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Partnering for Sustainability

Tom Johnson | **Anthony Corso**

Executive Director of Facilities | *Sustainability & Energy Manager*

Facilities & Construction

October 16, 2024

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Why Sustainable Healthcare?

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U.S. Healthcare Sector

- Healthcare makes up 18% of U.S. economy (GDP) – expected to be 34% by 2040.
- Hospitals are ranked by USEPA as the second-largest commercial energy user in the U.S. – $8.3 billion on energy each year; 10% of U.S. greenhouse gas emissions.
- Hospitals produce more than 5 million tons of waste each year – 30+ lbs. of waste per bed/per day.
- Hospitals use approximately 7% of all water use in commercial and institutional U.S. facilities.
- The majority of healthcare emissions are indirect emissions largely from the supply chain – including food, pharmaceuticals, supplies and devices.

- Practice Greenhealth, 2022

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Why Sustainable Healthcare?

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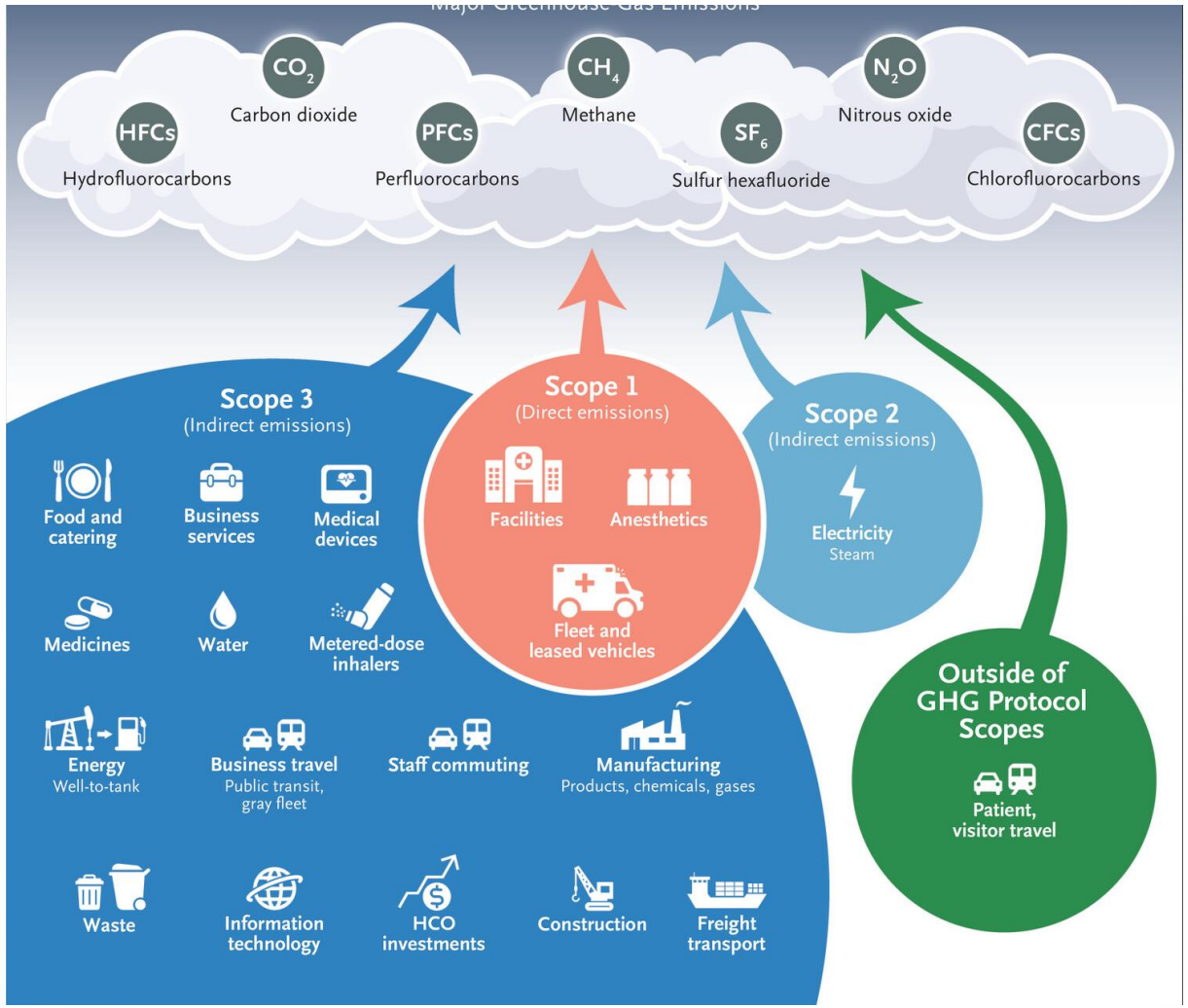
Reducing Emissions



Mandatory Reporting of Emissions to Achieve Net-Zero Health Care | NEJM

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Why Sustainable Healthcare?

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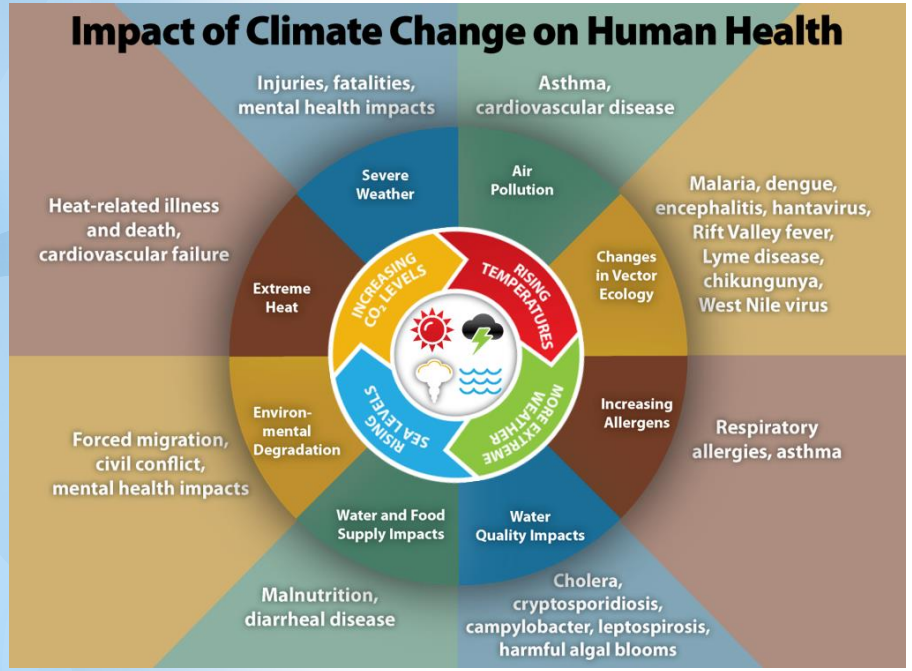
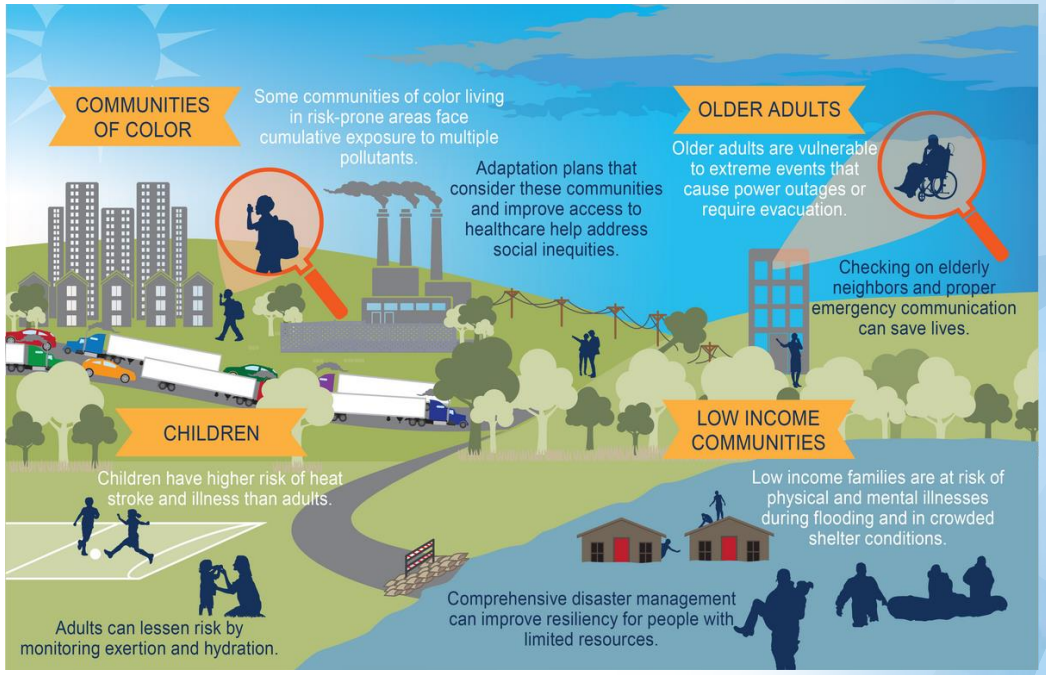
Protecting Human Health & Wellbeing



Climate Effects on Health | CDC



Human Health - Fourth National Climate Assessment (globalchange.gov)

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A Commitment to Sustainability

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"Carle Health is committed to improving the health, safety and wellness of our team members, patients and communities. Our responsibility goes beyond healthcare delivery and will be realized through our sustainability practices that support a better local, regional, national and global environment for all."

