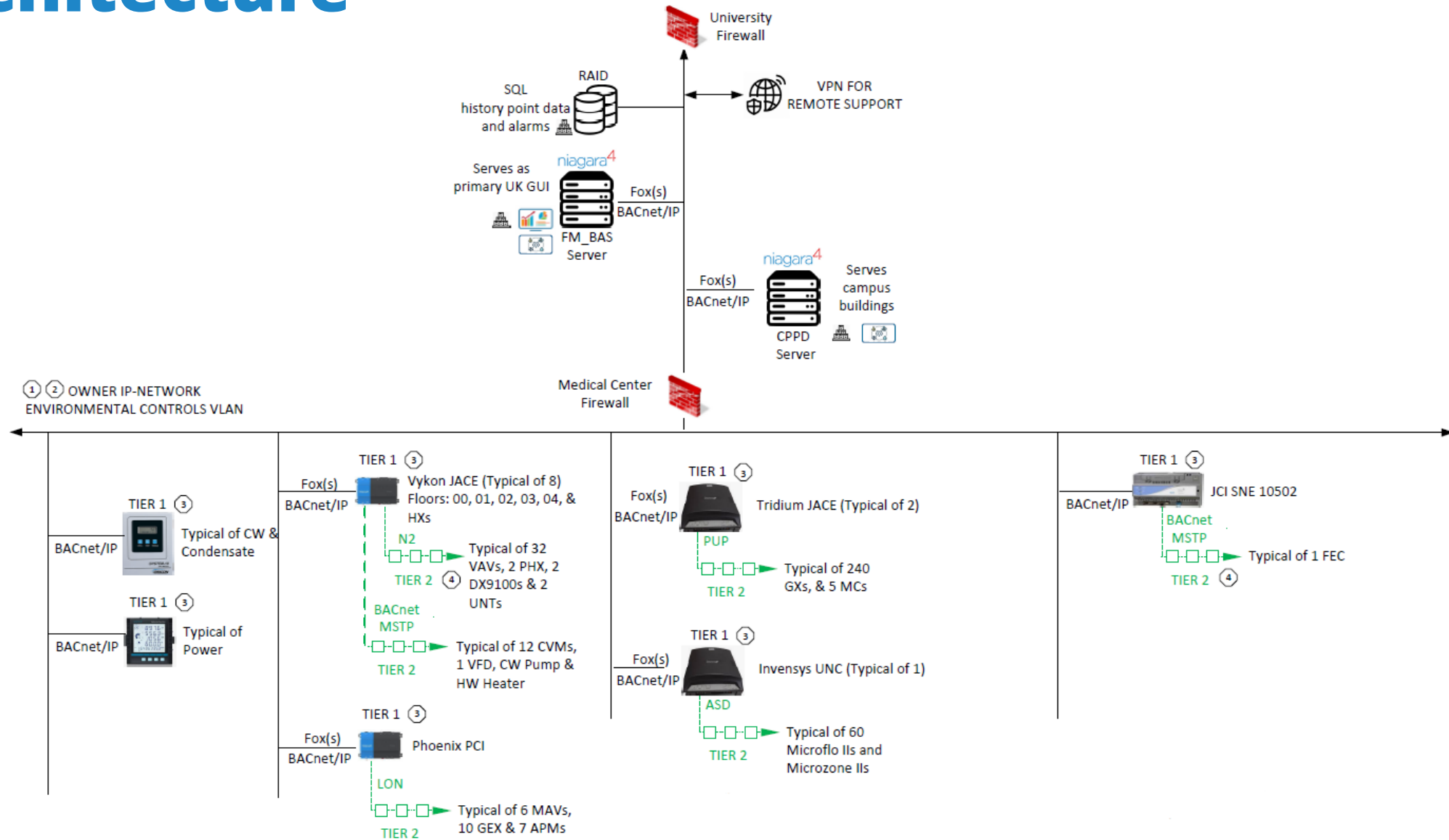
Current Campus Automation Integration

- **Legacy Systems**
 - **Invensys Network 8000**
 - **American Auto-Matrix**
 - **JCI N2**
- **Work Management Integrations**
 - **SAP**
 - **Service Now**

Architecture



Legacy Architecture



Capital & Minor Project Construction

- **Controls & Instrumentation Standards**
 - **230000 Heating, Ventilating & Air Conditioning (HVAC)**
 - Fume Hoods, VAV/CAV/FCU Systems, AHUs, Pumps, etc.
 - **250000 Integrated Automation**
 - Building Controls
 - **260000 Electrical**
 - Lighting Integrations
 - **140000 Conveying Systems**
 - Elevator Monitoring



Capital & Minor Project Construction

- **Process Development**
 - **Schematic, Design & Construction Review**
 - **Pre-Commissioning no major equipment**
 - **Controls Meetings**
 - **Integration**
 - **Commissioning**
 - **Close Out**



What Have We Learned?

