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**ENVIRONMENTAL
CONTROL SOLUTIONS** INC.

A PremiStar Company

POINTCORE



BUILDING AUTOMATION SYSTEM OPTIMIZATION

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Building Automation Controls Engineer
PointCore, Inc.

Agenda



Energy Efficiency
PROGRAM

- Building Automation Controls Engineer Role
- Optimization Process
- Tools
- Verified Results
- Conclusion / Take-aways



Building Automation Controls Engineer



Energy Efficiency
PROGRAM

Roles and Responsibilities

1. Identify opportunities for energy efficiency improvement through building automation system controls
 - Consulting vs. Implementation
2. Energy and infrastructure project reviews
3. Standards development
4. Internal building automation resource



Optimization Review Process

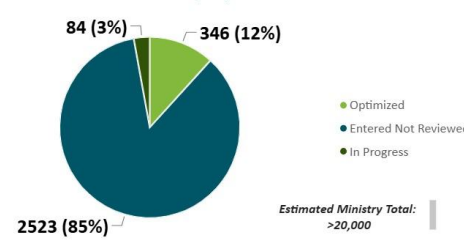
- Log every piece of equipment controlled by a Building Automation System
- Review against specific optimization strategies
- Review control of those strategies (trends / reports)
- Identify mechanical deficiencies (work orders)
- Updated programming or setpoints as needed
- Identify future energy or infrastructure project opportunities



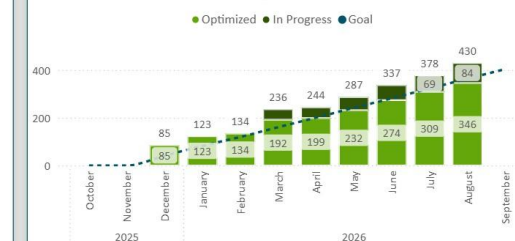
Energy Efficiency
PROGRAM

Primary	Current Conditions Optimized	Date Optimized	Infra Opp / Ineff Equip	Energy Project Opp	Pneumatic Actuators	AHU - SAT Reset	AHU - Static Reset	AHU - Economi...	A...
Learning Center AHU (LL3 - 1018)	Yes**	09/23/26	No	Yes	No	Yes	Yes	Yes	N
(VAV) Conference Room	Yes**	09/23/26	No	No	No	N/A	N/A	N/A	N
(VAV-) Rm LL3-1006	Yes**	09/23/26	No	No	No	N/A	N/A	N/A	N
(VAV) Zone 3	Yes**	09/23/26	No	No	No	N/A	N/A	N/A	N
(VAV-) Rm LL3-1007 - D	Yes**	09/23/26	No	No	No	N/A	N/A	N/A	N
(VAV-) Rm LL3-1008	Yes*								
(VAV-) Rm LL3-1009 -	Yes*								
(VAV-) Rm LL3-1010 - D	Yes*								
(VAV) Zone 2	Yes*								
(VAV-) Rm LL3-1011 - C	Yes*								
(VAV) Zone 1	Yes*								
(VAV-) Rm LL3-1012 - C	Yes*								
(VAV) Entry / Mens & W	Yes*								
AHU-16 Cath Lab	Yes*								
AHU-17 Surgery	Yes*								
RTU-1 Cath Lab	I/P								
(RHC) Cath Lab B-1048	Yes								
(RHC) Angio BI-Plane B	Yes								
(VAV-1) EP Lab B1113	Yes								
(VAV-2) EP Lab B1113	Yes								

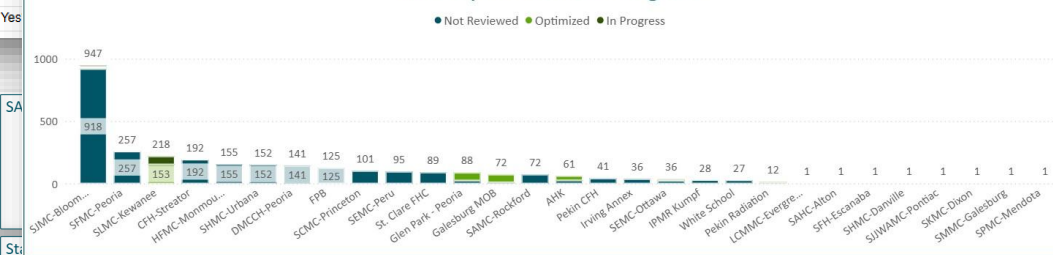
Controllable Equipment Reviewed



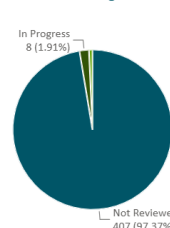
Monthly Progress Cumulative



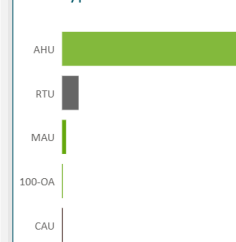
BAS Optimization Progress



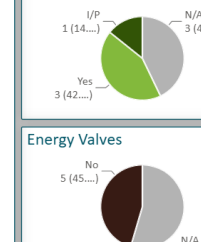
AHU Progress



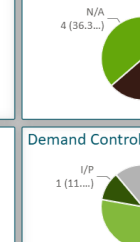
AHU Types



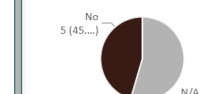
Building Pressure Control



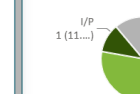
Energy Recovery



Energy Valves



Demand Controlled Ventilation



Select all
☐ (Blank)
☐ ALC-WebCTRL
☐ Alpha
☐ Delta
☐ Johnson Metasys
☐ Pneumatic/Unknown

Group
☐ 20K
☐ Hospital
☐ Other

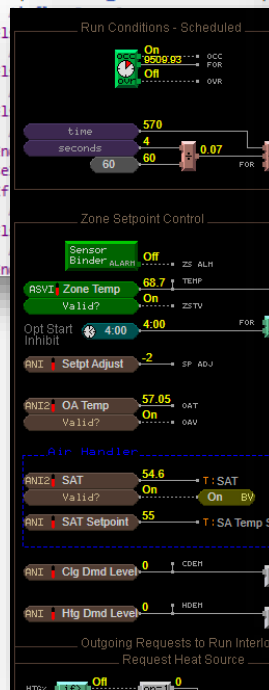
Status Information

HFM-Monmouth
IPMR Kumpf
Irving Annex
LCMMC-Evergreen
Pekin CFH
Pekin Radiation
SAHC-Alton
SAMC-Rockford
SCMC-Princeton
SEMC-Ottawa
SEMC-Peru
SFH-Escanaba
SIJWAMC-Pontiac
SMC-Bloomington
SKMC-Dixon
SLMC-Kewanee
SMC-Galesburg

Reviewing Optimization Strategies

- Review each strategy per applicable equipment.
- This is better accomplished with access and understanding of the programming.
- Can be done with trend reviews and watching operation.

```
1 // Airflow Program
2
3 // Air Flow Setpoint (AVE)
4 DoEvery 2S
5   If (Controller_Mode = Unoccupied) Or
6     //Master Mode 17: Startup Calibrat
7     Airflow_Sp = 0
8   ElseIf (Controller_Status = Maximum
9     Airflow_Sp = Max (Max_Clg_Airflow_
10   ElseIf (Controller_Status = Minimum
11     Airflow_Sp = Min (Min_Clg_Airflow_
12   ElseIf (Controller_Status = Heating
13     If (Controller_Mode = UnoccCoolSB)
14       Airflow_Sp = 0
15     ElseIf (Controller_Mode = UnoccHe
16       Airflow_Sp = Max_Htg_Airflow_Sp
17     ElseIf (SA_TMP < RM_TMP + 5) And
18       Airflow_Sp = Min_Htg_Airflow_Sp
19     Else
20       Airflow_Sp = Scale (Rm_Tmp_CO, 0
21   End If
22   ElseIf (Controller_Status = Cooling
23     If (Controller_Mode = UnoccHeatSB)
24
25   E1
26   E1
27   E1
28   E1
29   E1
30   E1
31   E1
32   E1
33   E1
34   E1
35   E1
36   E1
37   E1
```