James C. Leonard, MD
President and CEO
Carle Health

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Past Sustainability Efforts

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Facilities and Construction

- Building commissioning and retro-commissioning
- Energy efficiency goals for new construction and major renovation
- LED lighting retrofits
- On-site solar pilot projects

Purchasing

- Exploration of waste stream reduction and diversion opportunities
- Shift from disposable to reusable products
- Electronics and battery recycling
- Sharps recycling

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Past Sustainability Efforts

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Food Service

- Reusable and compostable packaging
- Expansion of healthy, climate-friendly meal options

Community Engagement

- Community health initiatives (e.g., maternal care, healthy food access, etc.)
- Climate risk survey
- Exploration of native landscaping practices
- Intensive green roof and healing garden

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Charting a Path to Decarbonization

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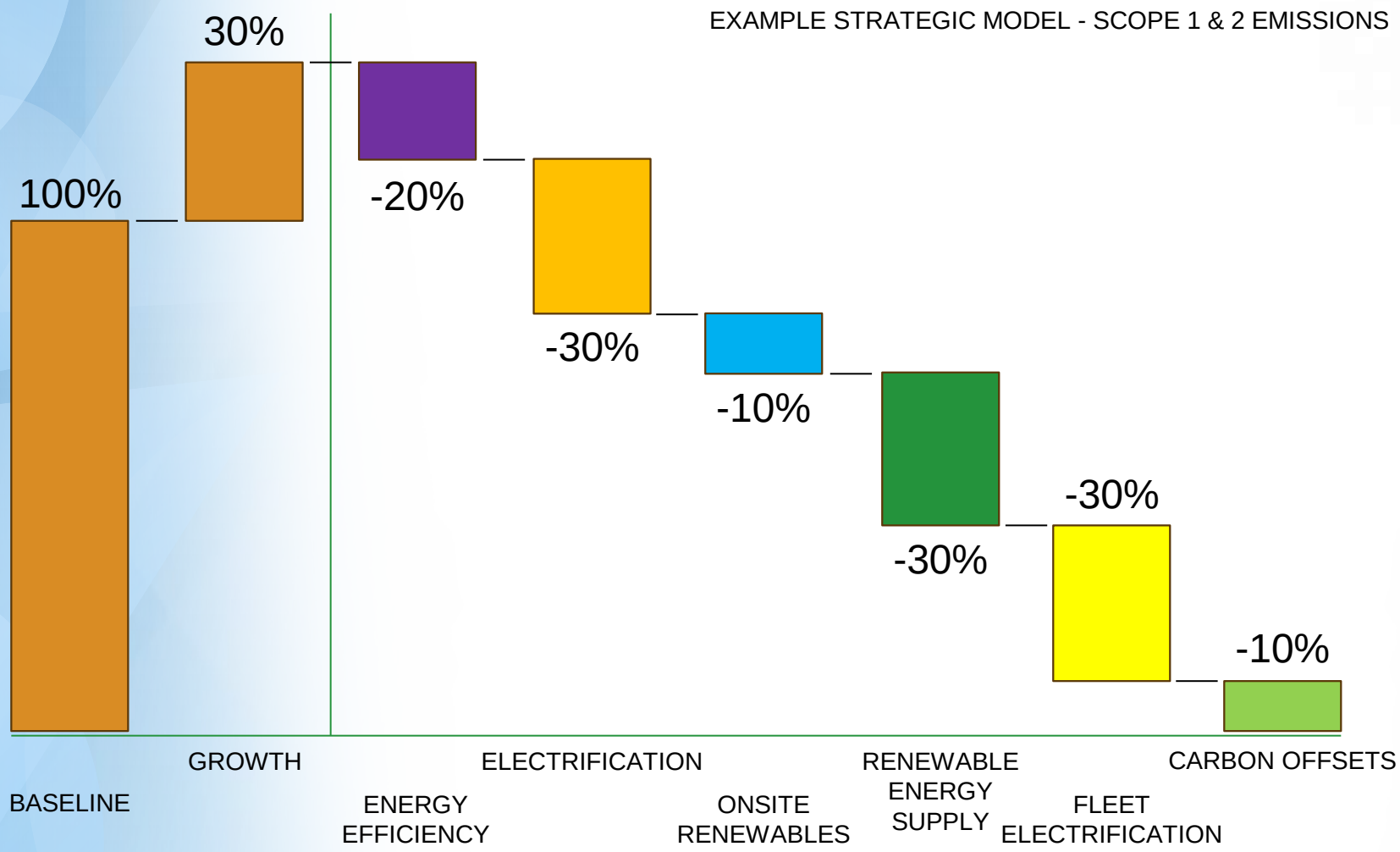

Category	Metric
Climate	GHG Emissions (MTCO2e)
	Anesthetic Gas Emissions (MTCO2e)
*Energy	Energy Use Intensity (kBTU/sf/yr)
	Renewable Energy (%)
Transportation	Fleet CAFE (MPG or MPGe)
	Alt. Fuel Fleet Vehicles (%)
*Waste	Recycling/Landfill Diversion Rate (%)
	Red Bag Waste Reduction (%)
	Overall Waste Reduction (%)
Purchasing	Reprocessed Devices/Equipment
	Office Paper Reduction (%)
	Recycled Office Paper (%)
*Water	Water Use (GAL/yr)
	Water Use Intensity (GAL/sf
Food	Local and/or Sustainable (%

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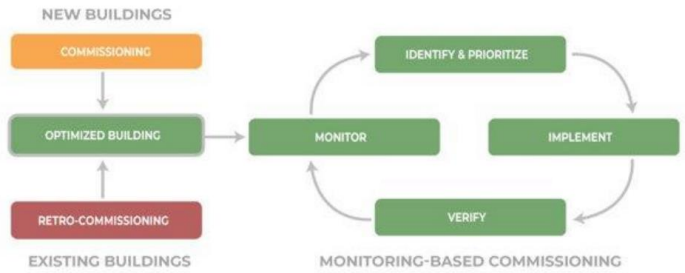
Accelerating Sustainability

Energy Efficiency

- Benchmarking energy use for all hospitals and facilities >20ksf
- Expansion of retro-commissioning and energy savings initiatives (e.g., peak shaving)



Renewable Energy

- Participation in Community Solar anchor subscriptions
- Exploring additional onsite solar projects

Accelerating Sustainability

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Clean Transportation

- Expansion of electric vehicle charging infrastructure
- Fleet electrification assessment and fleet EV pilot project

Sustainable Food Policy

- Food prep waste reduction pilot projects
- ‘Healing Menus’ pilot project
- Food scrap composting pilot project

Environmental Stewardship/Sustainable Sites

- Expansion of native and drought-tolerant landscaping
- Integration of ecological stormwater management

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Leveraging Ameren EE Incentives

Retro-Commissioning at **Carle Foundation Hospital** (1,908,966 sf)

- Energy Cost Savings: $184,594
- Incentives: $344,576
- Simple Payback: **0.76 years**

Retro-Commissioning at **Carle Richland Memorial Hospital** (170,930 sf)

- Energy Cost Savings: $63,359
- Incentives: $26,973
- Simple Payback: **0.61 years**

Retro-Commissioning at **Carle Champaign on Curtis** (141,220 sf)

- Energy Cost Savings: $38,410
- Incentives: $33,956
- Simple Payback: **1.11 years**

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Energy Conservation Progress 2024

ILLINOIS

Karl Helmink, P.E., C.E.M.

Associate Director of Retrocommissioning & Energy Efficiency

Sylvia McIvor

Associate Director of Energy Performance Contracting

Retro-Commissioning

- Established **2007**
- **$120M+** cost avoidance
- **90+** campus buildings
- **27%** average energy reduction
- **14M** gross square feet of academic space

fs.illinois.edu/**retrocommissioning**-rcx

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RCx Team

- Fix broken items.
- Implements occupancy scheduling.
- Optimizes HVAC and control systems.
- Collaborates with building occupants to develop efficient building and equipment operation strategies.