- **There needs to be a Team in House**
 - **Team Members**
 - **Controls Engineering Technicians, Controls Commissioning Technicians, Controls Supervisors, Controls Applications Technicians**
 - **Niagara Certification requirement**
 - **Environment of Learning and room for mistakes**
- **There needs to be rules**
 - **Standard Operating Procedures**
 - **Graphics, alarms, trending, scheduling, energy management**
 - **Organization of the Networks**
 - **Ownership over BACnet integrations**
 - **BACnet isn't always "BACnet"**
 - **BACnet Polling**
 - **Tagging**



What Have We Learned?

- **Keep up with Technology**
 - **Things change quickly**
 - **Versions, Firmware, Hardware**
 - **Cybersecurity**
 - **Interconnections**
 - **Passwords**



Graphics: Then & Now



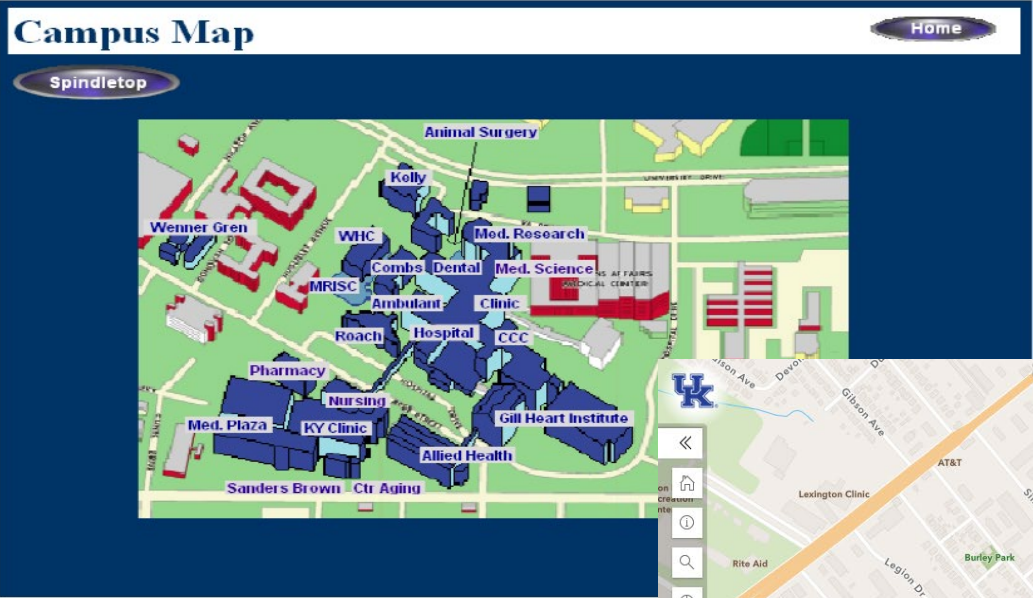
Campus Emergencies: 859-257-2830
Medical Center Emergencies: 859-323-6281
Triage Support: 859-257-4801

Campus Map	Alarm Reporting
Building List	Override Reporting
eFacts	Campus Dashboards
Exterior Lighting	Medical Center Dashboards
Generators	Utilities Dashboards
Elevators	Outside Air Temps
Energy Savings Setbacks	Chilled Water Data
Weather Report	Reheat Data
Event Issued Programs	ITS Dashboards

Date & Time
08-Apr-24 9:28 AM EDT
Outside Air Temperature: 69.7 °F
Outside Air Humidity: 59.0 %



Graphics : Then & Now



Graphics - AHU

PAVA - AHU - Bed Tower AHU-BT-111AW (M-)

