HESNI Spring Conference ‘24

Children’s Wisconsin Facility Condition Assessment & Energy Master Plan

May 3, 2024

Introductions

Matt Cale, PE, CxA, LEED AP BD+C

National Program Manager at Farnsworth Group

- **20 years** of experience including commissioning for various healthcare clinics and campuses across the US.

Michael Gorham, MSOM, CHFM, CHC, NICET

Director of Facilities Management at Children's Wisconsin

- Engineering professional with progressive experience in facilities management, project management, budget development and staff management in the healthcare industry.

Jeff Boyer, LEED AP

Section Manager at Farnsworth Group

- **19 years** of experience including 17 years of experience in healthcare design and commissioning.

Agenda

- Overview/Introduction
- Facility Condition Assessment (FCA)
  - Approach
  - Results
  - Next Steps
- Energy Master Plan
- Energy Project Case Study

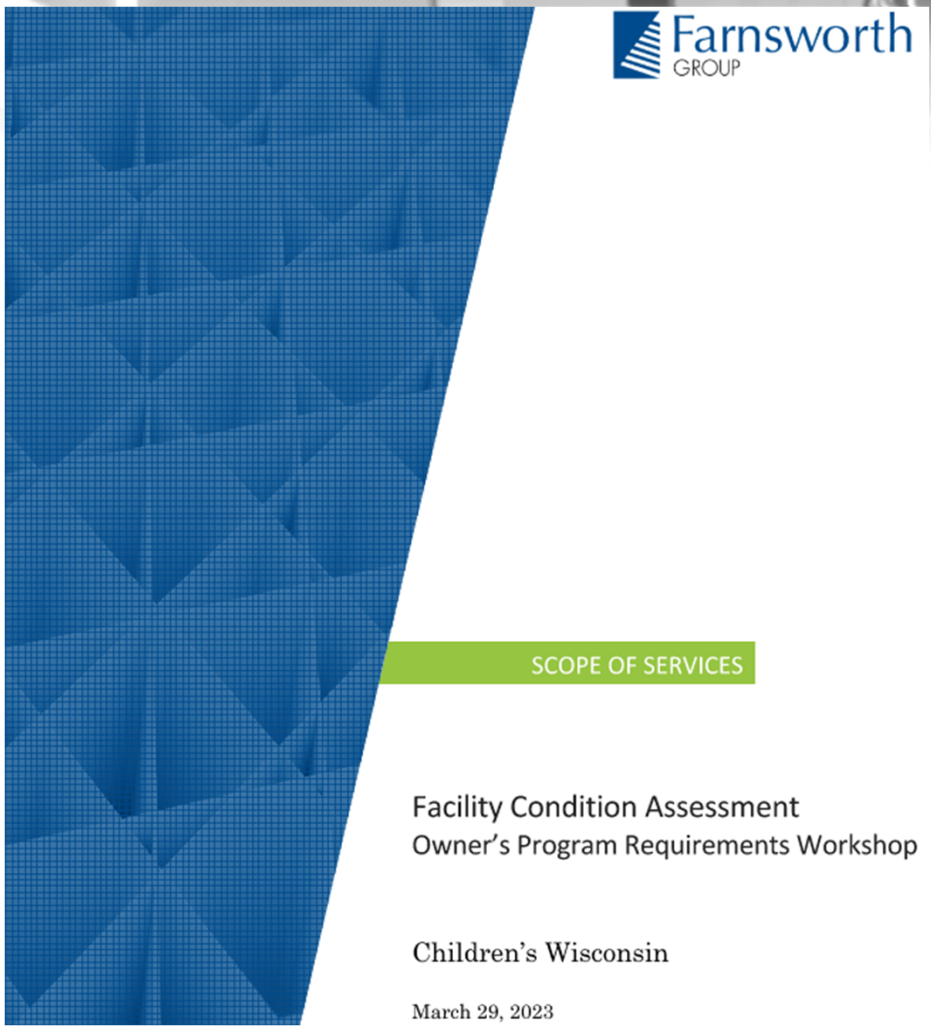




Needs Driven RFP

- The project was requested to:
  - Benchmark the performance and condition of the facilities
  - Quantify the budget gap using third party Licensed Professionals
  - Enable a more strategic and targeted annual budgeting process

- An Owner's Program Requirements Workshop was conducted to:
  - Further refine needs into scope
  - Right size the sampling and assumptions
  - Leverage the prior knowledge to avoid duplicated efforts
  - Define what a successful effort looks like



Begin with the End in Mind

Facility Condition Assessment

What do we have?

Where should we spend our next maintenance dollar?

What condition is it in?

How do we move our program forward?

What needs to be done?

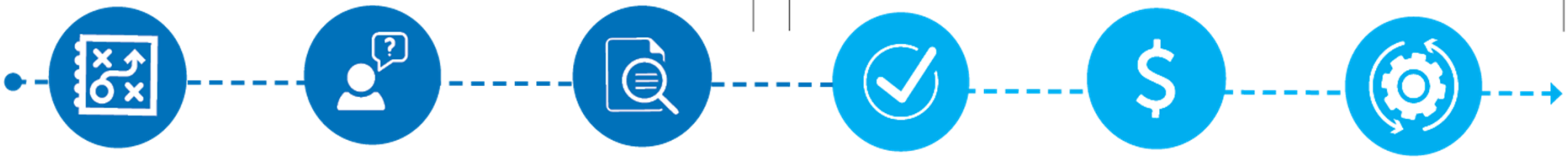
Asset Management: Building Your Capital Planning Model

Build Sustainment Model

Through phases 1-3 Farnsworth Group will work with client to build a sustainment model.

Analysis & Interpretation of Assessment

Through phases 4-6 Farnsworth Group will continue to train clients how to manage the sustainment model.



