GREEN+ 2026
Session 5 - Energy Modeling & Why We do it

GREEN+ INITIATIVE

tacdc
Texas Association of Community Development Corporations

GREEN+ 2026

SUSTAINABLE DEVELOPMENT
10 TRAINING SESSIONS

hosted and supported by

TEXAS ASSOCIATION OF COMMUNITY DEVELOPMENT CORPORATIONS

Why Do We Need a Green CDC Training in Texas?

- Nearly one-third of Texans face high energy burdens, with low-income, minority, and rural communities disproportionately affected due to aging homes and inefficient infrastructure.
- Rising utility costs, grid upgrades, and new industrial demands like data centers threaten to worsen affordability and reliability across the state.
- While conservation and clean energy is a potential solution, public understanding is low and opinions are deeply divided along partisan lines, highlighting a need for broader education and policy focus on both supply and demand.
- Nearly 45% of households pay over $200 a month on average for summer electricity. About one-third of Texans spend 7% or more of their income on energy — surpassing the high energy burden threshold of 6%.

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Intro to Green Building and Overview of Types of 3rd Party Certifications

Session 1
Today - January 13

Designing For Resilience

Session 2
February 10th

March 29 - 31
TACDC Conference

Passive Solar Design in Texas

Session 4
April 14

Basic Energy Modeling & Why We Do It

Session 5
May 12

Renovation & Reuse: The Hidden Power of Existing Buildings

Session 6
June 9

LEED & The Living Buidling Challenge

Session 7
July 14

WELL, Fitwell, & Healthy Materials

Session 8
August 11

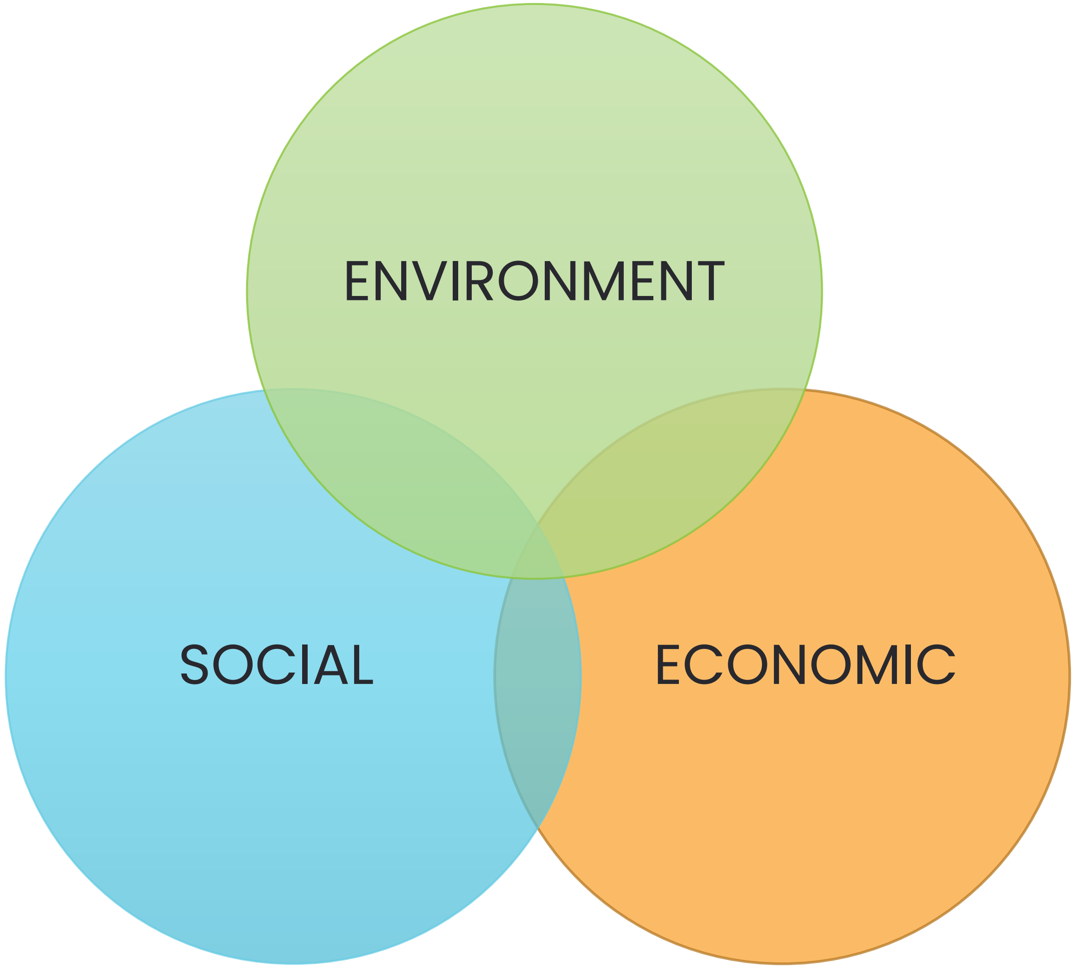
Net Zero Energy (NZE)

Session 9
September 8

Carbon/Electrification & A Year In Review

Session 10
October 13

Sustainability
Interconnection & Complexity

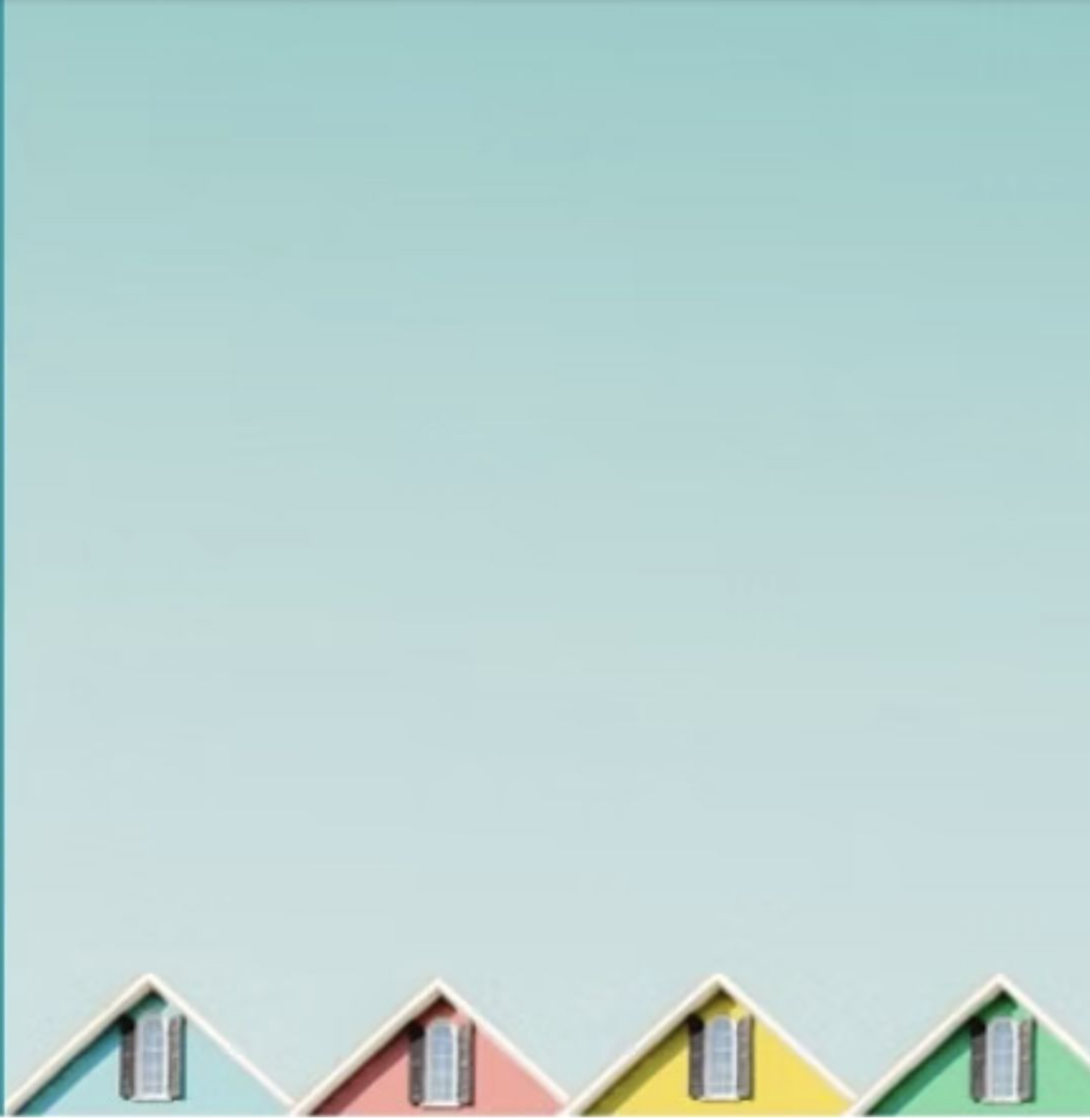


Sustainable design and green building certifications offer a comprehensive framework to create healthier, more eco-friendly, and socially-conscious communities. By embracing these principles, organizations can enhance the quality of affordable housing projects, unlock funding opportunities, and foster greater community well-being. The journey towards a more sustainable future starts with taking the first steps to incorporate these practices and certifications into your development plans.

Basic Energy Modeling & Why We Do It

May 12

Energy modeling is a simple but powerful tool to inform design decisions and highlight opportunities for improved performance. This session will introduce the basics of energy modeling and explain how it helps architects, engineers, and owners evaluate different design options. We'll focus on how modeling can guide conversations about efficiency, reveal strategies with quick paybacks, and support smarter choices early in the process. Attendees will gain an understanding of why investing in this step with their design team leads to more affordable and sustainable projects over time.



Presenters

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LAKE | FLATO

Agenda

1. What is energy modeling? Why is it important?

2. Typical Tools used for Energy Modeling

3. The Process of Energy modeling (per type of project)

4. Case Studies

5. Summary of Benefits

6. Q&A / Discussion

Agenda (Notes Version)

1. What is energy modeling? Why is it important? - General intro slide
2. The Process of Energy modeling (per type of project)
   a. Each goes through our approach (2-4 slides each)
3. Typical Tools used for Energy Modeling (one slide showing a few - IES, Trane Trace, Sefaira, Autodesign insight, Open studio / energy plus - DOE website)
4. Project Gains / Benefits (one slide)
5. Case Studies
   a. Kate 2 case studies
   b. Adam:
      i. Airport case study too detailed for this audience. No Affordable housing energy models. Looking into a residential home energy model. Speak to the progress and early energy modeling.
   c. Beth: Library case study
6. Q&A / Discussion

What is is energy modeling?

Building Energy Modeling (BEM) is a computer-based, physics-driven simulation that predicts a building's energy consumption, costs, and performance during the design phase. It allows architects and engineers to optimize the building envelope (aka insulation and windows), HVAC, lighting, and other electric loads to meet code compliance, enhance efficiency, and / or reduce carbon emissions.

Key Aspects of Energy Modeling in Building Design

- **Performance Optimization:** Evaluates tradeoffs between design options (e.g., window-tall ratios, insulation levels) to minimize energy use while ensuring occupant comfort.
- **HVAC Design:** Helps mechanical engineers evaluate different systems and design efficient HVAC systems.
- **Regulatory / Codes or 3rd Party Green:** Used to verify compliance with energy codes (like ASHRAE 90.1) and to achieve green building certifications such as LEED.
- **Cost Analysis:** Enables Life Cycle Cost Analysis (LCCA) to compare the upfront construction costs with long-term operational energy savings.
- **Simulation Scenarios:** Models unique factors like building orientation, occupancy schedules, and local weather data for accurate performance

Performance Optimization

Evaluates tradeoffs between design options (e.g, window ratios, insulation levels) to minimize energy use ensuring occupant comfort.