Optimization Strategies

X

AHUs:

- Supply Air Temp Reset
- Static Press Reset
- Economizer
- Demand Controlled Ventilation
- Energy Valves
- Energy Recovery
- Building Press Control
- Schedules/Setbacks

CHW:

- CHW Supply Reset
- CW Reset

Pumps:

- Diff Press Reset

HW:

- HW Supply Reset

EFs:

- Static Press Reset

VAVs:

- Standard Sequence
- 30% Min CFM

Reheat Coils:

- DAT Control

General Zones:

- Occupancy Sensor (setbacks)
- CO2 Sensor (airflow setbacks)
- Temperature Standard

Optimization Strategy Considerations



Energy Efficiency
PROGRAM

Humidity

- Measure return of air humidity at handling equipment as well as representative zones.
- Override supply air temperature resets for dehumidification purposes.
- Use enthalpy-based economizing whenever possible.
- Include unoccupied overrides for high humidity levels.



Scheduling

- Include “extreme weather overrides” when needed to override schedules (building dependent).



Occupancy Sensing

- Caution against setting back temperatures too far during occupied periods, instead lower minimum airflow setpoints to allow space to slowly drift but stay ready to use in a “standby mode.”



Temperature setpoint standard / consistency

- Have found that heating setpoint of 70°F, a cooling setpoint of 74°F and a user adjustment limit of +/- 2°F has worked well for our buildings.
- Key is consistency across zones so spaces are not fighting each other and driving to meet extreme heating and cooling loads at the same time.

Removing or supplementing process cooling loads

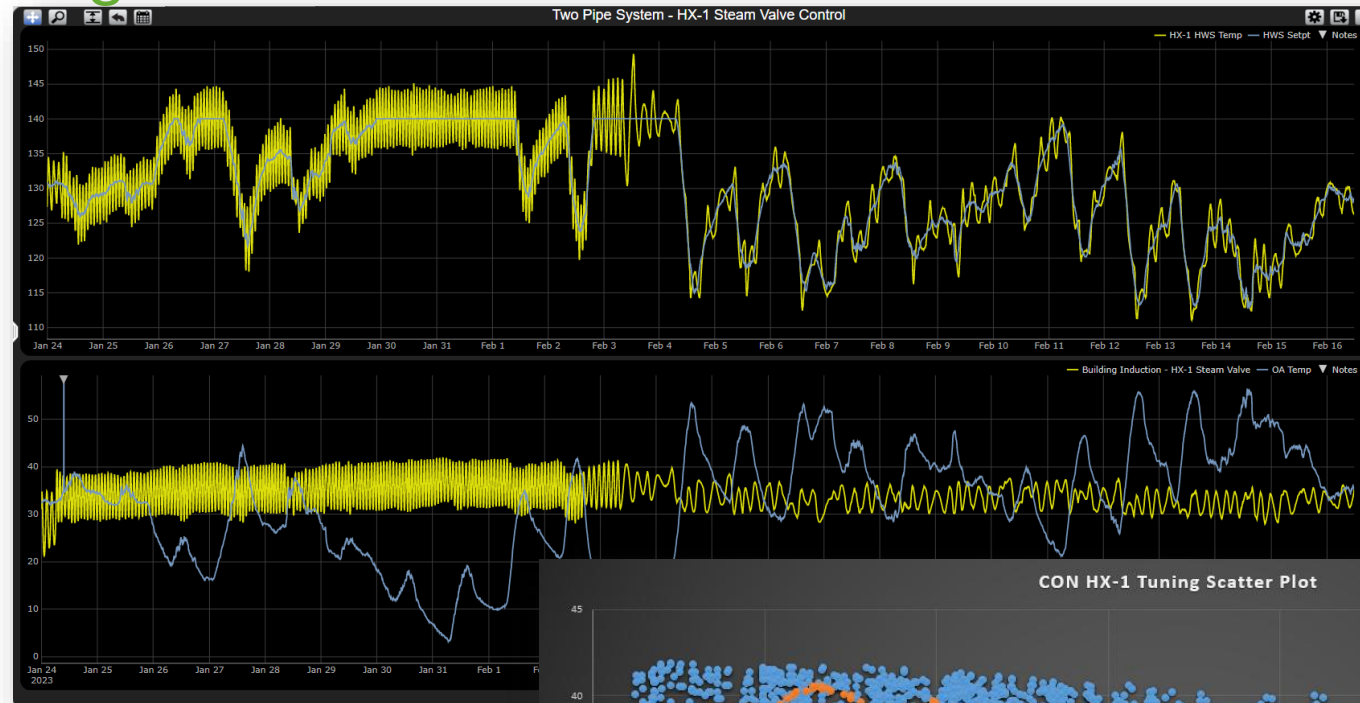
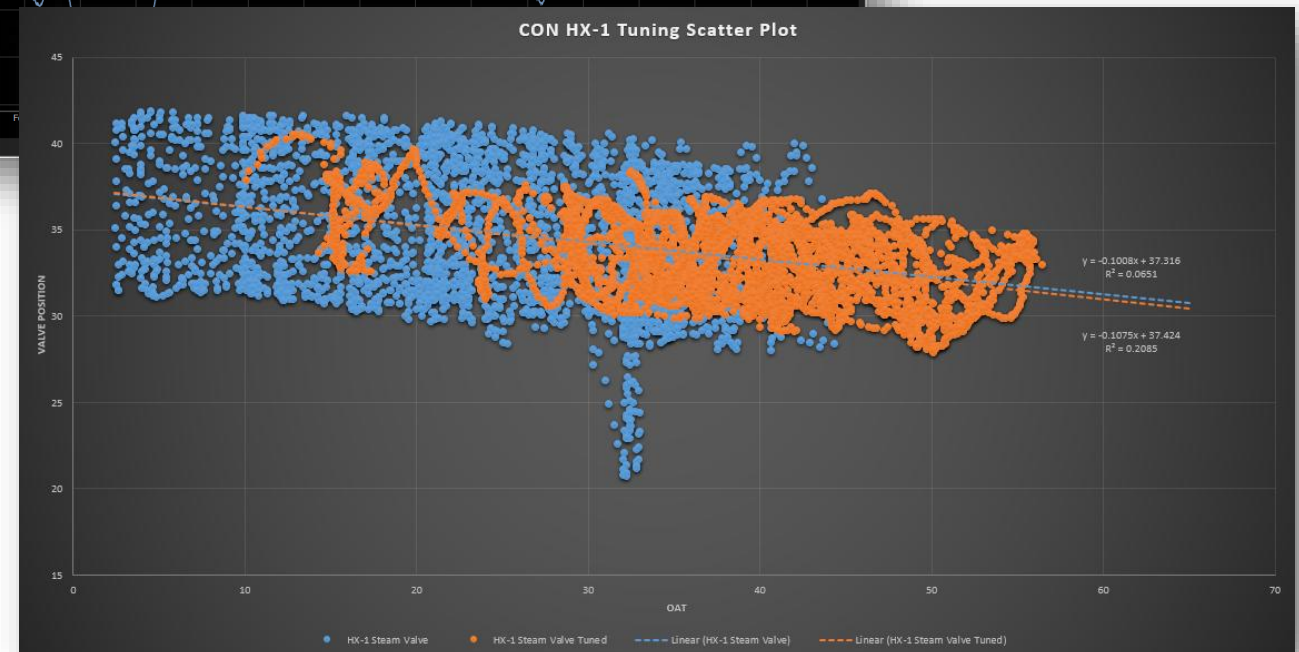
- Cooling spaces like IT, electrical, mechanical or equipment rooms off of the same systems that serve offices, patient rooms, etc. can drive that entire system to provide cooling 24/7/365.
 - Providing DX cooling, transfer fans, exhaust/economizer cooling allows temperature resets to occur and perhaps allows earlier shutdown of cooling plants in swing seasons when economizing is available.

