Using Real World Data to Make the Case for Passive House

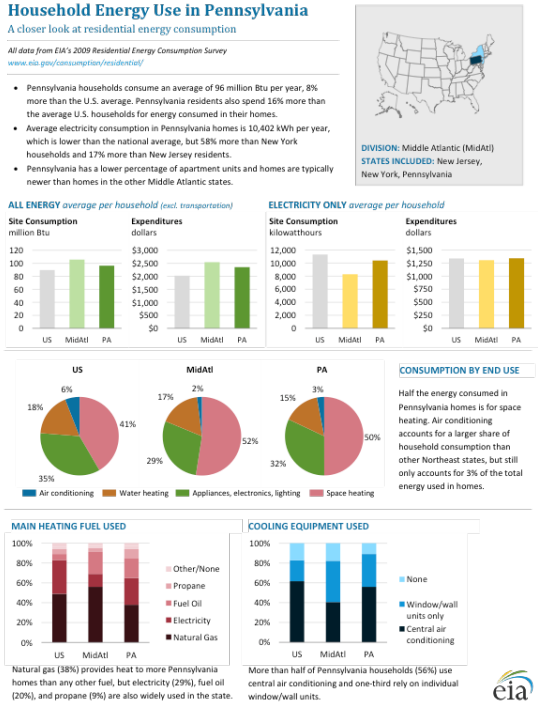
EUI

Energy Use Intensity

The measure of a building's energy consumption measured in kBTU / Gross Square Foot / Year

BENCHMARK PERFORMANCE

CBECS:
Commercial Building Energy Consumption Survey



RECS:
Residential Energy Consumption Survey

DOE Commercial Reference Buildings
Version 1.4_7.0
New Construction, ANSI/ASHRAE/IESNA 90.1-2004
Site Energy Use Intensities (EUIs) [kBtu/ft^2/yr]
August 2012

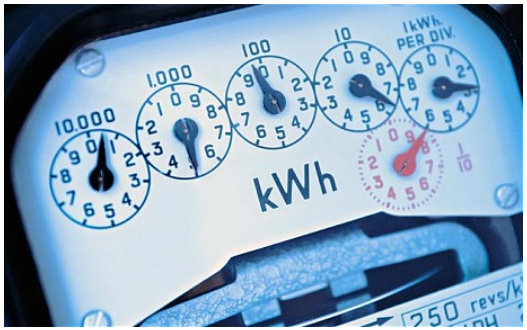
	Miami	Houston	Phoenix	Atlanta	Los Angeles	Las Vegas	San Francisco	Baltimore	Albuquerque	Seattle	Chicago	Denver	Minneapolis	Helena	Duluth	Fairbanks	Weighted Average
Climate Zone	**1A**	**2A**	**2B**	**3A**	**3B**	**3B**	**3C**	**4A**	**4B**	**4C**	**5A**	**5B**	**6A**	**6B**	**7**	**8**	
Large Office	47	48	45	44	39	41	41	46	40	41	47	42	52	46	53	67	45
Medium Office	51	51	51	48	41	47	43	51	46	45	52	47	57	51	59	76	50
Small Office	52	51	53	47	41	46	41	51	47	47	54	49	59	54	61	83	51
Warehouse	29	23	24	27	19	24	23	32	29	28	38	34	46	41	53	78	30
Stand-alone Retail	60	63	62	63	46	58	53	74	64	68	84	72	96	87	107	150	72
Strip Mall	57	61	60	65	48	61	57	78	68	74	89	76	103	94	115	164	71
Primary School	57	57	57	55	46	54	52	62	56	55	66	59	75	67	80	103	60
Secondary School	60	61	59	60	44	56	51	71	59	63	78	66	91	79	99	135	67
Supermarket	158	169	161	173	156	162	169	186	171	184	197	183	211	200	225	272	183
Quick Service Restaurant	536	553	546	566	507	551	535	614	576	584	660	612	711	666	760	930	598
Full Service Restaurant	406	428	418	447	387	429	428	495	457	478	534	491	575	541	621	758	478
Hospital	149	155	149	154	147	145	152	160	137	150	160	140	163	147	165	184	155
Outpatient facility	221	225	233	227	212	227	216	233	230	219	232	228	239	233	239	258	230
Small Hotel	68	67	66	66	60	64	61	68	65	63	71	67	76	71	79	95	68
Large Hotel	105	115	107	125	111	113	121	138	130	135	151	144	164	159	181	214	132
Mid-rise Apartment	37	38	37	37	31	36	32	42	37	38	47	41	54	48	59	78	40