HVAC Design

Helps designs mechanical engineers evaluate differemt systems and design efficient HVAC systems.

Cost Analysis

Enables Life Cycle Analysis to compare the upfront construction costs with longn- operational energy savings.

Simulation Scenarios

Buildins unique factorring schedules, oocuouics, and local weather data for accurate performance

Why is it Important?

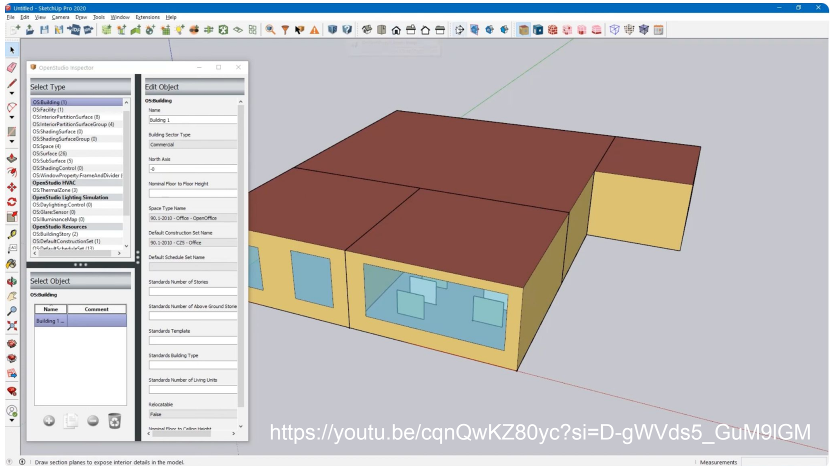
Energy modeling augments best practices with tangible data. It allows teams to test a building's performance virtually before construction begins, identifying flaws and optimizing systems when changes are still inexpensive.

- **Cost Reduction:** Modeling can reduce total lifecycle costs by 20% to 30%. It helps "right-size" expensive HVAC equipment, potentially lowering upfront capital expenses.
- **Risk Mitigation:** It acts as a "design-assist" tool to ensure buildings meet evolving energy codes (like ASHRAE 90.1) and avoid costly mid-construction redesigns.
- **Occupant Comfort:** Beyond energy, models predict indoor environmental quality, including daylight levels, humidity, and thermal comfort.
- **Environmental Impact:** With the building industry accounting for roughly 40% of global energy consumption, modeling is essential for meeting carbon neutrality and net-zero goals.
- **Third Party Certification:** It is a required component for obtaining high-value green certifications like LEED, Living Building, or Green Globes.

Typical Tools used for Energy Modeling

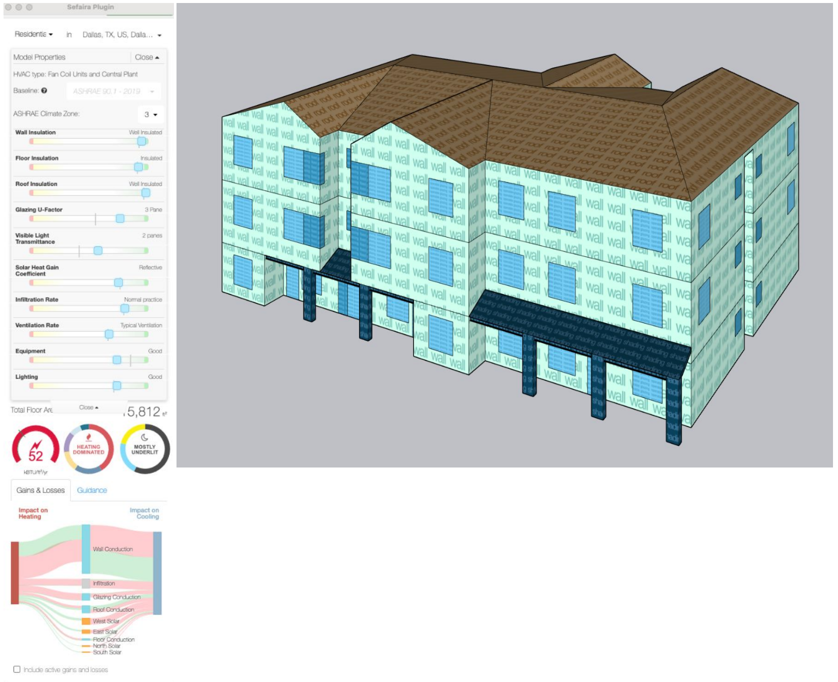
Open Studio / Energy+ is an **open-source and graphical interface** that **facilitates building energy modeling**, acting as a **user-friendly front-end for the EnergyPlus simulation engine**.

EnergyPlus is a free simulation engine from the US Dept of Energy. Together, they allow users to create 3D geometries **(via SketchUp)**, define HVAC systems, and simulate energy usage using EnergyPlus, while OpenStudio streamlines input management and results visualization.



Sefaira is a **cloud-based, real-time building performance analysis tool** that **enables architects** and engineers **to quickly simulate energy**, carbon, and daylighting during the early stages of design. It **acts as a plugin for SketchUp and Revit**, using industry-accredited engines (EnergyPlus/Radiance) to provide fast, actionable feedback on design decisions.

It also directly links to the AIA's DDX which the platform used to report for the AIA 2030 Commitment.

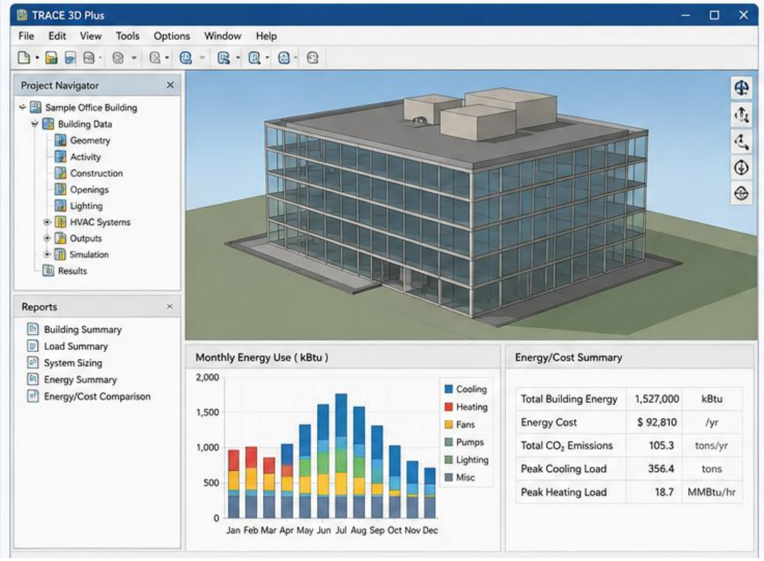


Typical Tools used for Energy Modeling

Trace 3D Plus is an intuitive building **simulation tool focused on HVAC load calculations, system modeling, and energy analysis.**

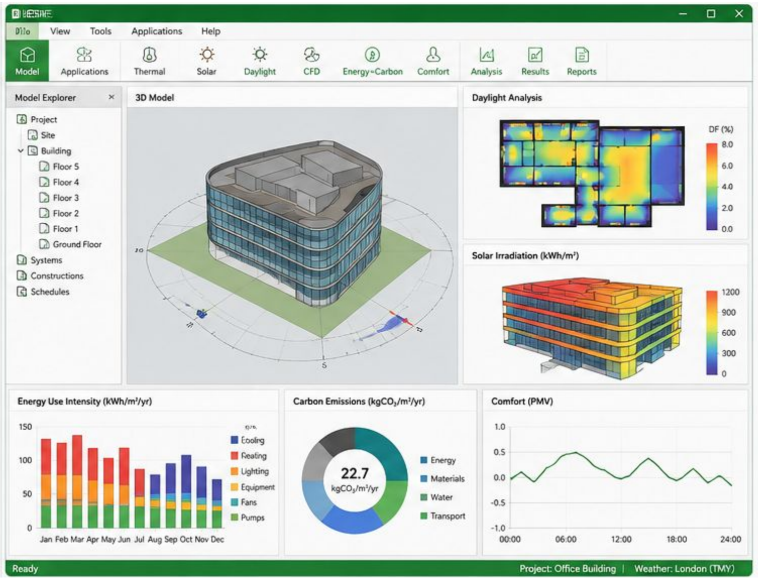
It is widely **used for sizing HVAC systems and comparing energy use**, operating costs, and carbon emissions across design options. The software offers a user-friendly interface with wizards and templates that streamline the modeling process.

It integrates well with Trane equipment and provides detailed reports to support engineering decisions. **TRACE is ideal for engineers** who need fast, reliable results for HVAC design and system optimization.



IESVE is a **comprehensive building performance simulation** platform that evaluates energy, daylight, solar, airflow, and more. It supports a **wide range of analyses** including **thermal comfort, natural ventilation, dynamic shading, and carbon assessments.** The software enables integrated design by connecting performance insights across the whole project lifecycle.

IESVE helps designers **achieve compliance with green building standards and drive low-carbon,** sustainable design. It is **ideal for complex projects where multidisciplinary analysis** and decarbonization strategies are required.



The Process of Energy modeling - per types of project

- **Small Projects -** ***in-house energy modeling will likely not be built-in*** to the fee, so be sure to ask for this service when defining the scope of work
- **Small Firms or Sole Proprietors -** some may not have the know-how to do energy modeling in-house, in which case you may ask them about this, and suggest they hire a sustainability consultant or encourage them to have the MEP engineer include this in their scope of work.
- **Medium / Large Firms -** larger firms ***might*** have the know-how to do energy modeling in-house, but it is best to confirm and ask them how many models they typically run, and if this is an add service and ***most prefer*** to engage with an MEP engineer to run the model(s)
- **MEP Energy Models -** MEP engineers ***should*** have the know-how to do energy modeling, but it is best to confirm and ask them how many models they typically run per project, and if this is an add service. *commodity, regulated, heavy-commercial…
- **Clarify the Goal!** - Be sure to clarify with the Design Team up front, what you want the energy model for.. i.e. to study design for optimization, for LEED, or to get to NET Zero? The answer will guide the design team as to which type of energy modeling you will need.
- **Third Party Certification:** It is a required component for obtaining high-value green certifications like LEED, Living Building, or Green Globes.