Location: Third Level MER
Serving: Eleventh Level with CFM

OAT - 68.9 °F

Back

Ctrl Drawings

PAVA Home

Basement

Ground

Floor 1

Floor 2

Floor 3

Floor 4

Floor 5

Floor 6

Floor 7

Floor 8

Floor 9

Floor 10

Floor 11

Floor 12

Floor 14

Floor 15

Floor 16

Mech Rm

ROOF

Setpoint

Command

System Reset

System Enable

Enable

Disable

Moist. Alm - Normal

RF Hi Pres - Normal

RF Static: 0.03 in/wc

RFA Cmd - On
RFA Sts - On
RFA VFD - 82 %

RFB Cmd - On
RFB Sts - On
RFB VFD - 82 %

RF Static Limit: -3.50 in/wc

RF Low Pres - Normal

RAD Close Sts - Open
RAD Open Sts - Open

RAT - 69.2 °F

EAD Open - 14 %

EA

Fan Detail

RFA

RFB

RFC

RFD

RA

Mode - HX Cool+Mech

RAD Open - 65 %

MA

RFC Cmd - On
RFC Sts - On
RFC VFD - 82 %

RFD Cmd - On
RFD Sts - On
RFD VFD - 82 %

Safety Switches for UV Door and SF Door. Hard Safety that will keep the unit from running. Not Status.

RF Static: -2.55 in/wc

RAH SP - 30.00 %
RAH - 46.3 %RH

RA Static SP: -1.50 in/wc
RA Static: -1.50 in/wc
Located in
Corridor A11168

OA CFM - -29.2 cfm

OA

MAT Sp - 62.00
MAT - 73.7 °F

PHCT - 81.4 °F

DA Low Pres - Normal

SF Cmd - On
SF Sts - On
SF VFD - 72 %

Coil Detail

Fan Detail

SF Static Limit: 3.60 in/wc
DA Hi Static - Normal

Fire Alm - Normal

DAT Sp - 60.00 °F
DAT - 60.4 °F

OAD Cmd Open - 35 %
OAD Pos Open - 34.6 %
OAD Min Open - 35.00 %

Prefilter Diff: 0.10 in/wc

CWV Open - 36 %

Frz Alm - Normal

UVL Cmd - On

PHWV Open - 0 %

HUMV Open Cmd - 0 %
DAH SP - 75.00 %
DAH - 84.0 %RH

DA Dmp Close Sts - Open
DA Dmp Open Sts - Open

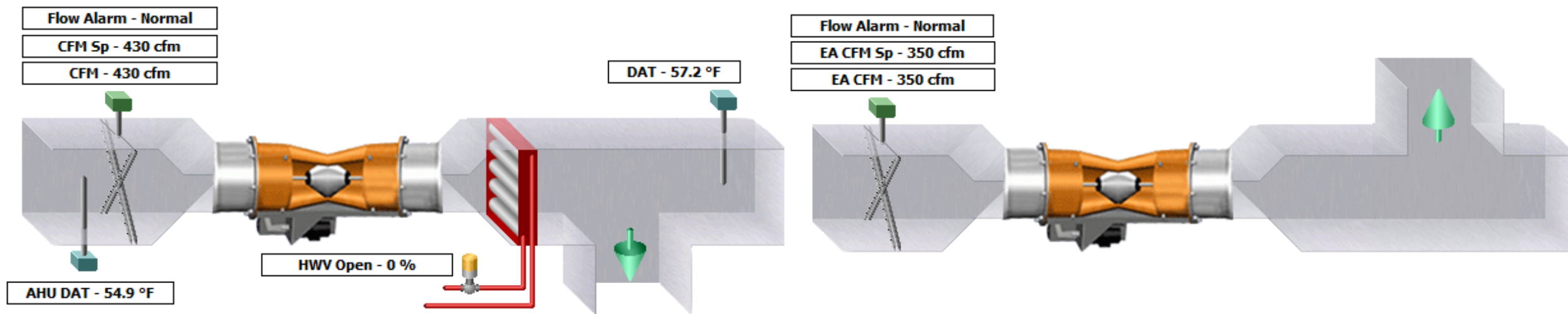
SA 2/3 Static SP: 1.10 in/wc
SA 2/3 Static: 1.10 in/wc
Located in
Corridor A11168