DOE:
Commercial Reference Buildings

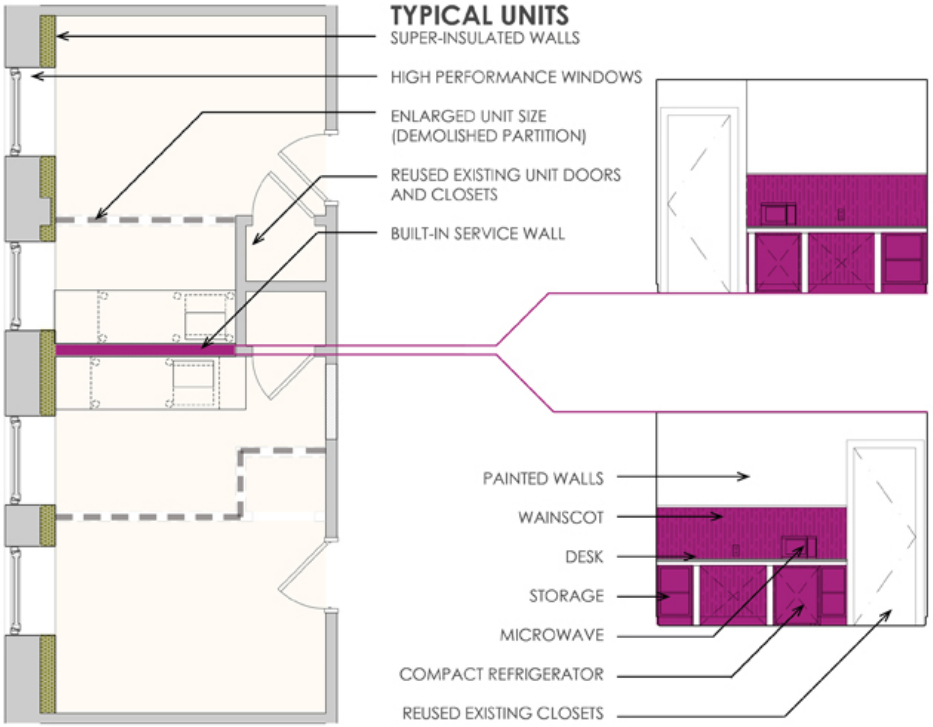
HISTORIC UTILITY DATA

			YTD Actual	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Payment Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15
Water	PA Amer		778.88	57.92	61.84	54.00	61.84	67.71	52.04	51.07	51.92	63.11	58.11	62.11	62.11	75.10
	Usage (in thousands)			4.4	4.8	4.0	4.8	5.4	3.80	3.7	3.5	4.6	4.1	4.5	4.5	5.8
	Est/Act			A	A	A	A	A	A	A	A	A	A	A	A	A
				5/29-6/26	6/27-7/29	7/30-8/28	8/29-9/29	9/30-10/29	10/30-11/26	11/27-12/29	12/30-1/28	1/29-3/2	3/3-3/30	3/31-4/26	4/29-5/27	5.28-6/26
Electric	Duquesne Light		4,233.46	686.89	731.75	712.57	686.39	652.05	538.73	544.30	424.40	197.21	198.28	254.71	293.45	365.73
	Usage			6,310	6,590	6,470	6,240	5,680	4,450	4,599	4,046	-	-	-	-	-
				5/5-6/4	6/4-7/3	7/3-8/5	8/5-9/4	9/4-10/6	10/6-11/4	11/5-12/8	12/8-1/8	1/8-2/9	2/9-3/10	3/10-4/8	4/8-5/9	5/10-6/10
			2,334.13								341.37	367.67	319.93	354.88	464.23	486.05
	Gullman		Usage								4,718	5,082	4,422	4,905	6,417	6,718.18
											1/7-2/4	2/5-3/6	3/7-4/6	4/7-5/5	5/6-6/6	6/7-7/6
Gas	Equitable		591.23	17.00	17.00	17.00	18.33	21.76	50.47	88.94	109.86	110.96	75.64	29.54	17.73	17.00
	Customer Charge			17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
	Usage (MCF)			-	-	-	0.2	1.2	9.1	19.3	25.3	25.6	16.4	3.5	0.2	-
	Est/Act			A	A	A	A	A	A	A	A	A	A	A	A	A
				5/29-6/29	6/29-7/30	7/30-8/28	8/28-9/29	9/30-10/30	10/31-11/25	11/26-12/30	12/31-1/29	1/30-2/26	2/27-3/30	3/31-4/29	4/30-5/28	5/28-6/29
01-820075-43300	Dominion		429.39	-	-	-	-	6.13	38.85	82.39	107.97	109.27	69.99	14.93	0.86	
	Usage (DTH)			-	-	-	-	1.2	9.1	19.3	25.3	25.6	16.4	3.5	0.2	
				5/29-6/29	6/29-7/30	7/30-8/28	8/28-9/29			12/1-12/31	1/1-1/31	2/1-2/28	3/1-3/31	4/1-4/30	5/1-5/31	

Can be used to calculate a building's *current* EUI




YMCA


TYPICAL UNITS
SUPER-INSULATED WALLS
HIGH PERFORMANCE WINDOWS
ENLARGED UNIT SIZE
(DEMOLISHED PARTITION)
REUSED EXISTING UNIT DOORS
AND CLOSETS
BUILT-IN SERVICE WALL
PAINTED WALLS
WAINSCOT
DESK
STORAGE
MICROWAVE
COMPACT REFRIGERATOR
REUSED EXISTING CLOSETS


"EXPERIENCE IS A
BRUTAL TEACHER.
BUT YOU LEARN.
MY GOD DO YOU LEARN."
C S LEWIS
PLEASE HELP

McKeesport Downtown Housing $124 per sf


Denmarsh Photography, Inc.