1 – PLANNING

- Project kick-off meeting Approach Overview of software Refine parameters, priorities, and schedule

2 – PRE-ASSESSMENT

- Coordinate with sites (access, resources, schedule)
- Configure software and systems
- Review systems and equipment categories

3 – ASSESSMENT

- Kick-off meeting at site Farnsworth Group & client site representatives for known information and site walks
- Visual assessment
- Out-brief meeting

4 – POST ASSESSMENT

- Collate data and results
- Quality review of data
- Baseline data review with client
- Review preliminary FCI, SCI, and capital forecast

5 – BUDGET MODEL & PRIORITZATION

- Review ranking prioritization strategy and future capital budget with client
- Develop prioritized budget list based on client's strategy
- Review future FCI impact to facilities based on proposed budget
- Refine and adjust the model

6 – SUSTAIN

(YEAR-OVER-YEAR)

- Planning for future fiscal year projects
- Develop project scopes, bundling and construction cost estimates
- Adjust model with project developed costs
- Update database with completed FY projects (as completed)
- Update database with actual construction costs
- Execute fiscal year budget projects

Standard Industry Approach

- Deferred Maintenance
  - The practice of postponing maintenance activities such as repairs or replacement on real property to save costs, meet budget funding levels, or realign available budget.

- Facility Condition Index (FCI)

$$FCI = \left(\frac{Total\ Facility\ Deferred\ Maintenance\ Cost\ (\$)}{Facility\ Replacement\ Value\ (\$)}\right)$$

- System Condition Index (SCI)

$$SCI = \left(\frac{Total\ System\ Deferred\ Maintenance\ Cost\ (\$)}{System\ Replacement\ Value\ (\$)}\right)$$

- Energy Use Intensity (EUI)
  - EUI is the amount of utilities consumed per square foot. Used as a benchmarking metric.

Customized Approach

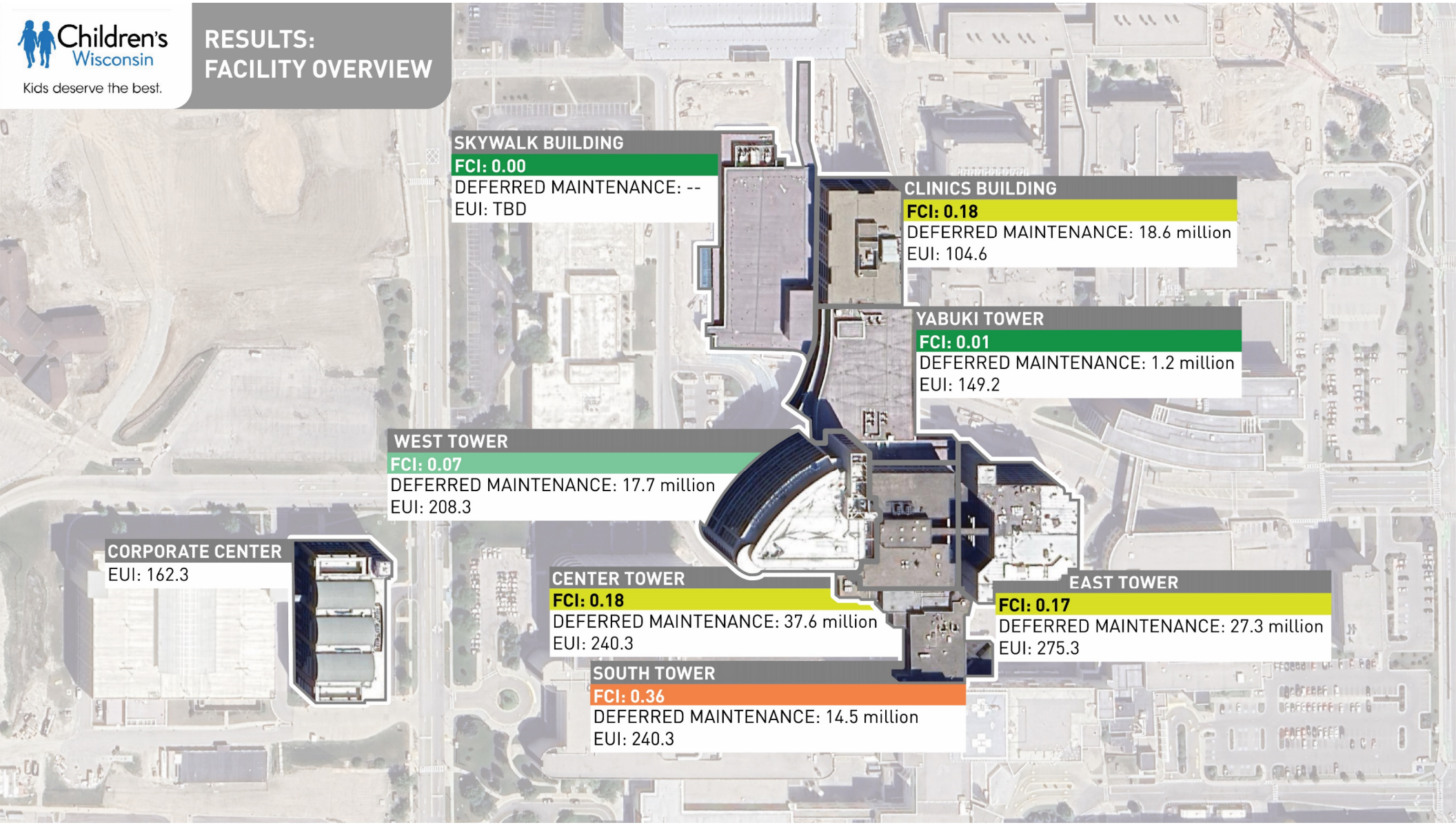
- Facility Condition Assessment
  - 7 facilities – 1.7M square feet
- Performed visual observations
- Collaborated with Childrens O&M team
- Goals
  - Identify condition of facilities and systems
  - Model future facility needs
  - Prioritize where next infrastructure dollar is spent (risk management).

Infrastructure Assessment Scope

- HVAC Air Systems
- HVAC Water Distribution Systems
- HVAC Controls
- Emergency Power
- Normal Power
- Plumbing
- Medical Gas
- Elevators
- Architectural Shell
- Architectural Finishes

Children's Wisconsin
Kids deserve the best.

