



How Does Belmont Achieve ZNE for BMHS

BELMONT MIDDLE AND HIGH SCHOOL

Perkins&Will

APRIL 28, 2022

WHAT IS ZNE

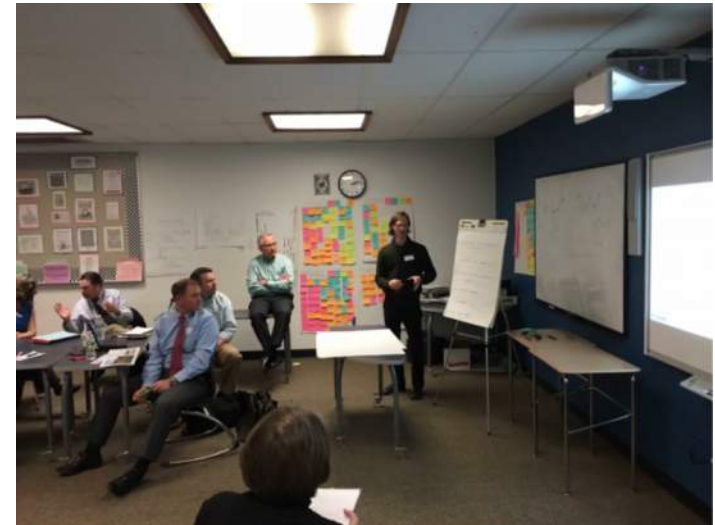
What are Net Zero Energy Buildings

Buildings with greatly reduced annual energy needs due to efficient design and operations in which the balance of energy needs are supplied from renewable energy sources.

Not just with Design, must include Occupants and Operations.

NREL Definitions: Renewable Energy

NZEB:A	Renewable energy harvested within the building footprint
NZEB:B	Renewable energy harvested within the building footprint and on the site
NZEB:C	Renewable energy harvested within the building footprint, on site or by renewable sources imported to the site
NZEB:D	Renewable energy harvested within building footprint and/or on site and supplemented by purchased renewable energy certificates



Planning Session: Discussing Plug Loads April 2018

What is Important in Belmont	Votes			
	Round 1	Round 2	Round 3	Total
Energy & ZNE	4			4
Fossil Fuel Free / Zero Emissions	2	3	1	6
General Sustainability			4	4
Demonstration Project	1		2	3
Mindful of Cost	2	3		5
Small Town Feel / Space				0
Flexibility		1		1
Teaching Sustainability		1	2	3
Learning Experience	1	3		4
Comfort				0
Aesthetics			1	1
Community	1			1
Traffic Flow / Security	1	1	2	4

Planning Session: Understanding Project Goals May 2018

BELMONT ENERGY REDUCTION STRATEGIES

Smart Skin-to-Volume / Envelope

- Optimize orientation for daylighting and control
- Minimizing the skin area per square foot of program
- Low Window to Wall area percentage
- High Performance skin systems

Optimized Distribution / Lighting

- 100% LED Lighting
- Decouple ventilation air from heating / cooling
- Regulate loads thru occupancy sensors / monitoring
- Condition multistory spaces with radiant floor
- High efficiency systems for high occ / low use spaces

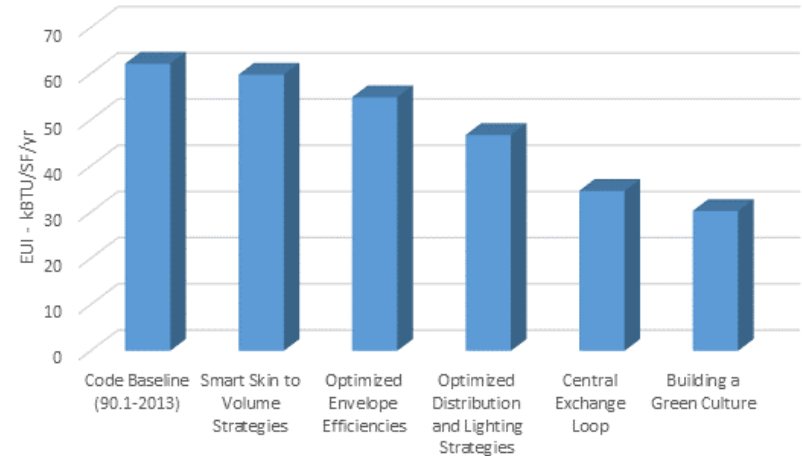
Central Geo-Exchange

- 283 wells at 500ft deep each maximizes central plant efficiency

Building a Green Culture

- Build a culture of awareness around energy use decisions and plug-load drivers
- Best practices with regards to food service
- Build a dialogue with facilities staff about best practices for system efficiency