Denmarsh Photography, Inc.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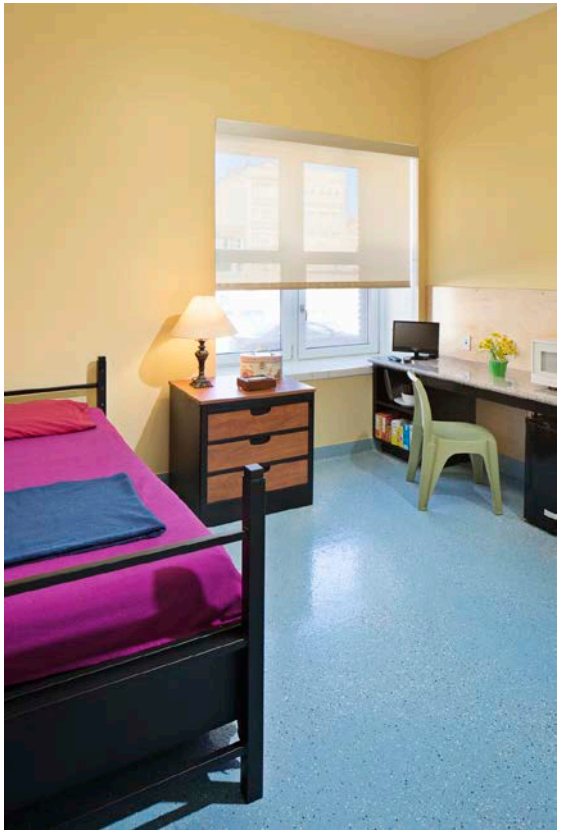
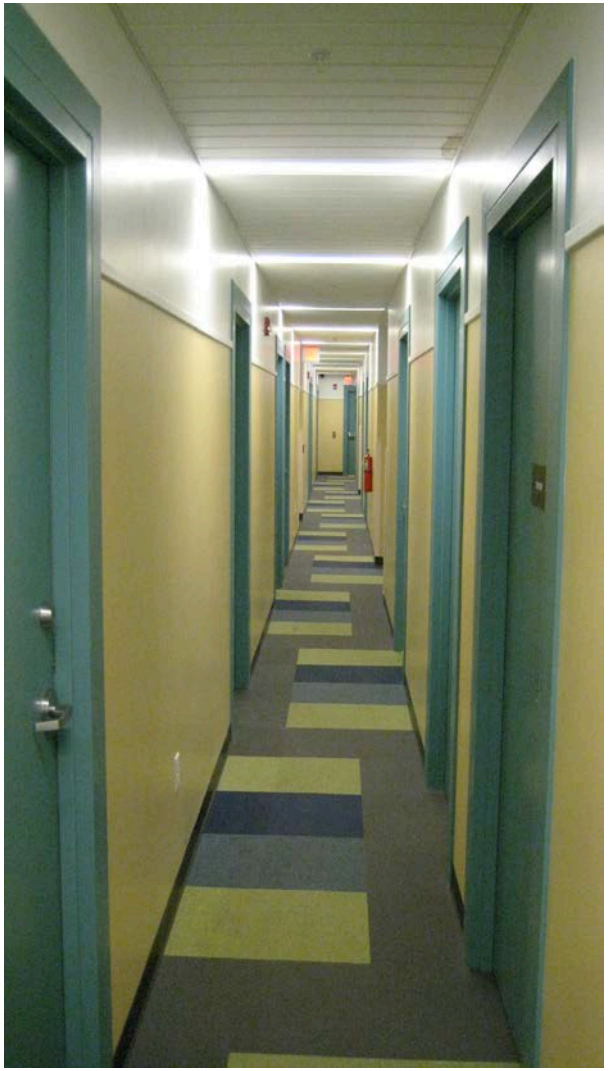



CLOTHING EXCHANGE
HEAT TREATING ROOM AUTHORIZED PERSONNEL ONLY



Ever wonder what

14,100 CFM50

actually looks like?

2.0 ACH50

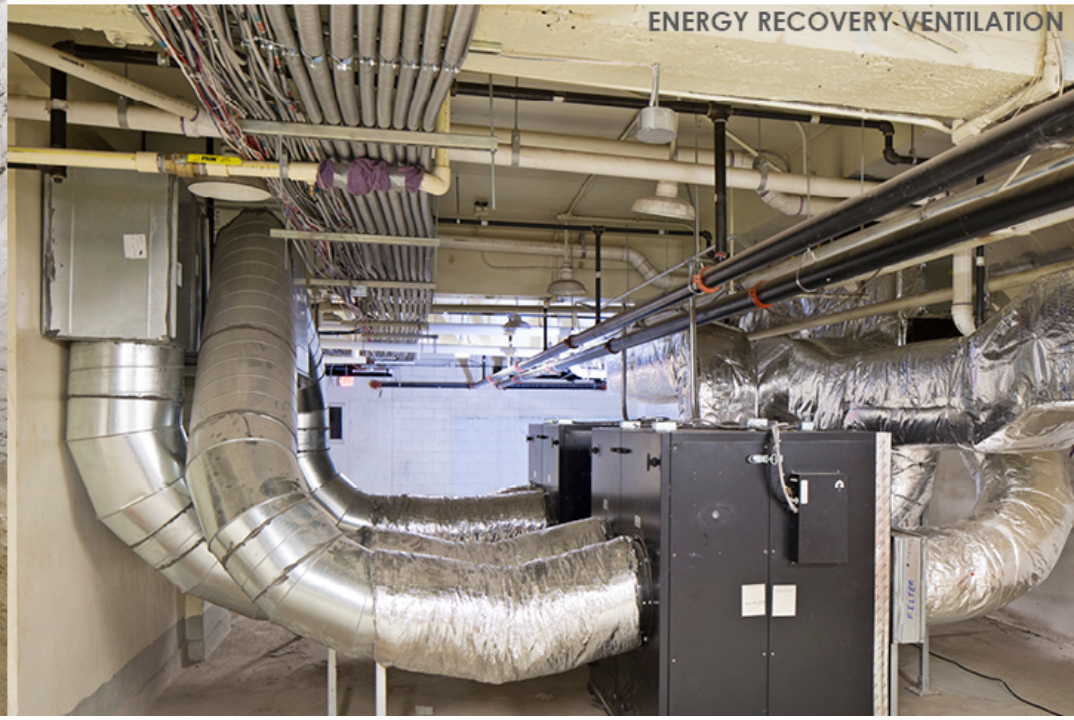
GEOTHERMAL HEAT PUMPS

MEASURED ENERGY PERFORMANCE

75% **less energy consumption** than SRO dwellings according to CBECS

68% **less energy consumption** than the original building
AFTER adding...