VAV Sequencing (Hot Water Reheats)

- Recommend utilizing a sequence based on ASHRAE-36 (high-performance control sequences for HVAC systems)
 - This stages the reheat up first and will increase the airflow if needed while maintaining a max discharge air setpoint.

Control Loop Tuning

- Gain efficiency with smoother operation.
- Oscillations in control can cause a chain reaction causing oscillations in systems upstream.
- Can affect comfort when oscillations occur at a zone level.
- Tuning can avoid unnecessary wear and tear on equipment.



Tools – Graphics/Reports/Trends



Energy Efficiency
PROGRAM

Setpoint Checks

Report pulls in the heating and cooling setpoints along with the user adjustment limit, airflow setpoints and color-coded indicators to show compliance with our energy guidelines and calculated airflow %.

Location	Heating Stpt	H OK	Cooling Stpt	C OK	ADJ Limit	A OK	Max CFM	Max Heat CFM	Max Heat %	H% OK	Min CFM	Min %	M% OK
(VAV-1) Lounge 1614	70		74		2		525	265	50		158	30	
(VAV-2) Stereo 1609	68		72		2		275	140	51		85	31	
(VAV-3) Ultrasound 1608	68		72		2		200	75	38		50	25	
(VAV-4) Subwait 1603	68		72		2		400	200	50		120	30	
(VAV-5) Corridor 1607	70		74		2		200	75	38		50	25	
(VAV-6) Consult 1620	70		74		2		250	125	50		75	30	
(VAV-7) Navigator 1619	70		74		2		400	200	50		120	30	
(VAV-8) Corridor 1615	70		74		2		150	75	50		50	33	

Tools – Graphics/Reports/ Trends

VAV Tables

- Report pulls in all the relevant VAV data:
 - Zone and discharge temp
 - Color status
 - Temp and airflow setpoints
 - Cooling, heating and airflow requests
 - Cooling, heating, damper and valve positions
- Table is sortable by column to quickly identify issues with various aspects of operation.

66.6 °F
63 %rh

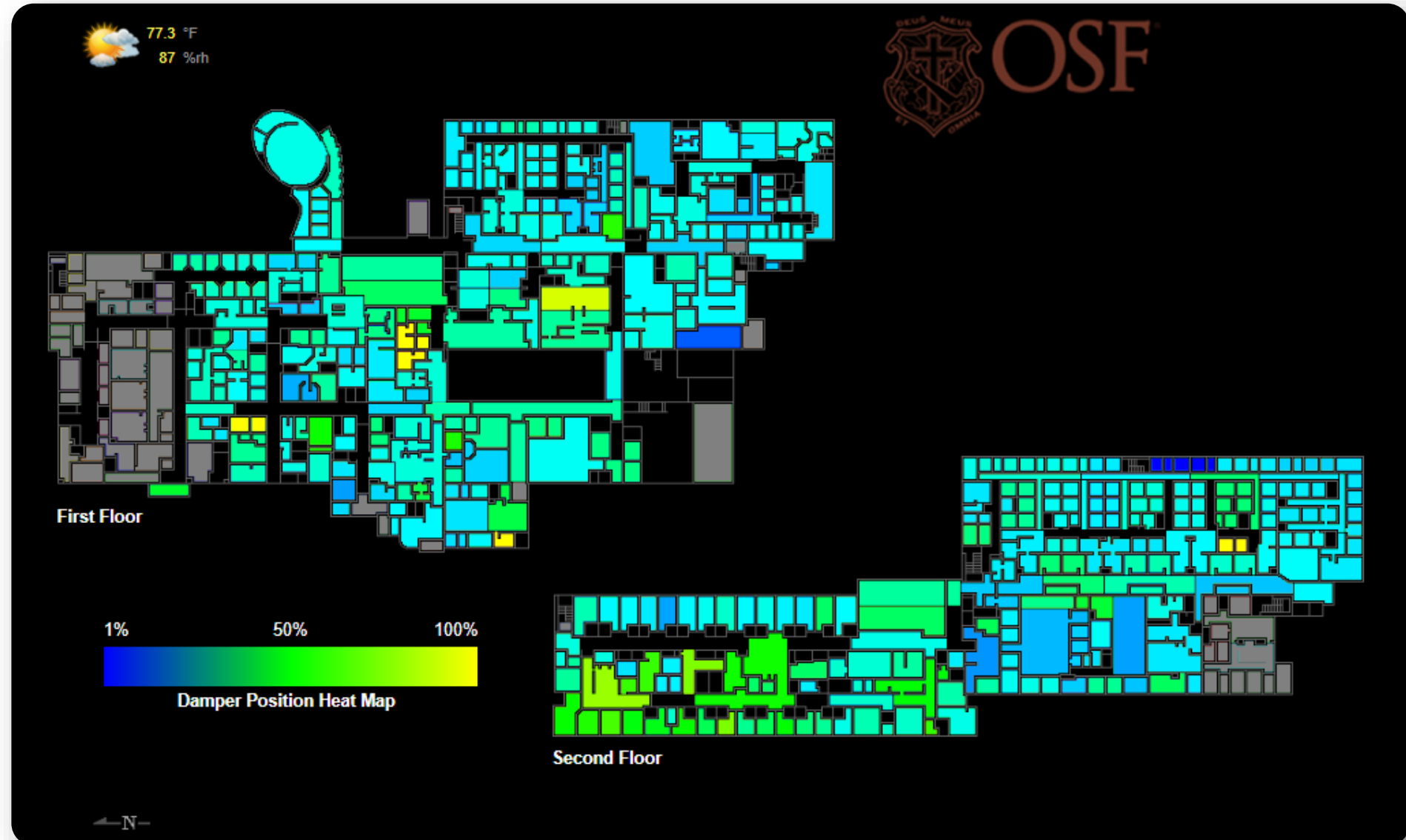
AHU-24 Terminal Units

Location	Zone Temp	Sts	Eff Heat	Eff Cool	Airflow	Airflow Setpoint	Min Airflow	Max Airflow	Clg Req	Clg%	Dmpr%	Htg Req	Htg%	HWV	Air Req	DAT
(TU-35) Soiled Utility A0064	73.9		68	72	405	400	400	400		100	61		0	0		54
(TU-36) Trauma 2 A0066	73.7		60	64	953	940	940	940		100	64		0	0		71
(TU-37) Trauma 1 A0063	70.2		70	74	460	450	450	450		0	69		20	100		69
(TU-39) Trauma 3 A0068	72.0		72	76	497	700	700	700		0	100		0	0		57
(TU-40) Trauma #15 A0062	73.2		73	77	288	280	280	280		0	49		28	100		76
(TU-41) EMS Work A0058	67.8		68	72	658	350	350	350		0	67		12	39		71
(TU-42) Decon. Shower/ Vestibule A0056/57	70.0		70	74	664	650	650	650		0	67		100	100		75
(TU-43) ED Storage A0069	70.0		70	74	586	570	570	570		0	52		5	32		72
(TU-44) Electrical A0070	72.4		68	72	334	340	0	340		100	51		0	0		53
(TU-45) ED Radiology A0072	72.2		72	76	545	530	530	530		0	49		6	83		74
(TU-46) Control A0073	72.4		74	76	175	175	105	350		0	34		100	100		89
(TU-47) Hospitalist Office A0074	70.0		70	74	407	400	300	1000		0	29		100	100		55
(TU-48) Trauma/SANE Coordinator A0091	75.1		71	75	96	100	36	120		75	29		0	0		57
(TU-49) Portable X-ray Parking / Offices	71.9		68	72	296	294	120	400		62	48		0	0		52
(TU-50) Storage J053	72.2		72	76	244	240	240	240		0	43		5	20		75
(TU-51) Trauma #21 A0080	73.2		73	77	176	170	170	170		0	36		27	25		75
(TU-52) Trauma #20 A0077	74.0		72	76	206	200	200	200		0	58		12	48		76