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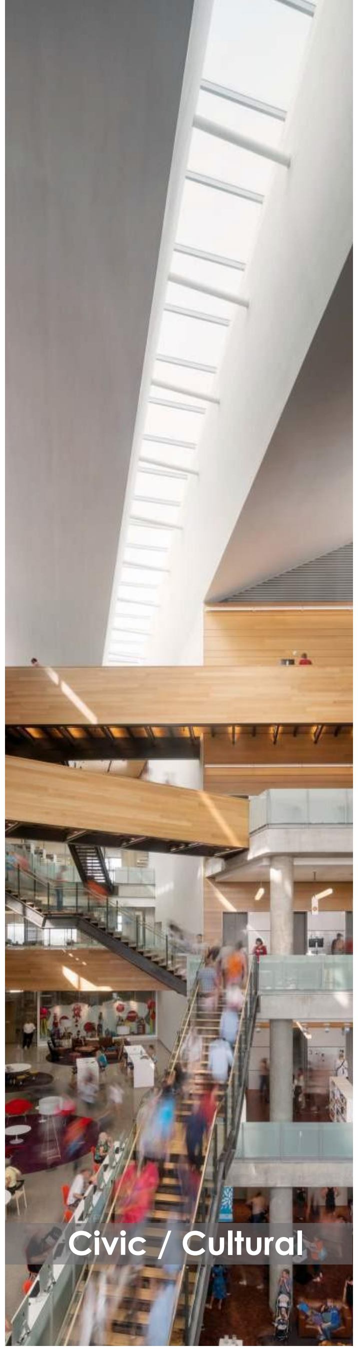
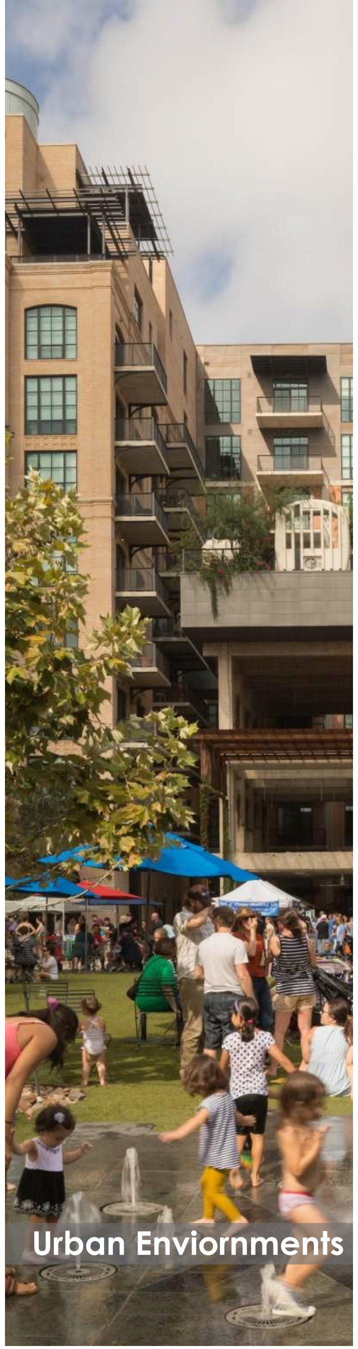
Custom Residential


Eco-Conservation


Independent Schools

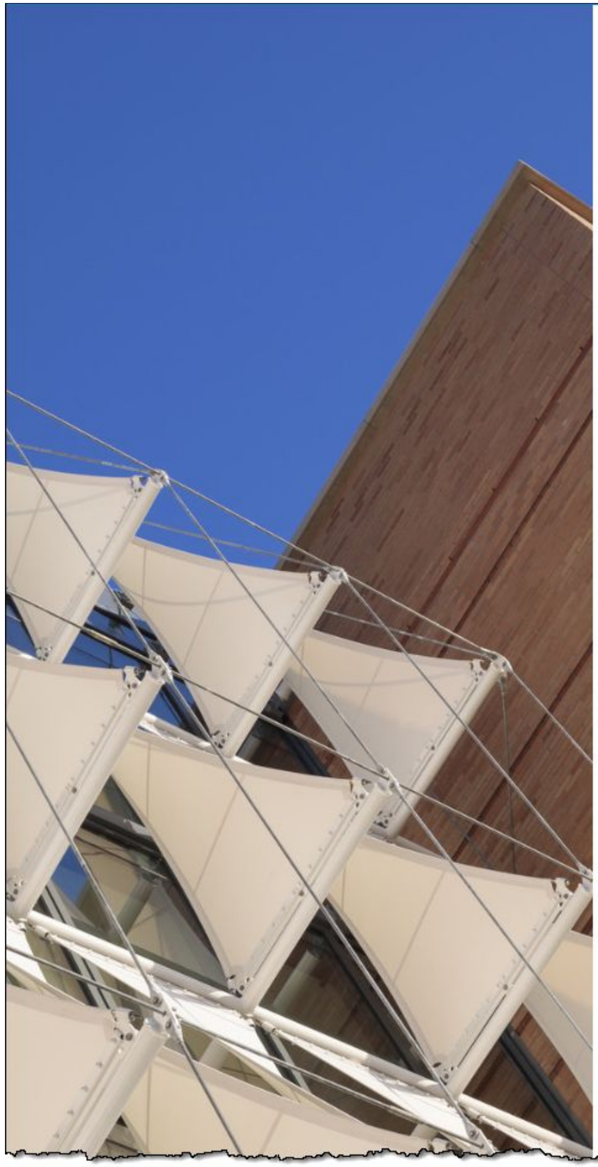

Civic / Cultural


Higher Education


Urban Enviornments

Lake Flato's Approach: Commitment to Firm-wide Energy Reduction

AIA 2030 COMMITMENT YR 15 REP



OBJECTIVE 3.B

ACHIEVE NET-ZERO ENERGY BY 2030 AND REGENERATIVE ENERGY BY 2050

L|F BASE:

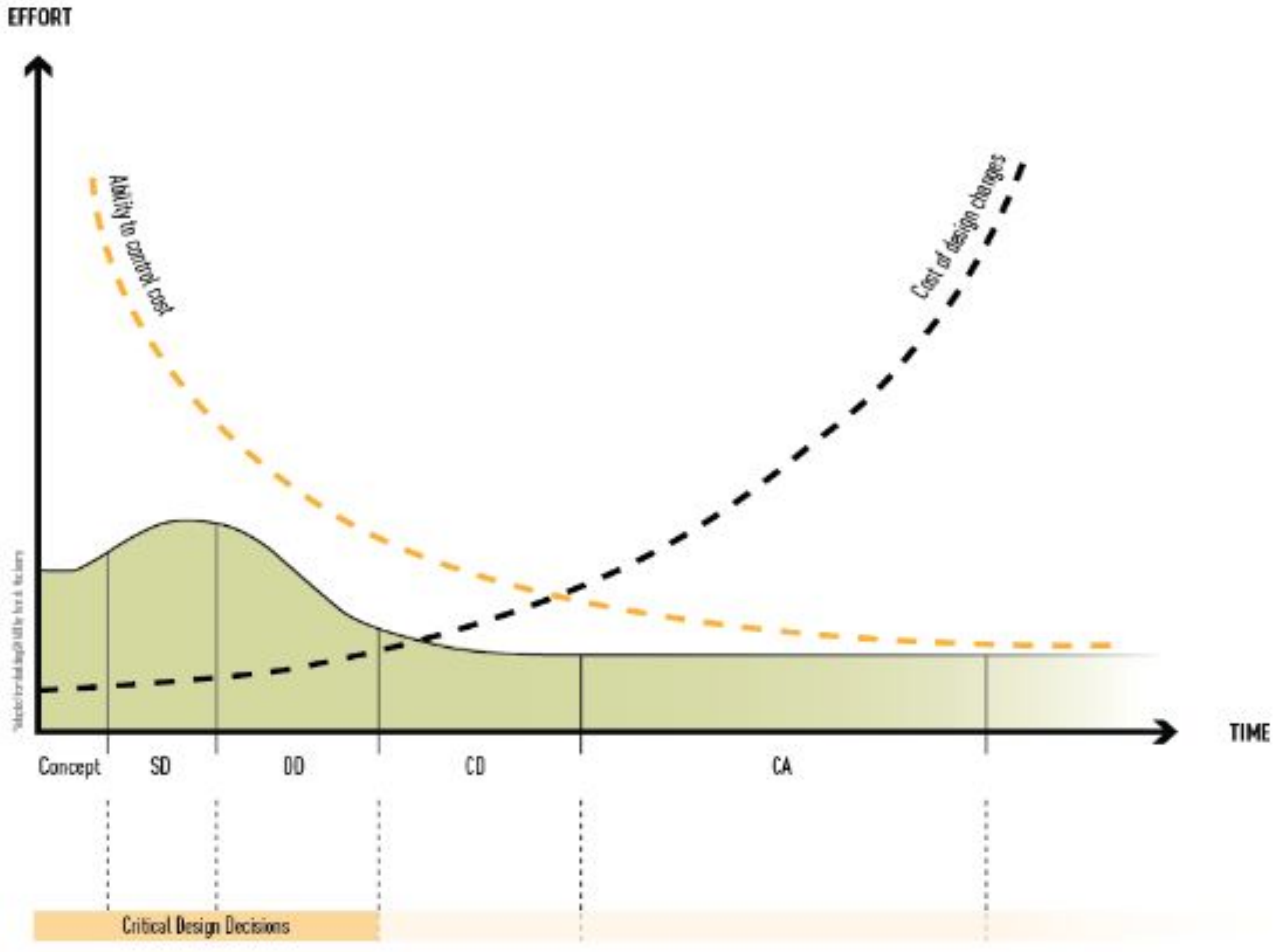
- **Establish** an energy use intensity baseline (EUI) from a benchmarked regional building of the same type. [1]
- **Achieve** AIA 2030 Challenge targets as they progress over time. As of 2022, meet an 80-90% annual energy reduction from a baseline after accounting for on-site renewable power. Achieve 100% annual energy reduction by 2030. [1]
- **Maximize** climate-specific passive strategies to minimize energy consumption and peak loads.
- **Collaborate** with consultants to optimize the building envelope and HVAC design.
- **Conduct** early and iterative energy modeling throughout the design process. [12]
- **Conduct** a renewable energy potential analysis, such as photovoltaics, and share results with the client.
- **Design** to be solar-ready and all-electric. [4] [12]

L|F REACH:

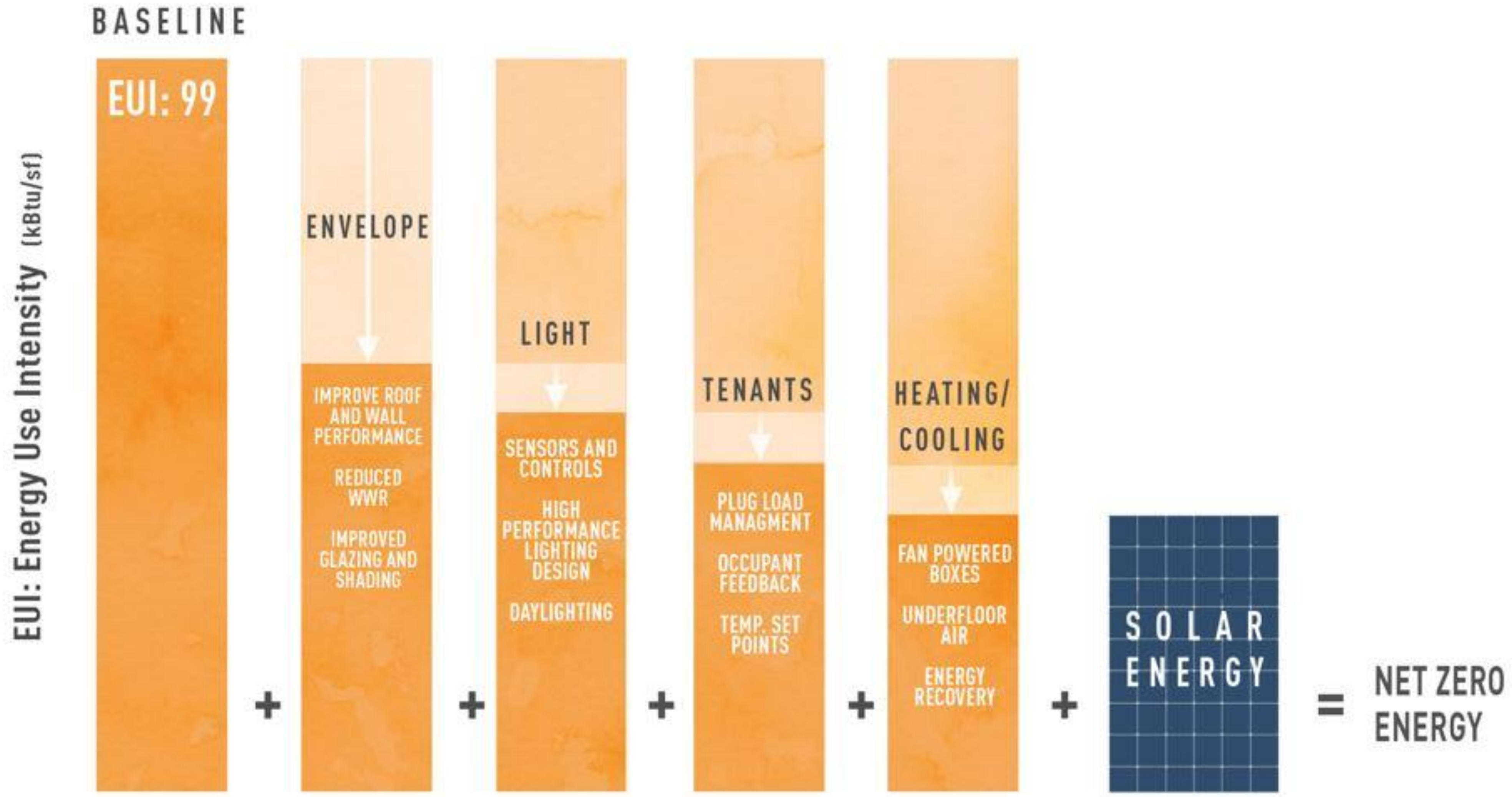
- **Achieve** annual net-positive energy use. [4]
- **Conduct** post-occupancy energy metering to confirm and further reduce energy after construction.
- **Conduct** building commissioning to ensure quality assurance. [12]
- **Offset** remaining operational carbon impact using third-party verified certifications. [12]
- **Generate** energy without combustion. [4]