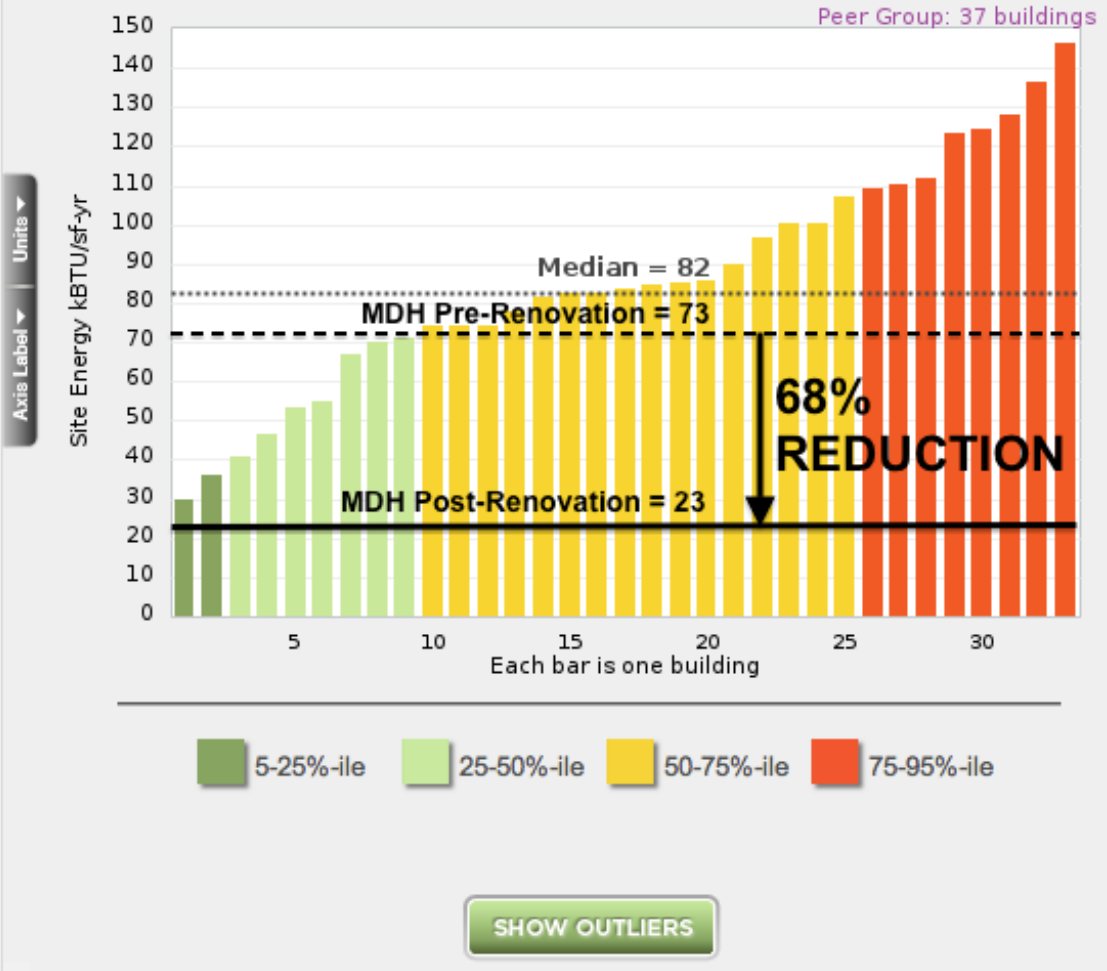
...lighting
an elevator
cooking equipment
constant ventilation
air-conditioning...


ENERGY RECOVERY-VENTILATION

Export | Email | Add to Dashboard | Create New Chart | Add Your Building

View

Whole Building - Total Site Energy (kBTU/sf-yr)



Units

Axis Label

SHOW OUTLIERS

Peer Group Information

SUMMARY The Site Energy for typical buildings of the type(s) you've specified is 83.1 kBTU/sf-yr [median value], with a range of 19.9 to 143.3 kBTU/sf-yr [5th to 95th percentiles] for the population. Select "Add a Building" button to see how yours compares. Try other Views for graphical and tabular detail. This analysis includes population weights for each building.

The data in the plot is an *unweighted* representation of the values you selected.

DATA SET U.S. National (CBECS)

