

From Aging Infrastructure to Innovation

Manchester Public Schools'
Sustainable Transformation

May 7, 2025



Speakers



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Agenda

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Introductions

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**Manchester
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**Costs &
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 **40 Staff**

 **Hartford/Boston Offices**



New Lebanon Elementary School



Eastern Greenwich Civic Center



Leaders in Net Zero Energy



**EUI
17.3**

Mansfield Elementary
New Construction - Mansfield, CT



**EUI
18.1**

Buckley Elementary
Renovation - Manchester, CT



**EUI
18.2**

Bowers Elementary
Renovation - Manchester, CT



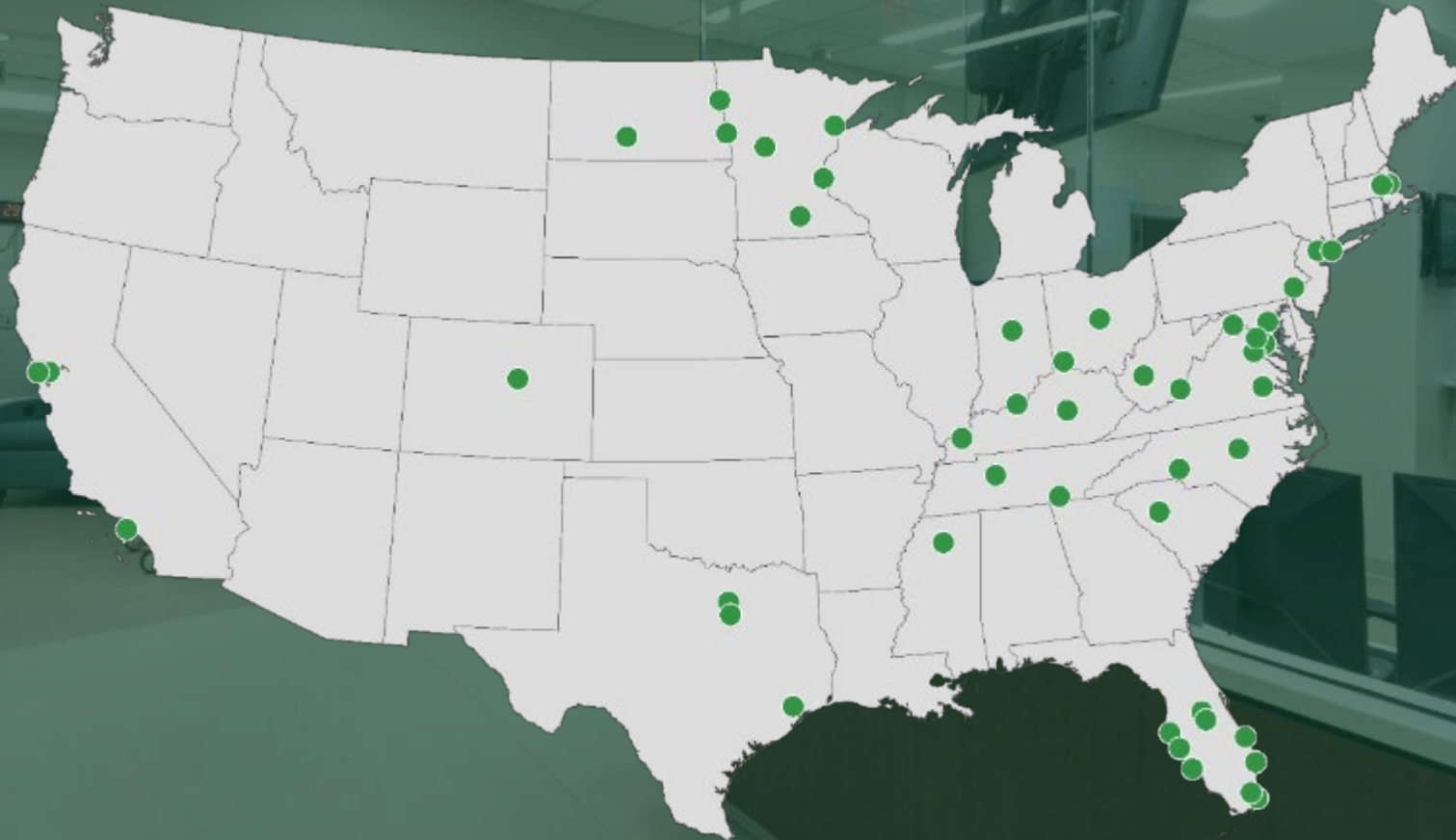
**EUI
19**

Keeney Elementary
Renovation - Manchester, CT



CMTA By the Numbers

A LEGENCE Company



1290

Employees

50

Offices Nationwide

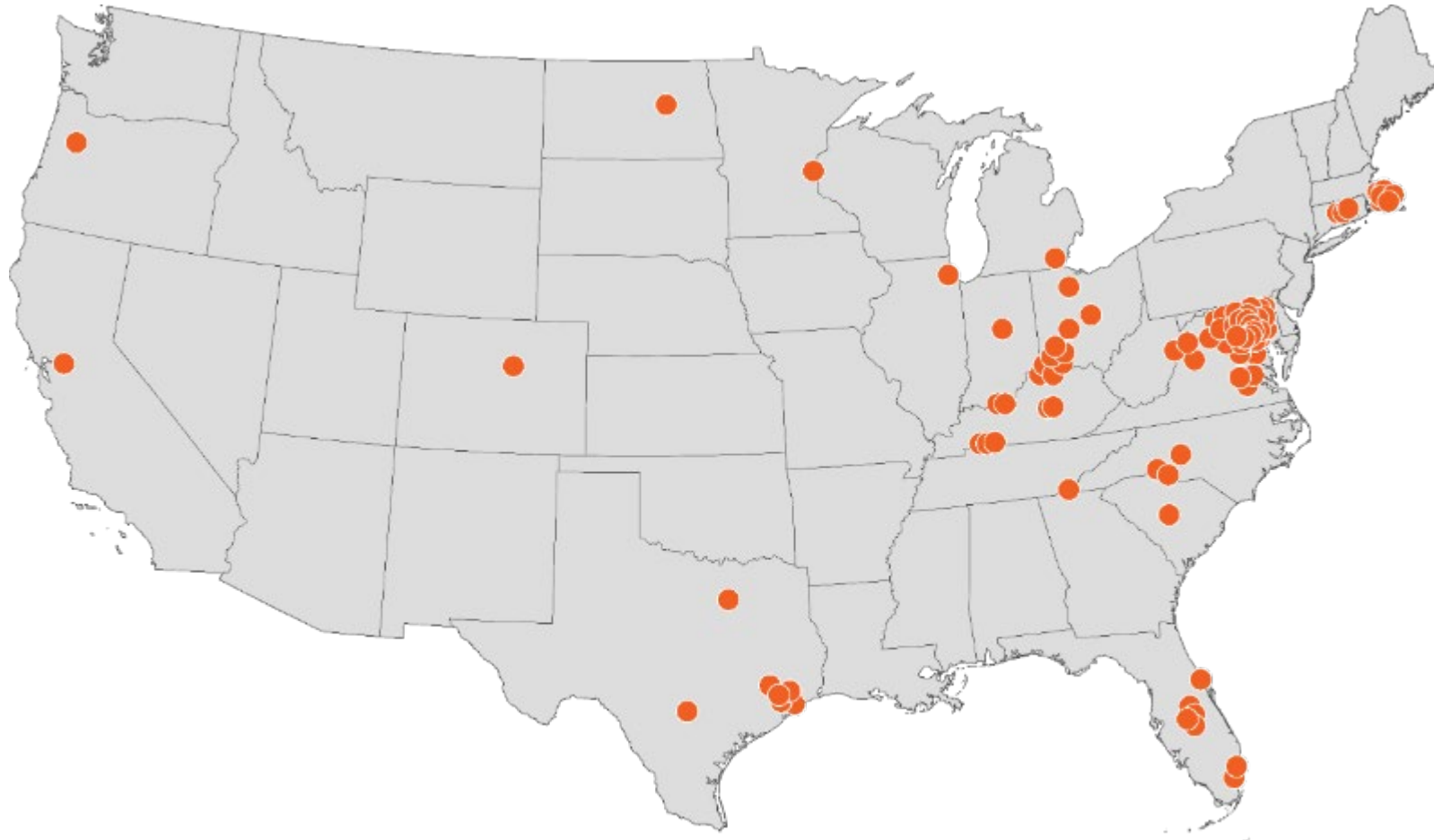
288

Professional Engineers

56

Years of Service

Operational Zero Energy / Zero Carbon



90+
Projects

9M SF
Operational Zero Energy

5.7M SF
Operational Zero Carbon

● Zero Energy Projects



Manchester's Sustainable & Equitable Transformation

10-Year 2025 School Modernization Plan for Elementary Schools

Phase 1 School Renovations (2015-2020)

- Reimagined Elementary Schools through strategic consolidation
- Maximized Space Efficiency to align with State grant reimbursement criteria
- Targeted Additions built to meet Education Specifications and support modern learning
- Redistricting and Consolidation designed to reduce racial imbalance
- Equity in Education advanced through consistent, high-quality learning environments

Phase 2 School Renovations (2020-2025)

- Phase 1 Strategic Objectives plus
- Net Zero Energy Goal and full Electrification

The 2025 Plan Timeline for Elementary School Upgrades

School Name	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
PHASE 1 Schools	<ul style="list-style-type: none"> BRIMLEY: 2015/16 (Design), 2016/17 (Design), 2017/18 (Design), 2018/19 (Design), 2019/20 (Design), 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) GRACE: 2015/16 (Design), 2016/17 (Design), 2017/18 (Design), 2018/19 (Design), 2019/20 (Design), 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) WINDMILL: 2015/16 (Design), 2016/17 (Design), 2017/18 (Design), 2018/19 (Design), 2019/20 (Design), 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) VERBLANK: 2015/16 (Design), 2016/17 (Design), 2017/18 (Design), 2018/19 (Design), 2019/20 (Design), 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) WINDMILL: 2015/16 (Design), 2016/17 (Design), 2017/18 (Design), 2018/19 (Design), 2019/20 (Design), 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) ROBINSON: 2015/16 (Design), 2016/17 (Design), 2017/18 (Design), 2018/19 (Design), 2019/20 (Design), 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) 										
PHASE 2 Schools	<ul style="list-style-type: none"> SCOTT: 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) WADSWORTH: 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) WINDMILL: 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) WINDMILL: 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) WINDMILL: 2020/21 (Design), 2021/22 (Design), 2022/23 (Design), 2023/24 (Design), 2024/25 (Design), 2025/26 (Design) 										

Legend: Design + State Grant Approval Phase (Yellow), Construction / Renovation Phase (Orange), Upgrade Completion (Purple)

Manchester sets a statewide benchmark for cost-effective, Net Zero-ready schools—blending climate action with educational equity and 21st-century design.



Learning Objectives

- **Identify** strategies for balancing budget constraints with the need to modernize aging school infrastructure while fostering sustainability.
- **Learn** how to incorporate high-performance design strategies and integrate efficient technologies to achieve energy goals.
- **Explore** innovative funding methods, including leveraging state grants, utility incentives, and federal tax credits, to support sustainable construction and renovation projects
- **Learn** how to design flexible, interdisciplinary learning spaces that promote student engagement, support STEAM education, and enhance academic success within sustainable environments.