RESULTS: FACILITY OVERVIEW



Facility Summary

Facility	Year Constructed	Age	Size (Sqft.)	Facility Replacement Value	Facility Replacement Value ($/Sqft.)	Deferred Maintenance (2024-2029)	Facility Condition Index	Facility Rating
South Tower	1988	36	68,872	$ 41,112,063	$ 597	$ 14,598,207	0.36	Fair / Poor
Center Tower	1988	36	362,624	$ 207,287,350	$ 572	$ 37,621,029	0.18	Good / Fair
Clinics Building	1994	30	181,793	$ 104,574,318	$ 575	$ 18,606,272	0.18	Good / Fair
East Tower	1988	36	269,446	$ 161,288,577	$ 599	$ 27,375,711	0.17	Good / Fair
West Tower	2008	16	447,980	$ 242,613,135	$ 542	$ 17,759,085	0.07	Excellent / Good
Yabuki Tower	2020	4	232,590	$ 135,372,032	$ 582	$ 1,200,000	0.01	Excellent
Skywalk Building	2023	1	152,552	$ 93,755,408	$ 615	$ -	0.00	Excellent
Total/Average:		23	1,715,857	**$ 986,002,884**	$ 583	**$ 117,160,304**	**0.12**	Good

- Facilities generally in good condition.
- Maintenance is being performed very well.
- Strong O&M knowledge of equipment, systems, and operations.
- Values are aligned with observed conditions.

Risk Assessment

- Worked with Children's O&M staff to incorporate the current risk matrix strategy.
- Developed a prioritized deferred maintenance strategy.

Risk Categories

(decreasing priority)

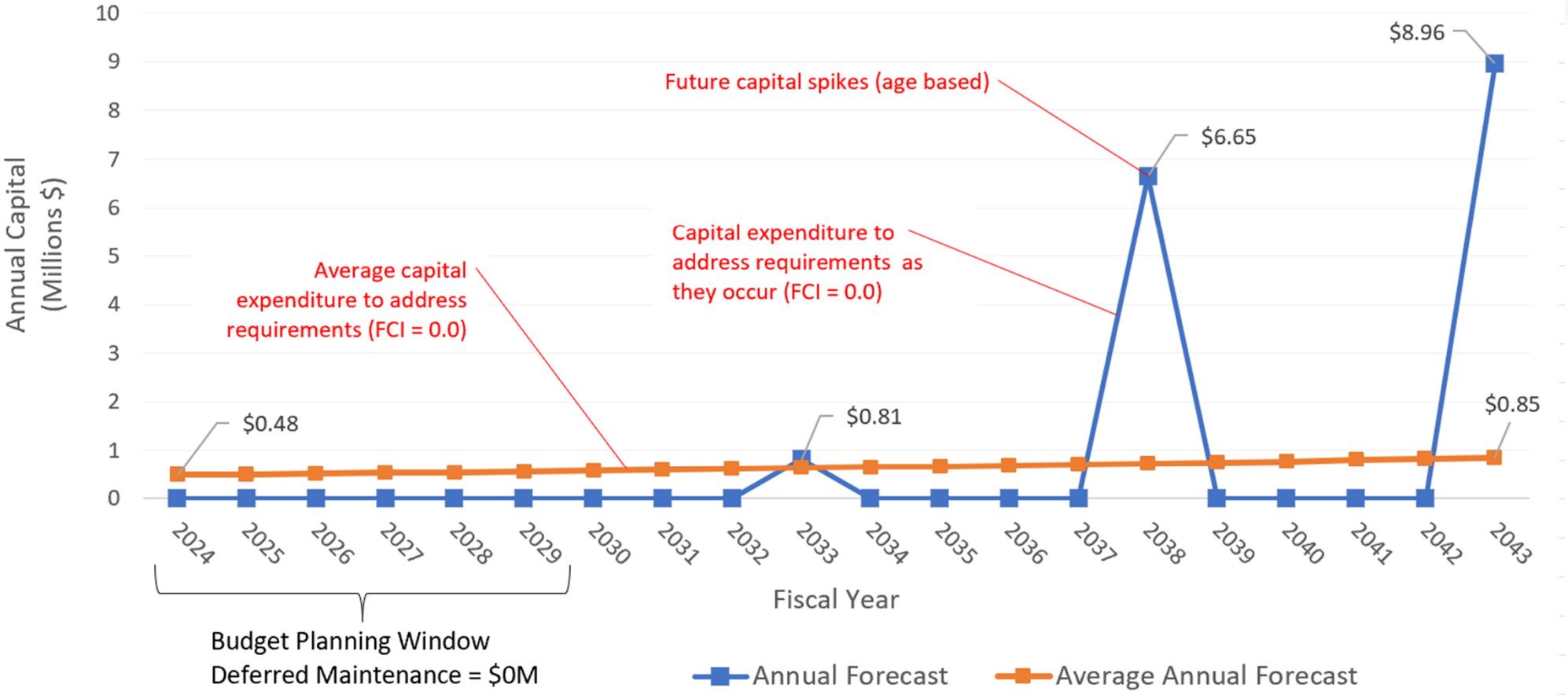
1. Children's Risk Matrix
2. Deficiency Category
3. Deficiency Priority
4. System Condition Rating

Facility Condition Index Scale		
Facility Condition Index (FCI)	**Condition Rating**	
FCI = 0.0	**New Facility**	
0.00 > FCI ≤ 0.10	**Excellent Condition**	
0.10 > FCI ≤ 0.20	**Good Condition**	Target FCI: 0.10
0.20 > FCI ≤ 0.35	**Fair Condition**	
0.35 > FCI ≤ 0.50	**Poor Condition**	
FCI > 0.50	**Extremely Poor Condition**	

Modelled Capital Forecast by Facility and Budget Year						
Facility	2025	2026	2027	2028	2029	Total
South Tower	$ 1,326,000	$ 1,089,000	$ 1,289,000	$ 1,320,000	$ 1,293,000	$ 6,317,000
West Tower	$ 352,000	$ 383,000	$ 450,000	$ 324,000	$ 437,000	$ 1,946,000
Clinics Building	$ 1,291,000	$ 1,263,000	$ 904,000	$ 1,256,000	$ 713,000	$ 5,427,000
Center Tower	$ 1,971,000	$ 1,824,000	$ 2,096,000	$ 2,287,000	$ 2,356,000	$ 10,534,000
East Tower	$ 1,982,000	$ 1,305,000	$ 1,650,000	$ 1,700,000	$ 2,347,000	$ 8,984,000
Yabuki Tower	$ -	$ -	$ -	$ -	$ -	$ -
Skywalk Building	$ -	$ -	$ -	$ -	$ -	$ -
Total:	$ 6,922,000	$ 5,864,000	$ 6,389,000	$ 6,887,000	$ 7,146,000	$ 33,208,000