LOCATION Us Climate= <2000 CDD, 5500-7000 HDD, <2000 CDD, 4000-5499 HDD

SIZE 25000 - 100000 sqft

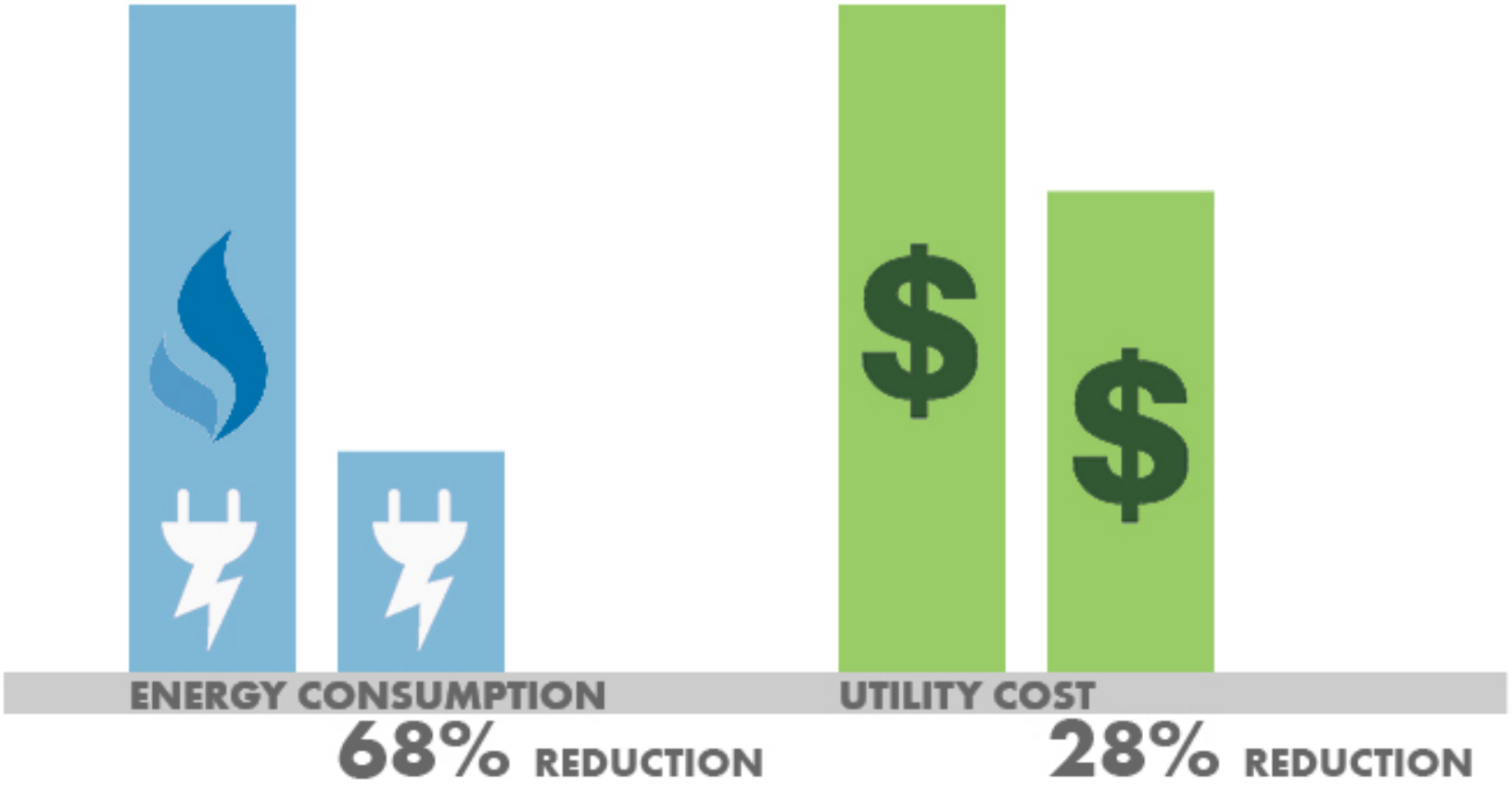
HOURS OF OPERATION 0 - 168 hours/week

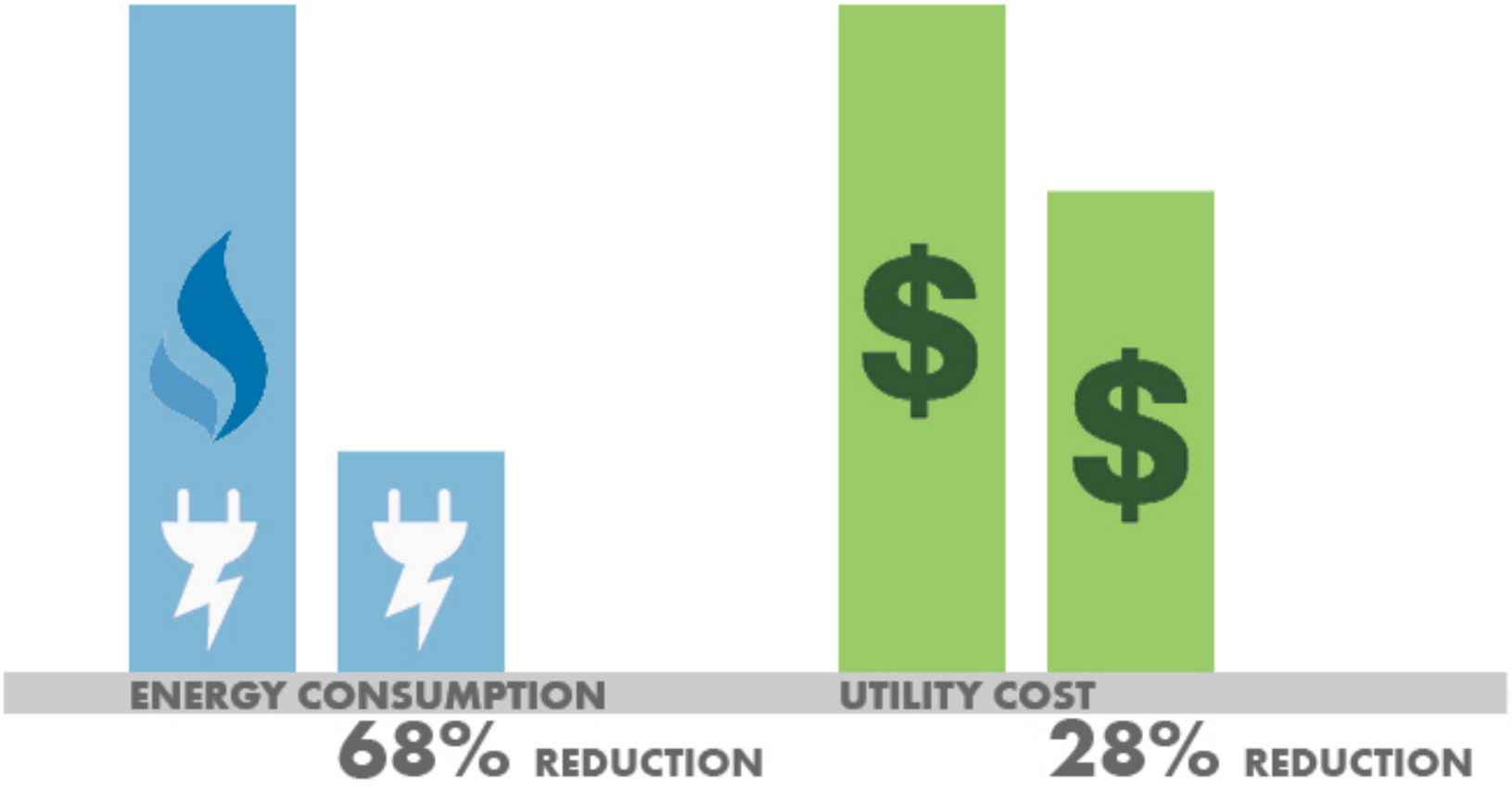
VINTAGE 1920 to 1945, 1946 to 1959, 1960 to 1969, 1970 to 1979, 1980 to 1989, 1990 to 1999, 2000 to 2003, Before 1920