EUI Energy Reductions



	EUI	% Savings
Code Baseline (90.1-2013)	62	
Smart Skin to Volume Strategies	60	4%
Optimized Envelope Efficiencies	55	12%
Optimized Distribution and Lighting Strategies	47	25%
Central Exchange Loop	35	44%
Building a Green Culture	30	51%

Energy Usage Intensity (EUI)

Used to compare the energy used by buildings of different sizes; measured in kBtu per sf per year

CBECS 2018 Median K-12 School EUI: 48.5

Belmont High School Predicted EUI: 30.2

Note: BMHS has Pool & Field House that require a lot of energy

PV ENERGY STATUS

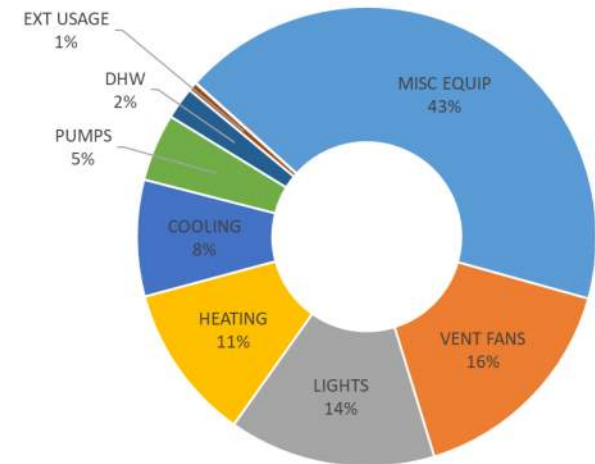
Percentage of Renewable Energy roof can provide

- Predicted Annual Energy Use = 4,036,001 kWh/yr
- Predicted Energy Use Intensity (EUI) = 30.2 kbtu/sf/yr
- Predicted Annual Renewable Energy Generation = 1,250 MWh/yr
- Percentage of Annual Energy Use Offset = 31%

Other Renewable Energy Sources

- Off-Site Renewable Energy Sources Imported to Site
- Purchased Renewal Energy Certificates (RECs)

Annual Energy End-Use Comparison



Note: Over 20% of Misc Equip are Plug Loads

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IT TAKES A COMMUNITY

Building Committee

For designing and constructing a high performance building with on-site renewable energy generation

School Department

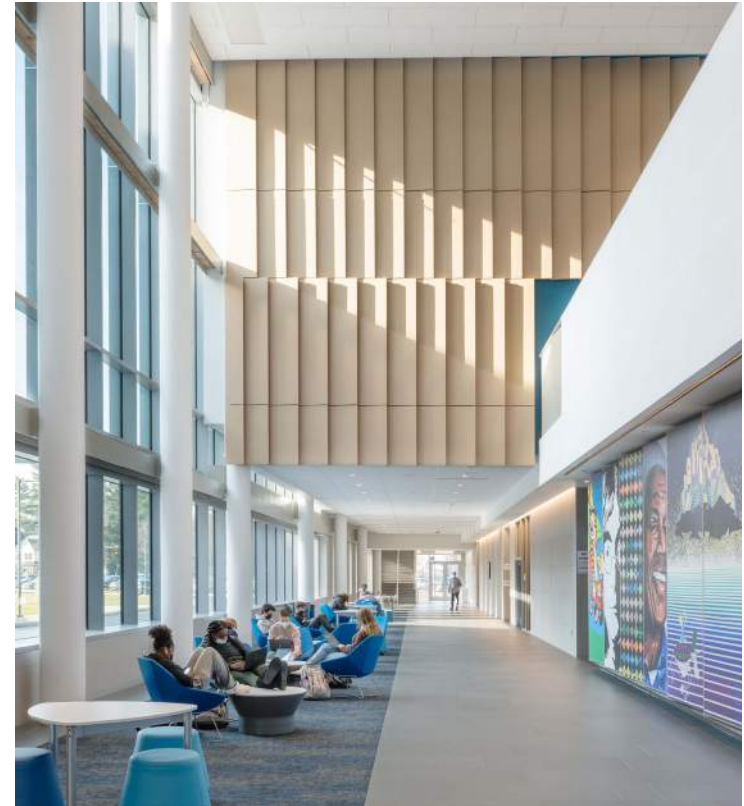
For establishing a program to achieve ZNE by setting policy and engaging the right guidance

Building Occupants

For being aware of energy usage and striving to change typical habits to more energy conscious behavior

Belmont Community

For continuing to foster an awareness to be a leader in energy efficiency and supporting those mentioned above to make the changes necessary to achieve ZNE



THANK YOU!