Tools – Graphics/Reports/ Trends

Heat Maps

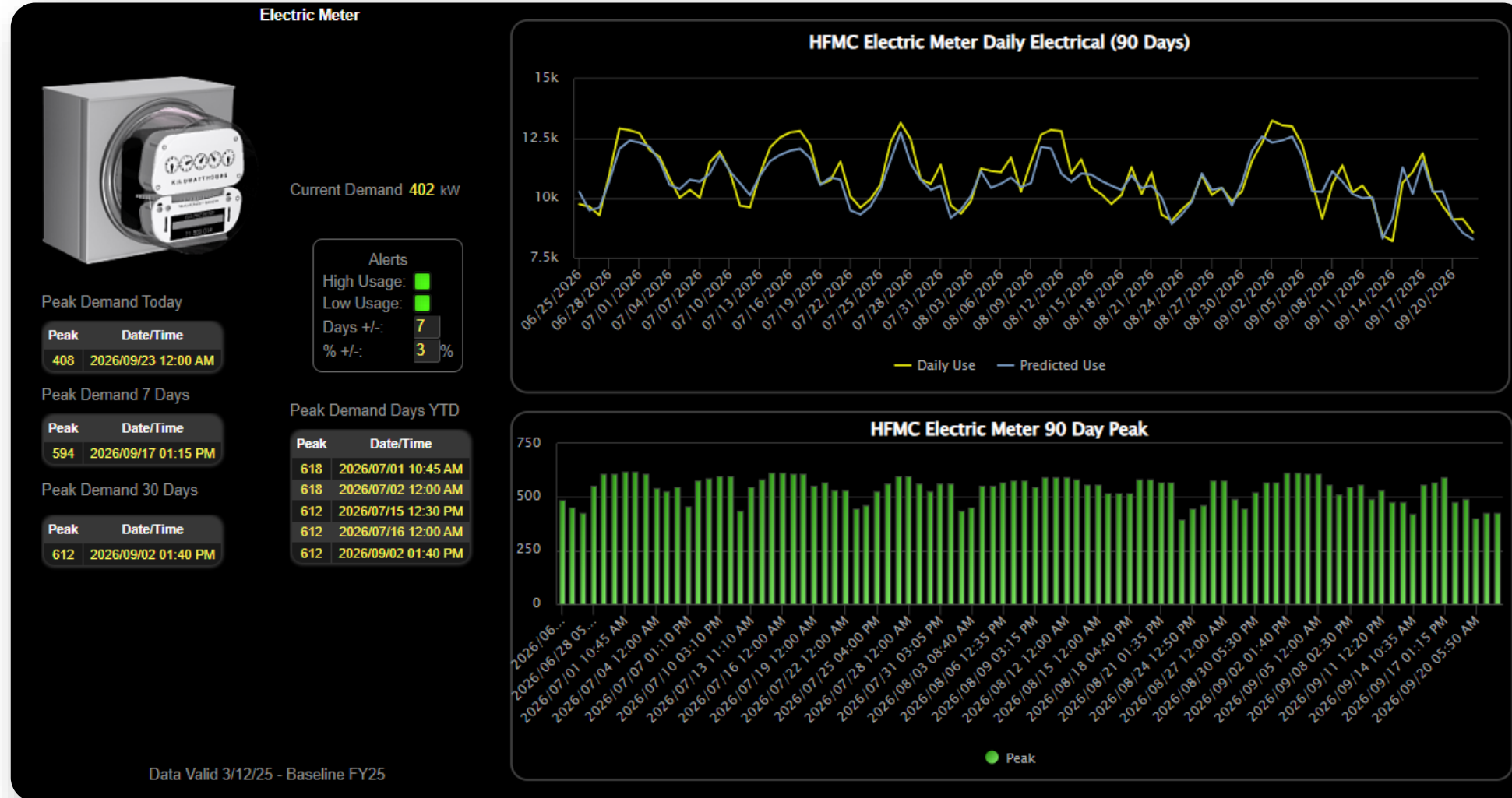
- Report pulls in damper position and assigns a color gradient from 0 to 100%.
- Graphic uses this report data and will update periodically to show a live heat map of damper positions.
- This can be used to find outliers and trouble areas, for example, if a fire damper was closed.