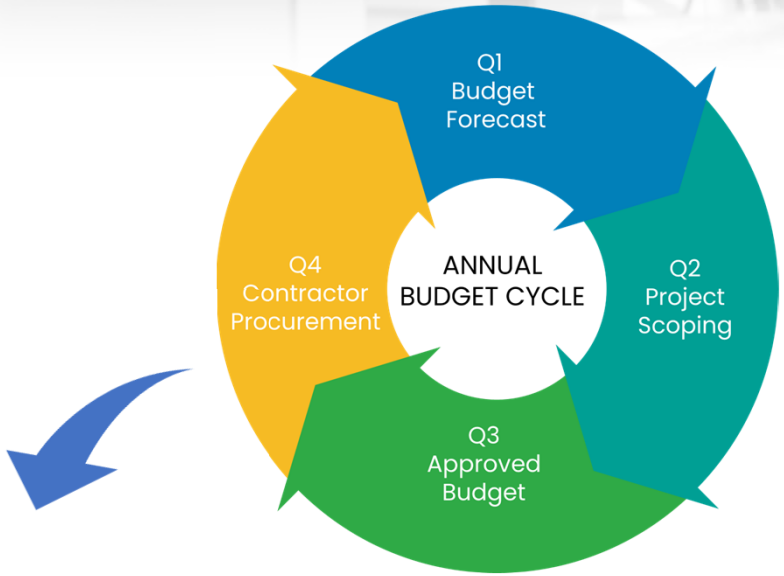
- FCI target of 0.10 for each individual facility
- Addresses deferred maintenance spending at the facility level
- No spending forecast for Yabuki and Skywalk (newer construction)

Yabuki – 20 Year Capital Forecast – Deferred Maintenance



Next Steps

- Leverage the study to inform the 2025 Budget
- Update 2023/2024 competed projects
- Identify 2025 projects to inform Children's budget
- Sustainment Plan for FCA program



2023-2024 — DEVELOP

+ Planning
+ Assessments
+ 2025 budget cycle
+ 2025 projects
+ Update database

2025 — IMPLEMENT

+ Capital project execution
+ Update database
+ 2026 budget
+ 2025 projects

2026 — SUSTAIN

+ Capital project execution
+ Update database
+ 2027 budget
+ 2027 projects
+ Assessment
+ Measure

Energy Master Planning

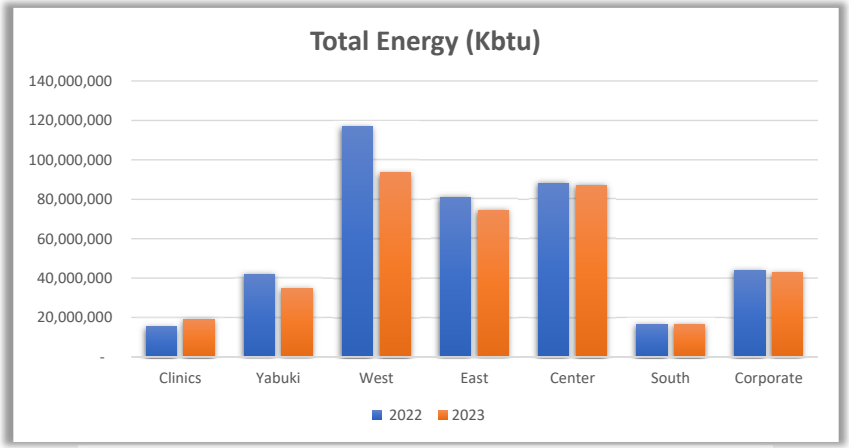
Key Takeaways:

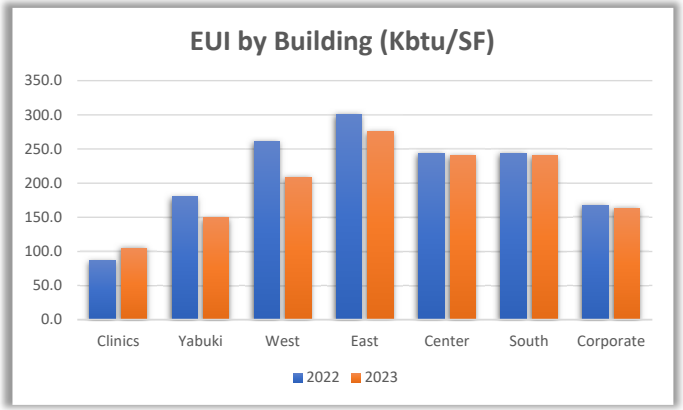
- Overall energy use **decreased** by 9.7% from 2022 to 2023.
- Overall energy spending **increased** by approximately $500k.
- Base Charges for Chilled Water and Steam drive spending.
  - A consumption only billing structure should be explored to translate energy savings into cost decreases. This policy is already in effect for Yabuki and Skywalk.
- Electrical focused projects offer the best cost reduction.
- Corporate Center offers the largest opportunity for improvement.

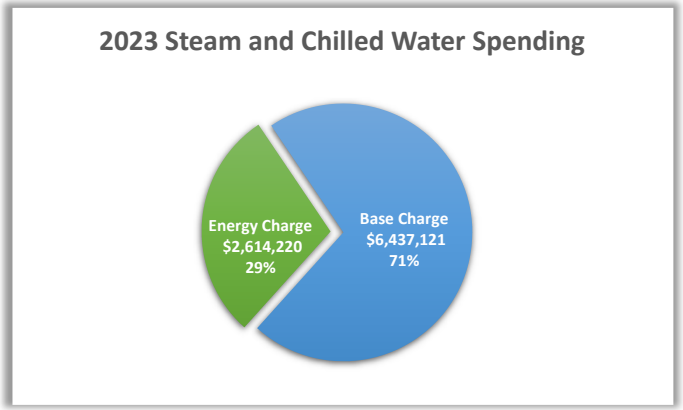
2022 Energy Use, Cost, & Performance			
	EUI	Total Cost	EUI vs. Target
Clinics	86.0	$ 785,189	183%
Yabuki	179.7	$ 1,214,190	127%
West	260.5	$ 2,974,734	183%
East	301.1	$ 2,546,379	212%
Center	243.0	$ 2,597,852	171%
South	243.0	$ 493,402	171%
Corporate	167.1	$ 1,283,779	309%
Total	**221.3**	**$ 11,895,524**	**185%**