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RCx Team

- 2 Electricians
- 2 Temperature Control Mechanics
- 2 Sheet Metal Workers
- +4 Engineers / Programmers
- +1 Energy Liaison (Paul)

Deep first dive or after controls upgrades

RCx Team

Keys to RCx Success

- Maintenance support
- Web-based temperature control w/trending
- Composite team with good skill set

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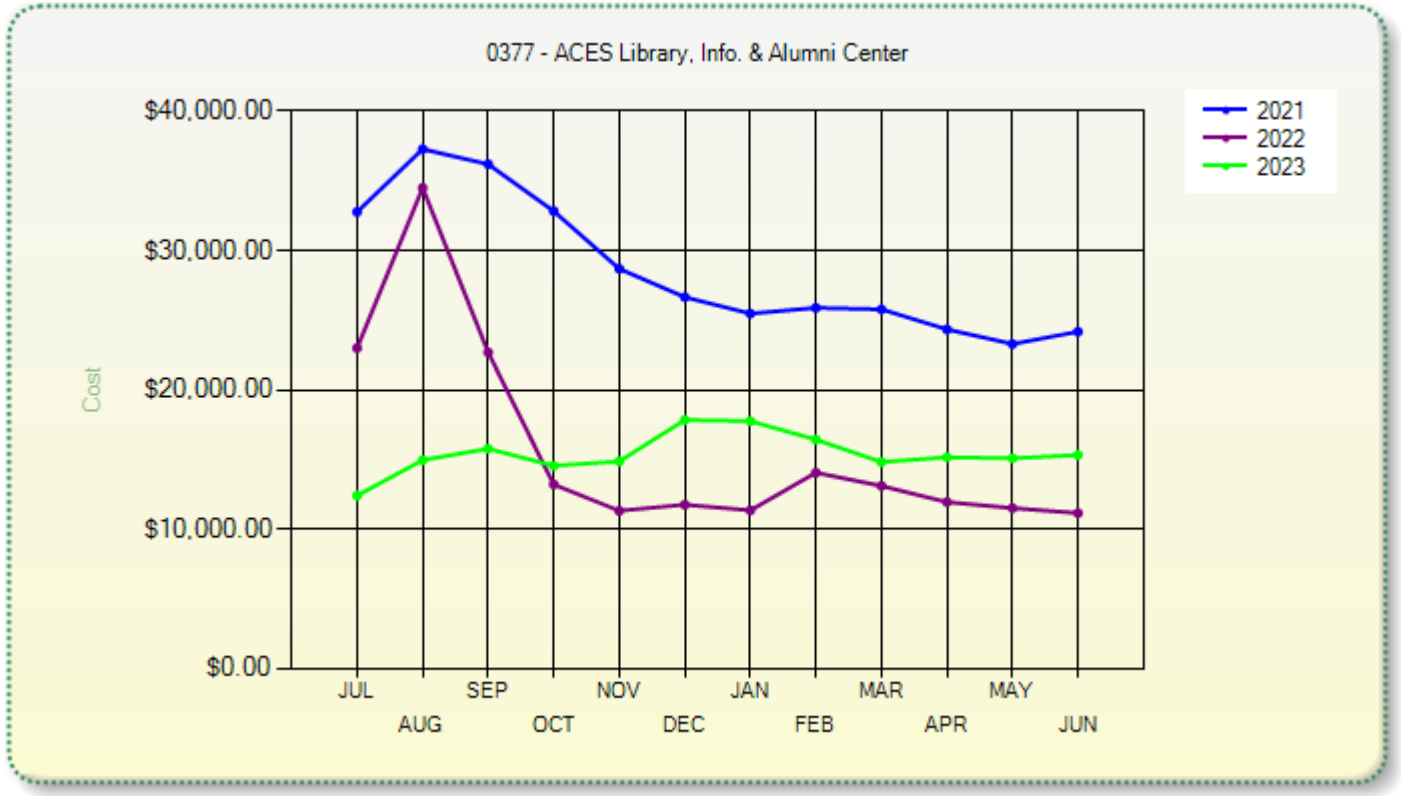
Pneumatic to DDC Conversions

- Existing VAV boxes (room level)
- 5-8 projects like this
- 30-40% energy reductions continue
- Add occupancy sensors – control HVAC and lighting

Direct Digital Controls (DDC) Upgrades



- Pre-Project
- Project Implementation
- Post-Project

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Energy Opportunities in LEED-Certified Buildings?

- 30+ campus buildings ranging from Silver to Platinum.
- Post-construction commissioning optimization necessary to capture significant energy savings.

BOUSFIELD HALL: LEED PLATINUM

Completed

BUSINESS INSTRUCTIONAL FACILITY: LEED PLATINUM

Completed

CAMPUS INSTRUCTIONAL FACILITY: LEED PLATINUM

Completed

MECHANICAL ENGINEERING BUILDING: LEED GOLD

Completed

NATURAL HISTORY BUILDING: LEED GOLD

Completed

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Mechanical Engineering Bldg.

- 137,672 square feet
- Partial renovation + Addition ($41 million)
- Portions of the building (say 1/3 untouched) – budget limitations
- Utility costs – down approx. $ 250K/yr
- Elec. down 22%; Chilled water down 30%
- Steam down 44%; Ameren Illinois gas down 64%
- Large amount of reheat reduced

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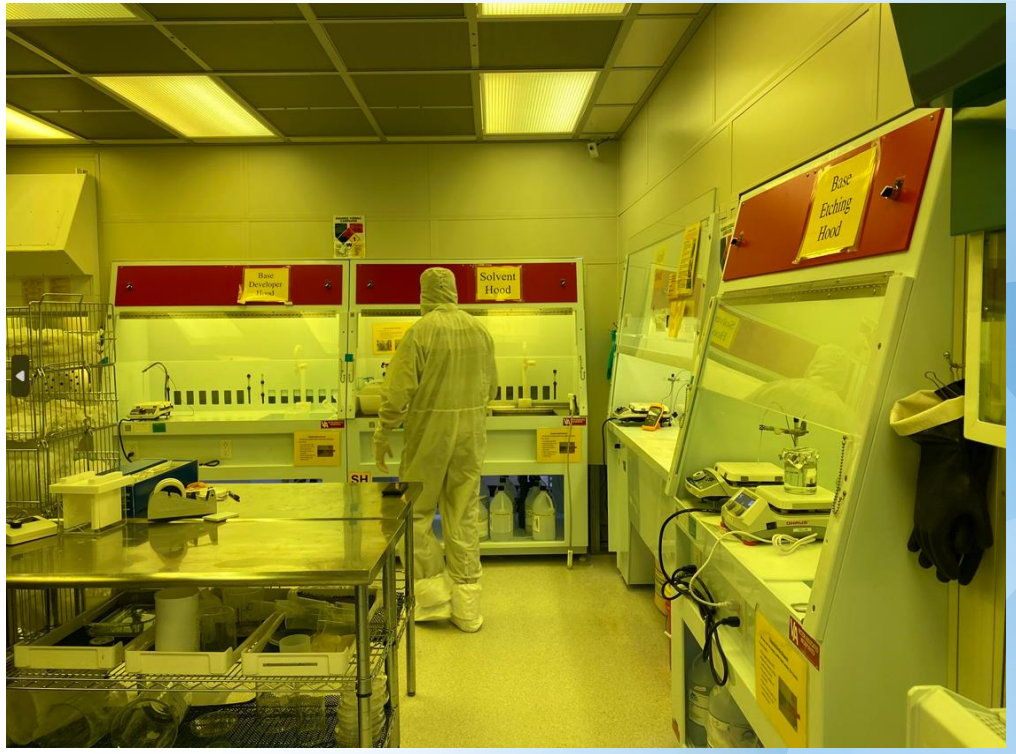
Mechanical Engineering Bldg.

- MEB Cleanrooms
  - Add VFDs
  - Add Occupancy Sensors
  - Particle Counters
- 6 ACH occupied
- 4 ACH unoccupied



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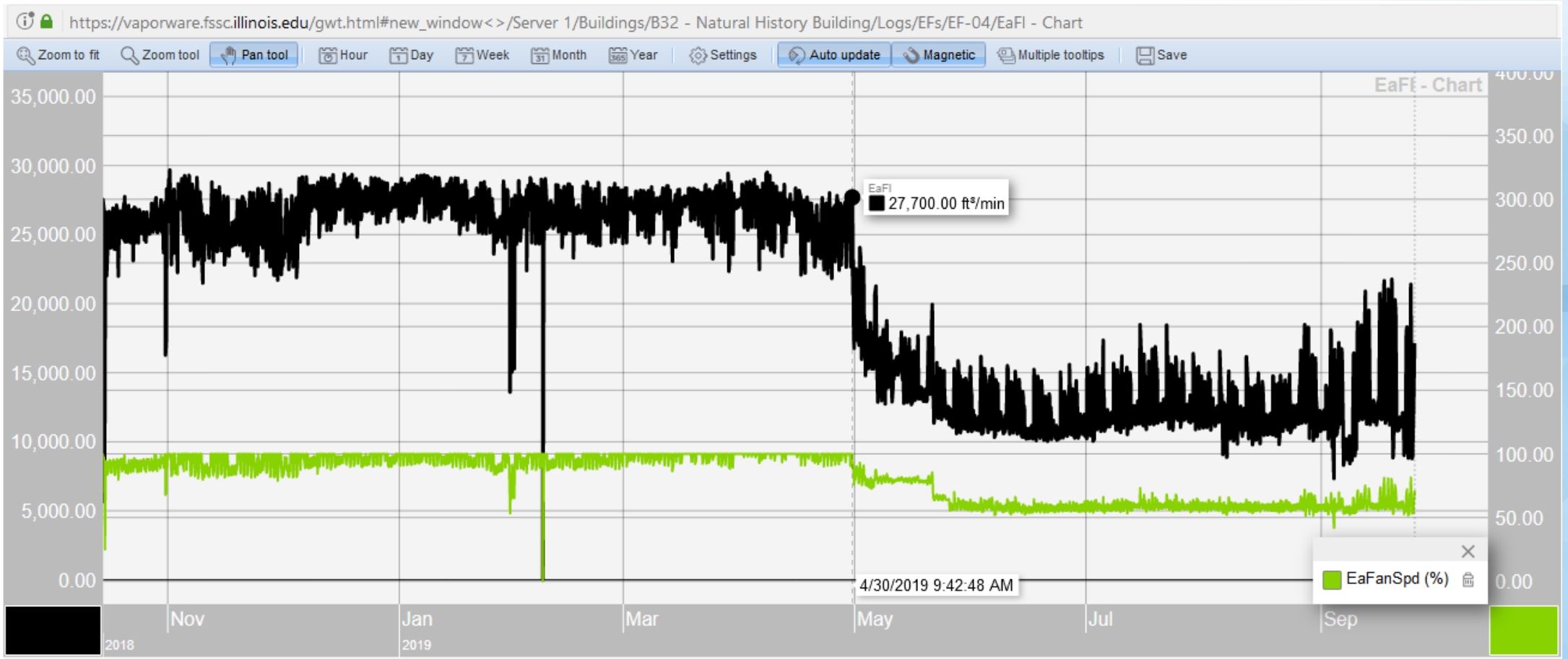
When Is a Lab a Lab?