OCCUPANCY Government, Private

TYPE Dormitory/fraternity/sorority, Hotel, Motel or inn, Other lodging

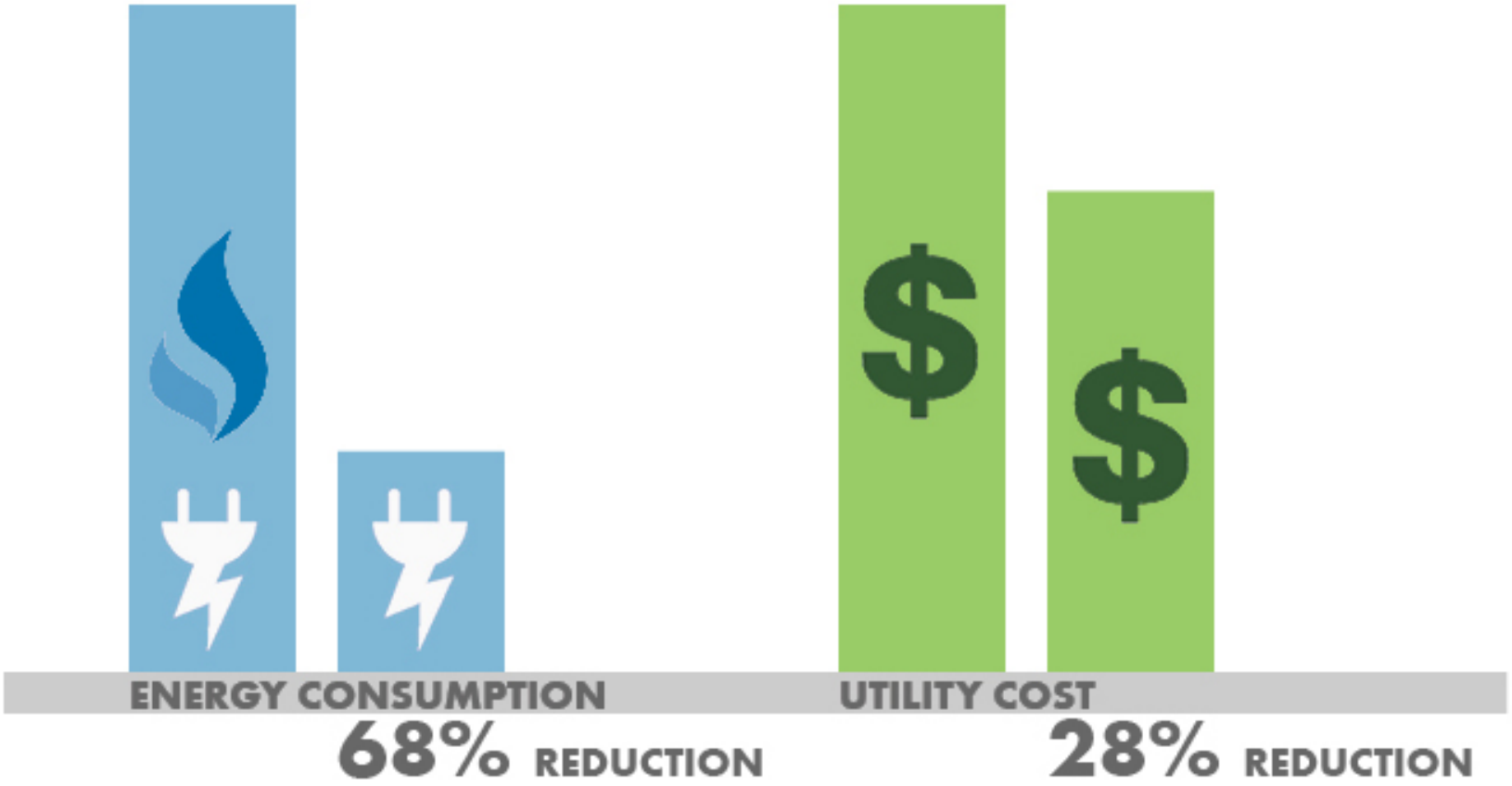
Energy Savings are Not Always Equal to Money Savings


ENERGY CONSUMPTION
68% REDUCTION
UTILITY COST
28% REDUCTION



What's going on here?