Final Fil Diff: 0.35 in/wc

HEPA Fil Diff: 0.00 in/wc

SF Static: 2.54 in/wc

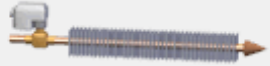
Graphics – Patient Room



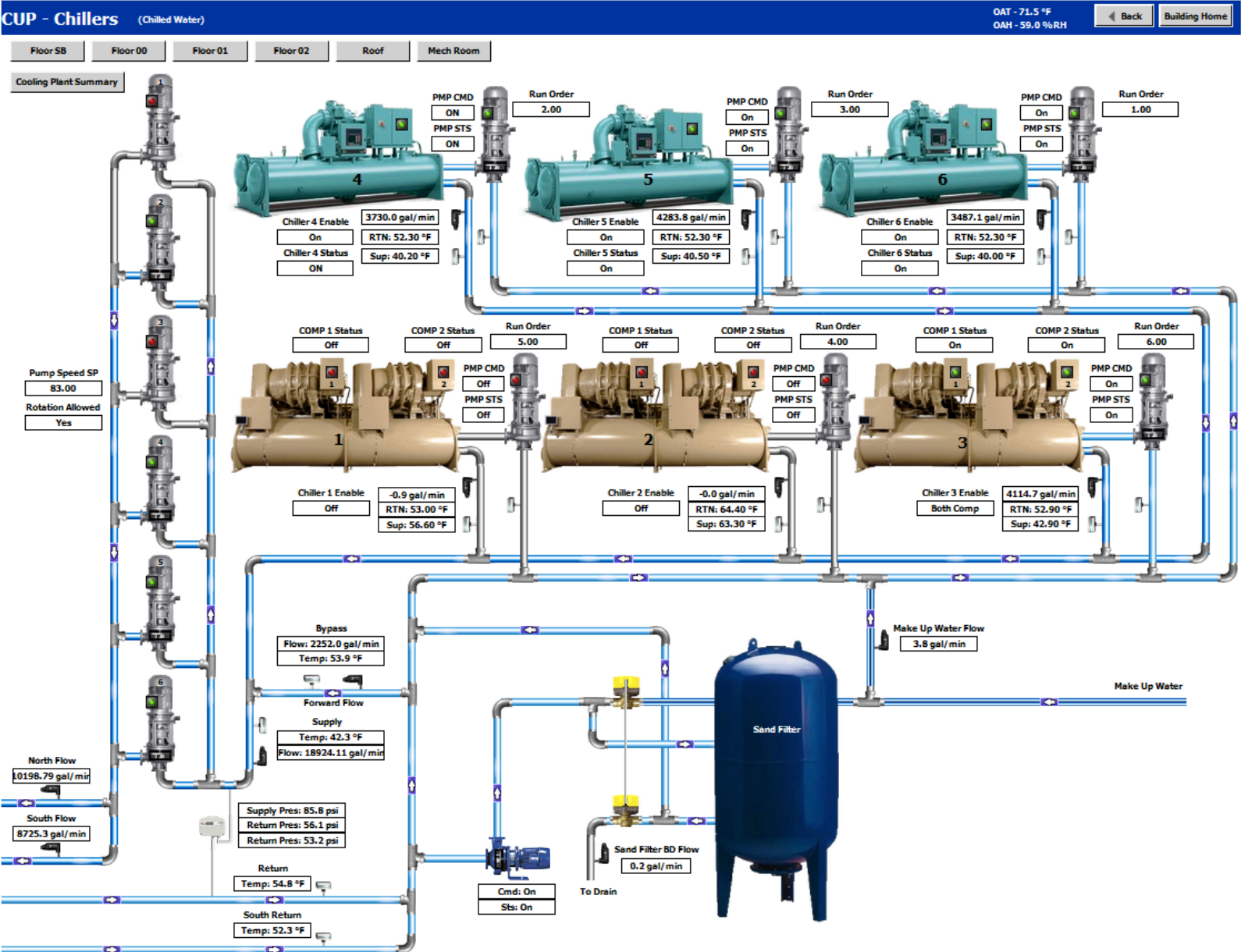
Zone Data
Occupancy - Occupied
Zone Temp - 69.2 °F
Zone SP - 65.0 °F
Cooling SP - 66.0 °F
Heating SP - 64.0 °F