Lake Flato's Approach: Integrated design and energy-focus from the start

Lake Flato's Approach: Upfront investing saves time and money



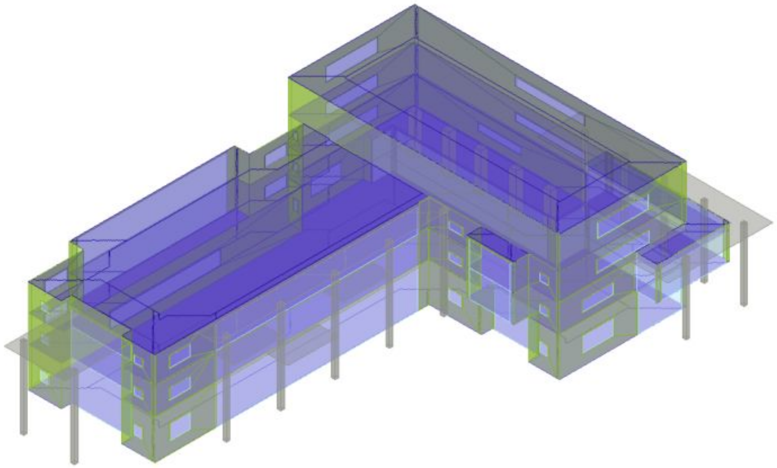
Lake Flato's Approach: Passive, Active, then Renewables



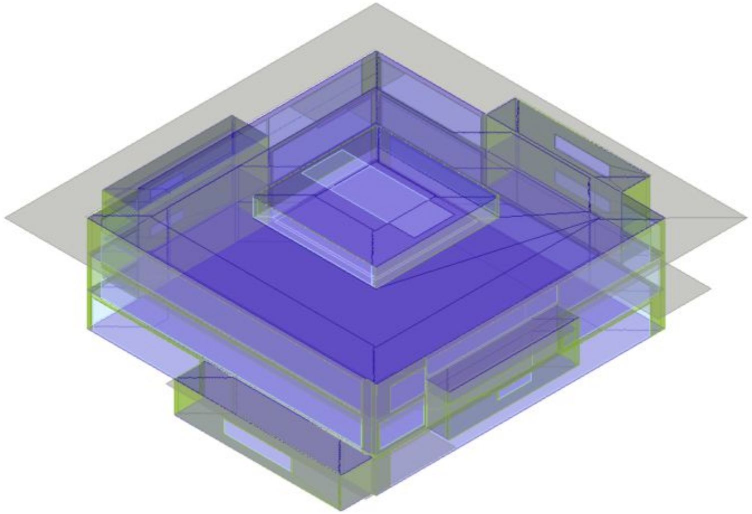
Case Study #1 – In House Modeling: Comparing Three Designs

University Project Concept Study

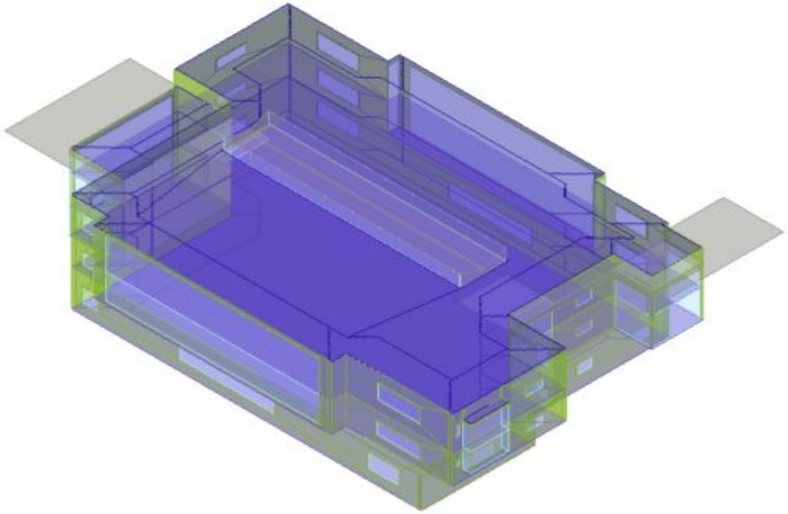
Option 1



Option 2



Option 3



Goal: Passive regional climate considerations and passive strategies first (orientation, window placement, shading, form and floor depth, etc), then active strategies

Case Study #1 – In House Modeling: Comparing Three Designs

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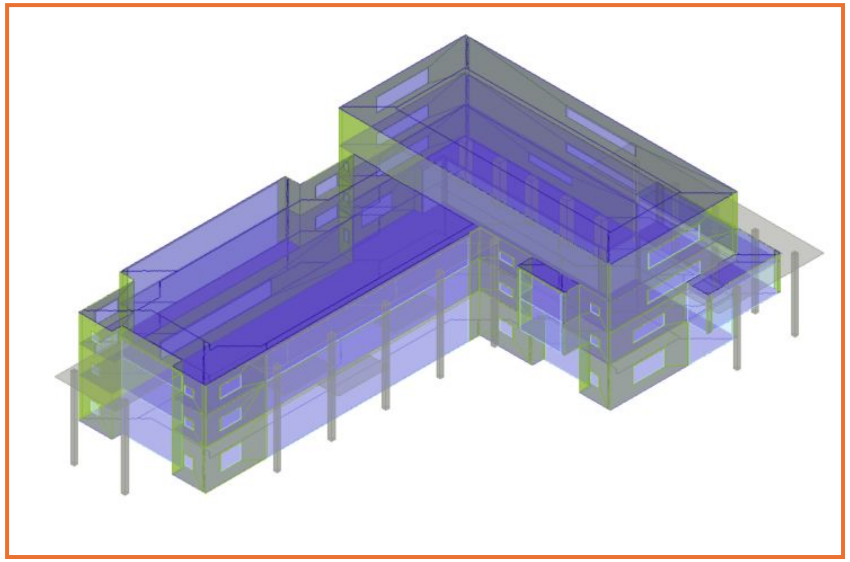
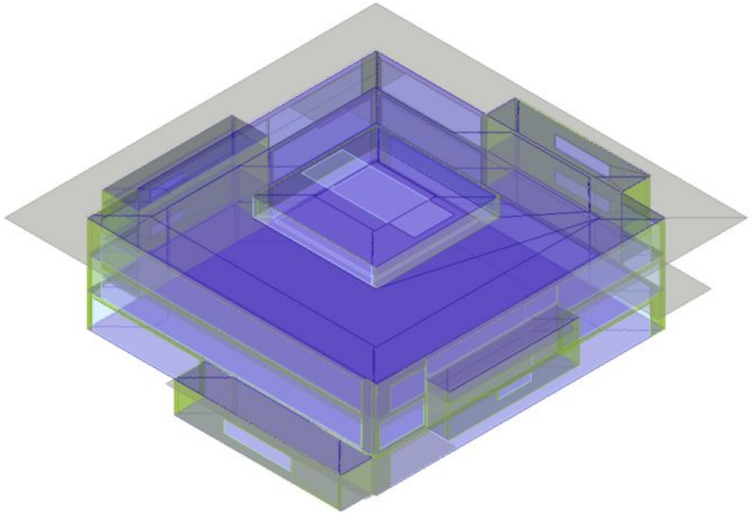