2023 Energy Use, Cost, & Performance			
	EUI	Total Cost	EUI vs. Target
Clinics	104.6	$ 762,125	223%
Yabuki	149.2	$ 1,109,650	105%
West	208.3	$ 3,109,570	147%
East	275.3	$ 2,546,961	194%
Center	240.3	$ 2,860,615	169%
South	240.3	$ 543,307	169%
Corporate	162.3	$ 1,546,557	301%
Total	**201.3**	**$12,478,786**	**168%**

Energy Master Planning

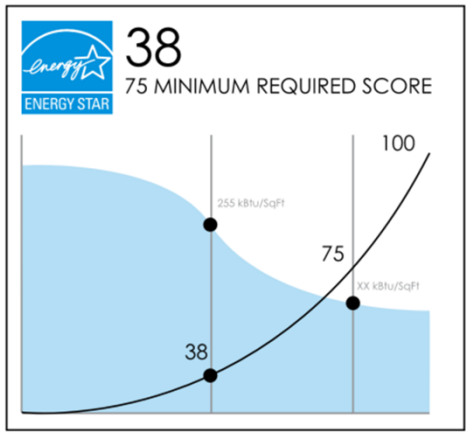






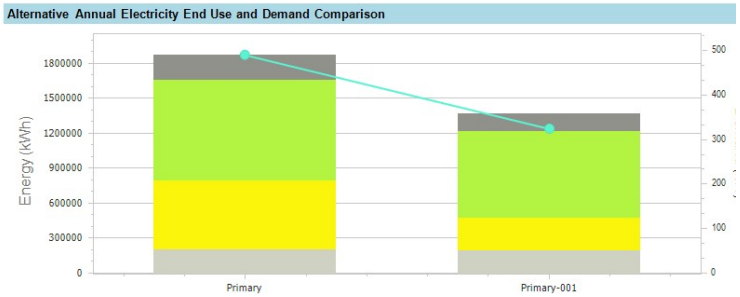
Importance of Swimming Your Own Race

- Every project is unique! Constraints and opportunities
- Benchmarking is a valuable effort in providing context to EUI numbers, compared to peers.
- Tools such as EnergyStar Portfolio Manager can be used to statistically rank performance.
    - Weather normalization
    - Grid region/Utility carbon emission factors.
    - Population/Schedule/MRIs/Etc.
- BUT, Benchmarking is not everything…
    - Built-in utility plan capital amortization as a base charge significantly skews ROI
    - Reliance on a district system limits multiplier effects on EEMs
        - Only control over the demand-side of the equation
    - Legacy Building Automation Systems can limit EEM deployment.
        - In initial hurdle investment may be required to enable future ROI



Standards, Methods and Tools

- Formal Methods
  - IPMVP – International Performance Measurement and Verification Protocol
  - ASHRAE Level 1, 2 & 3 Energy Audits
  - NREL Strategic Energy Management (SEM) Evaluation Protocol
  - EnergyStar/ASHE Energy-To-Care
- Agile Approach – Embrace the 80/20 rule
  - High-level sweep across the portfolio to identify outliers annually.
  - Time/weather dependent audit of specific buildings/zones looking for correlations.
  - Correlation != causality, test interventions and concurrently assess feedback
  - 80% of the outcome (EUI deviation) will likely result from 20% of the causes.
  - Don't hesitate to utilize light-weight energy models (interdependencies)



	Primary		Primary-001	
	Energy (kWh)	Demand (kW)	Energy (kWh)	Demand (kW)
Cooling	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00
Exterior Receptacles	0.00	0.00	0.00	0.00
Fans	201,376.60	67.31	195,869.30	76.03
Heat Recovery	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00
Heating	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00
Interior Lighting	595,675.80	181.59	277,342.30	84.55
Interior Receptacles	854,697.10	205.09	743,290.10	140.91
Pumps	214,418.80	34.91	153,093.50	22.01
Refrigeration	0.00	0.00	0.00	0.00
Service Water Heating	0.00	0.00	0.00	0.00
Grand Total	**1,866,168.30**	**488.90**	**1,369,595.20**	**323.50**

MC0

Fast and "easy" wins

- Outside Air Flow exceeding ASHRAE 170/62.1 ventilation rates (can be exhaust driven)
- Economizer operation at night with radiant reheat feedback
- AHUs “stuck” in dehumidification mode
- DAT control and MAT control
- Rogue zone suppression
- Parallel VAV reheat and perimeter radiant control
- Deadband relaxation, PID tuning
- Seemingly easy, but not necessarily easy:
  - Unoccupied setback
  - Lighting control

	WARMUP	Disable	Warmup Command Status
	1CCIg-T	59.0 deg F	Cooling Coil Discharge Air Temp
	DA-T	60.2 deg F	Discharge Air Temp
	DAT-STPT	59.7 deg F	Discharge Air Setpoint
	MA-T	48.6 deg F	Mixed Air Temp
	DA-H	18 %RH	Discharge Air Humidity
	DAHUM-LMT	2.0 deg F	Discharge Humidity Limit Setpoint
	RA-T	71.9 deg F	Return Air Temp
	RA-H	25 %RH	Return Air Humidity
	CHS-T	56.7 deg F	CHW Supply Temp
	CHR-T	68.3 deg F	CHW Return Temp
	OA-FLOW	17.656 cfm	Outdoor Air Flow (kCFM)
	OAFLSPT	7.863 cfm	Outdoor Air Flow Setpoint (7.965)
	CLG-VLV	0 %	Cooling Coil Valve
	RH-VLV	0 %	Reheat Coil Valve
	HTG-VLV	0 %	Heating Coil Valve
	OA-DPR	52 % open	Outdoor Air Damper
	RA-DPR	43 % clos...	Return Air Damper
	EA-DPR	43 % open	Exhaust Air Damper
	ECON	Free	Economizer Mode
	AHU-1A RA Enthalpy	21.8 Btu/lb	Return Air Enthalpy
	OA Enthalpy	14.4 Btu/lb	Outside Air Enthalpy
	HCP1-S	Off	Heating Coil Pump Status
	MAPInSP	0.036 in wc	MA Plenum Static Press (Across RA-Dpr)
	PF-DP	0.10 in wc	Pre Filter Diff Press
	FF-DP	0.17 in wc	Final Filter Diff Press
	ZN-H	26 %RH	Air Handler Zone Humidity
	HUM-SPT	26 %RH	Zone Humidity Setpoint resets(20-26)
	HUM-VLV	12 % open	Humidifier Valve