Tools – Graphics/Reports/ Trends

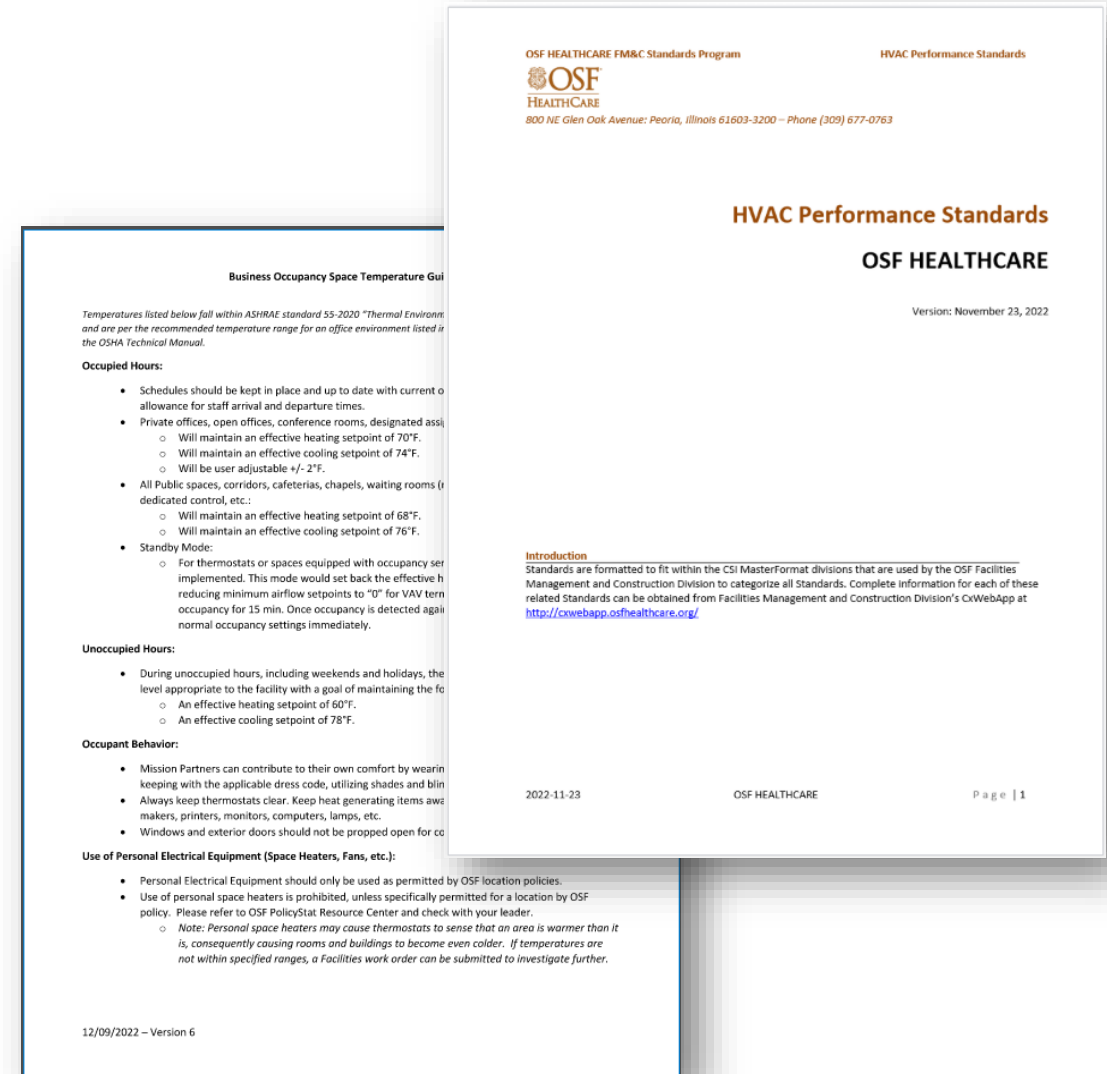
Real-time metering

- Reports for Peak Demand pulled into graphics.
- Linear regression formula used to generate predicted usage based on CDD, HDD, and weekends.
- Alerts (Alarms) setup to give us a heads up if energy use is 3% higher or lower than predicted for 7 days in a row.



Tools - Standards

- Temperature setpoint guidelines
 - Have found that heating setpoint of 70°F, a cooling setpoint of 74°F and a user adjustment limit of +/- 2°F has worked well for our building.
 - Key is consistency across zones so spaces are not fighting each other and driving to meet extreme heating and cooling loads at the same time.
- Design guidelines
 - Build in language for the optimization strategies that you want to see.
 - Set temperature standards right away.
 - Set requirement for system types and efficiencies.
 - Require dedicated cooling for spaces that can drive a vav system (electrical rooms, IT rooms).
 - Require systems to serve similar spaces.
 - Continuously review and update with lessons learned.
- Design Reviews
 - Utilize the standards and verify they are being followed with any new designs.
- Beware of equipment replacements
 - Evaluate “Like for Like” replacements for improvement opportunities.

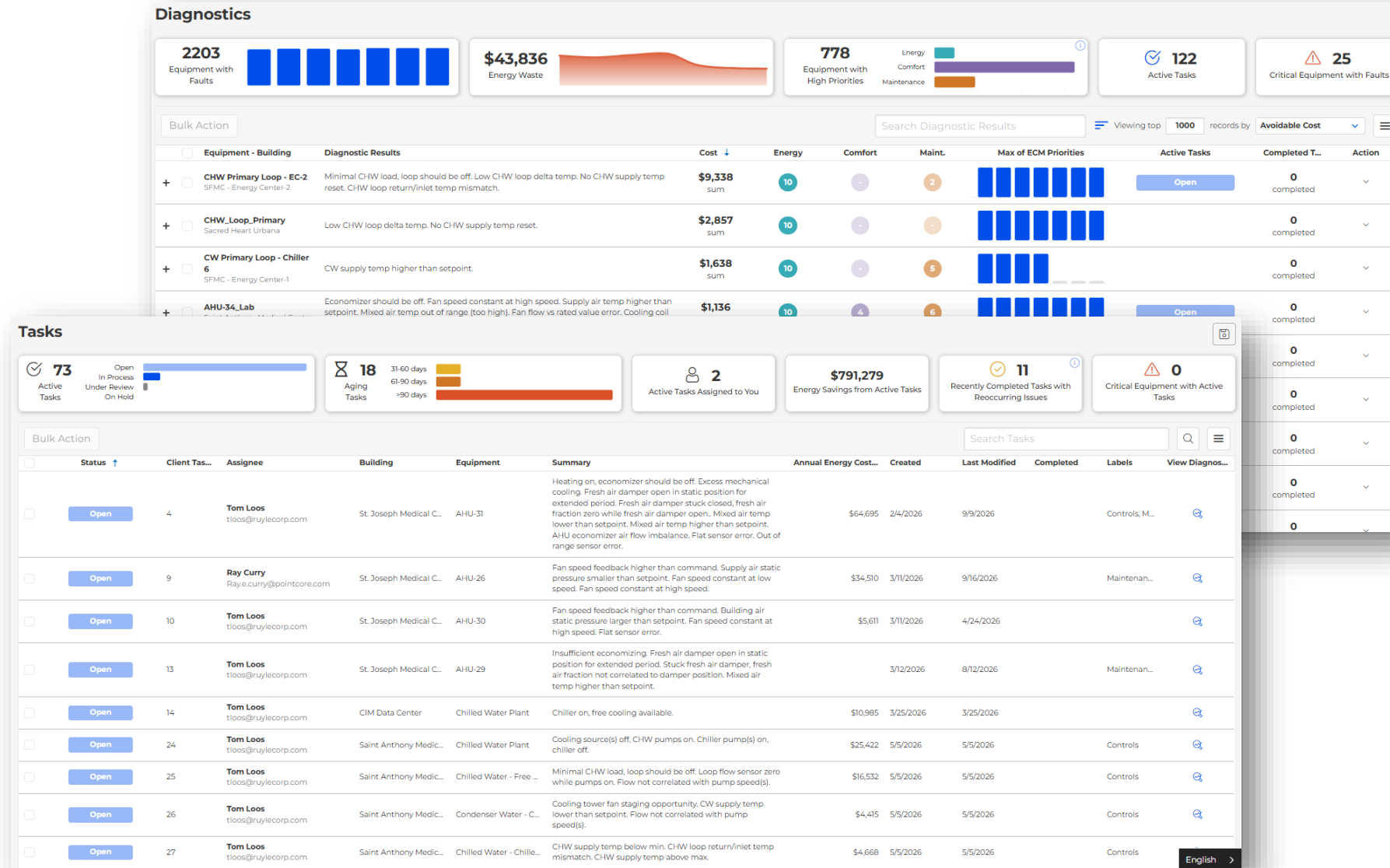


Tools – Analytics Software



Energy Efficiency
PROGRAM

- Setup is similar to how items are being logged
 - Equipment sizes and desired control sequences established
- Continuously evaluates rules to keep things on track
- May provide cost impact
- May include tasking module
- May be able to integrate to Work Order system