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Buckley ES, Bowers ES & Keeney ES

Can a Ford Pinto be transformed into a Tesla

"Reducing the EUI to less than half of the prior similar renovation seemed like a long shot. The first glimpse of optimism came during the interview process for the design teams when Manchester was presented with several successful Net Zero Energy projects completed by CMTA across the country."

Chris Till, Facilities Manager
Town of Manchester, CT

Buckley Elementary School

Manchester's Vision

➤ Community Input

- Carbon Footprint Reduction
- 21st Century Technology
- Electrification - Eliminate Fossil Fuels

➤ Net Zero Energy Goal Uncertainties

- Technically viable for 1950's-era school renovations?
- Financially feasible?

➤ Budgeting for NZE Goal – Add 5% (\$4.1M total for 3 schools)

- Budget conscious, working-class community – Show ROI

What did we do?

All Three Schools Include:

- Renovate as New
- Envelope Improvements
- Geothermal HVAC
- Geothermal Water Heating
- Dedicated Outside Air with Energy Recovery
- Solar PV
- Zero Energy Performance

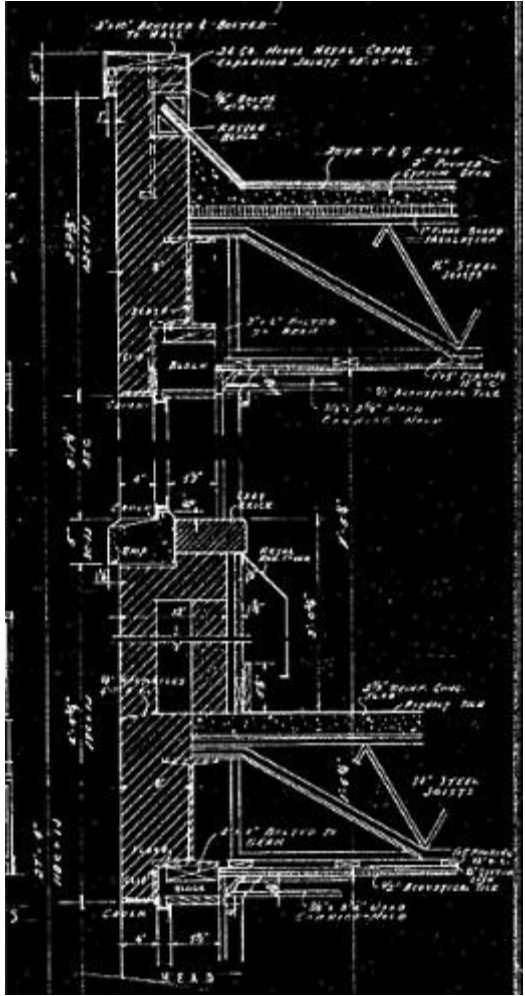


Bowers Elementary School

Aging School Infrastructure

73% of US Schools
Were **Built Before**
1969...

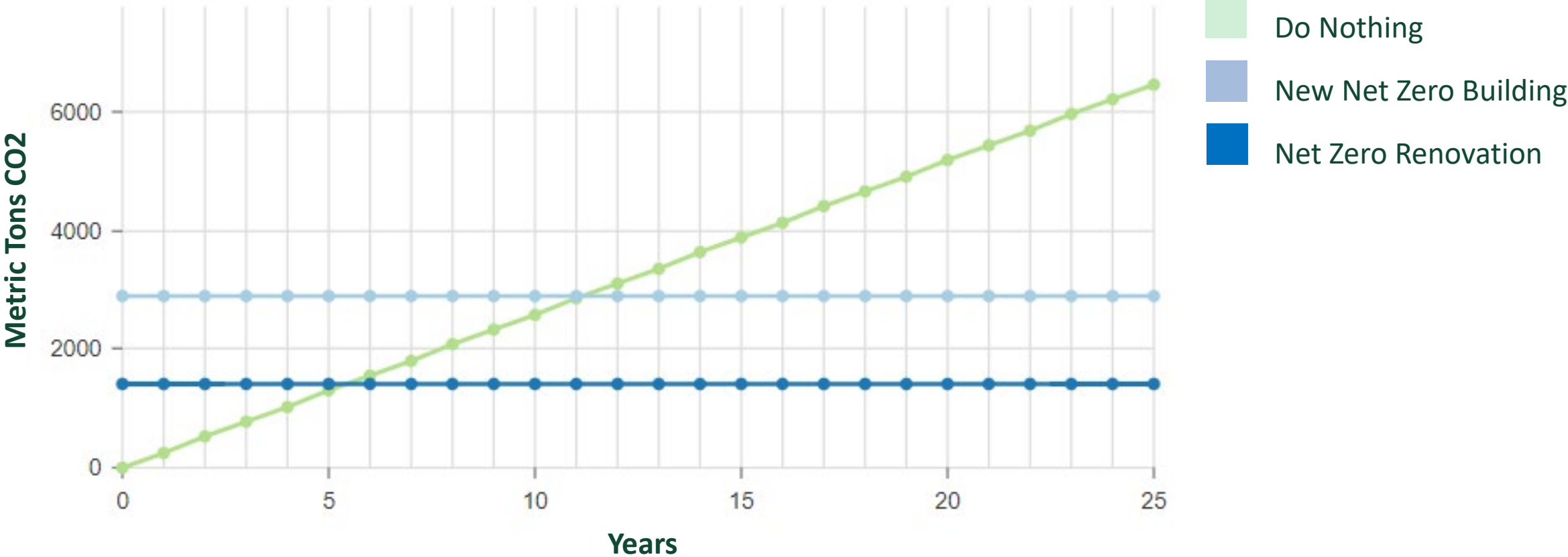
Source: US Department of Education,
National Center for Education Statistics



6353-C

Embodied Carbon

Cumulative Emissions Over Time



Carbon Avoided: Retrofit Estimator
caretool.org

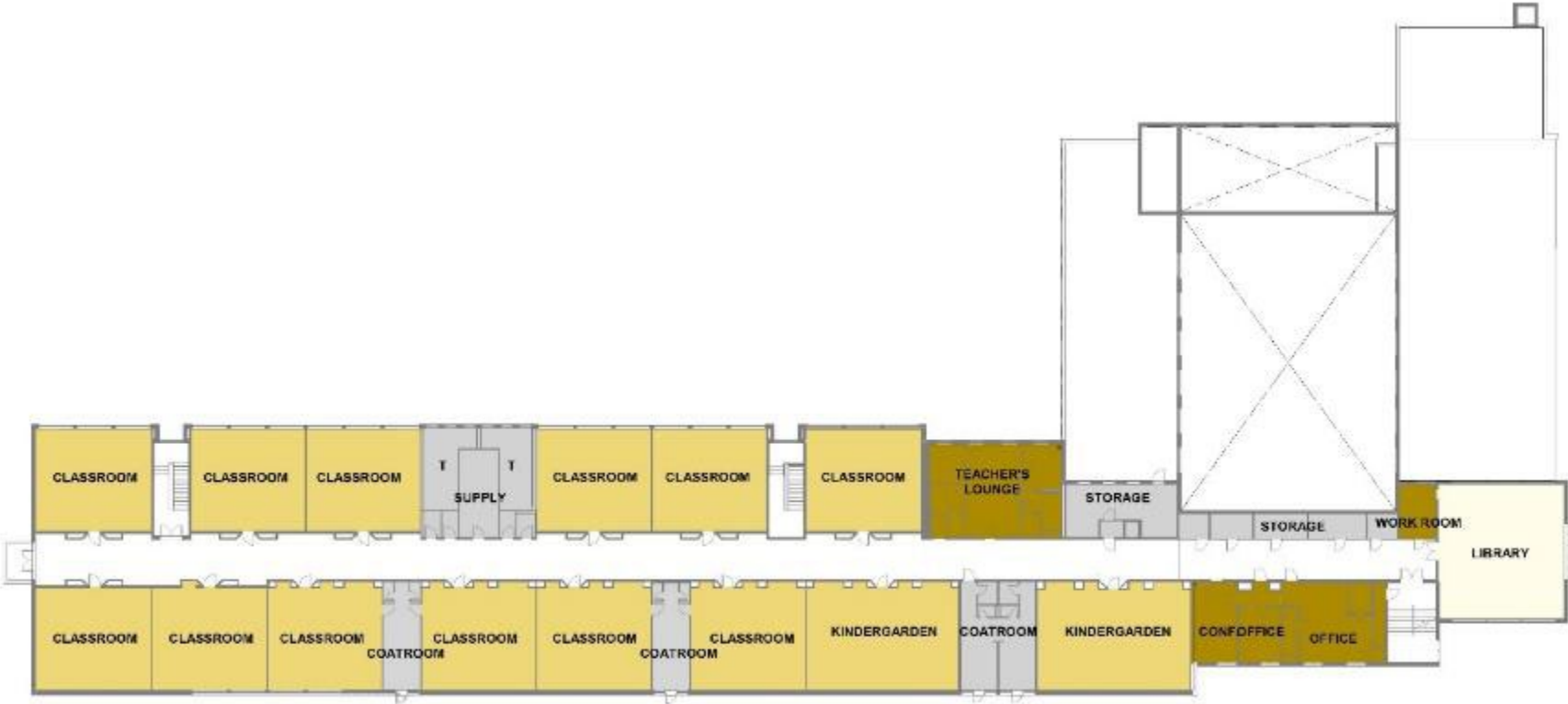
Buckley Elementary School (Before)