Option 2



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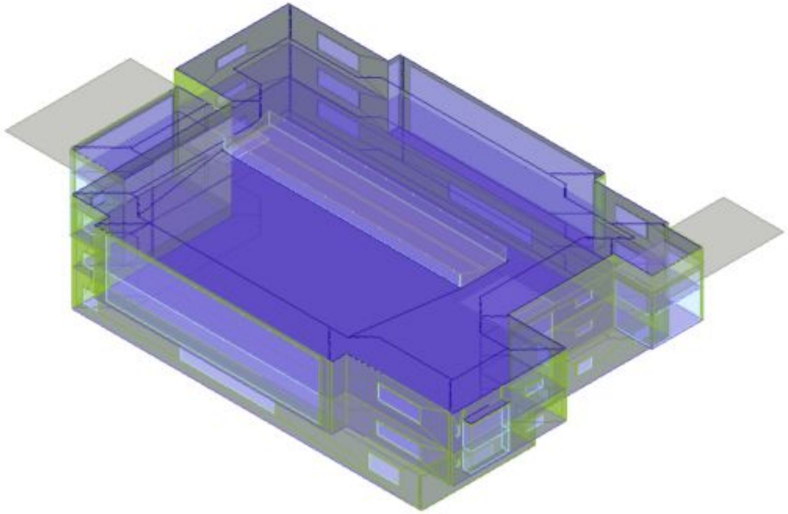
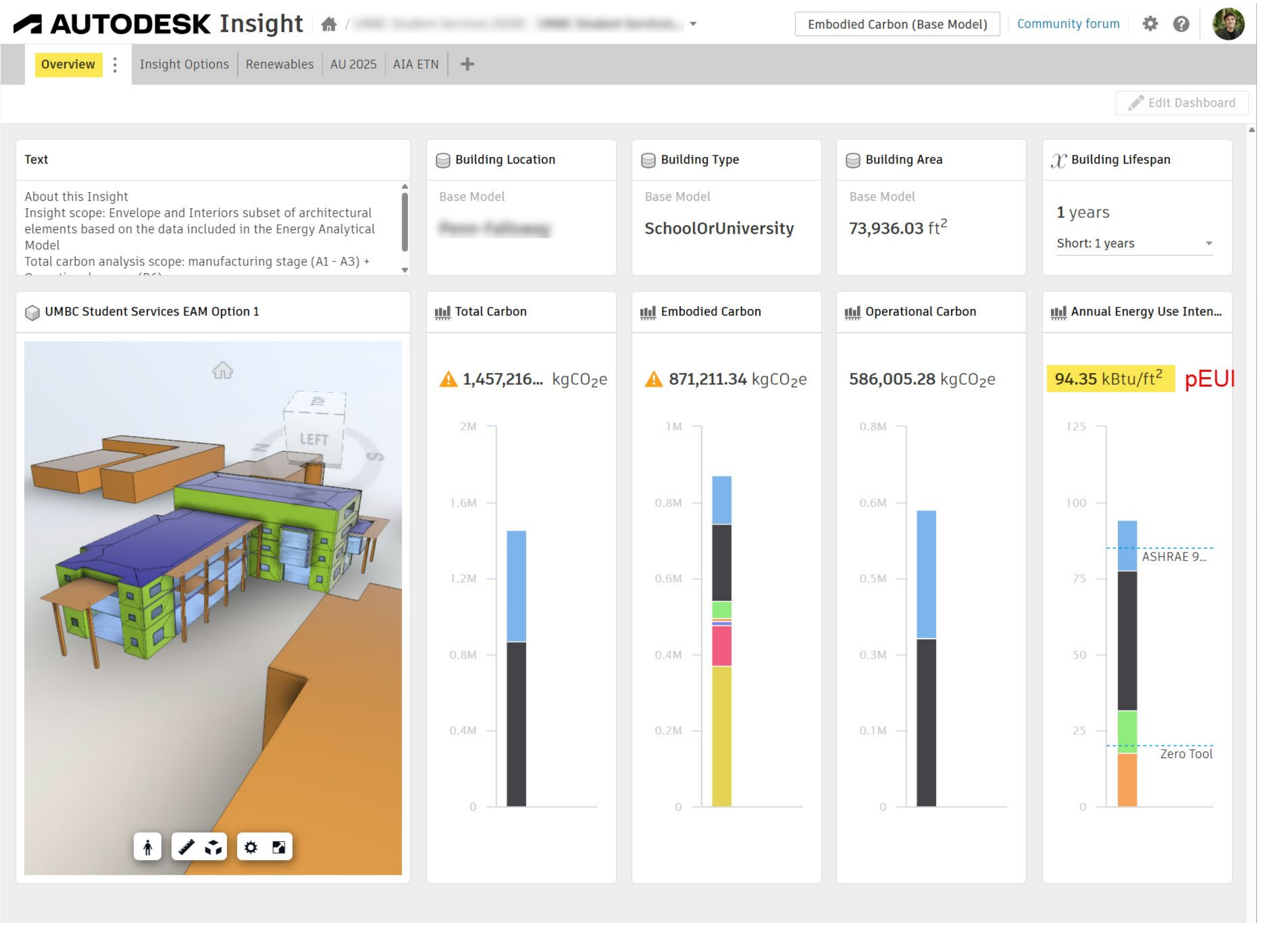
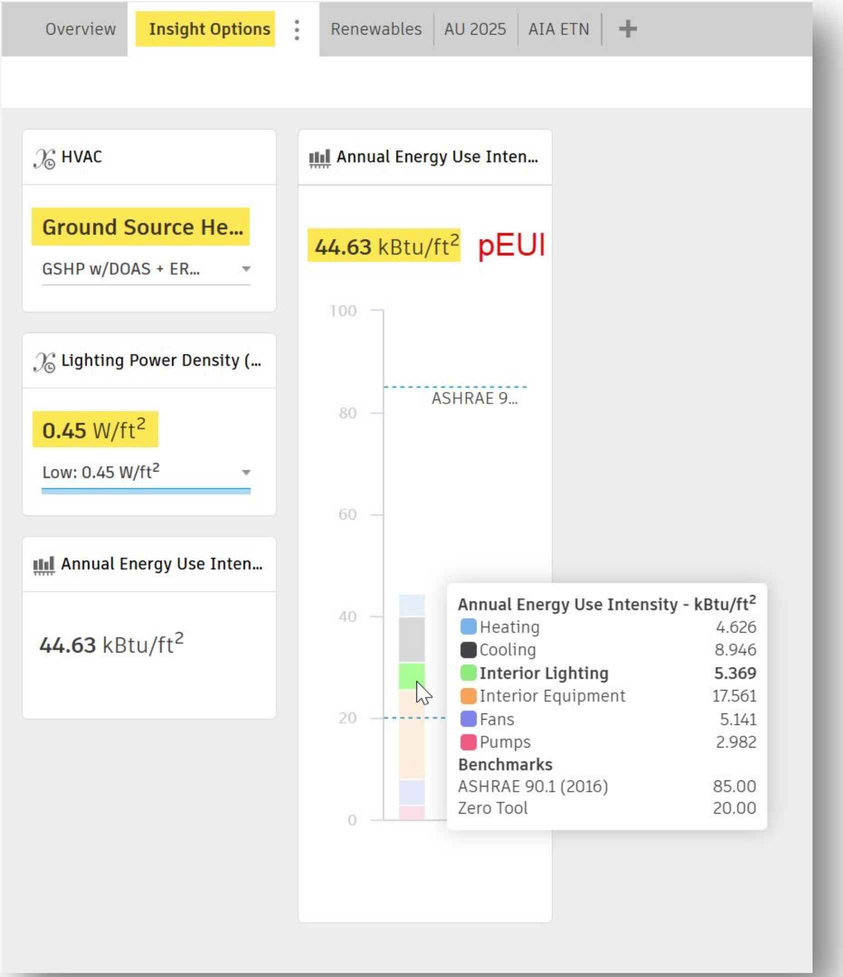


***The L-shaped form** allowed for slightly lower energy use through self-shading geometry, narrower floor plates that improve daylighting and reduce lighting loads, increased natural ventilation potential, and orientation-responsive window placement that minimizes excessive heat gain.*

Case Study #1 – In House Modeling: Results

Exploring HVAC and LPD options in Autodesk Insight





Biggest energy saving strategies: high performance envelope, efficient HVAC and set points, reduced lighting and plug loads, airtight envelope, hot water efficiency,

Case Study #1 – In House Modeling: Modeling Solar Potential

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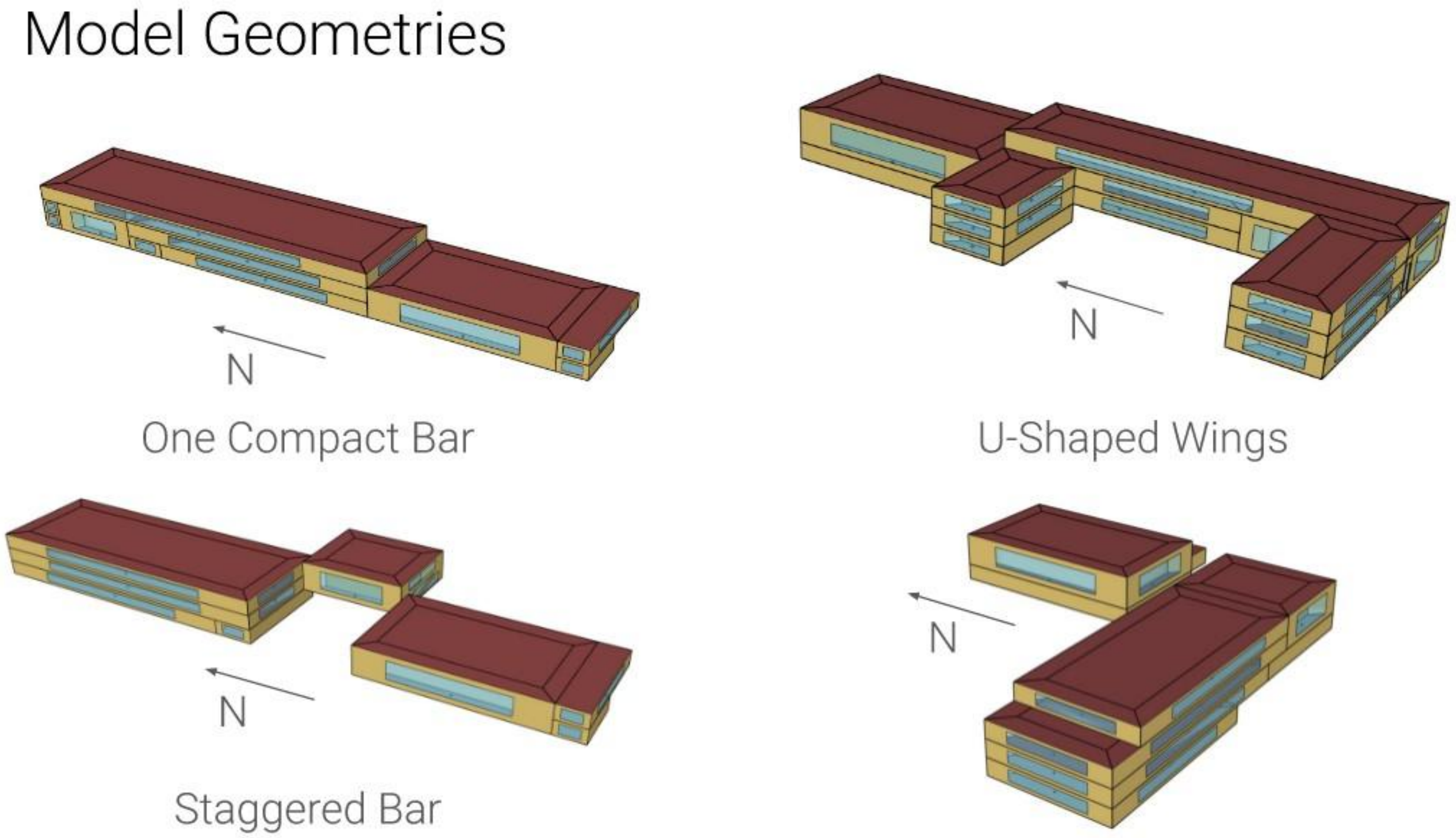
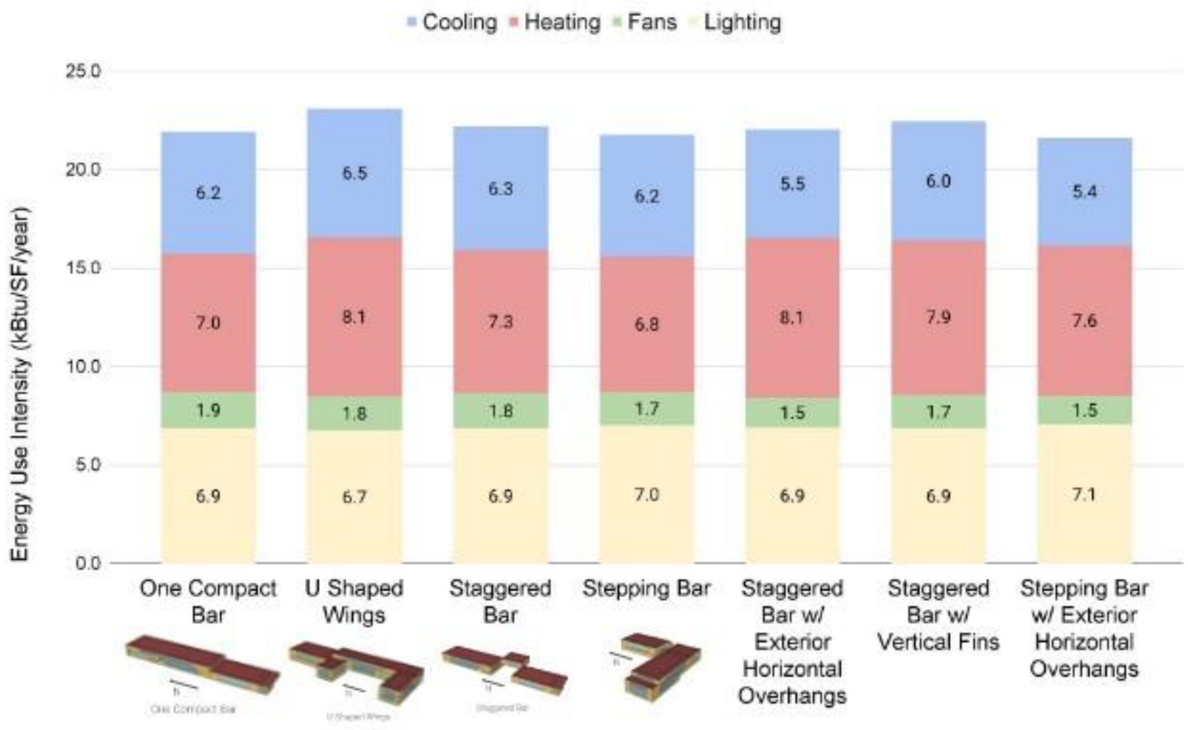
Case Study #2 – Outsource MEP Modeling: Design Options



Case Study #2 – Outsource MEP Modeling: Design Options

Box Model Energy Analysis



Peak Cooling Load (tons)	99	121	98	118	97	97	117

Key Takeaways

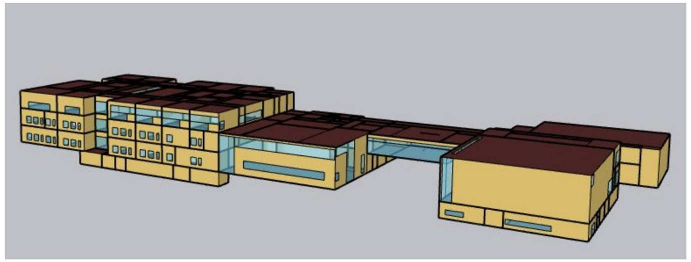
Horizontal overhangs reduce the annual cooling energy by ~15%.