Slide 21

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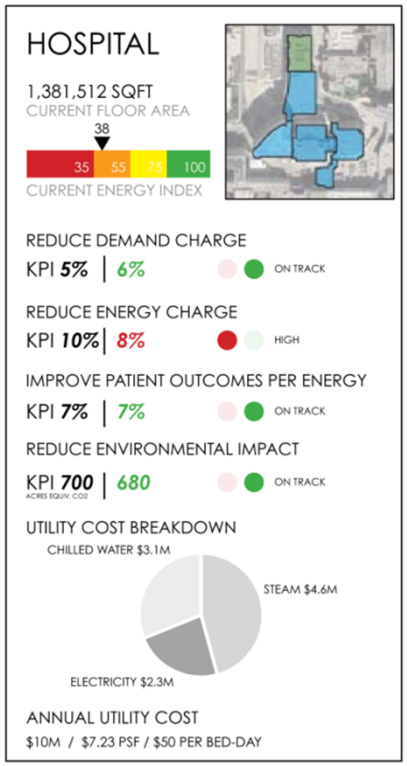
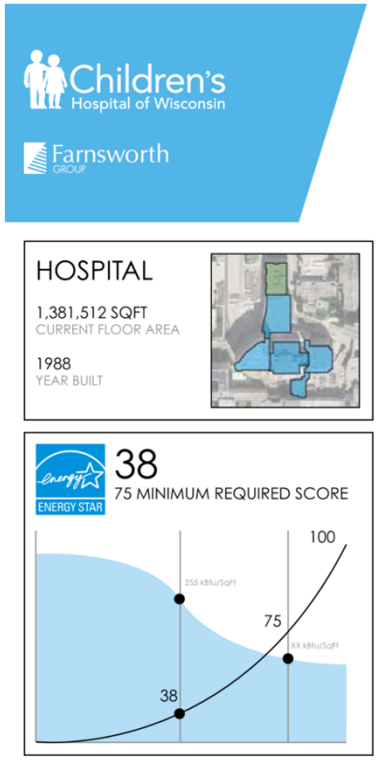
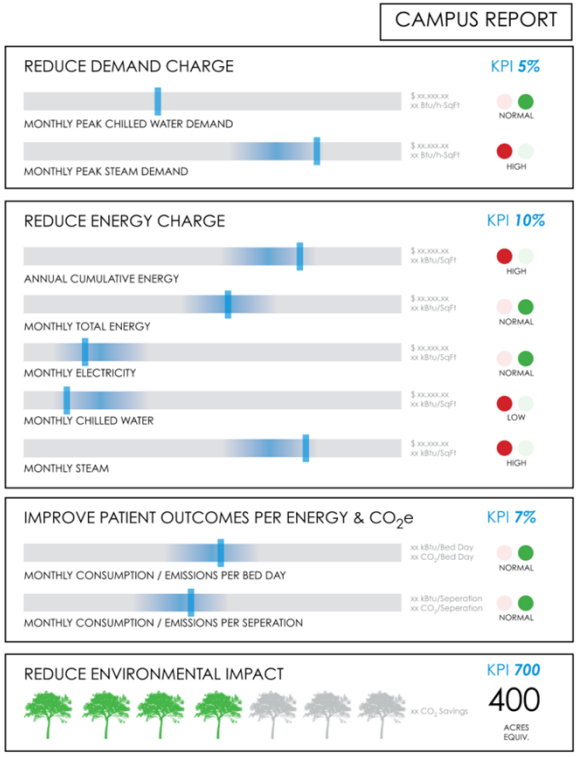
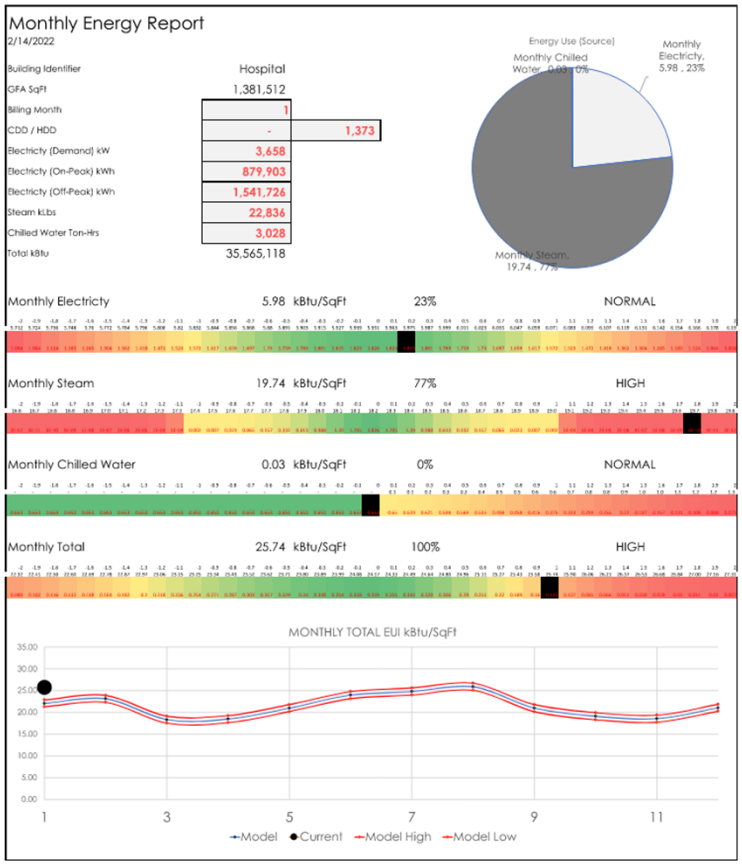
KPI Reporting Accessibility