- Teaching lab only uses chemicals 2 weeks out of the year.
- Work with safety folks to establish efficient room operations.

New Operations Big Savings



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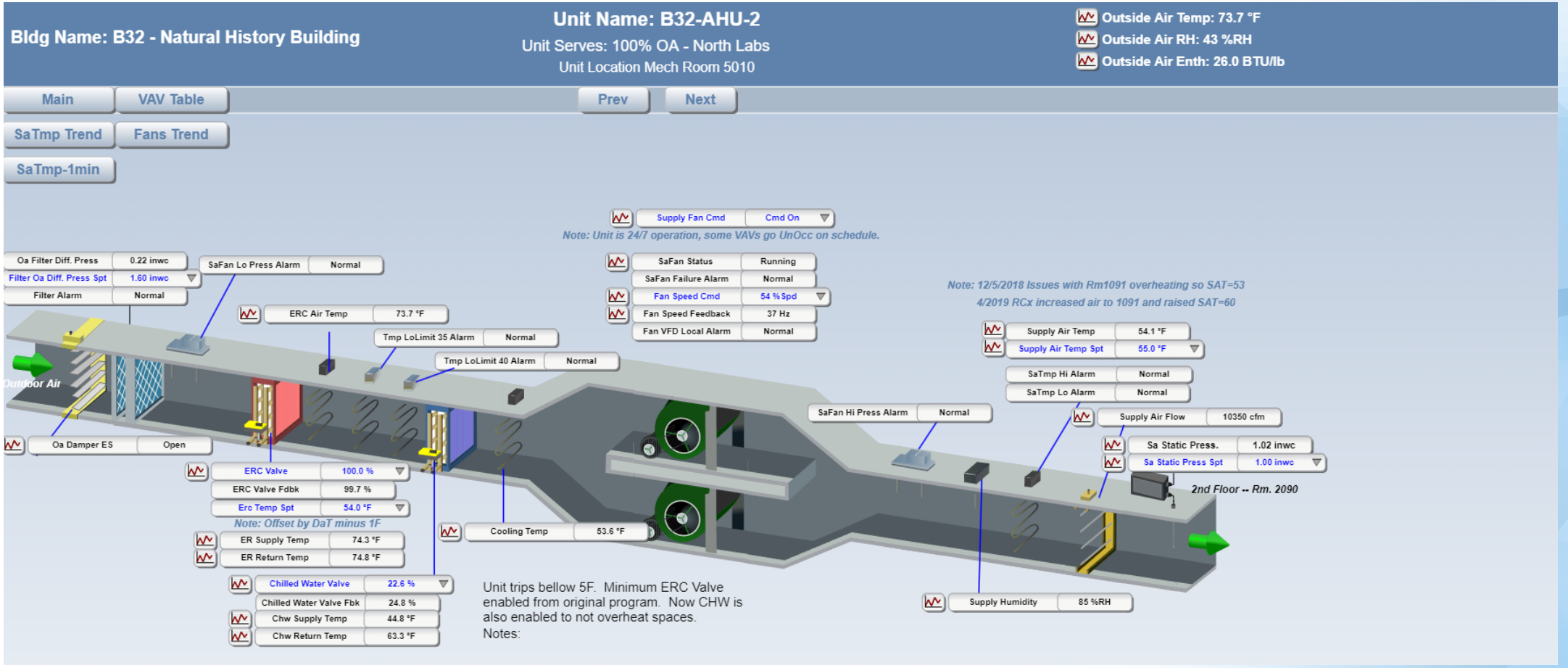
DDC Controls Graphics Monitoring



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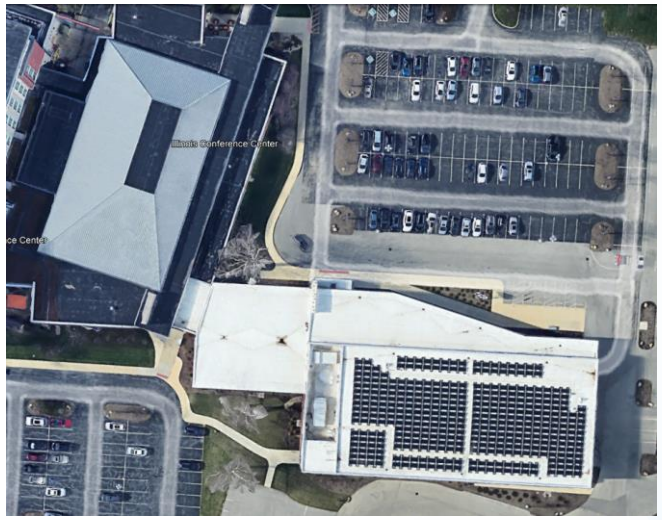
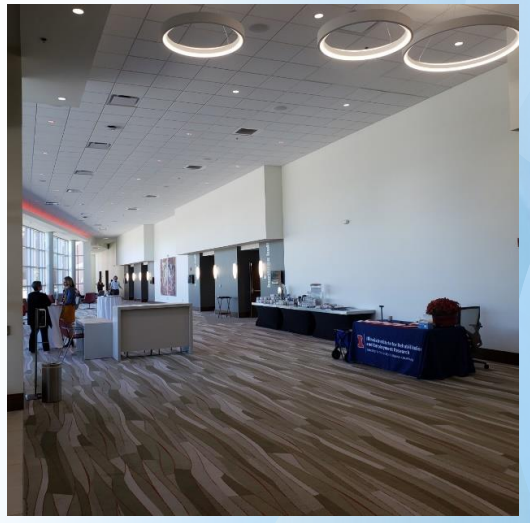
Conference Center Project

- 40,598 square feet
- Original building: 2006
- Addition: 2020
- Utility costs: approx. $270K in FY 24
- New room level scheduling software
- Working w/ Alpha Controls





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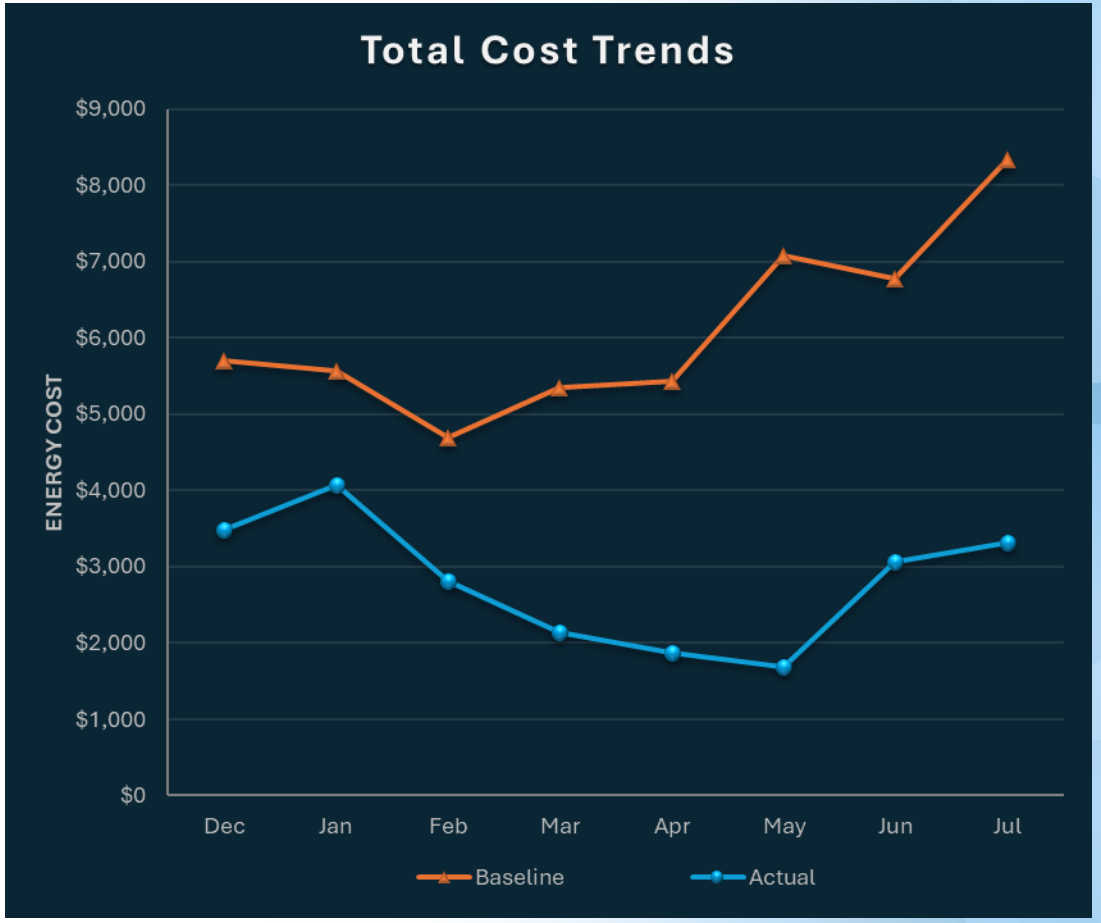
iHotel Conference Center - Addition