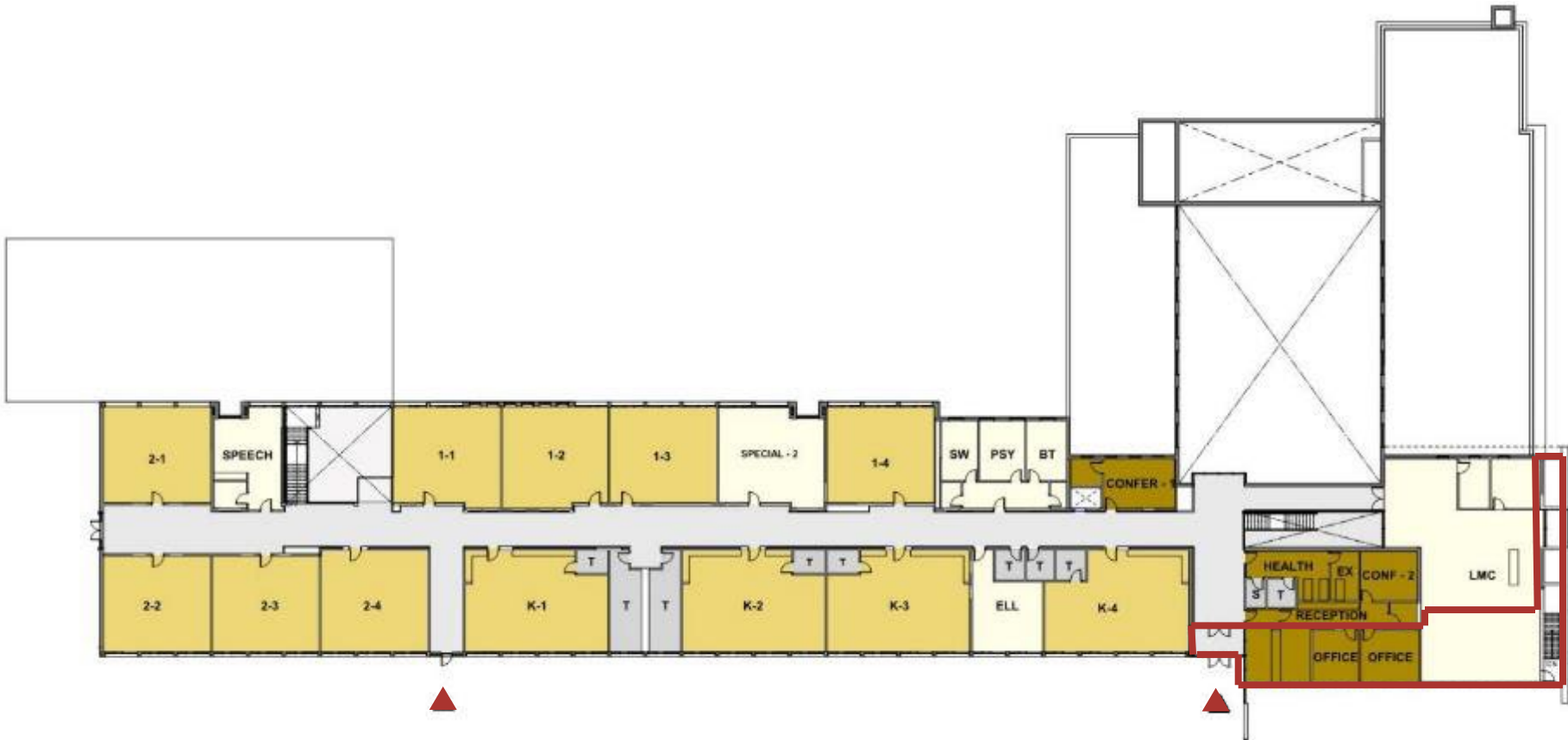
Site Plan



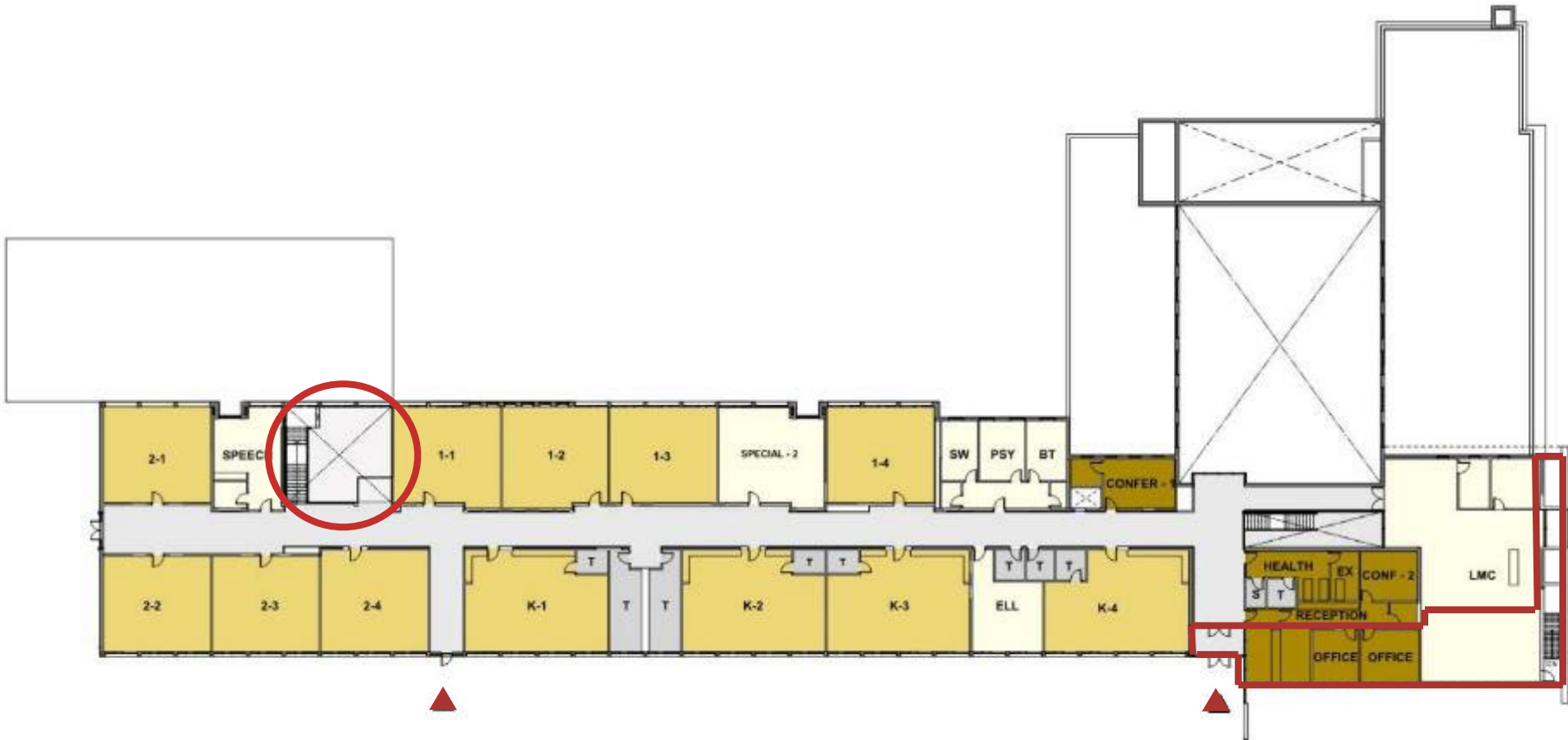
Existing Upper Floor



Proposed Upper Floor



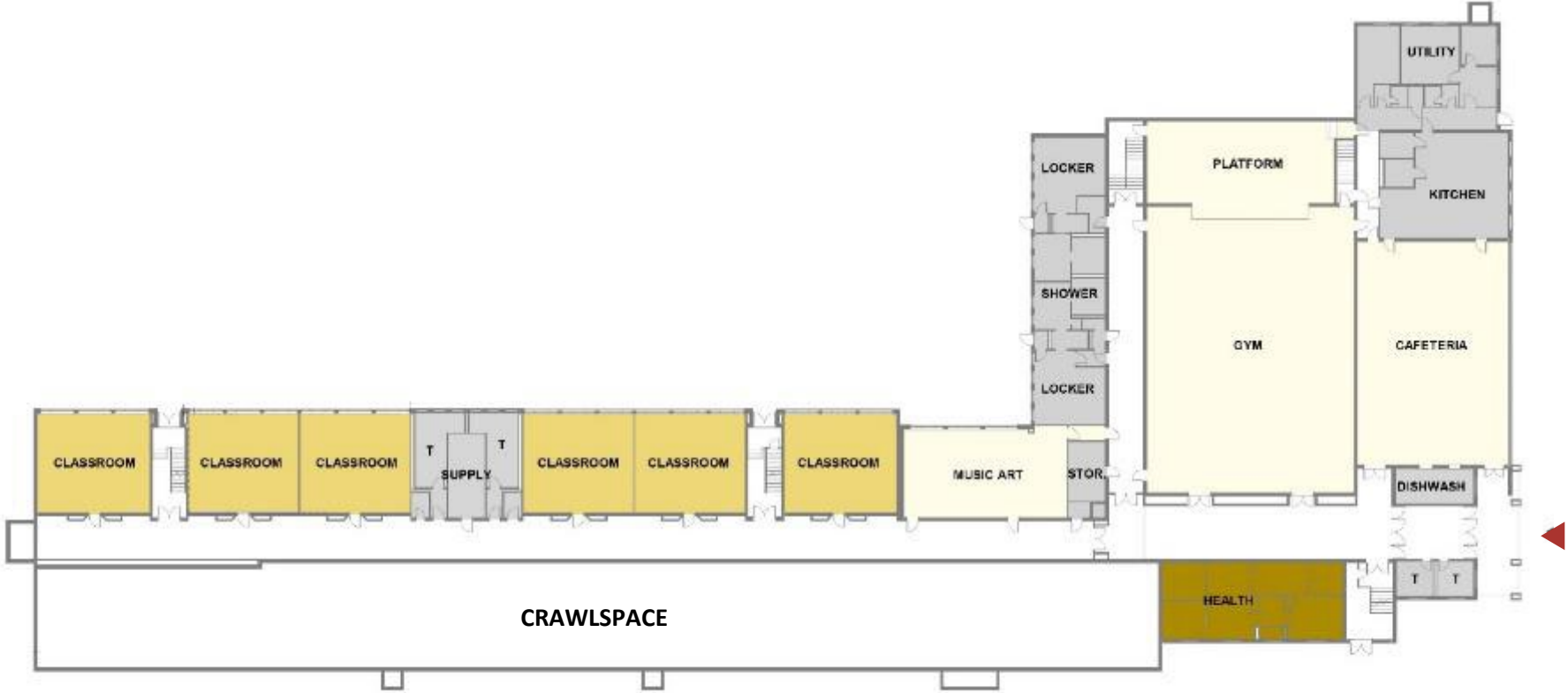
Proposed Upper Floor



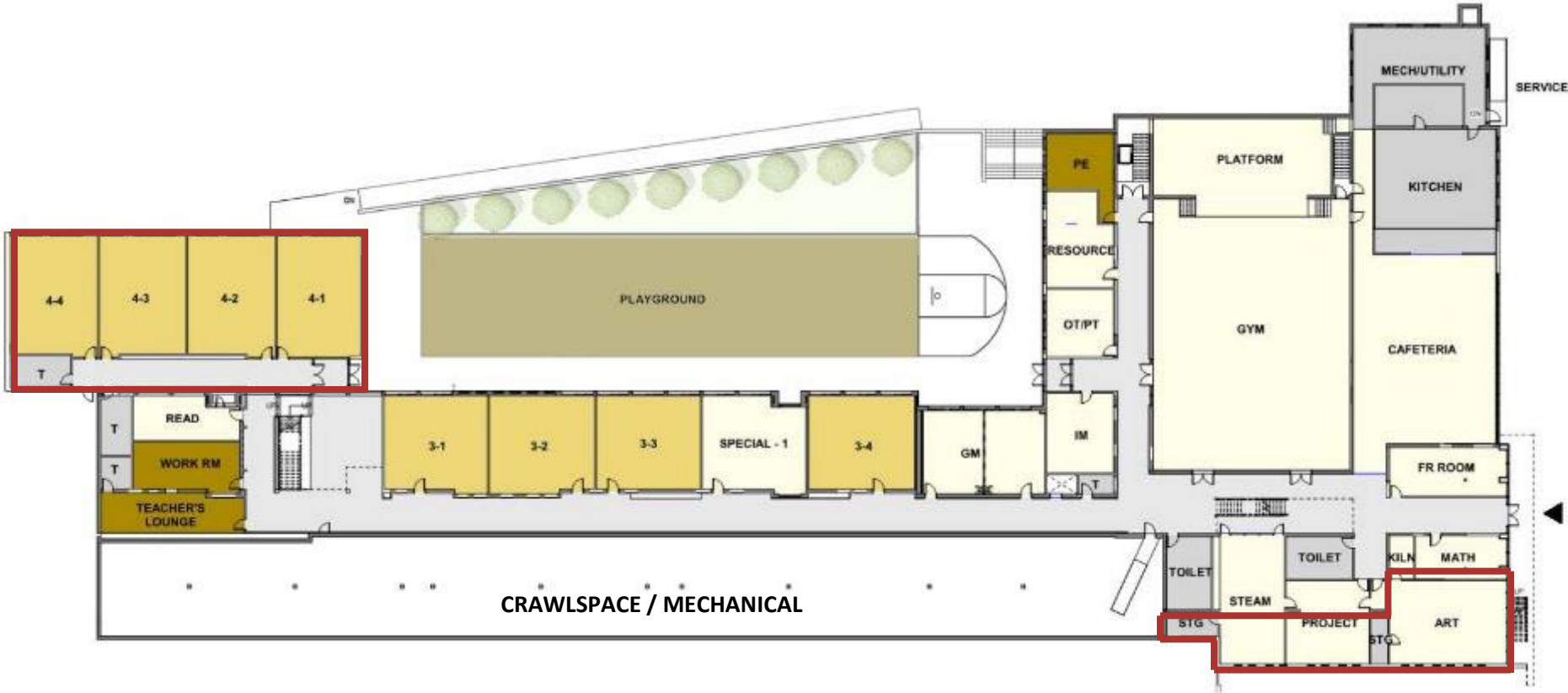
Breakout Area



Existing Lower Floor











Proposed Lower Floor

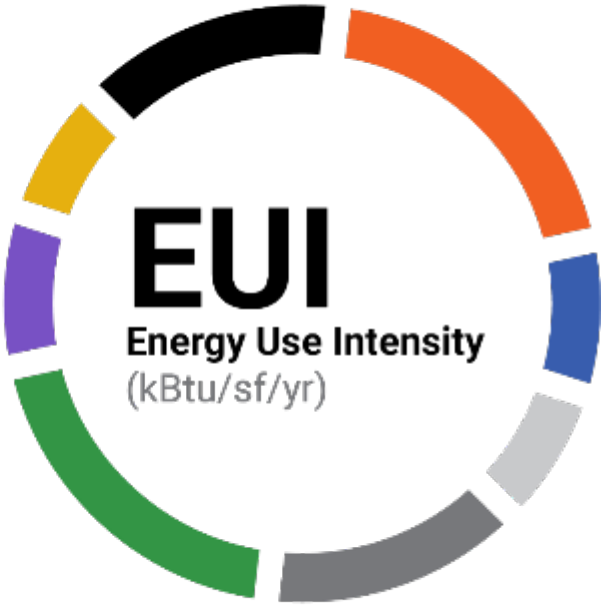
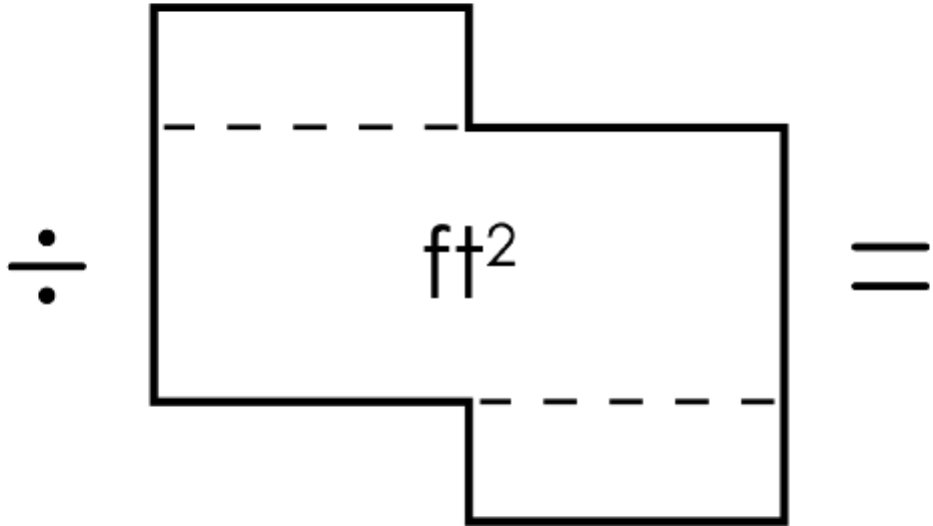


Building Section



Achieving Net Zero Energy









-  Heating
-  Cooling
-  Pumps + Fans
-  Lighting
-  Hot Water
-  Plugloads
-  IT / AV
-  Kitchen