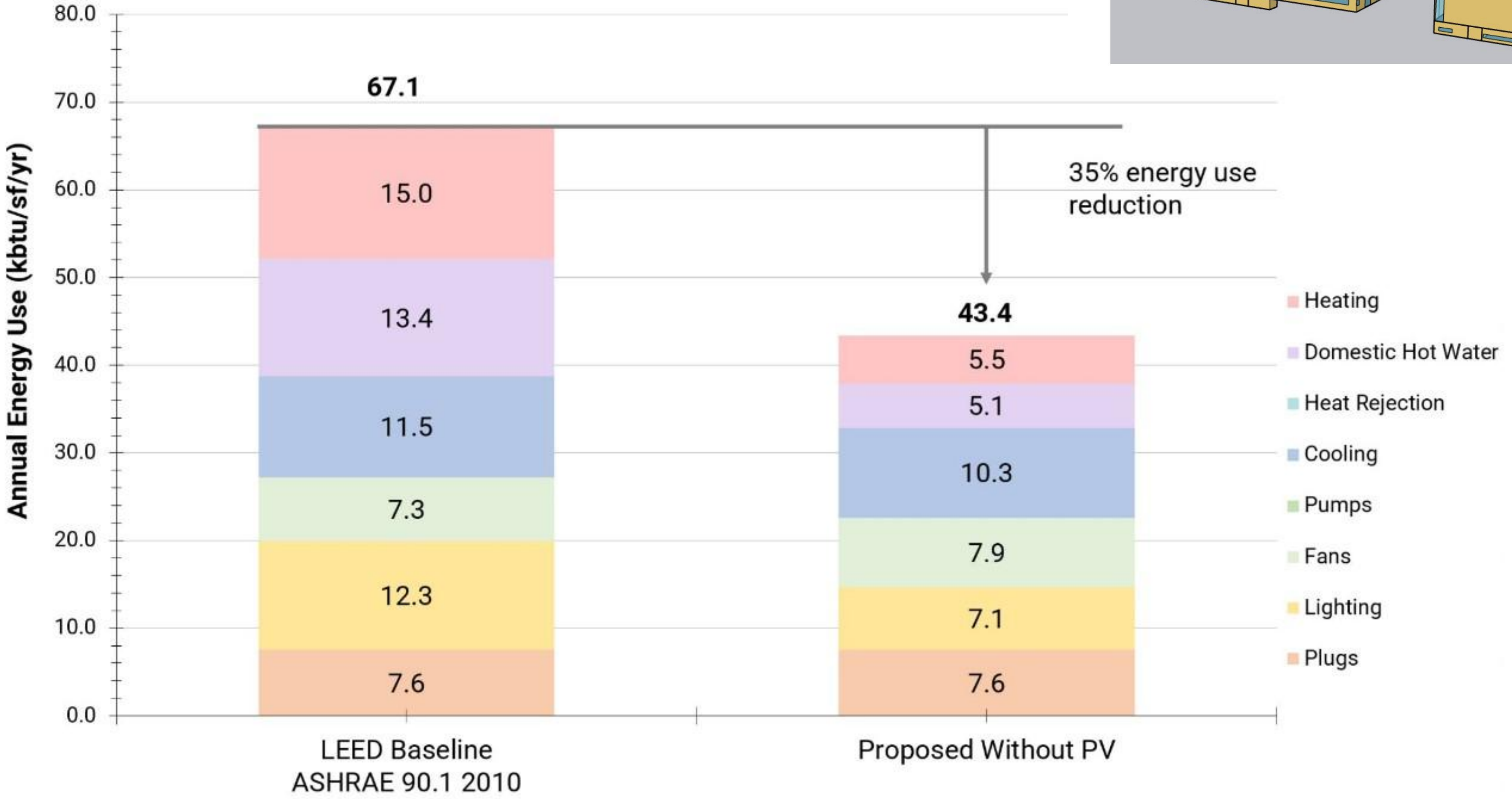
The U Shaped Wings has the highest HVAC energy due to greater skin area, but the lowest lighting energy.

The Stepping Bar with Horizontal Overhangs will use the least energy overall.

Case Study #2 – Outsource MEP Modeling: Energy Reduction Results

Energy Use Comparison





Projected PV Generation

Power Rating = 490.4 kW

Annual Energy Generation = 639.7 MWh

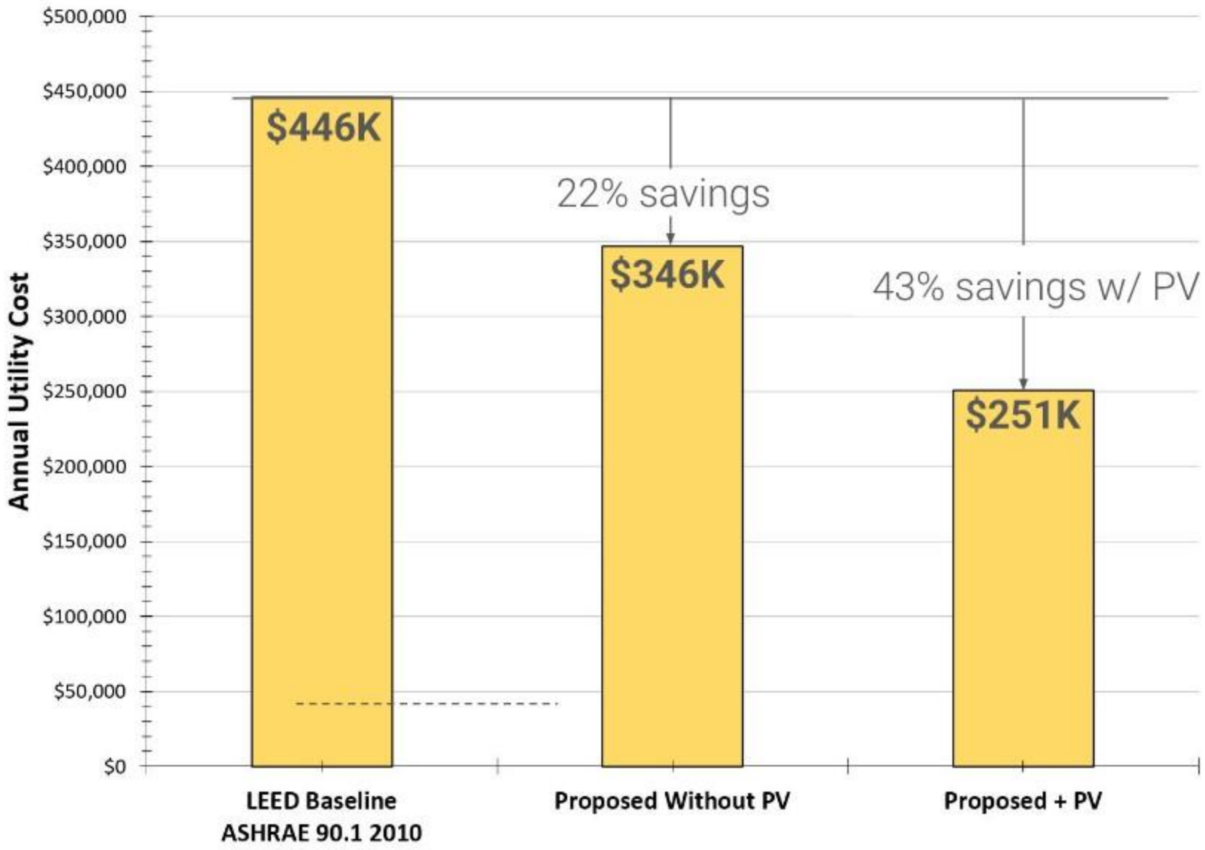
Module: Canadian Solar, CS6R-445H-AG (1500V) (445W)

Inverter: Sunny Tripower 24000TL-US (SMA)

POINTENERGY INNOVATIONS

Case Study #2 – Outsource MEP Modeling: Cost Savings

LEED Energy Cost Savings Comparison



Estimated Blended Electricity Rate (actual rate will depend on agreement with utility)
$0.15 / kWh