- Temperature Controls Solution
  - › Room Level Scheduling
- Ameren Illinois - Custom Incentive
- Leveraged Ameren Coupon
- Two Month $$- Simple Payback Period after Incentives



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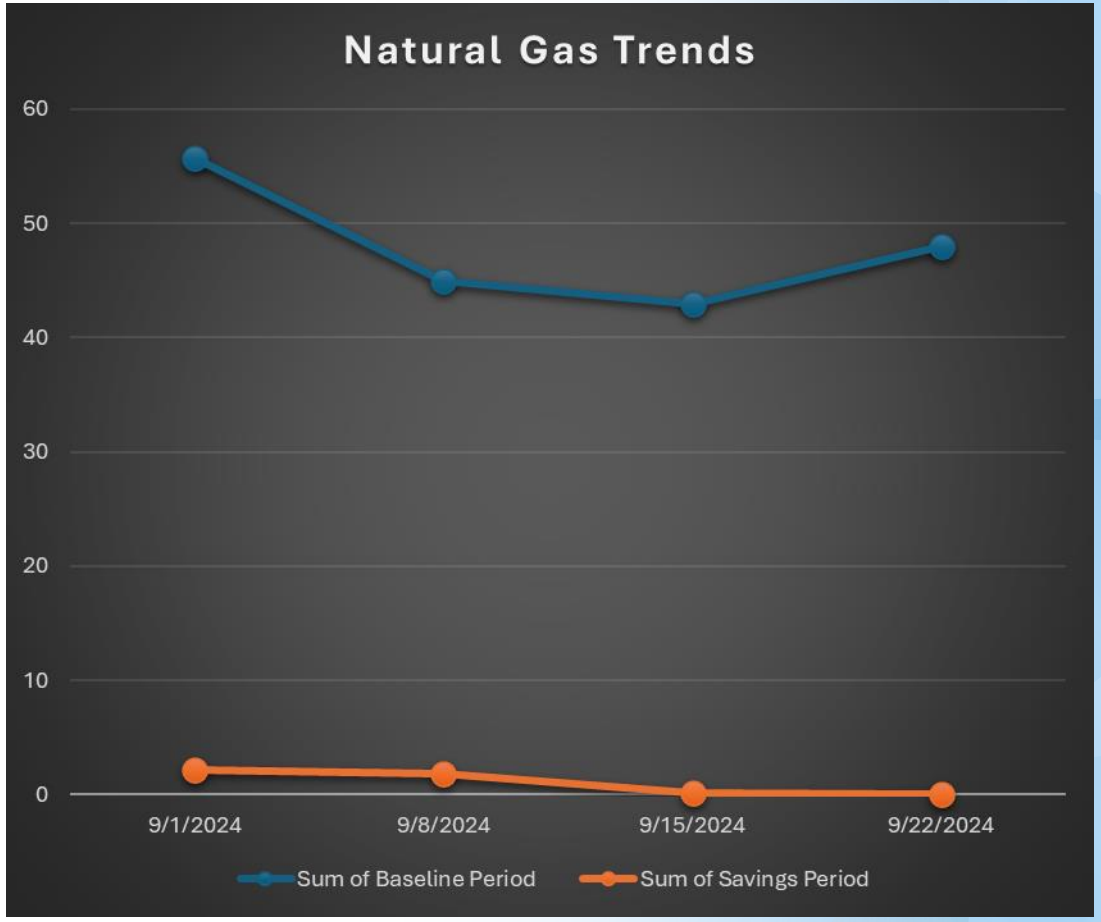
iHotel Conference Center - Original Section

- Temperature Controls Solution
  - › All the same ECMs from the addition, plus…
  - › Retired Legacy Controllers
- Custom Incentives
- Leveraged Ameren Illinois Coupon
- 96% Summer reheat reduction



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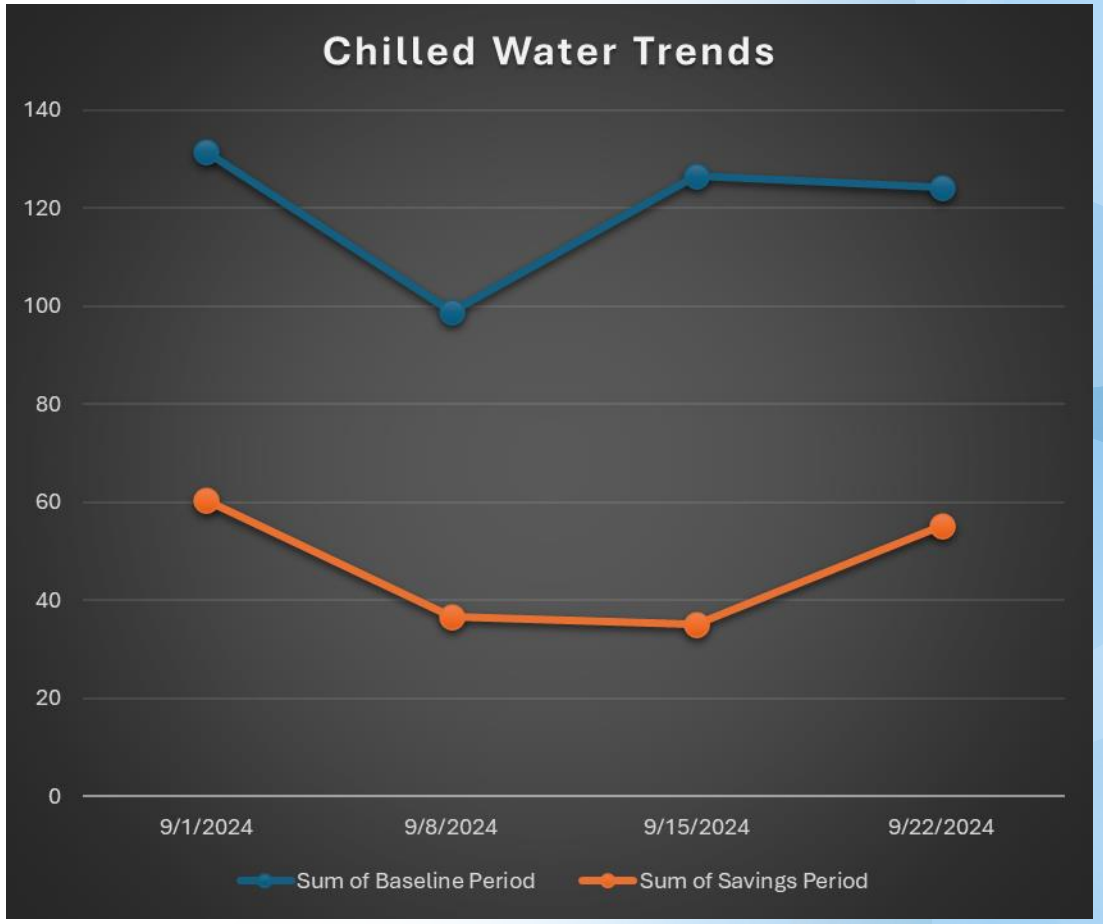
iHotel Conference Center - Original Section

- 61% Summer CHW reduction
- On track to exceed
  - › $108,164 Ameren incentives
  - › $100,000/yr. approx. cost reduction
  - › 3.7 year payback



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Energy Performance Contracting (EPC)

The university employs the Energy Performance Contracting (EPC) process for large-scale energy conservation projects and to optimize energy efficiency in complex, high-energy-use facilities, such as laboratories, while simultaneously addressing deferred maintenance needs.

The Urbana campus has successfully implemented **over $100 million** in Energy Performance Contracting (EPC) projects, beginning with the Veterinary Medicine facilities in 2010. These initiatives have resulted in campus **energy savings of over $7 million per year**.