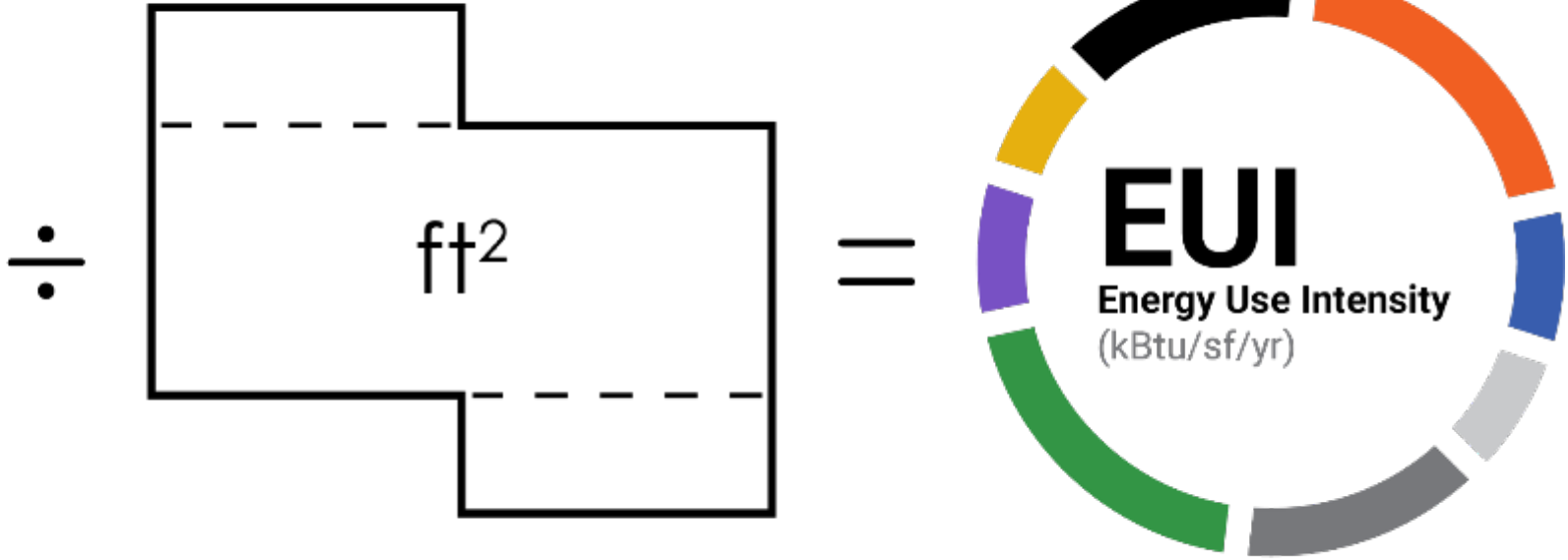


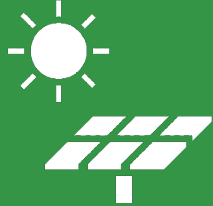
Energy per Square Foot per Year

Measured in kBtu

Achieving Net Zero Energy

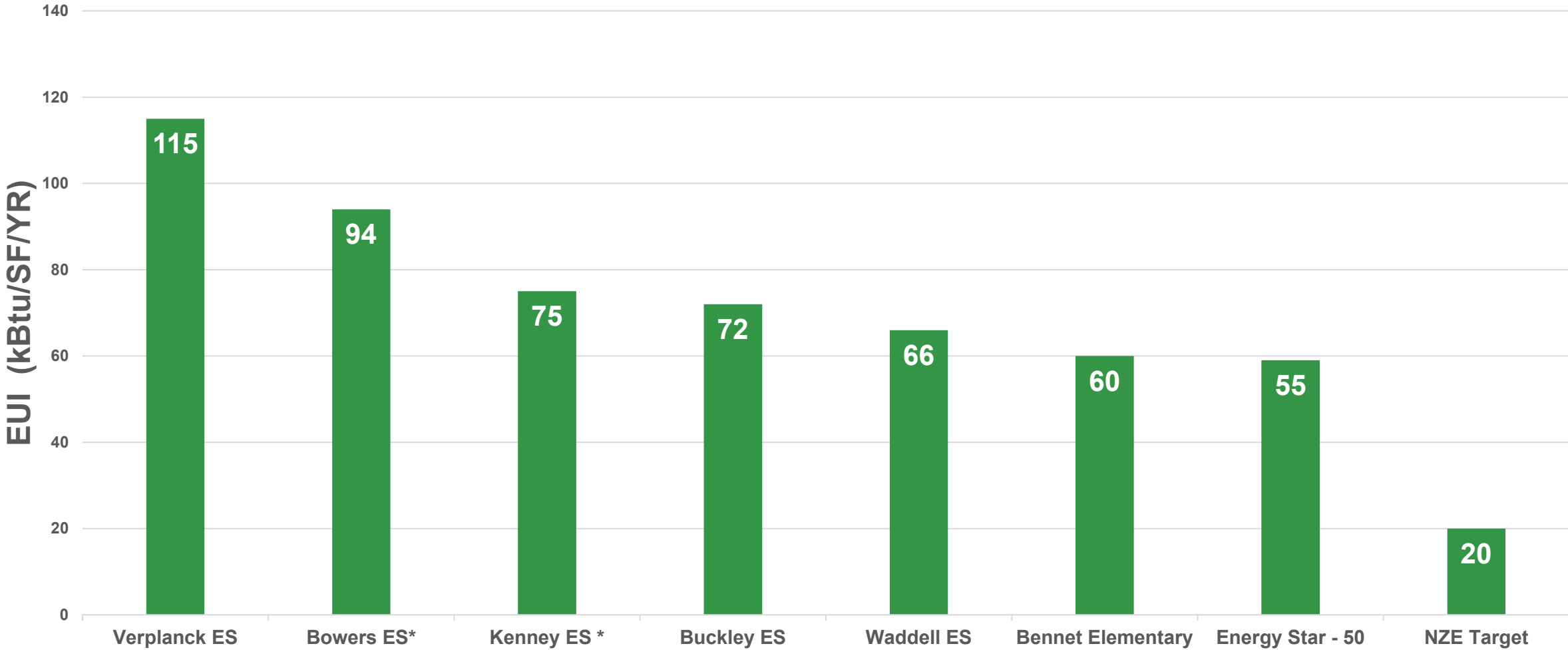
-  Heating
-  Cooling
-  Pumps + Fans
-  Lighting
-  Hot Water
-  Plugloads
-  IT / AV
-  Kitchen



Total Building Consumption (kBtu/ft²/yr) $-$  **Renewables** $=$ **0** **Net Zero Energy**

Benchmarking

Partial School District Energy Use Intensity



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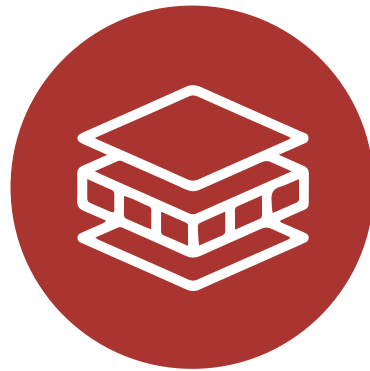
Q&A