CFM Data
Room Offset - 80 cfm
Room Offset SP - 80 cfm

Radiation Heat
RAD Heat Valve Cmd - 0 %
RAD Heat Valve Offset - 0.0 °F



Graphics – Plant CWS



Graphics – Storm Water Harvesting

CUP – Storm Water Harvest Control Screen

OAT - 62.1 °F
OAH - 90.0 %RH

Back

CUP Home

Floor SB Floor 00 Floor 01 Floor 02 Roof CUP Mech Room

System Enabled ☐

Auto Mode ☒

Wet Well Level

9.25 ft

Conductivity Level

1102.9 uS

CUP Make Up Pit Level

109.07 in

Click Here For CUP Condenser Pit View

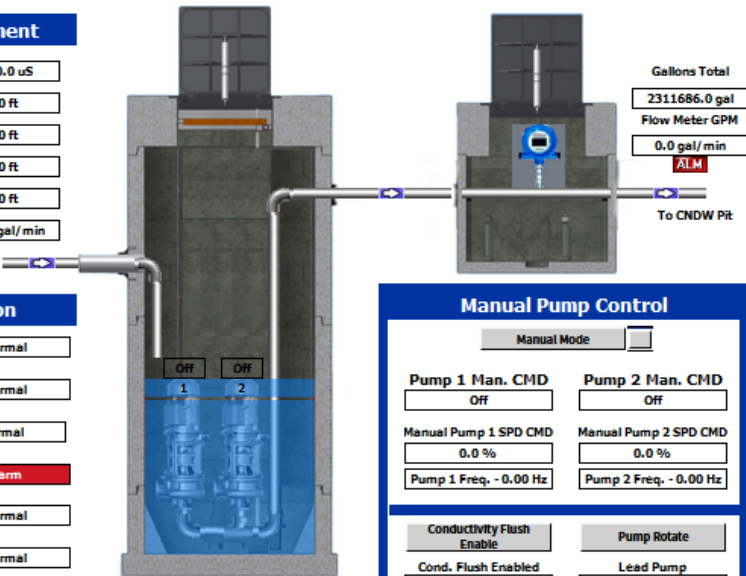
Setpoint Adjustment

Conductivity High Level Alarm SP	1700.0 uS
Wet-Well High Level SP	8.0 ft
Wet-Well Low Level SP	5.0 ft
Pump MIN SPD SP	6.0 ft
Pump MAX SPD SP	8.0 ft
Low Flow Alarm SP	100.0 gal/min

Flow Alarm Reset

Alarm Indication

Low Level Alarm	Normal
Conductivity Level Alarm	Normal
Conductivity Interlock Alarm	Normal
Low Flow Alarm	Alarm
Pump 1 Overload Alarm	Normal
Pump 2 Overload Alarm	Normal
Pump 1 Seal Leak Alarm	Normal
Pump 2 Seal Leak Alarm	Normal



Manual Pump Control

Manual Mode ☐

Pump 1 Man. CMD	Off
Manual Pump 1 SPD CMD	0.0 %
Pump 1 Freq. - 0.00 Hz	
Conductivity Flush Enable	
Cond. Flush Enabled	Disabled
Cond. Flush Gal. Accum.	0.0 gal
Cond. Flush Gal. SP	5000.0 gal
Conductivity Interlock Reset	
Pump Rotate	
Lead Pump	Pump_2
Pump Rotate Interval	168.00 hr
Remaining Rotate Time	165.7 hr
VFD Details	

CUP – Chillers (Condenser Water)