Link: https://fs.illinois.edu/utilities-energy-services-energy-conservation/

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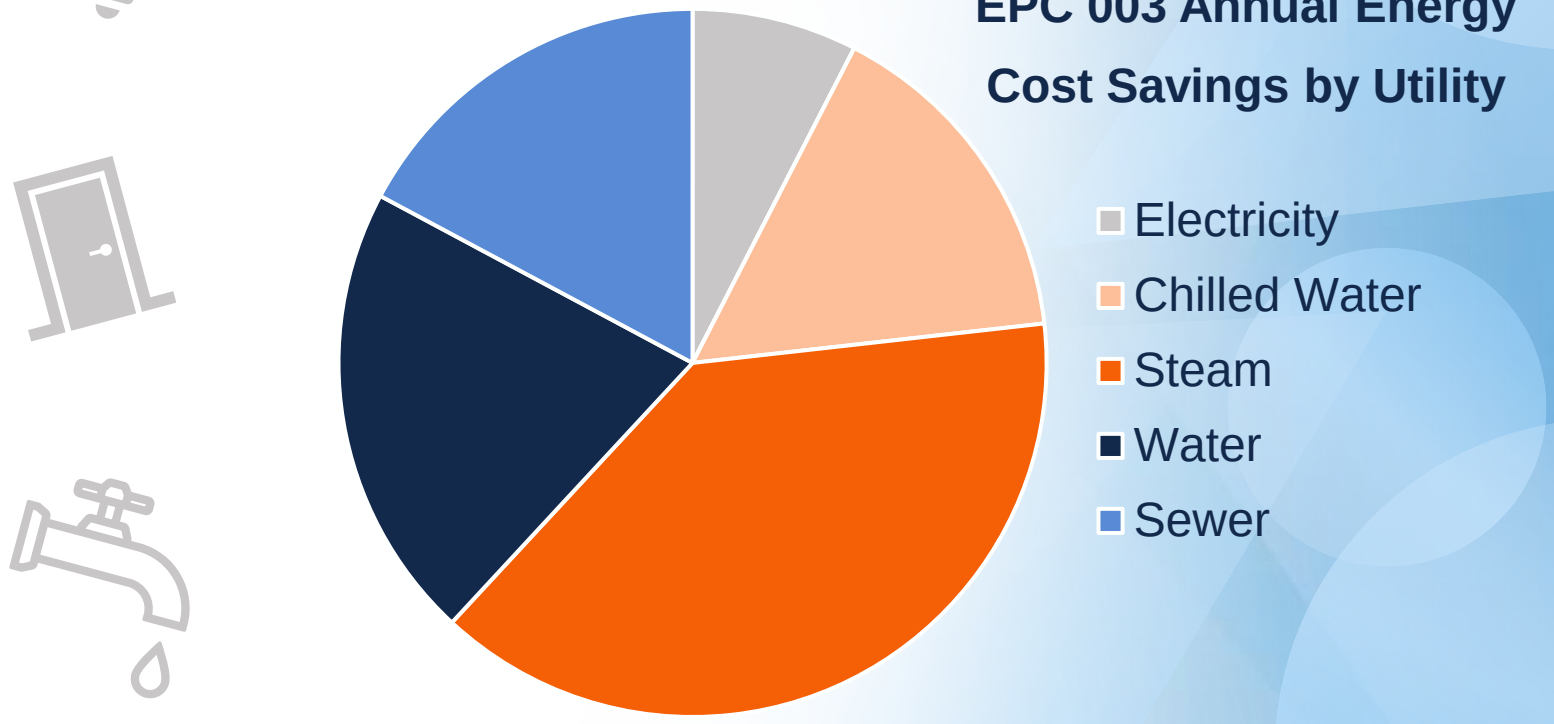
Energy Performance Contracting (EPC)

- Lighting Retrofits
- Occupancy Sensors
- Building Envelope
- Pipe Insulation
- Steam Traps
- Water Conservation



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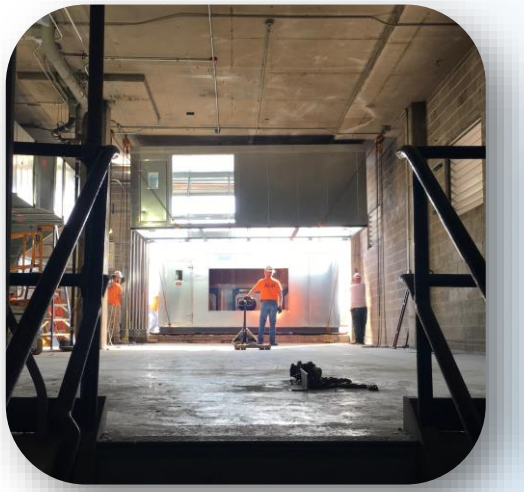
Energy Performance Contracting (EPC)

- DDC Control Upgrades
- Variable Air Volume Conversion
- Demand Controlled Ventilation
- Heat Recovery
- Efficient Equipment
- Variable Frequency Drives



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Energy Performance Contracting (EPC)

	EPC 001 **Vet Med**	EPC 002 **Oak St CP**	EPC 003 **Engr Bldgs**	EPC 004 **Abbott**	EPC 005 **Lab Bldgs**	EPC 006 **CWS Opt**	Program Totals
FY Completed	2013	2013	2020	2018	2023	2024	
Project Size	$21,118	$10,731	$40,569	$2,062	$32,597	$2,499	**$109,576**
First Year Energy Cost Avoidance	$1,400	$1,900	$1,400	$210	$2,000	$265	**$7,175**
20 Year Energy Cost Avoidance	$44,000	$60,000	$42,000	$5,000	$55,000	$3,258	**$209,258**
Def. Maint. Addressed	$25,000		$15,000		$27,000		**$67,000**

(amounts in thousands)

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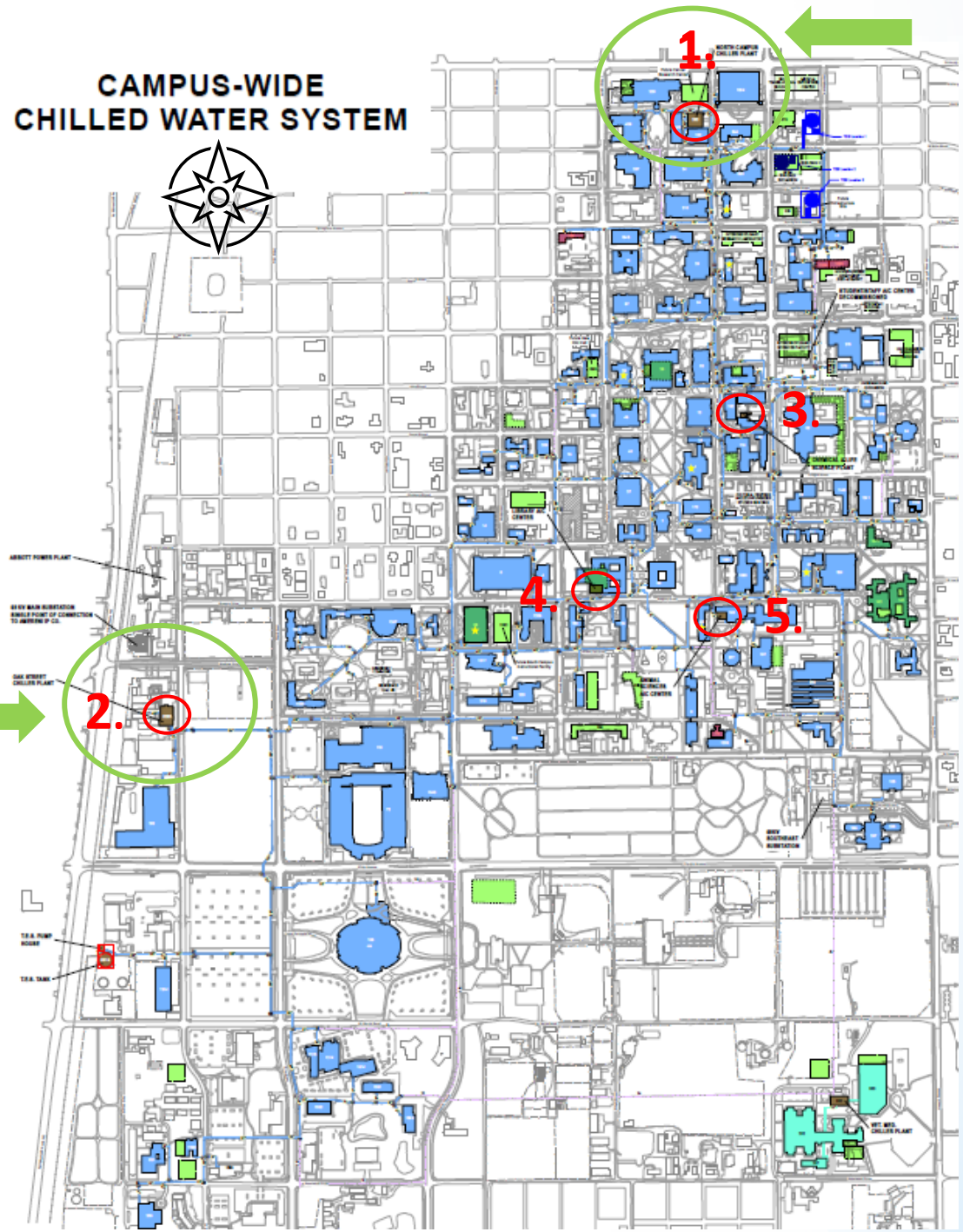
EPC 006 – Chilled Water System (CWS) Optimization



1. North Campus
2. Oak Street
3. Chem Life
4. Library
5. Animal Sciences

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Oak Street Chilled Water Plant