Verified Results: SJMC CFH Mini Splits



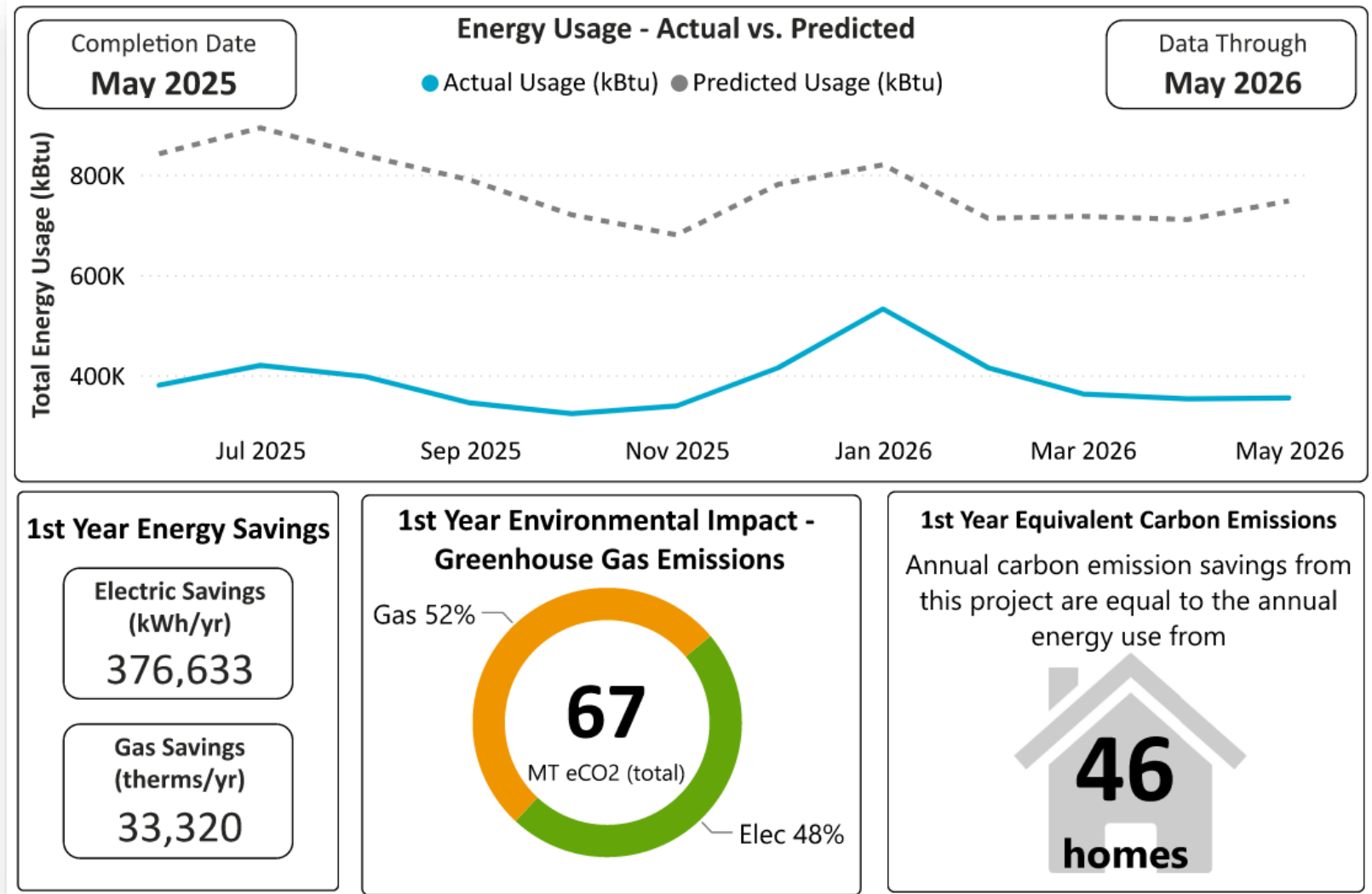
Energy Efficiency
PROGRAM

- **Project Scope:**

- Installed (2) mini-splits to cool IT closets
- Adjusted static pressure setpoints

- **Financials:**

- Project Cost: \$33,115
- Incentive: \$28,662
- **Out-of-Pocket: \$4,453**
- **>\$85,000** saved in first year!

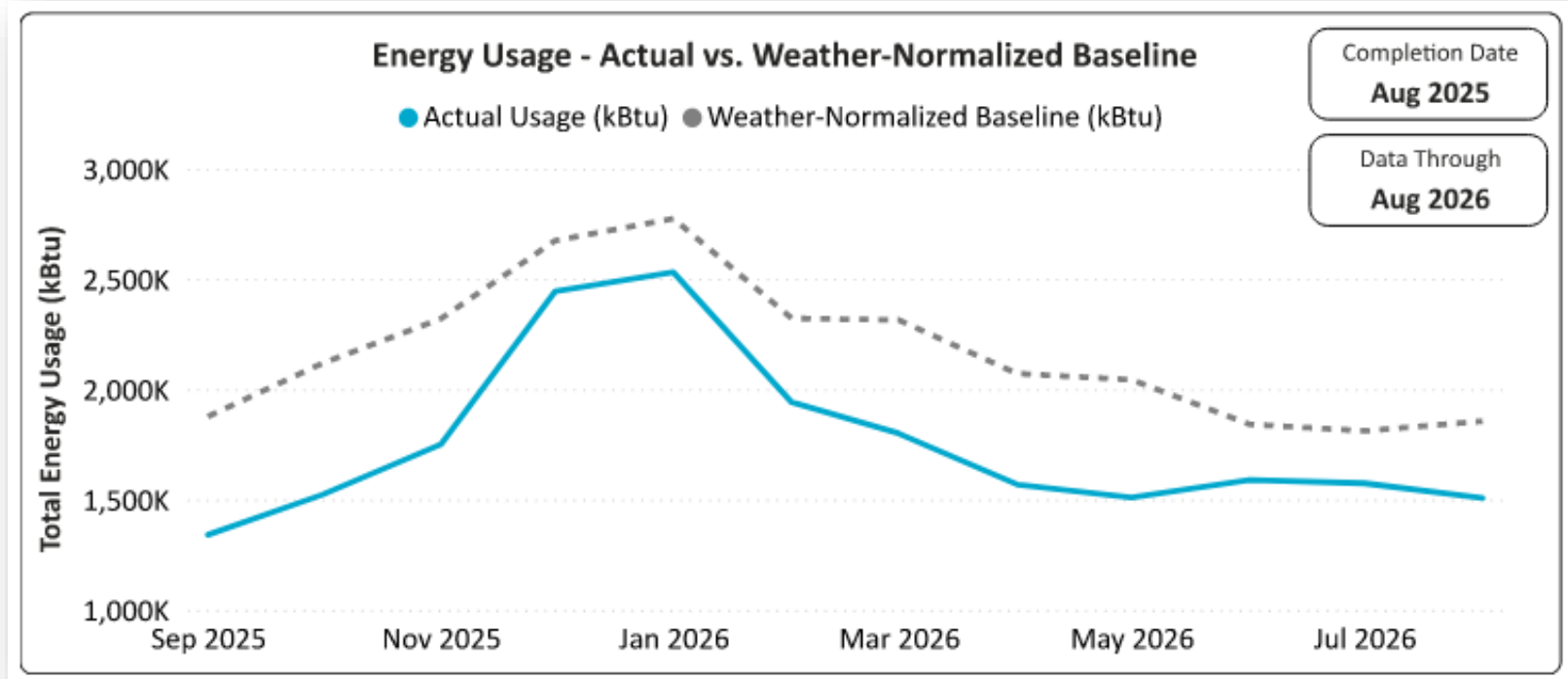


Verified Results: Headquarters BAS Optimization



Energy Efficiency
PROGRAM

- **Optimization Strategies:**
 - Revised occupancy schedules
 - Improved cooling controls to prevent chiller shutdowns
 - Implemented optimal start
- **Verification Approach:**
 - Weather-normalized baseline
 - 12-month reporting period
 - Daily data from utility
- **\$0 capital cost, \$47,000 first-year savings!**



Projects and Results (past 5 years)



Energy Efficiency
PROGRAM

- **31** Controls-related projects
- **\$3 Million** in Ameren incentives
- **\$1.3 Million** / year in annual savings

Projects (current) – Excluding ⇒

- **5** Controls-related projects
- **\$420K** in Ameren incentives
- **\$270K** / year in estimated annual savings

Current Project Highlight:

St. Francis Medical Center Chilled Water Optimization

50 – New Belimo Chilled Water Energy
Valves

27 – Ultrasonic Flow Meters

New control strategies for pumping and
flow control from 2 chiller plants

\$1.3 Million in Ameren incentives

\$900K / year in estimated annual
savings

Project Types



Energy Efficiency
PROGRAM

- 6** Air Handling Unit Controls (multiple AHUs per project)
- 13** BAS upgrades from older controls systems or pneumatics (large areas or buildings)
- 2** Chilled Water Plant BAS upgrades from older systems
- 4** Chilled Water Energy Valve projects
- 11** Monitoring Based Commissioning Projects (Various project types identified byMBCx)

Conclusions / Takeaways



Energy Efficiency
PROGRAM

- Set a temperature guideline/policy.
- Start with the zones. Most optimization strategies build from the ground up.
- Address high cooling demands that can drive a system (IT, electrical, mech rooms).
- If you are spending money on anything that will save energy, look for incentives!