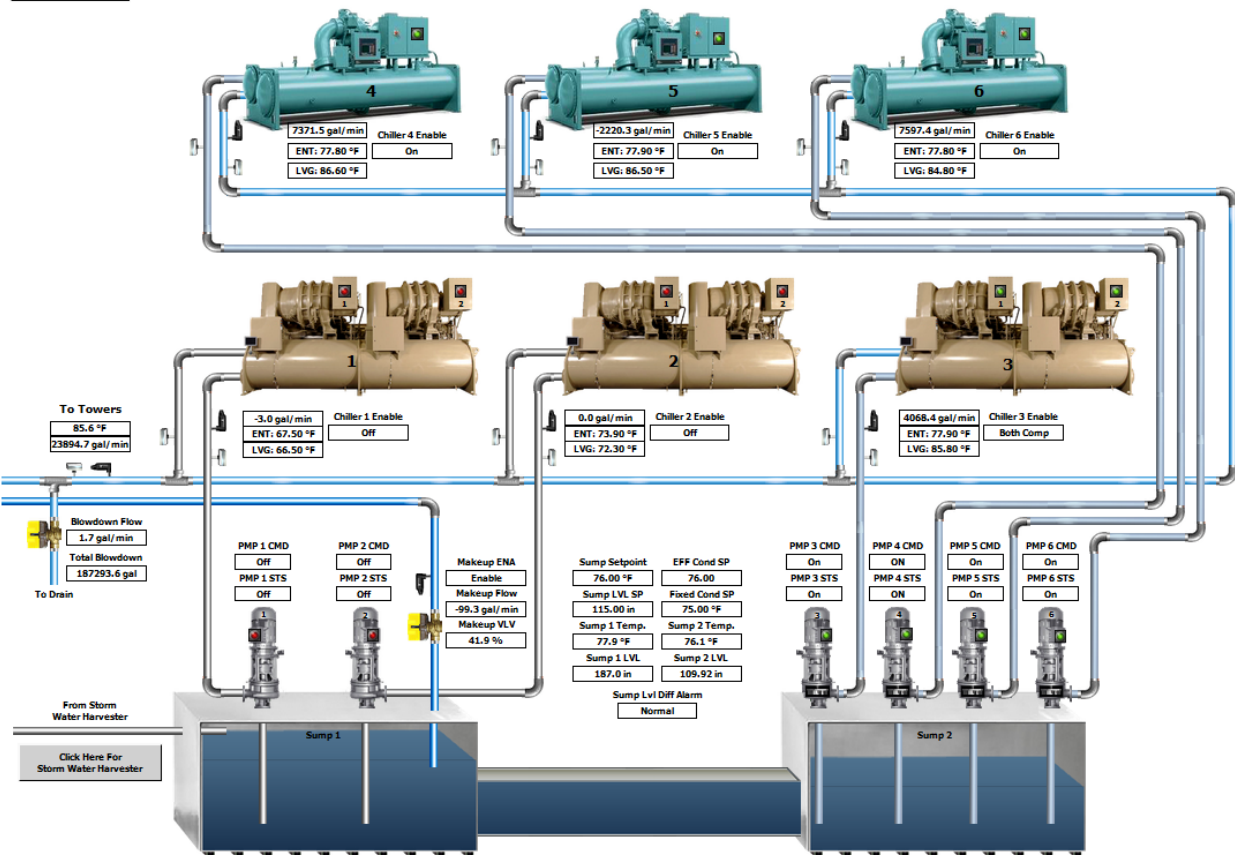
OAT - 62.1 °F
OAH - 90.0 %RH

Back

Building Home

Floor SB Floor 00 Floor 01 Floor 02 Roof Mech Room

Cooling Plant Summary



Graphics – Energy Management

Electrical Distribution Event

Back

Home

DANGER

Information contained within this page is not an actual indication of circuit breaker positions. Always verify circuit breaker positions with high voltage team before approving service or relaying information.