The energy SOURCES changed…

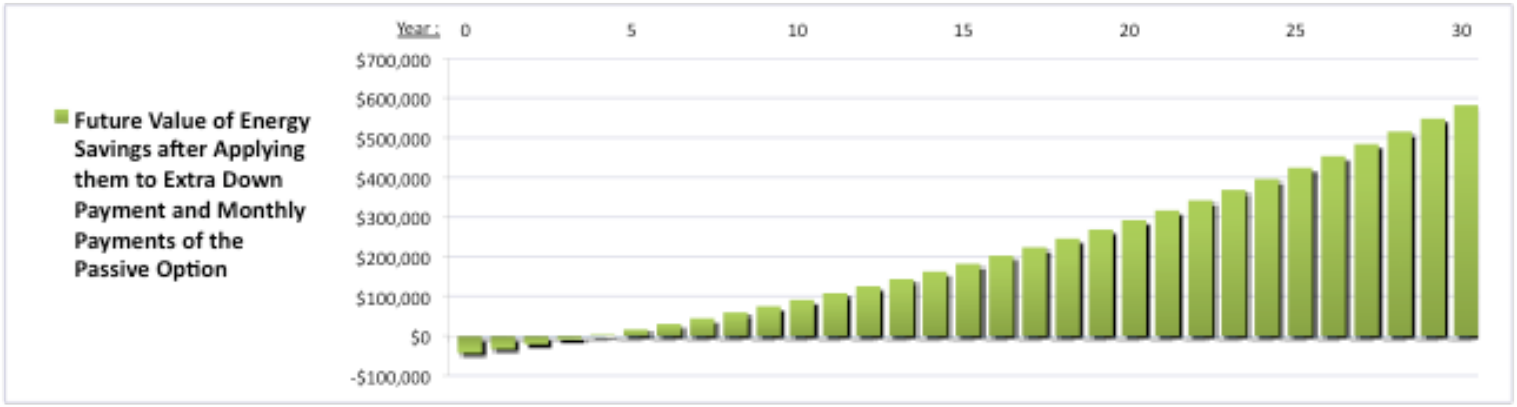


The cost of energy varies by SOURCE…

Gas: $16.35 per MMBTU Electric: $27.65 per MMBTU

Cost of Building Options	Cost of Baseline Renovation	Cost to Upgrade to Passive House	Cost of Passive House Renovation
	7,225,000	3%	7,441,750

Energy Cost, Baseline Building ($ per month)	5,000
Annual Rate of increase in Energy Costs Projected	3%
Utility Cost Reduction from Passive House Approach (%)	28%



Areas below zero indicate that the extra down and monthly payments exceed the value of the energy savings to date.

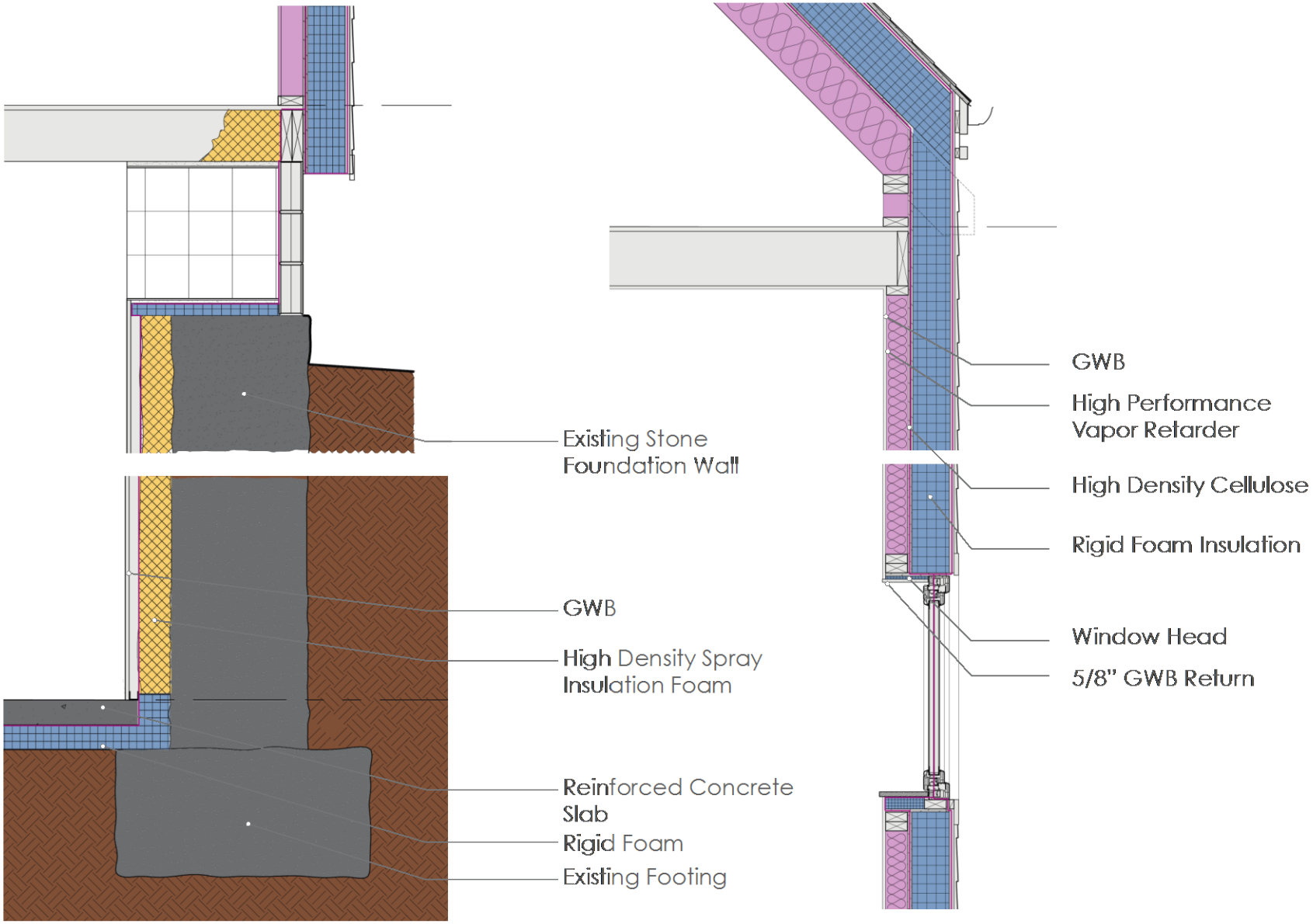
When the value reaches zero, it's all gravy - and the energy savings each month will add up to a substantial sum!