PEKIN COMMUNITY HIGH SCHOOL ENERGY EFFICIENCY PLAN

Tim Bonnette, CPMM
Director of Facilities and Grounds
Pekin Community High School District #303
October 28, 2026



Our Process at PCHS



Energy Efficiency
PROGRAM

- **Step 1:** Reduce energy through lighting and HVAC upgrades
- **Step 2:** Build a behind-the-meter solar array.
- **Step 3:** Continued upgrades
- **Step 4:** Future efficiency projects
- **Step 5:** Culture change



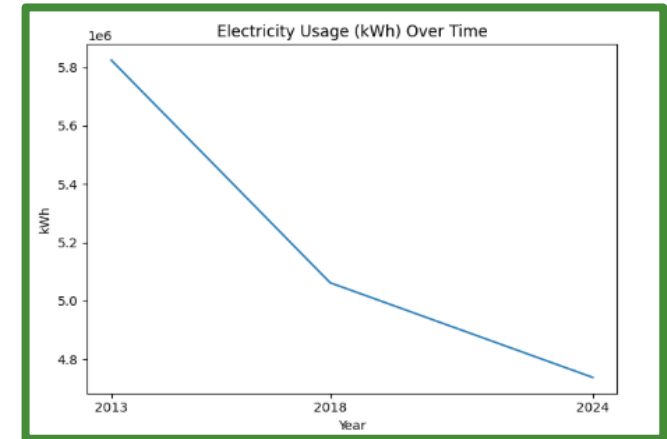
Lighting and HVAC Upgrades

PCHS Dist. #303 - Timeline

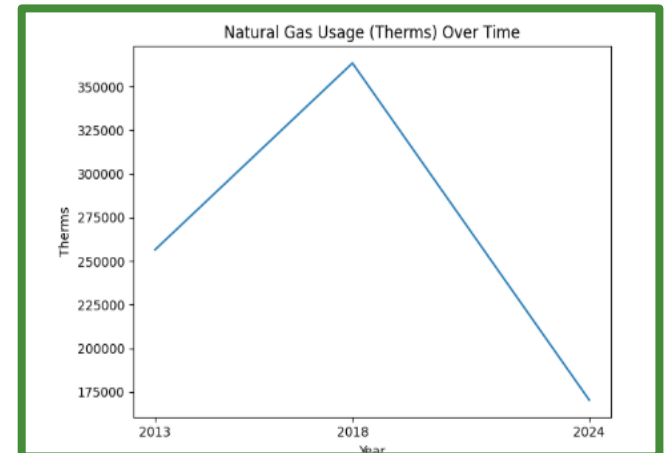
- **2013** - The beginning of our energy reduction plan.
 - SEDAC performed a benchmark report of where we started before any major energy efficiency changes.
- **2018** - Underwent an additional SEDAC program review.
 - A significant reduction in kWh but an increase in therms.
 - The increase in therms is partially because of a colder-than-normal winter and issues with aging equipment.
 - Both steam boilers and gas-driven chillers were struggling to get through, and one cost was more therms used.
- **2024** - Data recorded after several boiler upgrades, chiller upgrades, lighting upgrades and other major HVAC equipment upgrades.
 - This was before solar was online.
- **2026** - We are planning to do another SEDAC report to once again benchmark the facility with all the changes we have made for energy reduction and equipment upgrades.



Energy Efficiency
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	Electric	Gas
2013	5824329	256540
2018	5062044	363389
2024	4737689	170410



PCHS Projects Completed



Energy Efficiency
PROGRAM



- LED lighting and motion occupancy sensors in buildings B,C,D,F and parts of buildings A and E.
 - BCD300 lighting reduced kWh by over 230,000 annually with estimated annual savings of \$25,000.
- All exterior lighting is now LED with dimmable occupancy sensors and/or daylight sensors.
- ALL AHUs and RTUs on campus were replaced.
 - Reduced from 35 to 29 total units.
- Chiller replacement from gas-driven to electric-driven.
- Boiler replacements from steam to condensing and noncondensing HE.
- Removed ALL pneumatics and replaced with digital controls.
- Roof replacements with added insulation in buildings A,B,C,D,E and G (roughly 76% of campus roofs).

PCHS has received more than \$780,000 for energy efficiency projects since 2018!

PCHS Solar Array



Energy Efficiency
PROGRAM



→ Size

- 1.63 MW solar array
- Estimated annual production of 2,193,710 kWh
- Estimated 50% of PCHS annual use

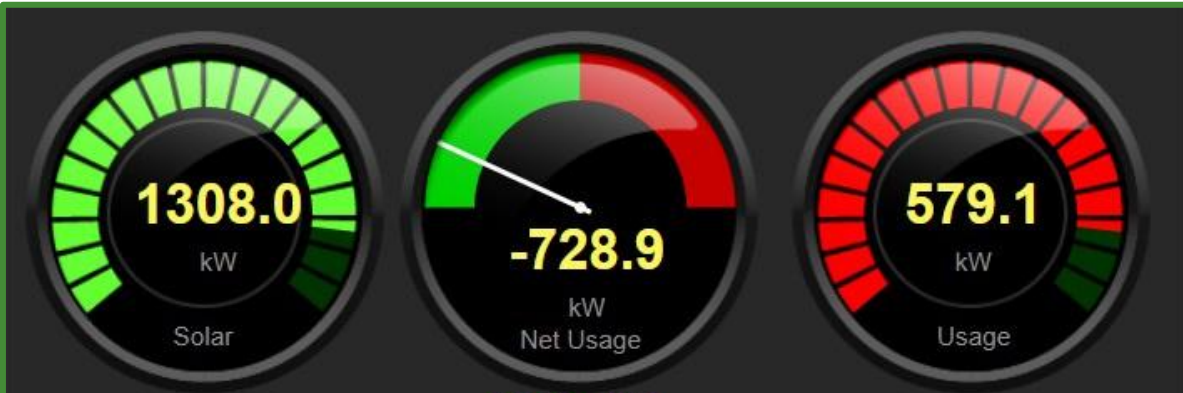
→ Costs

- Project costs of \$4,030,000
 - \$1,466,044 Federal tax credit
 - \$407,542 Ameren incentive
 - \$2,149,666 SRECs (20-year quarterly)
 - \$3,000 Homefield Energy Greenback check
- **Final cost: \$3,748**



Projected Savings

- 2,193,710 annual kWh saved
- First year estimated cost savings of \$275,000
- 25-year savings of \$9,485,041