The Process



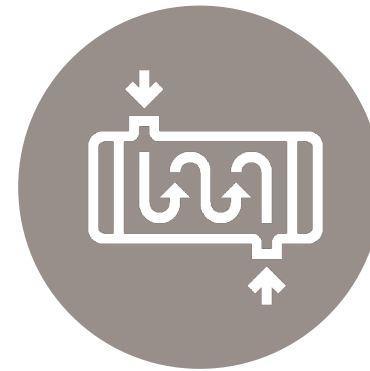
Building Orientation & Massing

Maximize daylighting and control solar heat gain



Building Envelope

Tight envelope for low infiltration, reduced heating and cooling loads



High Performance MEP Systems

Fully electrified, heat pumps, improved IEQ



On Site Renewables

Reduce EUI first and maximize roof area



Geothermal HVAC

- Maximized HVAC Efficiency
- Reduced Energy Use
- Eliminates On Site Combustion
- 60 Wells – 500 Feet Deep



Solar Photovoltaics Array

- Maximized Available Roof PV
- Modeled Energy Generation
- Verified Zero Energy Performance



High Performance Kitchen

- 100% Electric / Fossil Fuel Free
- Highly Efficient Appliances and Refrigeration



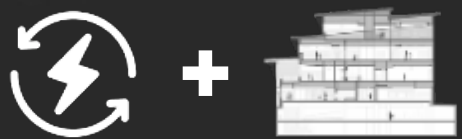
Ultra Tight Building Envelope

- New Roof, Walls and Windows
- Building Pressure Test
- Reduced Building Energy Loss
- Enhanced Daylight Access



Occupant Health + Wellness

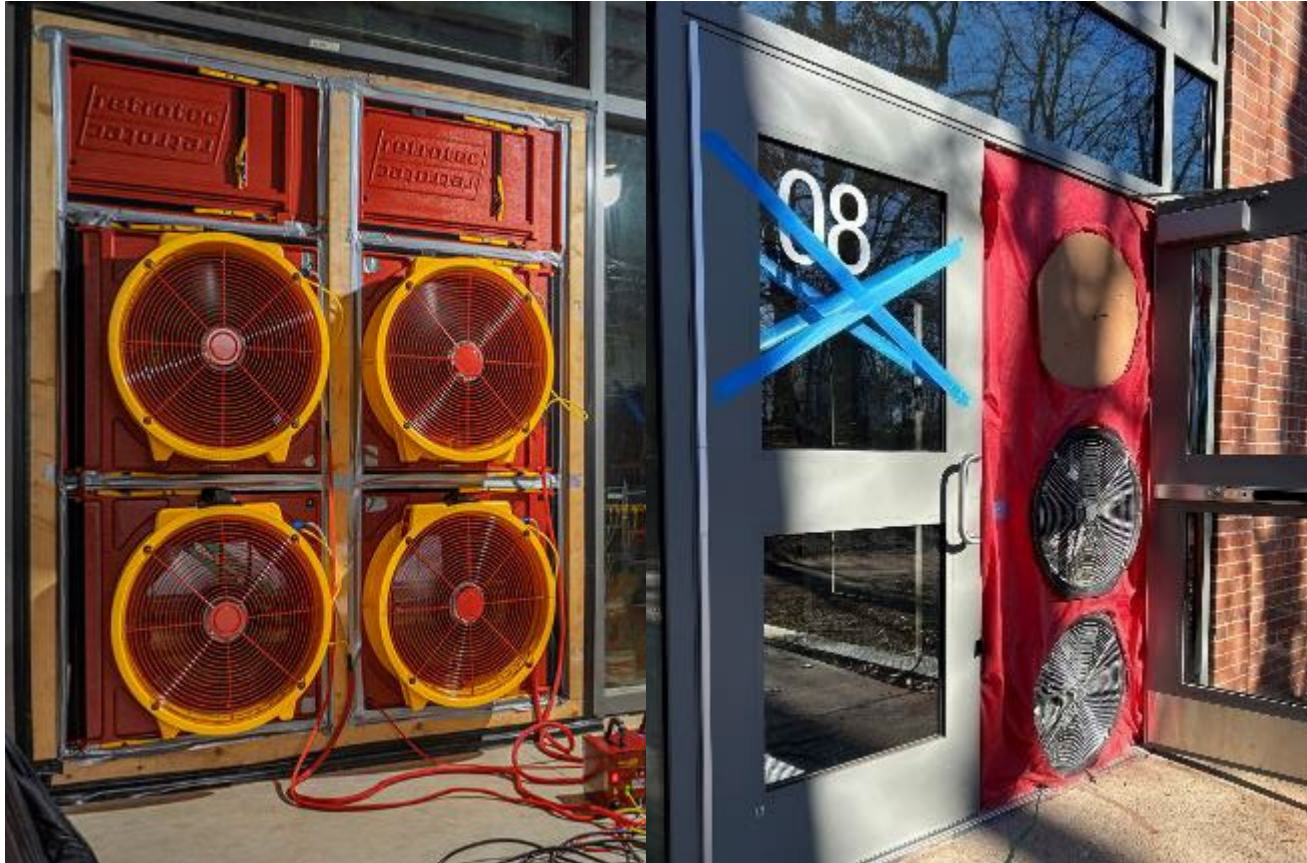
- Improved Ventilation
- High MERV Filtration
- UV Lighting
- Energy Recovery



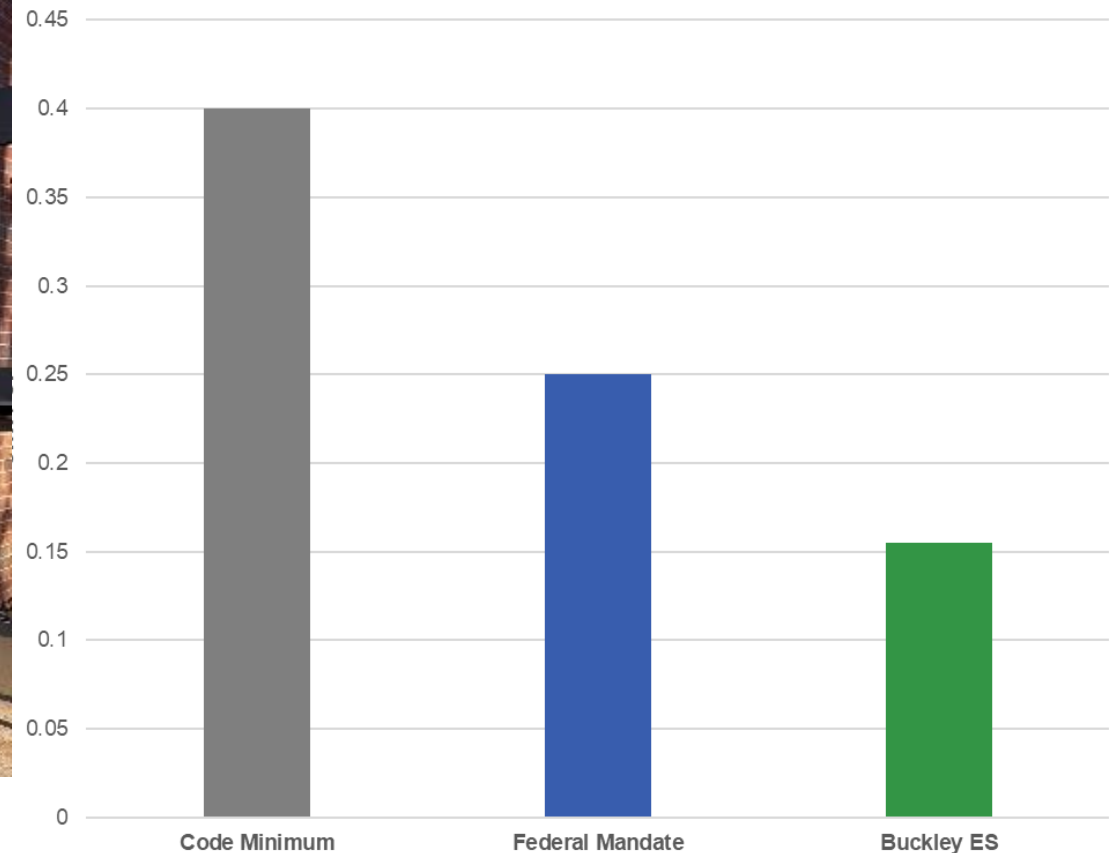
Verified Performance

- Verified Zero Energy through NBI
- Data-Driven Design Decisions
- Significant Utility Incentives
- Performance: 17 EUI

Building Envelope Testing is Critical



Air Infiltration Rate



Blower Door Test: Air leaks in the building envelope can be identified and sealed leading to reduced utility costs long-term

Follow The Energy

HVAC (~45%)

- Massing/Orientation
- Envelope/Shading
- Systems
- Controls

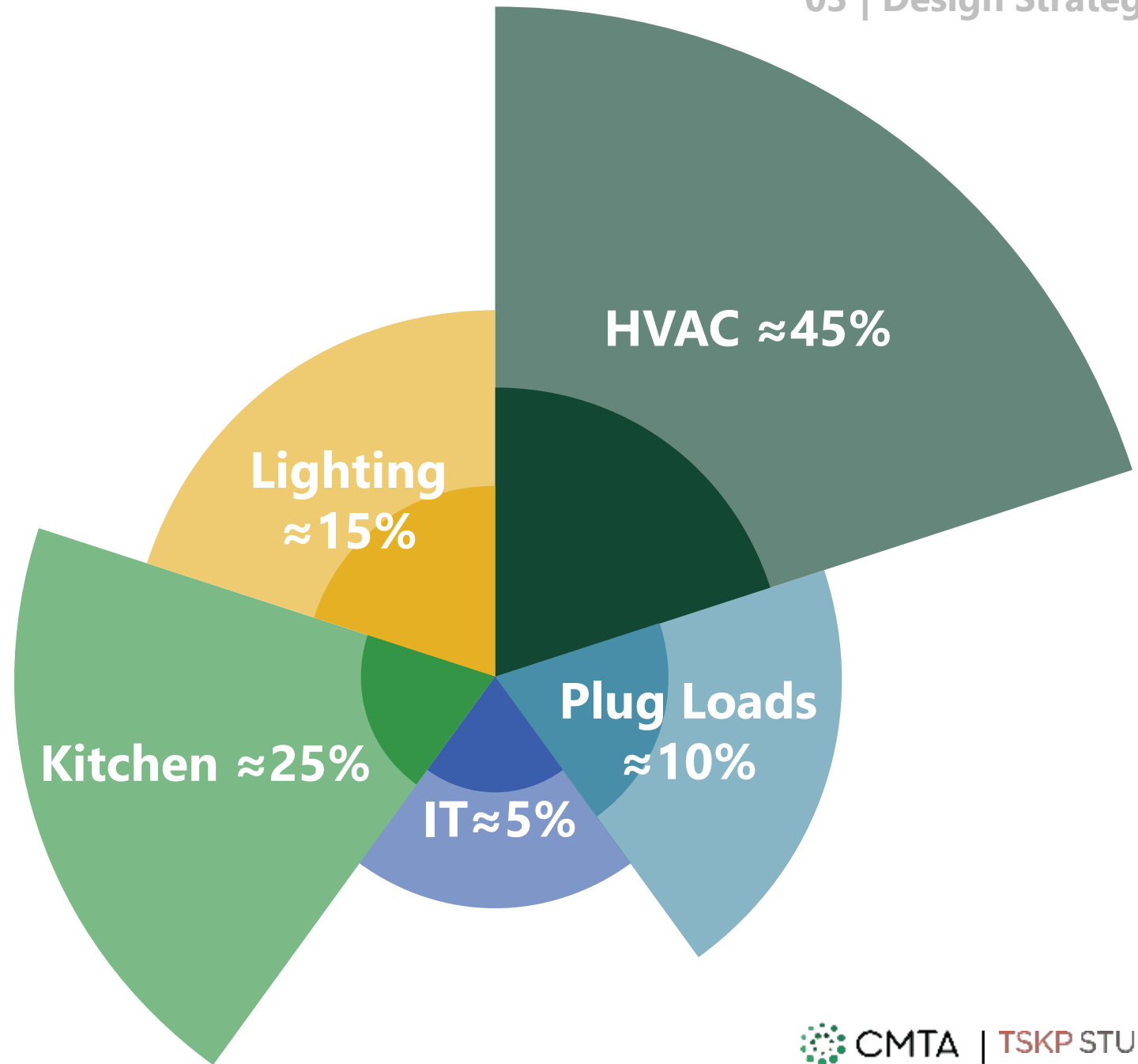
Kitchen (~25%)