Oak Street Chiller Plant	Type	Capacity (Tons)	Manufacturer	Installation
Chiller 1	Steam Centrifugal	5000	York	2004
Chiller 2	Steam Centrifugal	5000	York	2004
Chiller 3	Electric Centrifugal	2000	York	2004
Chiller 4	Electric Centrifugal	2200	York	2005
Chiller 5	Electric Centrifugal	5000	York	2007
Chiller 6	Electric Centrifugal	2800	York	2012
Chiller 7	Electric Centrifugal	5600	York	2012

North Campus Chilled Water Plant

North Campus Chiller Plant	Type	Capacity (Tons)	Manufacturer	Installation
Chiller 1	Electric Centrifugal	1200	York	2001
Chiller 2	Electric Centrifugal	1000	York	1998
Chiller 3	Electric Centrifugal	1000	York	1998
Chiller 4	Electric Centrifugal	2000	York	2000
Chiller 5	Electric Centrifugal	1000	York	1997
Chiller 6	Electric Centrifugal	2000	York	2001
Chiller 7	Electric Centrifugal	1200	York	2001

Optimization Scope of Work (SOW)

Condenser side optimization (variable speed pumps and towers) – Oak and North
Hydraulically balance loads between multiple plants – all 5 plants
Optimize chiller staging based on efficiency and campus hydraulics – all 5 plants
Variable evaporator flow – Oak and North
Chilled water temperature and differential pressure reset – Oak and North, matching the other systems online
Cloud connectivity for operator support, M&V, and fault diagnostics – Secure, remote access from anywhere; KPIs for all 5 plants; fault diagnostics for Oak and North; operator support for all 5 plants
Close decouplers - Oak and North

Year	Electricity	NG	CHW	Water	Steam	Total Undiscounted Cost Savings	Guaranteed Undiscounted Cost Savings	Monitoring, M&V, Training Fees	Net Savings
1	$429,414	$0	$0	$0	$413,912	$843,326	$264,971	$0	$264,971
2	$450,885	$0	$0	$0	$430,468	$881,353	$276,920	($71,760)	$205,160
3	$473,429	$0	$0	$0	$447,687	$921,116	$289,413	($74,630)	$214,783
4	$497,101	$0	$0	$0	$465,594	$962,695	$302,477	($77,616)	$224,861
5	$521,956	$0	$0	$0	$484,218	$1,006,174	$316,138	($80,720)	$235,418
6	$548,053	$0	$0	$0	$503,587	$1,051,640	$330,423	($83,949)	$246,474
7	$575,456	$0	$0	$0	$523,730	$1,099,187	$345,362	($87,307)	$258,055
8	$604,229	$0	$0	$0	$544,680	$1,148,909	$360,985	($90,799)	$270,186
9	$634,440	$0	$0	$0	$566,467	$1,200,907	$377,323	($94,431)	$282,892
10	$666,162	$0	$0	$0	$589,126	$1,255,288	$394,409	($98,209)	$296,201
11	$699,470	$0	$0	$0	$612,691	$1,312,161	$0	$0	$0
12	$734,444	$0	$0	$0	$637,198	$1,371,642	$0	$0	$0
13	$771,166	$0	$0	$0	$662,686	$1,433,852	$0	$0	$0
14	$809,724	$0	$0	$0	$689,194	$1,498,918	$0	$0	$0
15	$850,211	$0	$0	$0	$716,761	$1,566,972	$0	$0	$0
16	$892,721	$0	$0	$0	$745,432	$1,638,153	$0	$0	$0
17	$937,357	$0	$0	$0	$775,249	$1,712,606	$0	$0	$0
18	$984,225	$0	$0	$0	$806,259	$1,790,484	$0	$0	$0
19	$1,033,436	$0	$0	$0	$838,509	$1,871,946	$0	$0	$0
20	$1,085,108	$0	$0	$0	$872,050	$1,957,158	$0	$0	$0
Total	**$14,198,989**	**$0**	**$0**	**$0**	**$12,325,498**	**$26,524,487**	**$3,258,421**	**($759,421)**	**$2,499,000**

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EPC 006 Case Study

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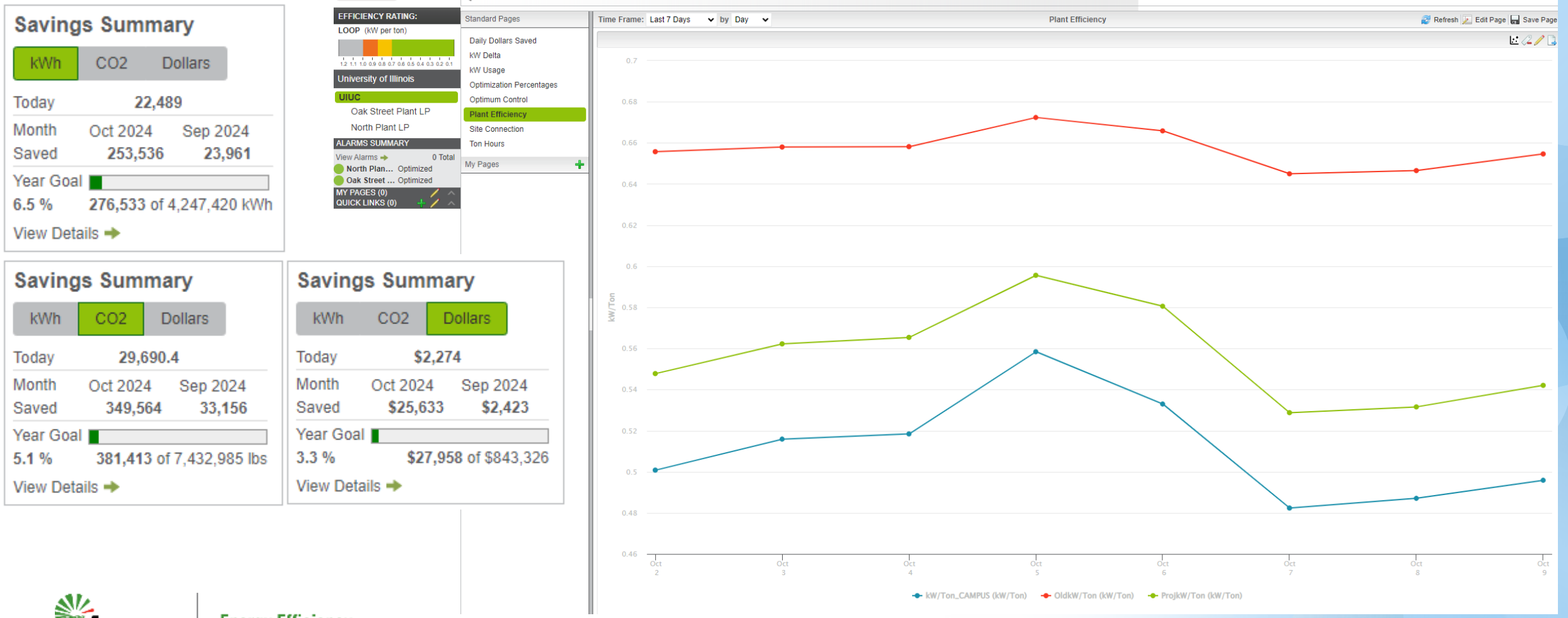
Annual Savings Estimates	Match Historical Steam Chiller Run Time
Electricity Savings (kWh/yr)	4,247,418
Cooling Tower Water Savings (gal/yr)	4,005,351
Steam Savings (klbs/yr)	18,234
Total Costs Savings ($/yr)	$843,326
Max Utility Incentive ($)	$862,500
Simple Payback (Years)	1.94
Carbon Reduction (mtons/yr)	**4,816**