Without PV
EAc2: 9 Points

With PV
EAc2: 16 Points
+3 additional points for renewable energy credit

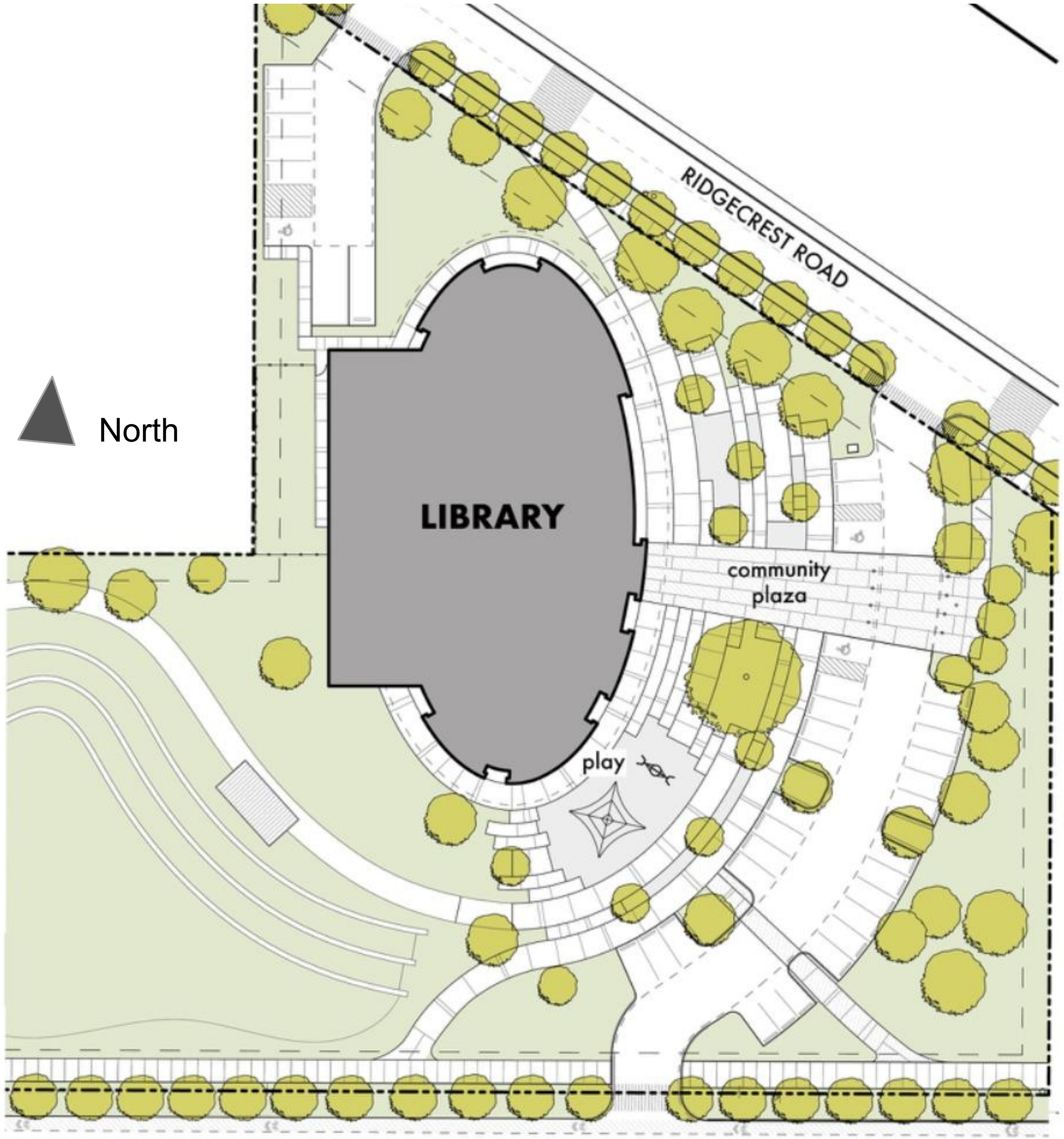
Notes: 20% safety factor is included in the LEED point estimate given the early stage of design.
PV Cost savings is per LEED calculation method and does not reflect the actual expected energy cost for the school, given the elimination of net energy metering in Arkansas.
Points are estimated assuming LEED V4 Schools category for the Optimize Energy Credit.

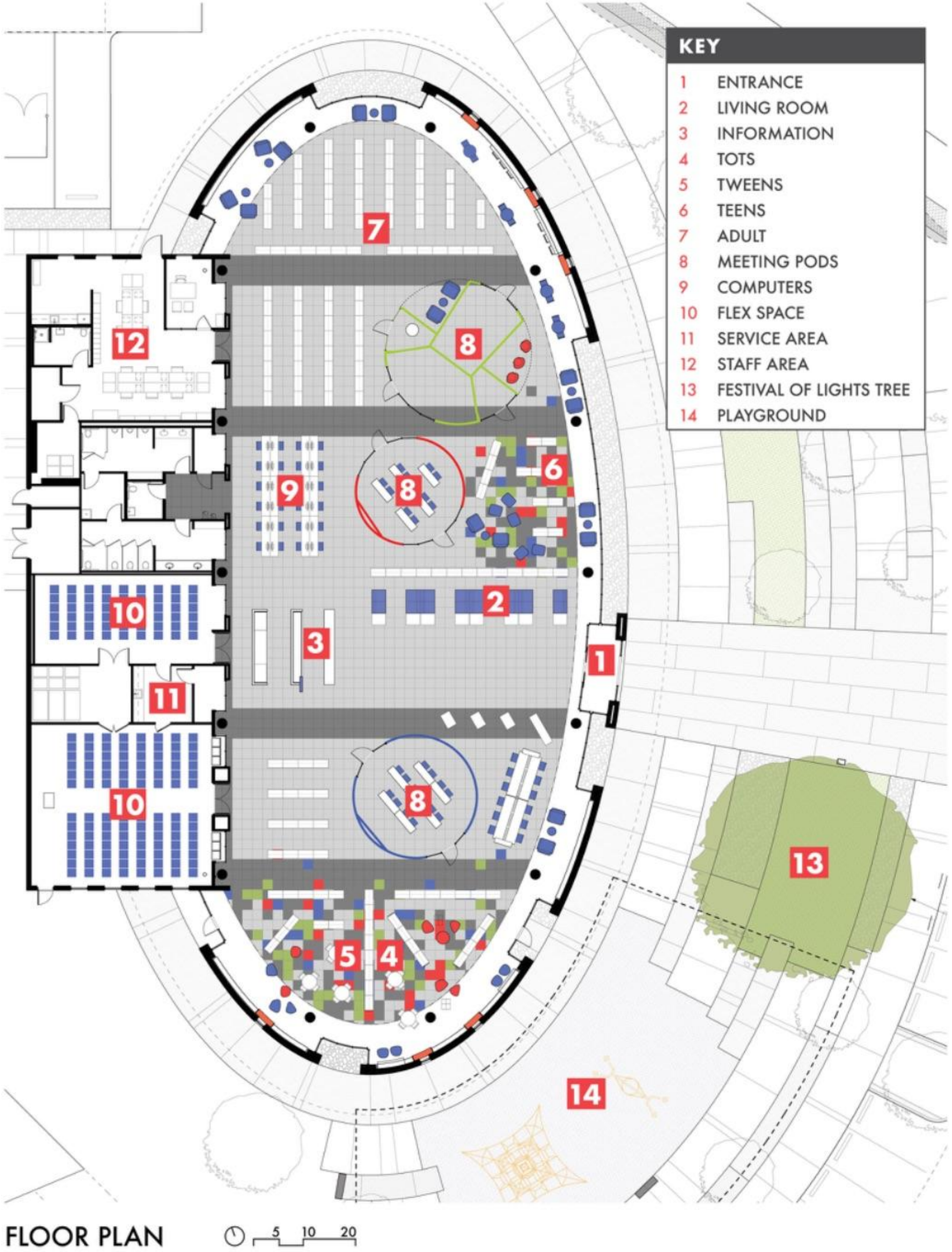
POINTENERGY INNOVATIONS

Case Study #3 - MEPCE - Energy Modeling & Adam's House

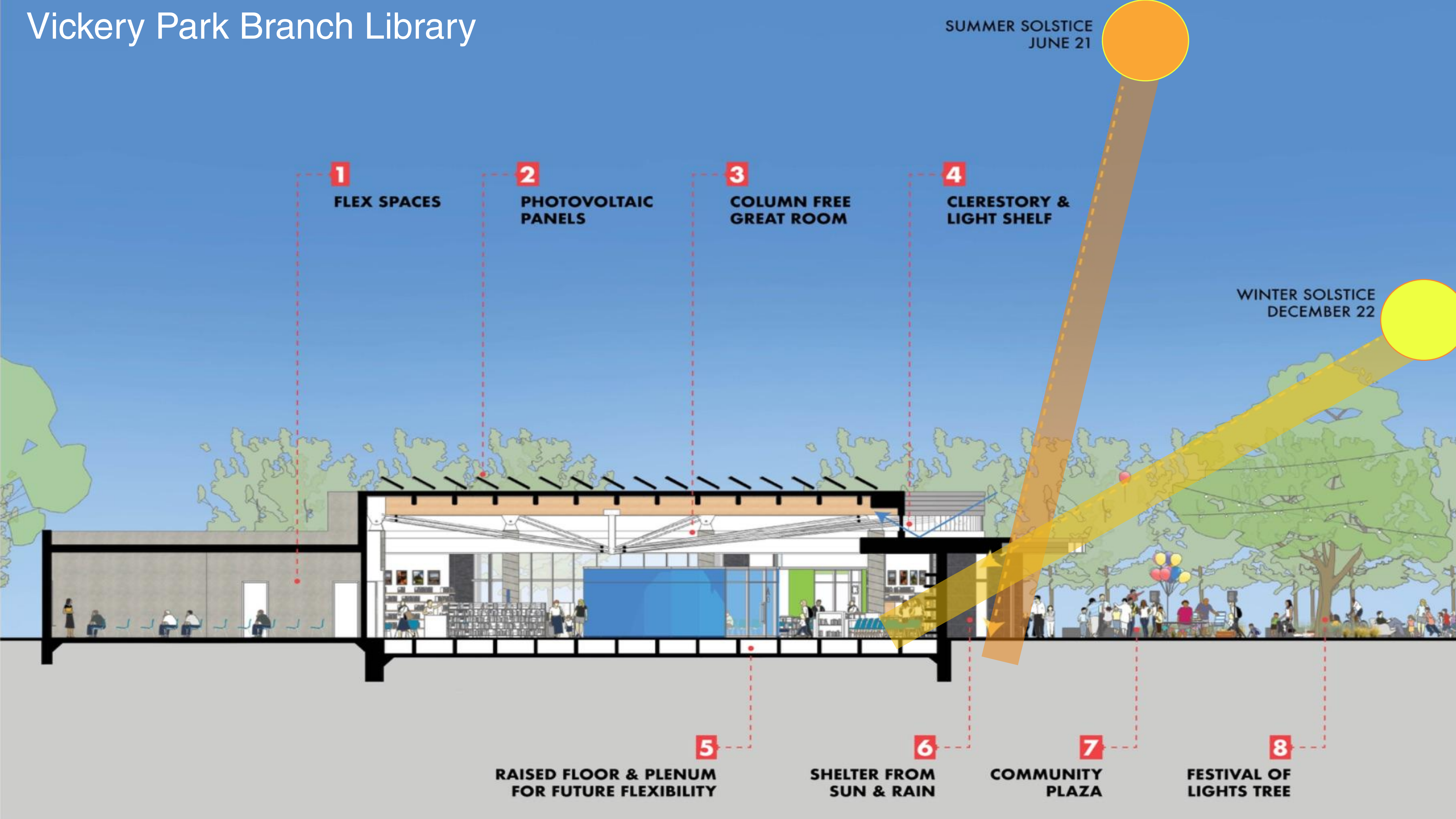
Case Study #4 - Vickery Park Branch Library

Vickery Park Branch Library





Vickery Park Branch Library



DSGN in-house energy model

MEP's TRACE 700 energy model for LEED

MEPCE

Energy Performance Evaluation
1833 Vickery Meadows Branch Library

Key Values

General Project Data
Project Name: Vickery Meadows Branch ...
City Location: Dallas
Latitude: 32° 47' 0" N
Longitude: 96° 49' 0" W
Altitude: 0.00 m
Climate Data Source: USA_TX_Da..._TMY3.epw
Evaluation Date: 1/29/19, 10:15 AM

Building Geometry Data
Gross Floor Area: 18445.98 sq ft
Treated Floor Area: 17785.04 sq ft
External Envelope Area: 5316.43 sq ft
Ventilated Volume: 141881.48 cu ft
Glazing Ratio: 3 %

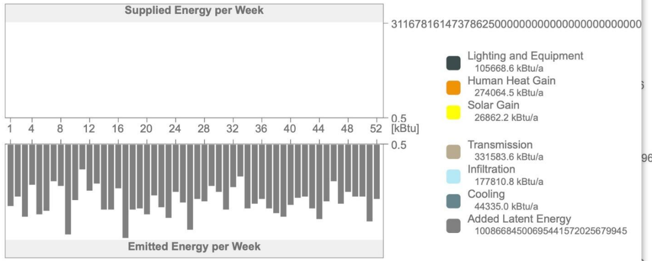
Building Shell Performance Data
Infiltration at 50Pa: 0.52 ACH

Thermal Resistances	R value	[sq ft,F,hr/Btu]
Building Shell Average:	9.75	
Floors:	38.00 - 2.21	
External:	20.00 - 2.99	
Underground:	--	
Openings:	2.69 - 1.51	