- Cooking
- HVAC + Lighting
- Sanitation
- Refrigeration

Lighting (~15%)

Plug Loads (~10%)

IT (~5%)

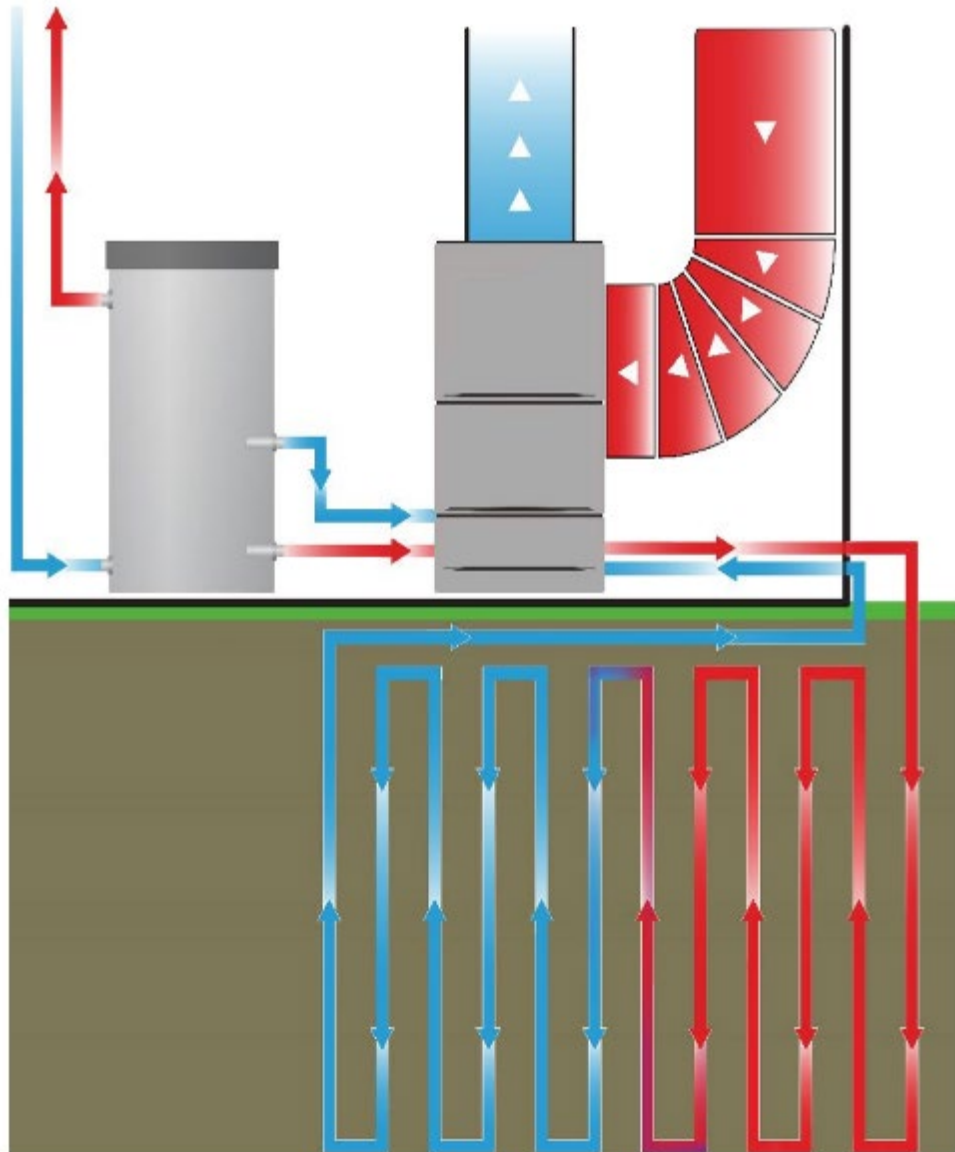


Geothermal Systems

- **Simple to Operate & Maintain**
- Carbon Emissions Eliminated on Site
- 40% More Efficient than Traditional System
- Consistency



Geothermal Systems



Geothermal HVAC – Heat Pumps & DOAS

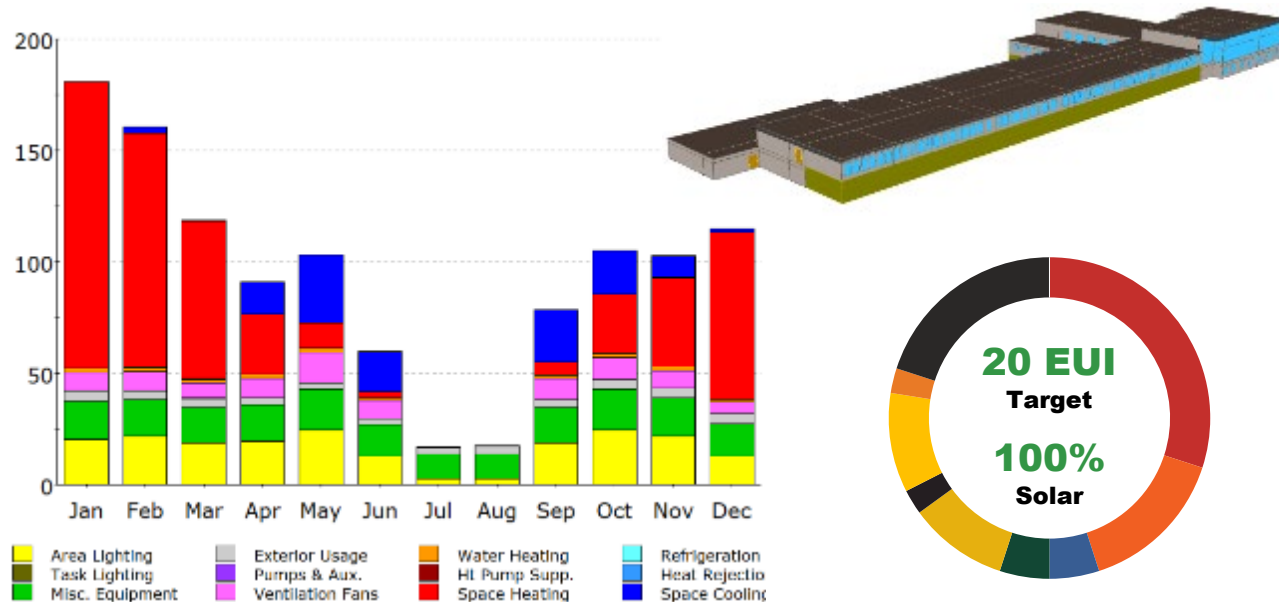


Renewable Energy – Solar PV

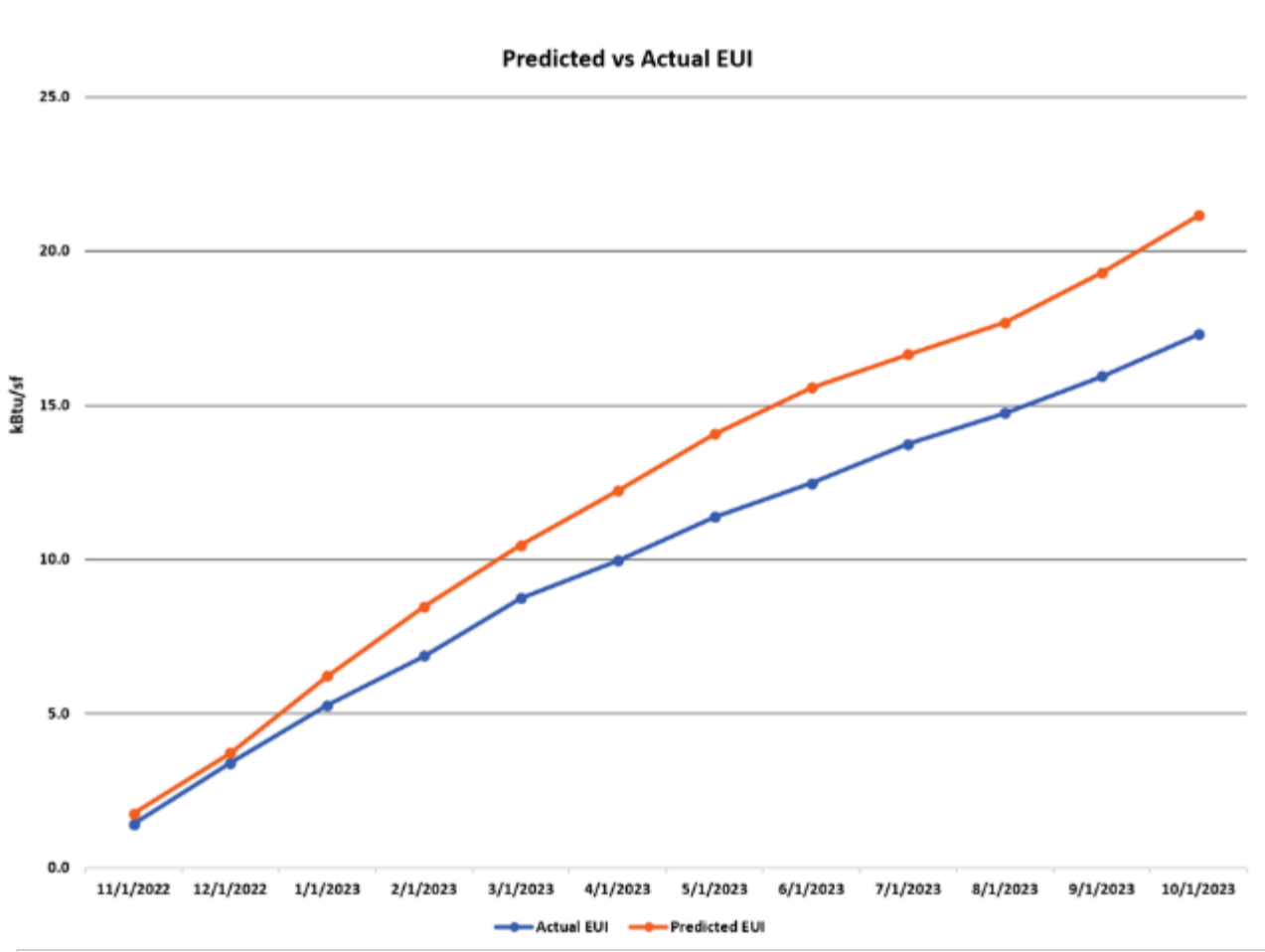
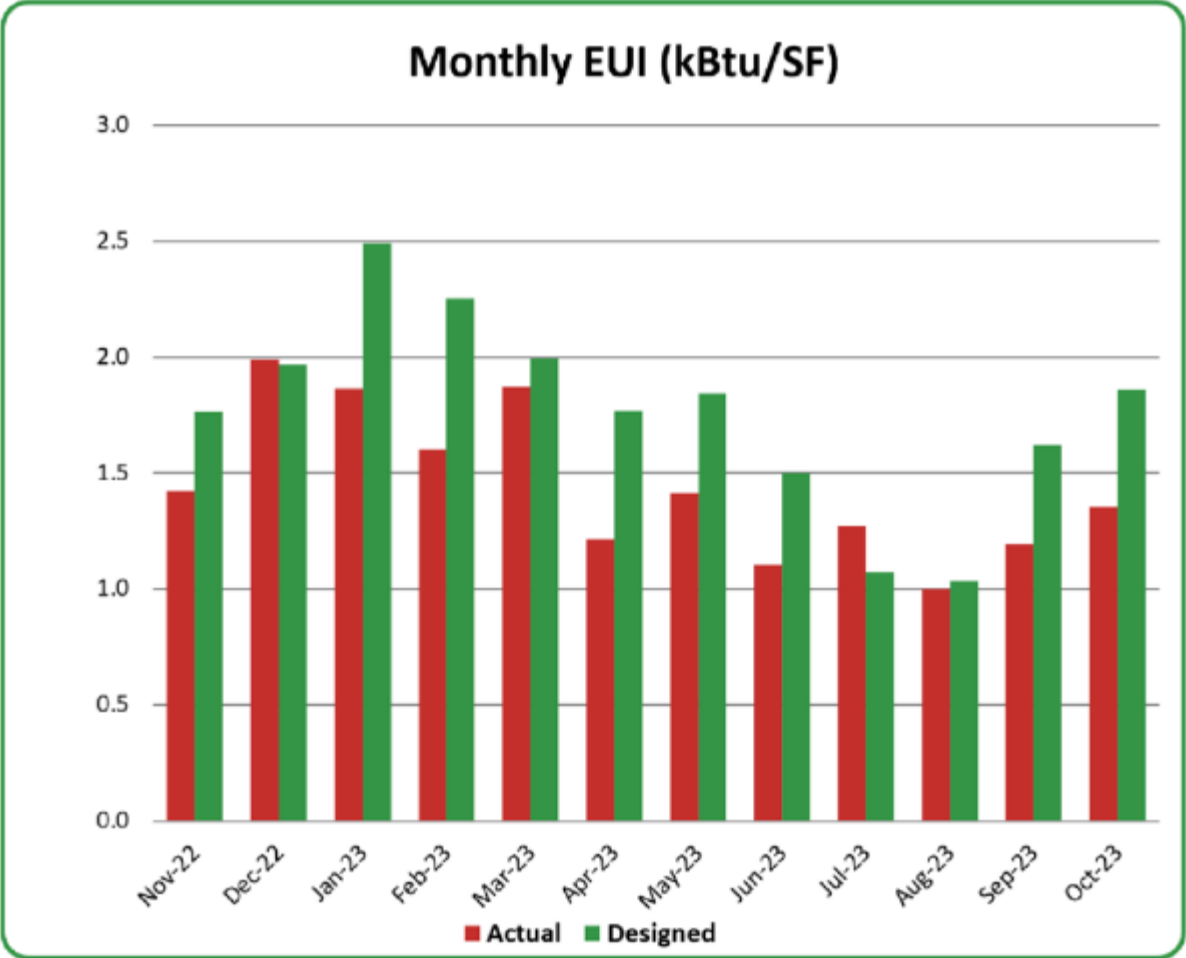
391 kw PV -> 18 EUI