Legend

Maintenance / Out of Service

Normally Open / Backup

Energized / Normally Closed

High Reading / Possible Issue

0 Amps / Possible Tripped Breaker

Sub-Station 1 Main 1

Main

Current 3 Phase AVG : 429.0 A

1-1

Current 3 Phase AVG : 69.0 A

1-2

Current 3 Phase AVG : 108.3 A

1-3A

Current 3 Phase AVG : 38.0 A

1-3B

Current 3 Phase AVG : 4.0 A

1-3C

Current 3 Phase AVG : 2.0 A

1-10

Current 3 Phase AVG : 84.0 A

1-12

Current 3 Phase AVG : 403.0 A

1-14

Current 3 Phase AVG : 0.0 A

1-15

Current 3 Phase AVG : 30.0 A

1-41

Current 3 Phase AVG : 0.0 A

Sub-Station 1 Main 2

Main

Current 3 Phase AVG : 342.0 A

1-5A

Current 3 Phase AVG : 3.0 A

1-5B

Current 3 Phase AVG : 6.0 A

1-5C

Current 3 Phase AVG : 39.0 A

1-6

Current 3 Phase AVG : 61.0 A

1-7

Current 3 Phase AVG : 102.0 A

1-8

Current 3 Phase AVG : 29.0 A

1-9

Current 3 Phase AVG : 113.9 A

1-42

Current 3 Phase AVG : 0.0 A

Sub-Station 2

Main

Current 3 Phase AVG : 0.0 A

2-0

Current 3 Phase AVG : 0.0 A

2-1

Current 3 Phase AVG : 0.0 A

2-2

Current 3 Phase AVG : 0.0 A

2-4

Current 3 Phase AVG : 0.0 A

2-5

Current 3 Phase AVG : 0.0 A

2-6

Current 3 Phase AVG : 0.0 A

2-7

Current 3 Phase AVG : 0.0 A

2-8

Current 3 Phase AVG : 0.0 A

2-9

Current 3 Phase AVG : 0.0 A

2-10

Current 3 Phase AVG : 0.0 A

2-12

Current 3 Phase AVG : 0.0 A

2-T

Current 3 Phase AVG : 0.0 A

Sub-Station 3 Main 1

Main

Current 3 Phase AVG : 376.0 A

3-T1

Current 3 Phase AVG : 0.0 A

3-1

Current 3 Phase AVG : 74.0 A

3-2

Current 3 Phase AVG : 40.0 A

3-3

Current 3 Phase AVG : 39.0 A

3-4

Current 3 Phase AVG : 8.0 A

3-9

Current 3 Phase AVG : 216.0 A

3-BT

Current 3 Phase AVG : 0.0 A

Sub-Station 3 Main 2

Main

Current 3 Phase AVG : 424.0 A

3-12

Current 3 Phase AVG : 83.0 A

3-20

Current 3 Phase AVG : 104.0 A

3-21

Current 3 Phase AVG : 43.0 A

3-22

Current 3 Phase AVG : 199.0 A

3-T2

Current 3 Phase AVG : 0.0 A

Message Board

Current Status:

Save

use / and your name at the beginning of each entry.
(example / JOHN DOE) Push save button to save text.

UEM Personnel Contacted

☐ Steven Hughes Contacted

☐ Steven Onsite

☐ John Nord Contacted

☐ John Onsite

☐ Ron Mercer Contacted

☐ Ron Onsite

☐ Brian Phippen Contacted

☐ Brian Onsite

☐ Mike Duffy Contacted

☐ Mike Onsite

☐ Britney Ragland Contacted

☐ Britney Onsite

Customers Contacted

☐ Derek Crouse

☐ Andrew Blues

☐ Phil Tackett

☐ Scott Geisinger

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Graphics – Energy Management

Sub-Station 1 Main 1		
Main	Current 3 Phase AVG : 429.0 A	
1-1	Current 3 Phase AVG : 69.0 A	
1-2	Current 3 Phase AVG : 108.3 A	
1-3A	Current 3 Phase AVG : 38.0 A	
1-3B	Current 3 Phase AVG : 4.0 A	
1-3C	Current 3 Phase AVG : 2.0 A	
1-10	Current 3 Phase AVG : 84.0 A	
1-12	Current 3 Phase AVG : 403.0 A	
1-14	Current 3 Phase AVG : 0.0 A	
1-15	Current 3 Phase AVG : 30.0 A	
1-41	Current 3 Phase AVG : 0.0 A	

approving service or relaying information.

Message Board
Current Status:
<div></div>
<div>Save</div> use / and your name at the beginning of each entry. (example / JOHN DOE) Push save button to save text.

<div>Save</div> use / and your name at the beginning of each entry. (example / JOHN DOE) Push save button to save text.
UEM Personnel Contacted
<div><div><input type="checkbox"/> Steven Hughes Contacted</div><div><input type="checkbox"/> John Nord Contacted</div><div><input type="checkbox"/> Ron Mercer Contacted</div><div><input type="checkbox"/> Brian Phippen Contacted</div><div><input type="checkbox"/> Mike Duffy Contacted</div><div><input type="checkbox"/> Britney Ragland Contacted</div></div> <div><div><input type="checkbox"/> Steven Onsite</div><div><input type="checkbox"/> John Onsite</div><div><input type="checkbox"/> Ron Onsite</div><div><input type="checkbox"/> Brian Onsite</div><div><input type="checkbox"/> Mike Onsite</div><div><input type="checkbox"/> Britney Onsite</div></div>
Customers Contacted
<div><div><input type="checkbox"/> Derek Crouse</div><div><input type="checkbox"/> Phil Tackett</div></div> <div><div><input type="checkbox"/> Andrew Blues</div><div><input type="checkbox"/> Scott Geisinger</div></div>