Net Positive

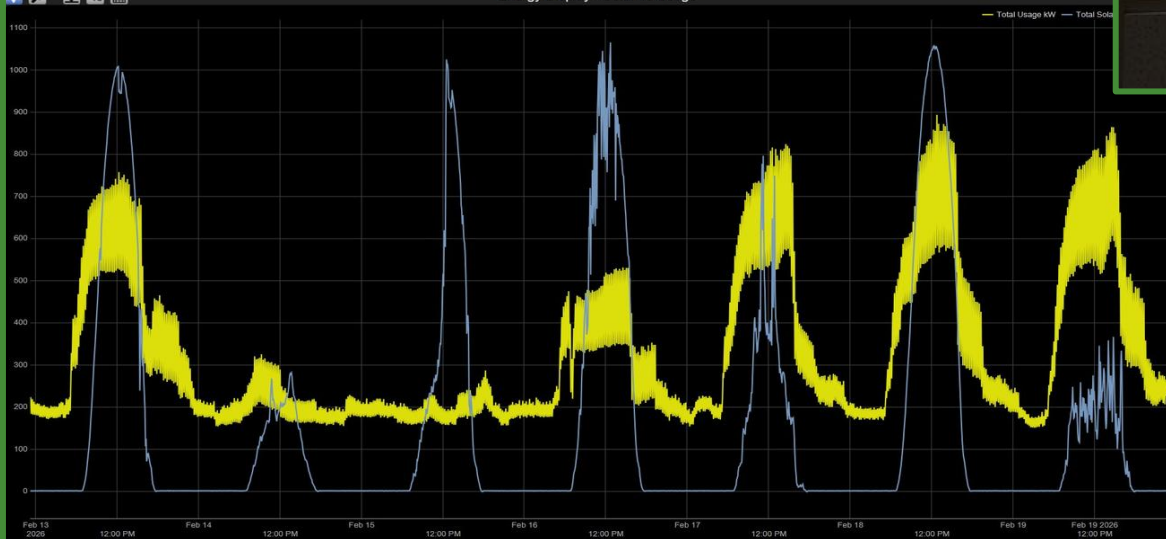
Month to Date Usage vs Production

75839 kWh

161832 kWh



Energy Display - Solar vs Usage



Continued Upgrades



Energy Efficiency
PROGRAM

Ongoing and Future Projects at PCHS

- LED upgrades in building “A” as we remodel it over the next few years.
- In 2026:
 1. **Building “A” boiler replacement with higher efficiency boilers.**
 - Currently we have 2 of 4 boilers functioning.
 - New boilers will be more efficient, will have longer warranties and we will go from 4 boilers to 3 boilers.
 - New boilers are also condensing vs near condensing.
 2. **Replace lighting in buildings E and G with new LED lighting.**
 - Around \$15,000 & 85 hours labor in just building “G” lighting in 2025.
 - Dimmable and programmable lighting could save approximately \$35,000 a year in electric costs.
 3. **Replace roof on Building “F”.**
 - Roughly 26 years old and leak repairs have been increasing the past 2-3 years.
 4. **Add additional renewable energy.**



Current and Future Efficiency Projects

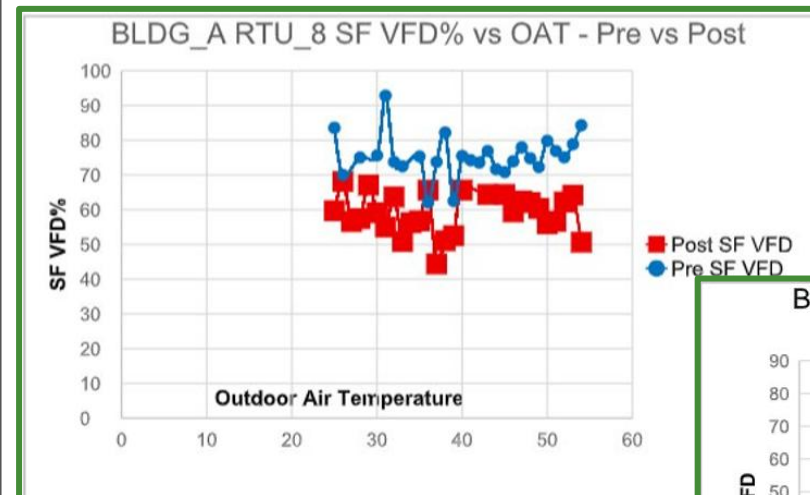


Energy Efficiency
PROGRAM

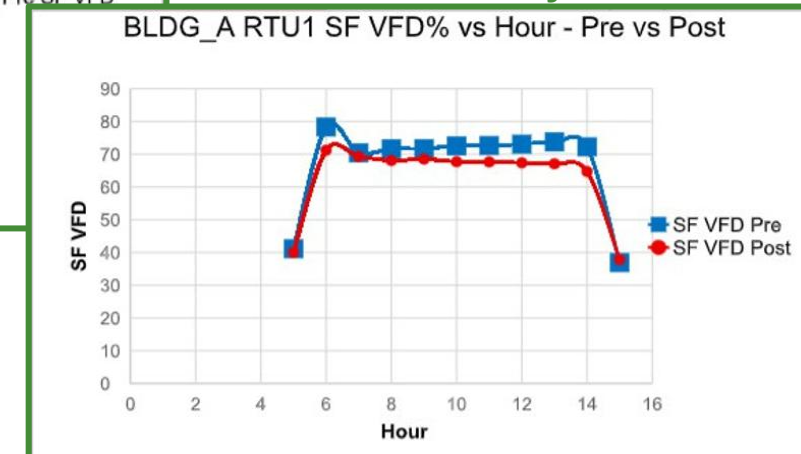
- **AI technology**

- Programming changes
 - Efficiency changes to program
 - Predictive maintenance
- BAS controls linked to lighting technology
 - Stronger and more detailed PMs
 - Demand Response

Building	Equipment	ECM/EEM/Logic	kWh Savings	Gas Savings
Pekin High School Building A	AHU-1	Static Pressure Reset	14,646.00	105.00
Pekin High School Building A	AHU-2	Static Pressure Reset	10,304.00	135.00
Pekin High School Building A	AHU-3	Static Pressure Reset	5,171.00	257.00
Pekin High School Building A	AHU-4	Static Pressure Reset	8,610.00	97.00
Pekin High School Building A	AHU-5	Static Pressure Reset	11,800.00	286.00
Pekin High School Building A	AHU-7	Static Pressure Reset	23,242.00	416.00
Pekin High School Building A	AHU-8	Static Pressure Reset	24,742.00	421.00
Total Energy Savings			98,515.00 kWh	1,717.00 Therms



This project cost
\$300 & is projected to
save \$10,800
annually



Culture Change

At PCHS Dist. #303



Energy Efficiency
PROGRAM

- **Lighting levels**

- New occupancy sensors turn on and off lighting without the switch.
- Classroom lighting on dimmers.

- **Temperature adjustments and setbacks**

- $\leq 2^{\circ}\text{F}$ temperature adjustments in the building.
- Lowering the temp by 1°F can decrease energy use in an 8-hour period by 1-3%.
- In one year, that could help lower our annual energy costs by as much as \$20,000 - \$40,000.

- **Unplugging**

- Accent lighting overnight
- Chargers
- Heaters
- Fans



Beyond the Dollars



Energy Efficiency
PROGRAM

How has this affected our students, faculty, staff and visitors?

- Lowering or raising thermostat setpoints has had NO complaints or issues.
- Areas reach setpoints quicker by using static pressure resets.
- Programmable switches and built-in occupancy sensors have lowered the issues with student incidents.
- Dimmable lighting controls:
 - Hallways were dimmed to 40%.
 - 70% of our teachers have their lights dimmed to around 60% or less in classrooms.
 - Some teachers have them as much as 45%.
 - Avoids fire hazards with improper lighting covers.
 - Fewer people complain about headaches from lighting.
- Better security in parking lots while using less energy by having occupancy sensors on the fixtures.
- Having a better regulated pool temperature and domestic water temperature using DDC v.s pneumatics.
- Overall budget savings in the O&M, results in less impact on department budgets throughout.
- Less downtime on equipment using AI software and finding issues before they fully develop.
- Faster repairs on equipment using AI software to detect problems.

QUESTIONS?



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