All on the Roof

Predictive Energy Model Needed



Measure & Verify!

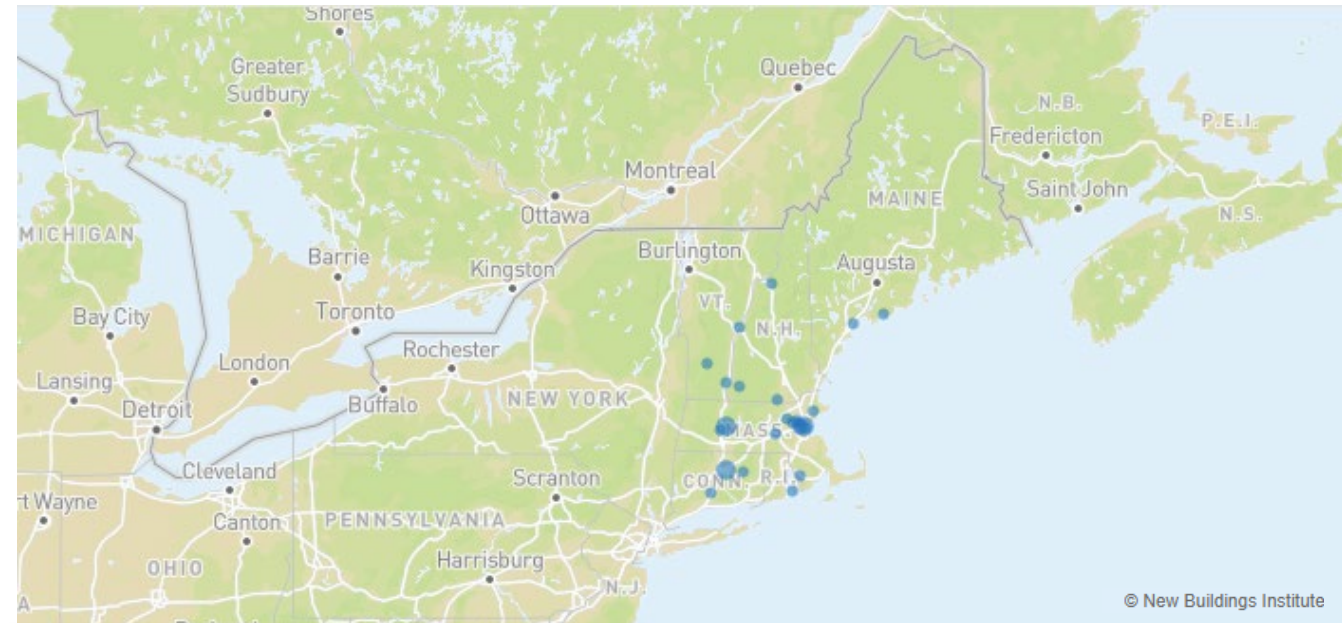


Net Zero Public Schools

The **only 3 verified Net Zero Energy** public schools in New England (+1 soon to be verified)

ZE Status	State or Province	Name
Verified	CT	Bowers Elementary School
Verified	CT	Buckley Elementary School
Verified	CT	Kohler Environmental Center
Verified	CT	Mansfield Elementary School
Verified	MA	Hitchcock Center for the Environment
Verified	MA	R W Kern Center at Hampshire College
Verified	MA	Sbrega Technology and Learning Center - Bristol
Verified	MA	Smith College Bechtel Environmental Classroom
Verified	ME	Coastal Maine Botanical Gardens Bosarge Family
Verified	VT	Putney Field House
Emerging	CT	Manchester Keeney Elementary School

nbi new buildings institute



ZE Status	State or Province	Name	Certifications	City	Building Type	Size (sf)	Total Site EUI	Net Site EUI
Verified	CT	Bowers Elementary School		Manchester	Education	65,300	15	-1
Verified	CT	Buckley Elementary School		Manchester	Education	65,900	17	-5
Verified	CT	Kohler Environmental Center	LEED, ILFI	Wallingford	Education	31,325		
Verified	CT	Mansfield Elementary School		Mansfield	Education	80,624	18	-1
Verified	MA	Hitchcock Center for the Environment	ILFI	Amherst	Education	8,950		
Verified	MA	R W Kern Center at Hampshire College	ILFI	Amherst	Education	16,940	23	-3
Verified	MA	Sbrega Technology and Learning Center - Bristol Com.	LEED	Fall River	Education	50,679	45	-15
Verified	MA	Smith College Bechtel Environmental Classroom	ILFI	Northampton	Education	2,500	13	-6
Verified	ME	Coastal Maine Botanical Gardens Bosarge Family Educ.	LEED, ILFI	Boothbay	Education	8,200	19	-4
Verified	VT	Putney Field House	LEED, ILFI	Putney	Education	18,800	9	0
Emerging	CT	Manchester Keeney Elementary School		Manchester	Education	57,300		

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Utility Incentives



Leverage Available Incentives

Contact Utility Company Early in Process

Buckley - ~\$267,000

Bowers - ~\$253,000

Keeney - ~\$250,000

EVERSOURCE

October 21, 2021

Christopher Till
Town of Manchester
P.O. Box 191, 321 Olcott Street
Manchester, CT, 06045

Reference: Energy Efficiency Project # CT20-P00072533 **REVISED**
Buckley Elementary School, 250 Vernon Street, Manchester, CT, 06042

Dear Christopher Till:

Congratulations on choosing to make your business energy-efficient! Eversource is pleased to present you with the details of your energy incentive for the upcoming project at your **Manchester, Connecticut facility**.

Should you decide to move forward with the project as submitted, you are eligible for a financial incentive of **\$266,789.00**.

This packet includes the following documents:

Energy Efficiency Services Letter of Agreement – Please review the document, sign both copies, and return one copy to my attention at the address noted below. **To reserve your incentive as stated, return the signed Agreement within 30 days of the signature date on the Agreement.**

Standard Terms and Conditions – In order to claim your incentive, you will need to agree to these terms.

W-9 Form – This form is necessary to process your incentive payment. Submit this completed form with your Energy Efficiency Services Agreement.

Exhibit A – The upgrades included in your project are outlined here. Information includes the energy and dollar savings estimated for each individual measure.

If you have any questions regarding this letter or the documents contained in the packet, please contact me.

Sincerely,

Jordan Schellens

Jordan Schellens
Energy Efficiency Consultant - New Construction
Eversource
107 Selden Street
Berlin, CT 06037
jordan.schellens@eversource.com
860-665-3749

EVERSOURCE

Exhibit A
Bowers Elementary School
Energy Efficiency Services Project #: CT21P00604955
January 6, 2023

Measure 1 of 1: Whole Building Energy Improvements

The incentive offer is based on an evaluation with an approved building energy modeling simulation submission by Kohler-Ronan using the 2015 International Energy Conservation Code with reference to ASHRAE 90.1 – 2013 Guidelines as energy code. The actual incentive earned will be based on the accepted as-built savings. This may require the submission of an as-built energy model simulation.

Total Estimated Incentive	\$253,782.00
---------------------------	--------------

Owner Incentives (Payable to the Owner)

Simulated Facility Gross Floor Area:	56,396
Simulated Percentage of Annual Site BTU Savings:	42.5%
Estimated incentive per square foot:	\$4.50
Proposed EUI (kBtu/SF)	15.25

Design Team Incentives (Payable to the Design Team Lead)

Design Team Incentive	\$	11,279.20
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INSTALLATION INCENTIVES (ELECTRIC)			
Estimated Measure Incentive Breakdown		Estimated Electrical Savings	
Construction Incentive *	\$197,386.00	Demand kW	Energy kWh
Post Occupancy Incentive	\$56,396.00	Summer	Annual
Total Participant Incentive	\$253,782.00	Winter	Lifetime
		229.90	3,156,371

INSTALLATION INCENTIVES (NATURAL GAS)			
Estimated Measure Incentive Breakdown		Estimated Natural Gas Savings	
Construction Incentive *	\$0.00	Demand CCF	Energy CCF
Post Occupancy Incentive	\$0.00	Winter	Annual
Total Participant Incentive		0.00	Lifetime
			0

*An overall project statement of compliance is required from an appropriate design professional that the simulation inputs and calculations are consistent with the rated performance of the equipment installed and the control methodology employed (as built).