Week 1 Results



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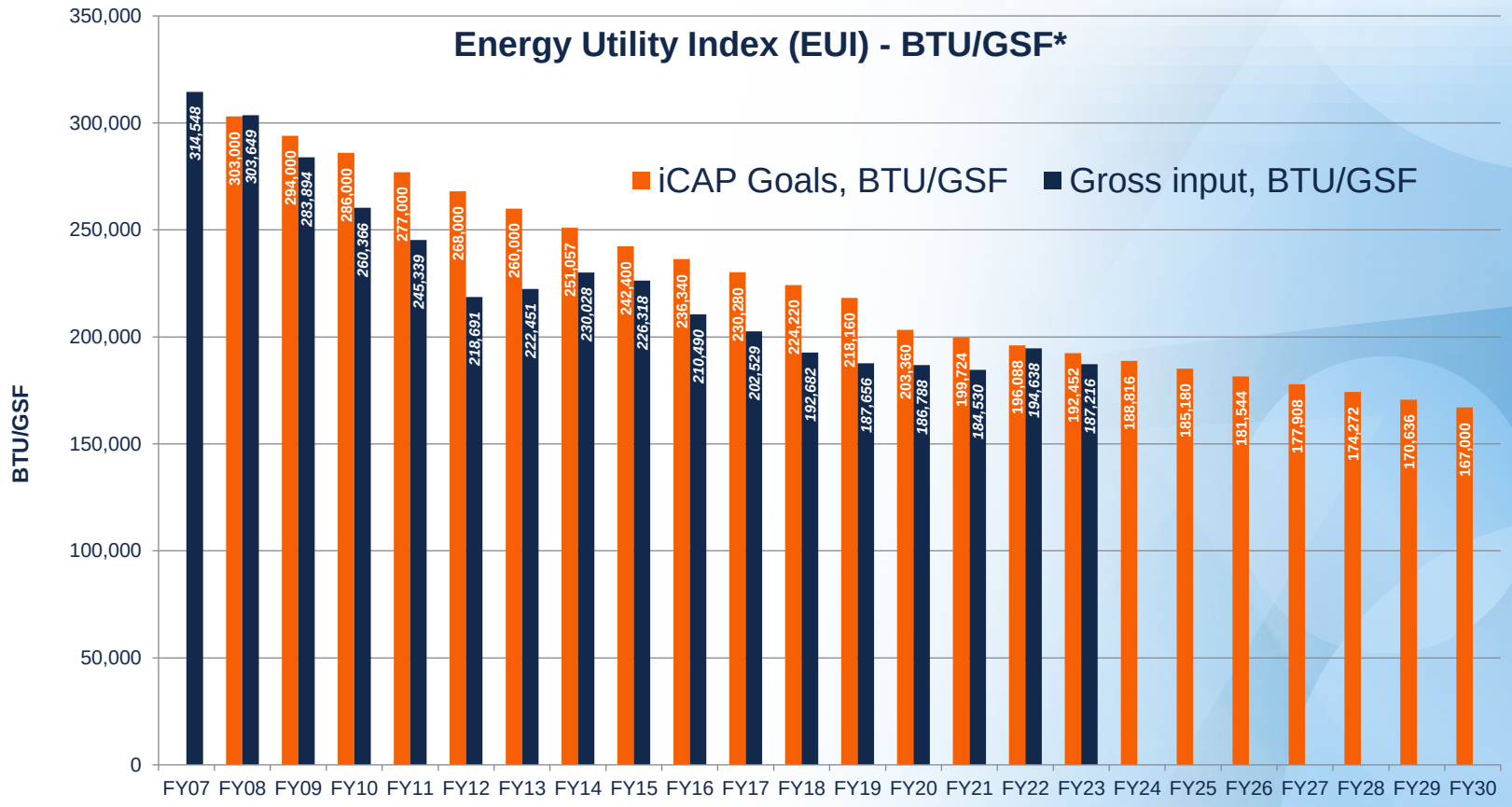
Current Challenges

- **Funding**
- Est. $2B deferred maintenance
- Diminishing savings margins
- Lab culture and space mgmt.



Gross square feet (GSF) includes UIUC owned space in Champaign and Urbana and gross input EUI excludes BTUs for Petascale electricity.

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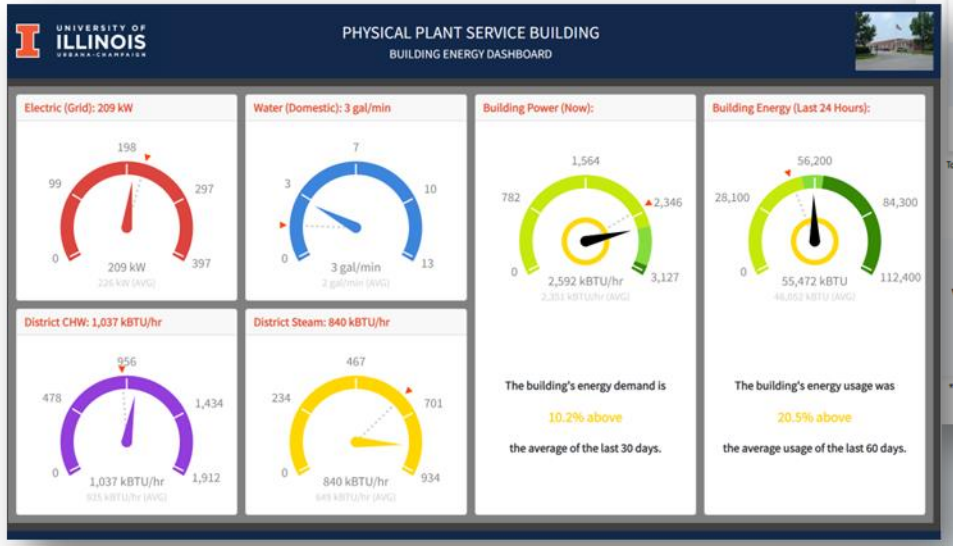
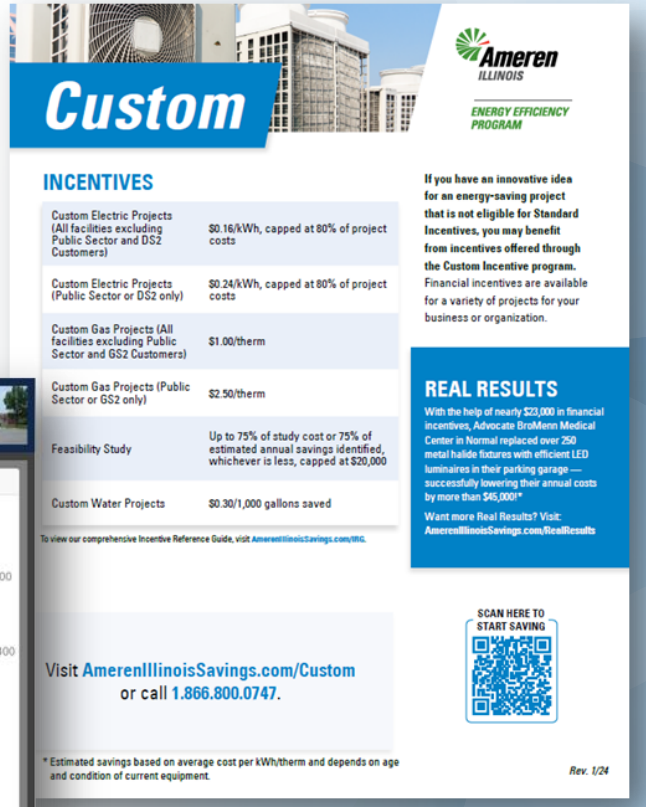
Keys to Our Success

- Leveraging **funding** opportunities (*utility rebates*)
- Investing in utility **meters** (*2008*) and **building automation** (*ReCx every 5 years*)
- Building a campus **culture** that values sustainability, energy efficiency and resiliency





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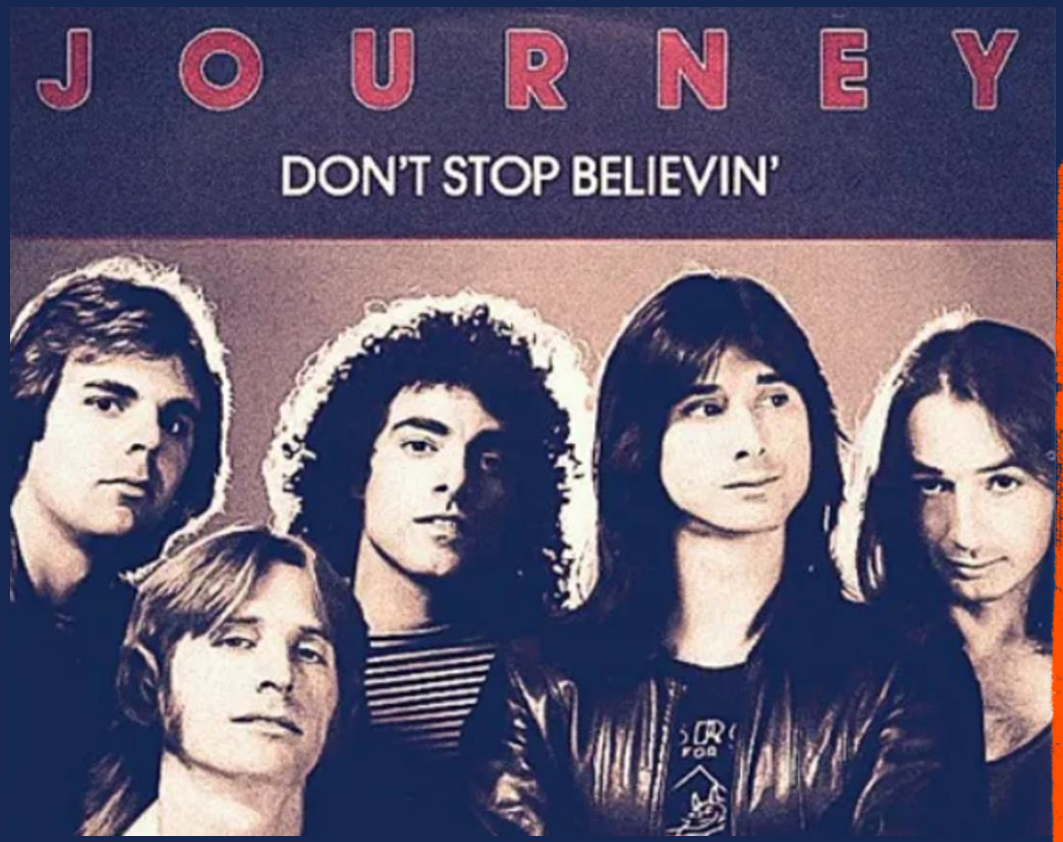
Next on our Journey

- Finding more **funding**
- More automation and technology in labs
- Improve space utilization
- iCAP 2025

The JOURNEY Continues..



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THANK YOU!

Questions?

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