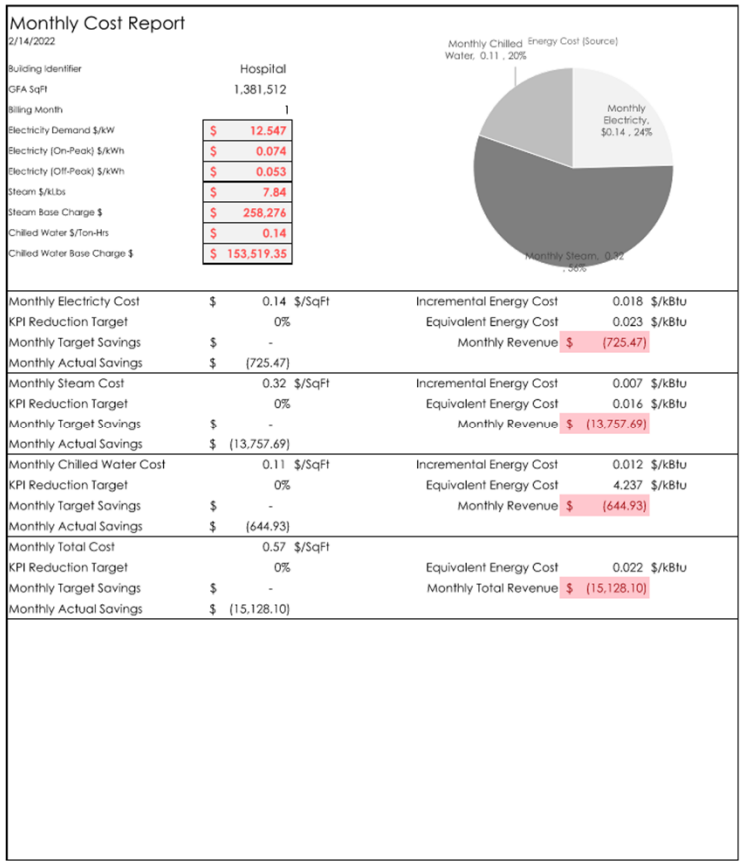




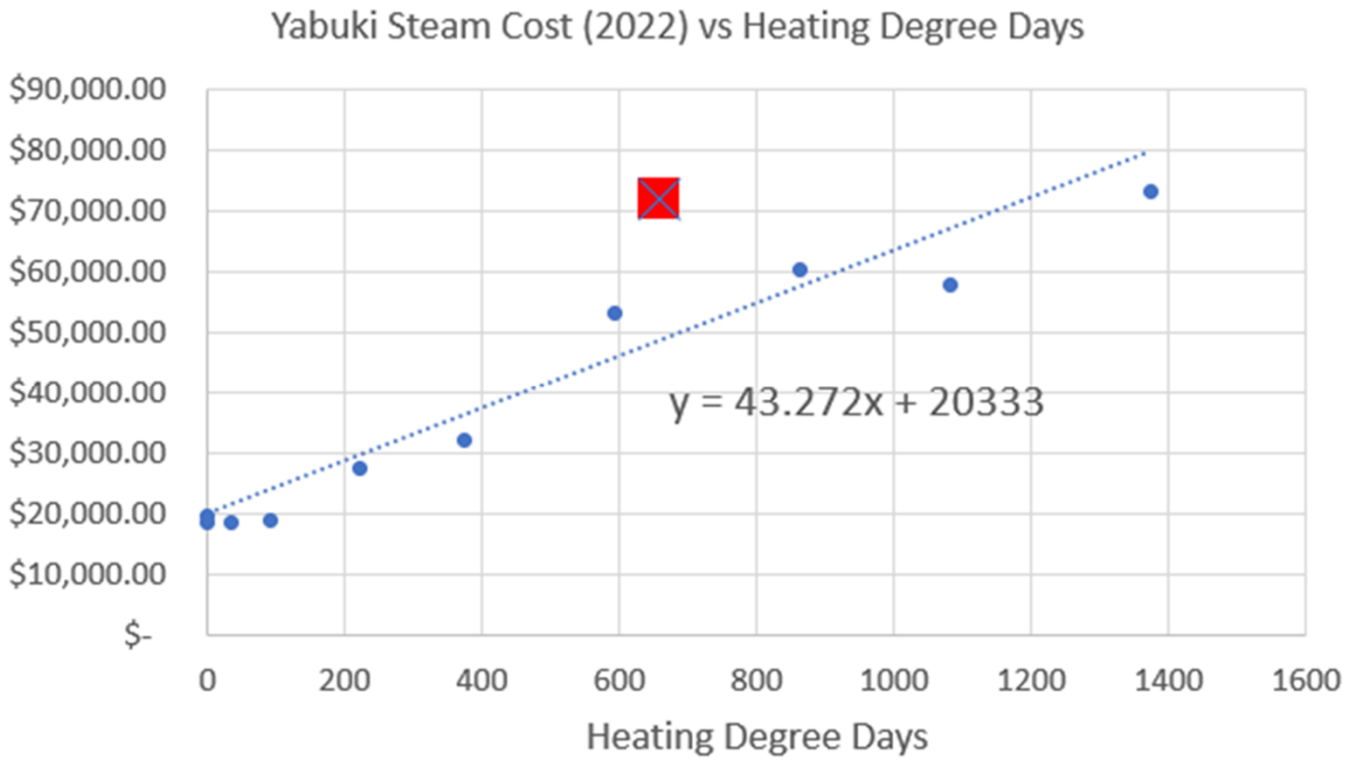


Energy Report Card Tracking





Accounting For Construction

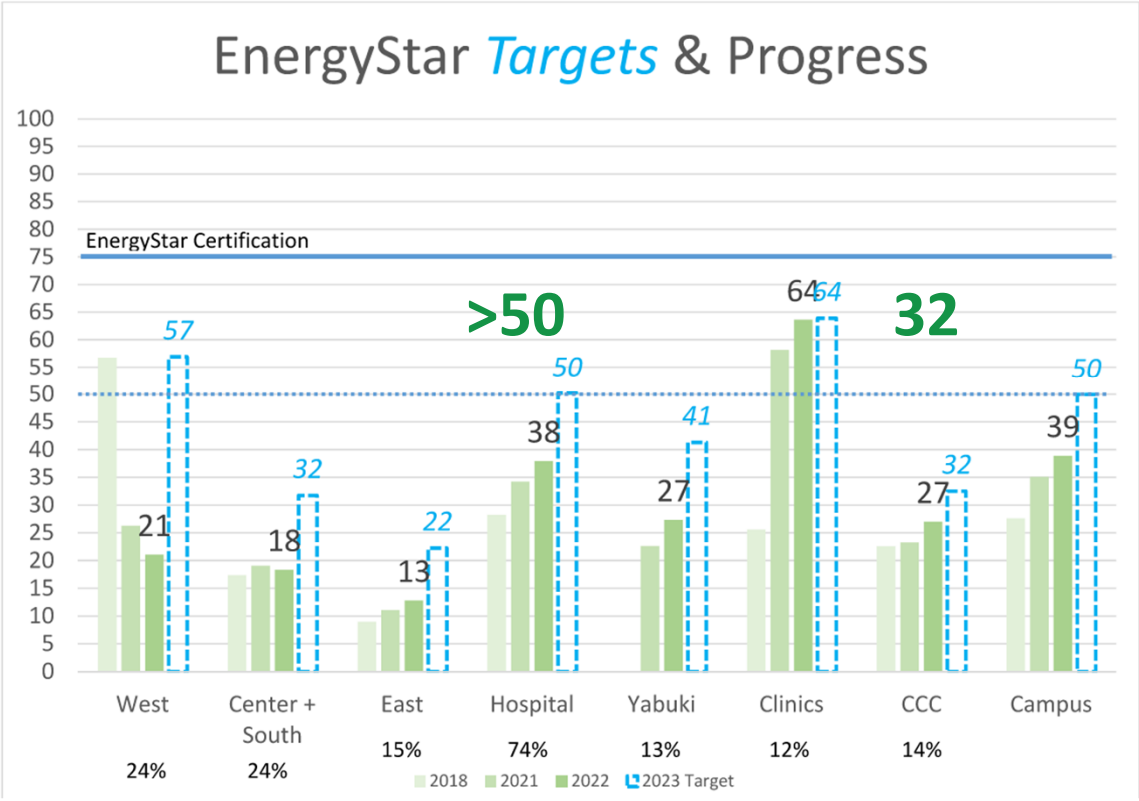


Energy Awareness in Cx -> FACOPS

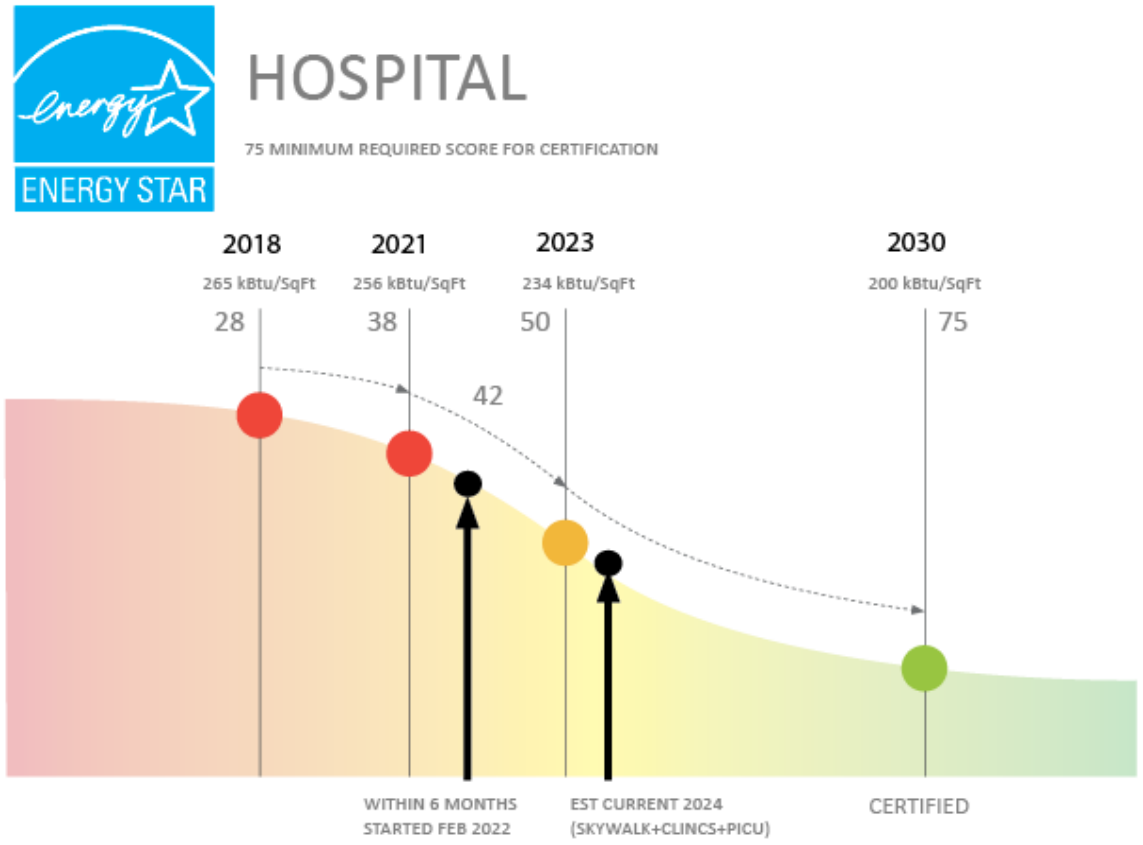
- Excess Heating Air Flow Setpoints
  - 7870 CFM above min flow
  - Estimated +$6572 annual fan electricity
- Excess ACH over ASHRAE 170
  - 2948 CFM above
  - +$2462 annual fan electricity
  - +$2312 annual steam consumption
  - +$8788 annual chilled water consumption
- Total potential cost avoidance: $0.67 psf
- Center tower baseline: $1.90 psf
- No schedule impact. Follow-up in ops.

EnergyStar Targets Met or Exceeded

Current



EnergyStar Progress



Key Results

- Identified an expected $8.2M budget deficit over five years
- Prioritized a master project list
- Created a database the Owner can manage independently and update over time
- Submitted for the ASHE Energy to Care Award
- Joint Commission Sustainable Healthcare Organization Certification
- Served Children's Core Value
  - Innovation - We commit to improvement with breakthrough ideas and solutions.

ASHE
Optimizing health care facilities
ENERGY to care
Greater efficiency supports patient care.

Q&A - Discussion