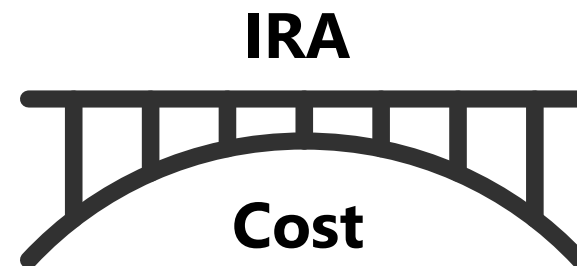
*Additional Measure Verification:

-Envelope requires a progress inspection or other verification method to confirm materials used prior to enclosure. Provide As-Built assembly description with copy of submittals of accepted materials as required to verify U values and SHGC ratings.

-Additional Measure Verification: The Participant or the Participant's design professional shall sign below stating that they have satisfied themselves that the system upgrades referenced in the Measures Requirements table are performing as intended. By signing below the Participant verifies that:

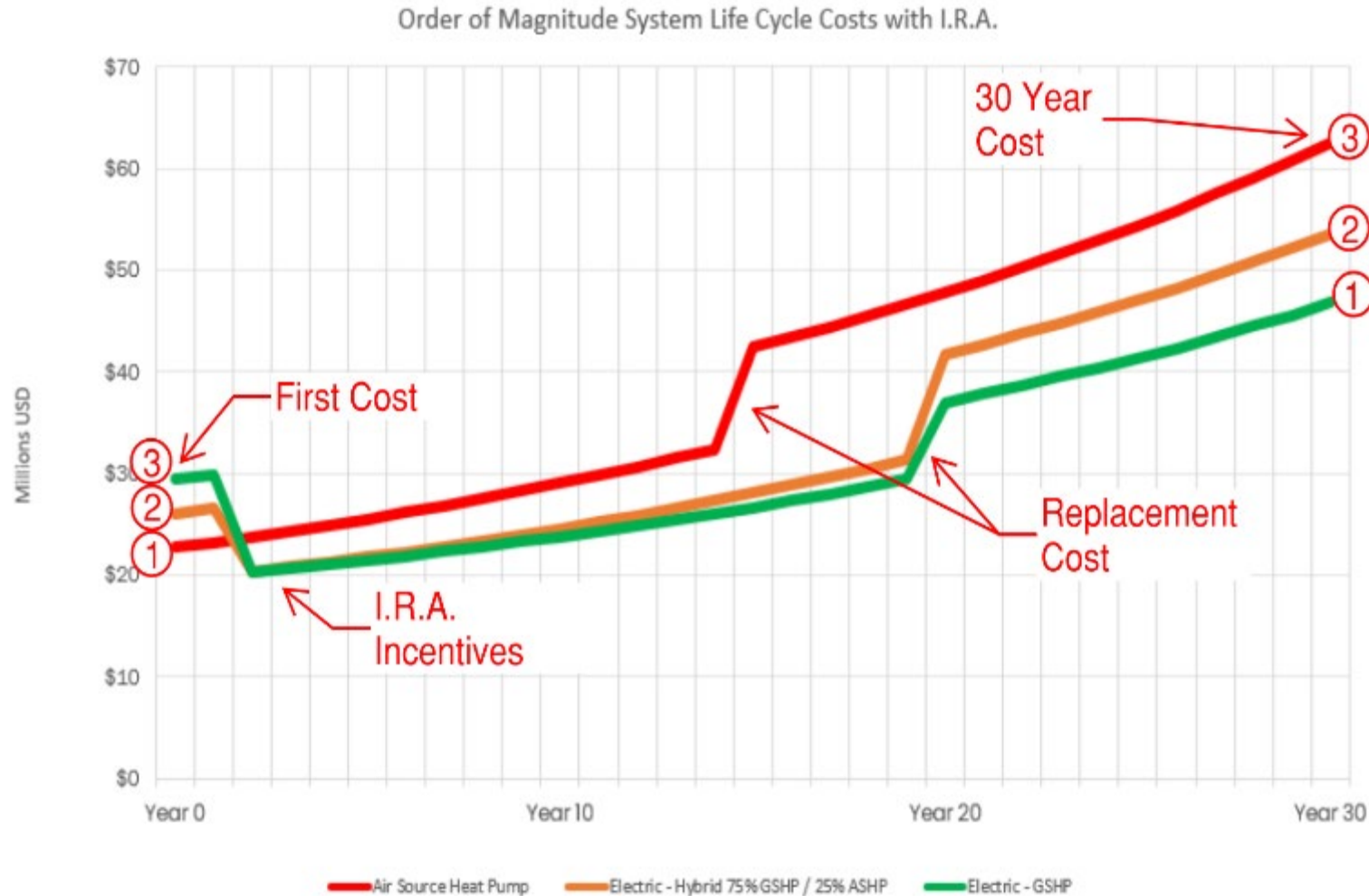
1. Verification that the design professional's documentation on how the system is intended to operate has been provided.
2. Verification of correct system installations. The systems shall be defined as any sensors, control devices, speed controllers, electrical isolation equipment required by the proposed equipment.
3. Verification that the all sensors and controls have been field calibrated and the input and output signals are documented.
4. Verification that the above named systems and equipment automatically follow the intended operation and function as designed.
5. Verification that operation and maintenance instructions have been provided.
6. Verification that the Participant's representative and/or operator has been instructed in the proper operation and maintenance of the equipment.

Clean Energy Tax Credits



Action

Clean Energy Tax Credits



75+

Clients in
Application
Phase

172M

In Targeted
Funding

Bowers - \$2,226,340

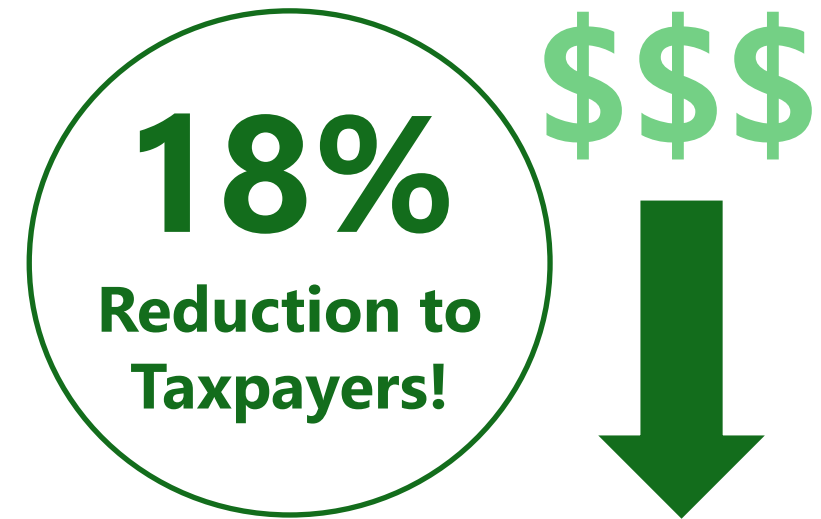
Keeney - \$2,000,000
(projected)

What Did It Cost?

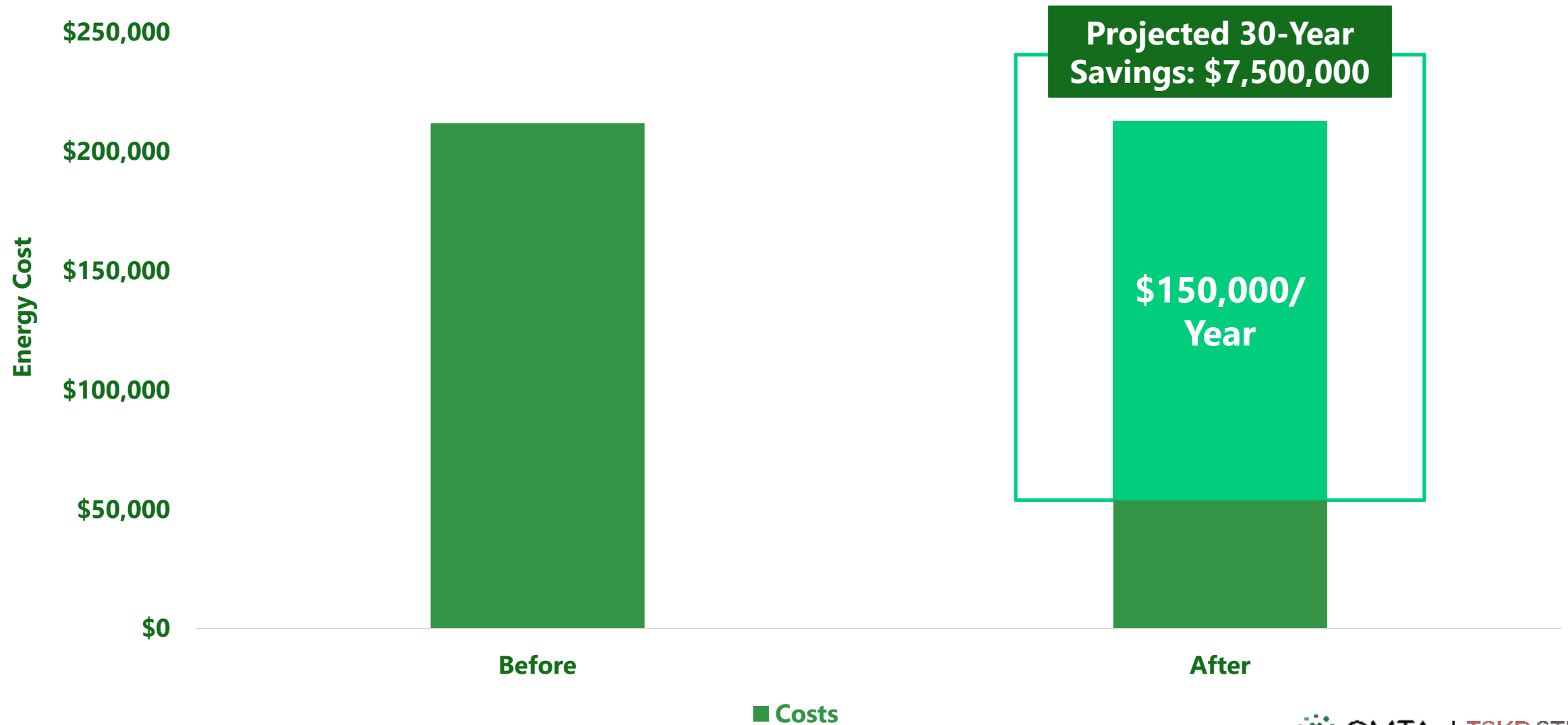
Total Budget:	\$96,300,000
Town Bonding:	\$30,640,000
State Funding:	\$63,760,000
DOE Grant:	\$1,900,000

Bid Savings:	\$1,672,183
Utility Incentives:	\$774,281
Energy Tax Credits:	\$4,226,340

➤ **Revised Bonding** **\$25,100,000**



Cost Avoidance



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Sustainability as a Teaching Tool



STEAM



STEAM



STEAM / PLAY



Buckley Elementary - Before / After



Buckley Elementary - Before / After



Buckley Elementary - Before / After



Buckley Elementary - Before / After



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Q&A

Thank You!