Specific Annual Values		
Net Heating Energy:	0.00	kBtu/sq fta
Net Cooling Energy:	2.49	kBtu/sq fta
Total Net Energy:	2.49	kBtu/sq fta
Energy Consumption:	8.43	kBtu/sq fta
Fuel Consumption:	6.58	kBtu/sq fta
Primary Energy:	22.86	kBtu/sq fta
Fuel Cost:	46.04	USD/sq fta
CO_2 Emission:	1.45	lb/sq fta

Degree Days
Heating (HDD): 2230.07
Cooling (CDD): 2937.43

Project Energy Balance



Thermal Blocks

Thermal Block	Zones Assigned	Operation Profile	Gross Floor Area sq ft	Volume cu ft
101 Reading Room / Library	1	Library (open stac...	12785.77	100545.20
113 Auditorium	1	Lecture room, aud...	1331.87	9933.59
127 Staff Work Area	1	Personal office	1300.29	9599.63
118 Restrooms	1	Toilets and sanitar...	654.39	4834.51
117 Multi-purpose	3	Classroom	1386.06	9747.18
114 Mech	1	Workshop	987.61	7221.38
Total:	8		18445.98	141881.48

Environmental Impact

Source Type	Source Name	Primary Energy MBtu/a	CO_2 emission lb/a
Renewable	External Air	55	0
Secondary	Electricity	350	7534
	Total:	405	7534

LEED Energy Performance Summary Report
By MEPCE

Section 1.1 - General Information

Simulation Program:	TRACE™ 700 v6.3.4
Principle Heating Source:	Fossil/Electric Hybrid
Energy Code Used:	ASHRAE 90.1-2010
Weather File:	_Full Year Dallas Love Field (Full Year - 8760)
Climate Zone:	3A
New Construction Percent:	100 %
Existing Renovation Percent:	0 %
Quantity of Floors:	1
Proposed:	Alternative 1 - Vickery Meadow Branch Library
Baseline:	Alternative 2 - ASHRAE Baseline 90.1-10 Climate Zone 3A

Section 1.2 - Space Summary

Building Use (Occupancy Type)	Space Area (ft²)	Regularly Occupied Area (ft²)	Unconditioned Area (ft²)
Default	17,136.00	17,136.00	0.00
Total	17,136.00	17,136.00	0.00

Section 1.3 - Advisory Messages

Advisory Messages	Baseline Building (0 deg rotation)	Proposed Building
Number of hours heating load not met:	0	0
Number of hours cooling load not met:	92	85
Total	92	85

Project Name:
Dataset Name: VMBL.TRC

Proposed Energy Totals:	Energy Use (MMBtu/yr)	739.23
	Process (MMBtu/yr)	103.15

Table 1.6 Table EAp2-9 Energy Cost Summary (Manual Cost Input) - Baseline Case

Energy Type	Baseline Cost (0° rotation)	Baseline Cost (90° rotation)	Baseline Cost (180° rotation)	Baseline Cost (270° rotation)	Average
Electric Consumption	$39,013	$39,903	$39,769	$38,377	$39,266

Table 1.6 Table EAp2-9 Energy Cost Summary (Manual Cost Input) - Proposed Case

Energy Type	Proposed Cost
Electric Consumption	$21,733

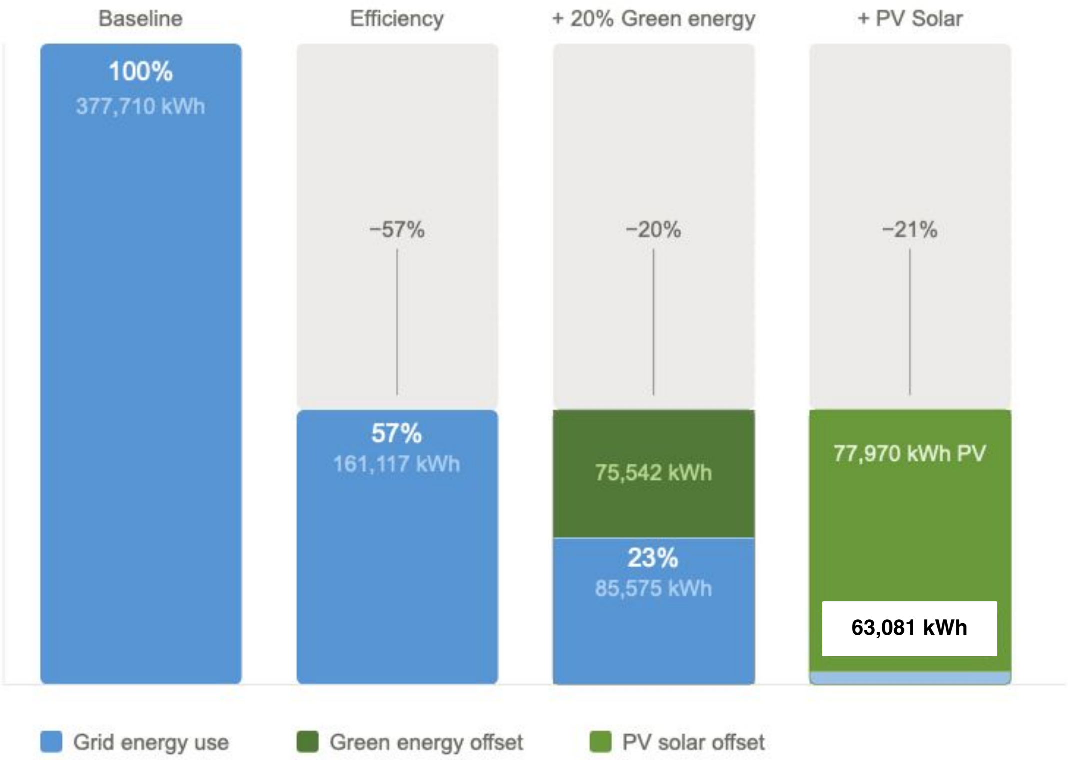
Proposed building economic cost improvement over baseline building: 44.65 %

Carbon Neutral Calculation / 2030 Challenge

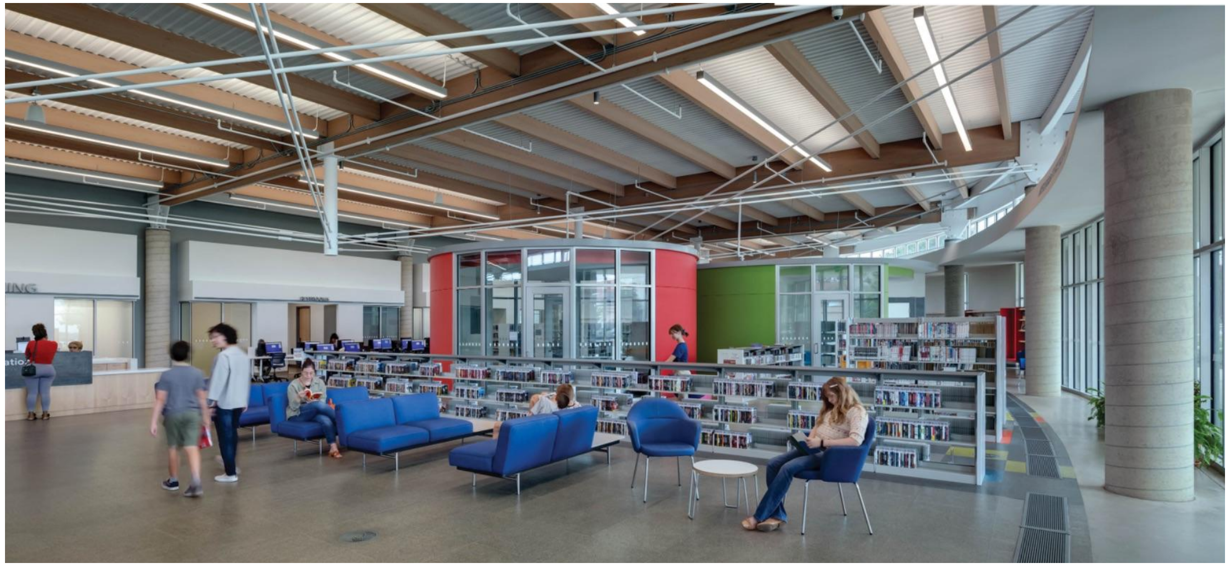
LEED Energy Performance Summary Report

By MEPCE

Proposed Energy Totals:	Energy Use (MMBtu/yr)	739.23
	Process (MMBtu/yr)	103.15



CBECS Calculation Methodology - per National EUI			
	kwh	%	(kbtu/sf/yr) EUI
CBECS (2003) baseline for Libraries)*	377,710	100.00%	96
Thermal envelope and efficient HVAC performance - **216,593 kwh**	(161,117)	(42.65%)	
Green power (20% max of CBECS baseline value)	(75,542)	(20.00%)	
Photovoltaic Panels 140 at 365W = 51.1 KW (77,970.7 kwh/yr)	(77,970)	(20.64%)	
			215,241.3kBtu / 18,000 sf / 1 yr
***National* Net Carbon per Architecture 2030 Challenge (EUI target = 20 or less)**	**63,081**	**-2.01%**	**11.96**




SPAIN MICRONESIA
MARSHALL ISLANDS
THE CAYMAN ISLANDS
PERU LITHUANIA BAHRAIN
HAITI TUNISIA MALAYSIA
AFGHANISTAN
ALGERIA MALTA
VENEZUELA SAUDI ARABIA
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TOGO VIETNAM
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PORTUGAL
FRY BREAD

Summary of Benefits

Key Aspects of Energy Modeling in Building Design

Performance Optimization: Evaluates tradeoffs between design options (e.g., window-to-wall ratis, insulation levels) to minimize energy use while ensuring occupant comfort.

HVAC Design: Helps mechanical engineers evaluate different systems and design efficient HVAC systems.

Regulatory / Codes or 3rd Party Green: Used to verify compliance with energy codes (like ASHRAE 90.1) and to achieve green building certifications as LEED.

Cost Analysis: Enables Life Cycle Cost Analysis (LCCA) to compare the upfront construction costs with long-term operational energy savrings.

Simulation Scenarios: Models unique factors like building orientation, occupancy schedules, and local weather data for accurate performance

Lifecycle & Performance Gains

Cost Reduction: Modeling can reduce total lifecycle costs by 20% to 30%. It helps “right-size” expensive HVAC equipment, potentially lowering upfront capital expenses.

Risk Mitigation: It acts as a “design-assist” tool to ensure buildings meet evolving energy codes (like ASHRAE 90.1) and avoid costly mid-construction redesigns.

Occupant Comfort: Beyond energy, models predict indoor environmental quality, including daylight levels, humidity, and thermal comfort.

Environmental Impact: In the building industry accounting for roughly 40% of global energy consumption, modeling is essential for meeting cabon neutrality and net-zero goals.

Third Party Certification: It is a required component for obtaining high-value green certifications like LEED, Living Building, or Green Globes.

Renovation & Reuse:
The HiddenPower of Existing Buildings

Session 6
April 14

LINK HERE AND IN THE CHAT!
https://tinyurl.com/2fjtv5cp

LEED & The Living Building Challenge

Session 7
July 14

Questions and Discussion

Summary of Benefits

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What is is energy modeling?

Building Energy Modeling (BEM) is a computer-based, physics-driven simulation that predicts a building's energy consumption, costs, and performance during the design phase. It allows architects and engineers to optimize the building envelope (aka insulation and windows), HVAC, lighting, and other electric loads to meet code compliance, enhance efficiency, and / or reduce carbon emissions.

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