Graphics – Energy Management

Area 1 Building Power Meters

Current Date & Time:
11-Apr-24 2:00 PM EDT

OAT - 62.4 °F
OAH - 90.0 %RH

◀ Back

Power Meter
Home Page

Tridium
Home Page

Building #	Building Name	Energy Total	Power Factor	Power Total	Phase A Current	Phase B Current	Phase C Current
0009	Patterson Hall	1279156.25 kW-hr	0.99 pf	74.12 kW	224.60 A	191.22 A	175.12 A
0012	Blazer Dining						
0019	Memorial Coliseum						
0021	Old Engineers Residence						
0022	Fine Arts Guignol	9219526.00 kW-hr	-0.97 pf	147.00 kW	418.00 A	425.00 A	422.00 A
0024	Lafferty Hall	1533138.25 kW-hr	-0.98 pf	13.00 kW	32.00 A	45.00 A	29.00 A
0025	White Hall	15269073.00 kW-hr	-0.94 pf	256.00 kW	681.00 A	627.00 A	663.00 A
0027	Patterson Office Tower #1	17437610.00 kW-hr	-0.96 pf	199.00 kW	586.00 A	610.00 A	538.00 A
0027	Patterson Office Tower #2	12691959.00 kW-hr	-0.93 pf	156.00 kW	498.00 A	538.00 A	525.00 A
0028	Barker Hall	2494916.25 kW-hr	1.00 pf	21.00 kW	65.00 A	56.00 A	49.00 A
0031	Frazee Hall						
0032	Main Admin SWBD1	93162.52 kW-hr	0.86 pf	29.03 kW	103.42 A	108.42 A	94.34 A
0032	Main Admin SWBD2	204955.06 kW-hr	0.99 pf	59.10 kW	215.95 A	154.13 A	125.15 A
0033	Ezra Gillis	868965.31 kW-hr	0.99 pf	16.00 kW	45.00 A	58.00 A	34.00 A
0034	Gatton Business and Economics #1	898161.38 kW-hr	0.98 pf	147.97 kW	172.93 A	185.52 A	176.44 A
0034	Gatton Business and Economics #2	1260046.88 kW-hr	0.99 pf	181.58 kW	216.25 A	226.85 A	228.76 A
0035	Miller Hall	2135599.00 kW-hr	-0.92 pf	22.00 kW	70.00 A	69.00 A	71.00 A
0039	MIK Library	15577346.00 kW-hr	-0.97 pf	211.00 kW	592.00 A	602.00 A	585.00 A
0040	Maxwell Place						
0095	Jewell Hall						
0123	Blazer Hall						
0166	Gatehouse						
0211	Maxwell Place Garage						
0224	Lucille Little Library	13043502.00 kW-hr	-0.97 pf	156.00 kW	468.00 A	422.00 A	429.00 A
0241	Singletery Center for the Arts #1	10621744.00 kW-hr	-0.86 pf	131.00 kW	419.00 A	419.00 A	412.00 A
0241	Singletery Center for the Arts #2	999079.62 kW-hr	0.99 pf	8.00 kW	24.00 A	22.00 A	23.00 A
0314	252 E Maxwell St						
0315	206 E Maxwell St						
0343	Bingham Davis House						
0344	Raymond F. Betts House						
0345	German House and Cultural Center						
0427	Bowman's Den						
0432	Common Wealth House						
0462	Sarah Bennett Holmes Hall #1	332586.41 kW-hr	0.96 pf	16.44 kW	38.41 A	55.91 A	48.48 A
0462	Sarah Bennett Holmes Hall #2	1165867.25 kW-hr	0.92 pf	21.40 kW			
0463	Celona Belle Mathews Boyd Hall						
0495	Hardymon Comm Building	2752835.25 kW-hr	0.81 pf	124.43 kW	375.00 A	413.96 A	371.90 A
0604	Joe Craft Center Basketball Training	10810438.00 kW-hr	0.98 pf	198.54 kW	227.18 A	238.37 A	251.99 A
0633	Davis Marksby Building	2870121.25 kW-hr	0.98 pf	97.47 kW	290.04 A	261.27 A	268.08 A
0644	Wildcat Coal Lodge	3406272.00 kW-hr	-0.96 pf	42.00 kW	90.92 A	74.77 A	68.10 A
0676	Gatton Student Center #1	1336607.50 kW-hr	1.00 pf	60.86 kW	124.77 A	111.81 A	92.10 A
0676	Gatton Student Center #2	1544056.50 kW-hr	1.00 pf	59.22 kW	180.71 A	124.62 A	109.05 A
0676	Gatton Student Center #3	8609505.00 kW-hr	0.97 pf	234.45 kW	323.92 A	282.58 A	271.10 A
0676	Gatton Student Center #4	12923015.00 kW-hr	0.97 pf	333.53 kW	432.65 A	432.65 A	392.96 A
0676	Gatton Student Center #5	2020925.12 kW-hr	1.00 pf	59.69 kW	168.12 A	124.87 A	175.57 A
0676	Gatton Student Center #6	1328996.12 kW-hr	1.00 pf	63.67 kW	288.88 A	244.09 A	237.09 A

Graphics – Energy Management

Area 1 Building Power Meters

Current Date & Time:
11-Apr-24 2:00 PM EDT

OAT - 62.4 °F
OAH - 90.0 %RH

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Power Meter Home Page

Tridium Home Page

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0027	Patterson Office Tower #2	17661650.00 kW-hr	-0.97 pf	192.00 kW	608.00 A	578.00 A	575.00 A



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Questions

Contact Information

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