INFORMATION PRESENTED BY: Michael Whartnaby, C.P.H.C., Thoughtful Balance, inc.

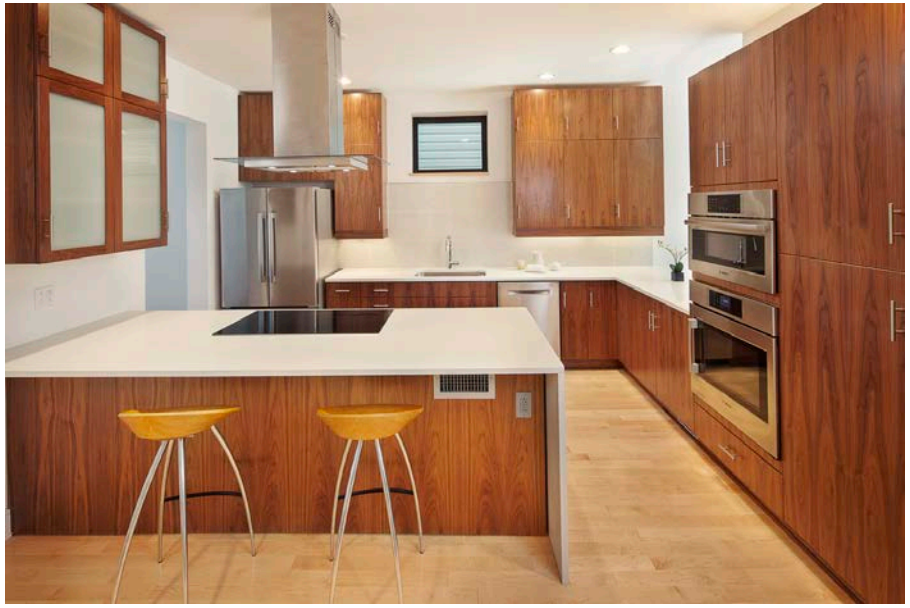
Five-year PAYBACK $600,000 SAVED over 30 years of building operation

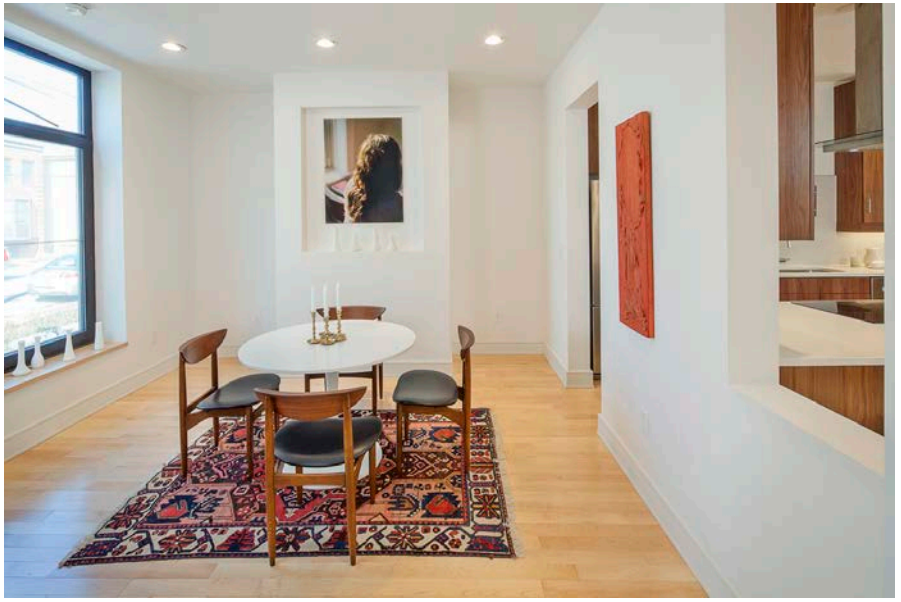
What Kind of Future Do You Want?

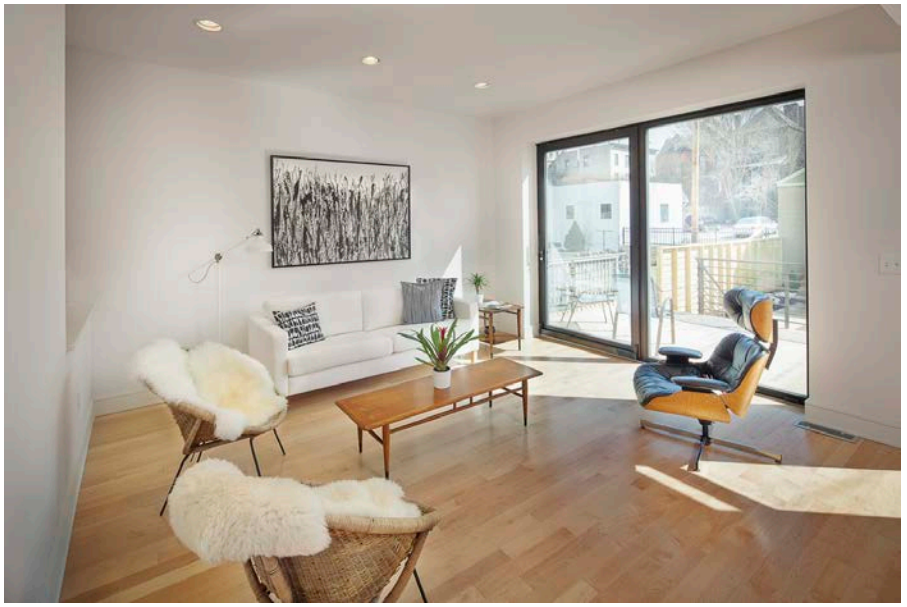

Live in Shadyside's
First Passive House

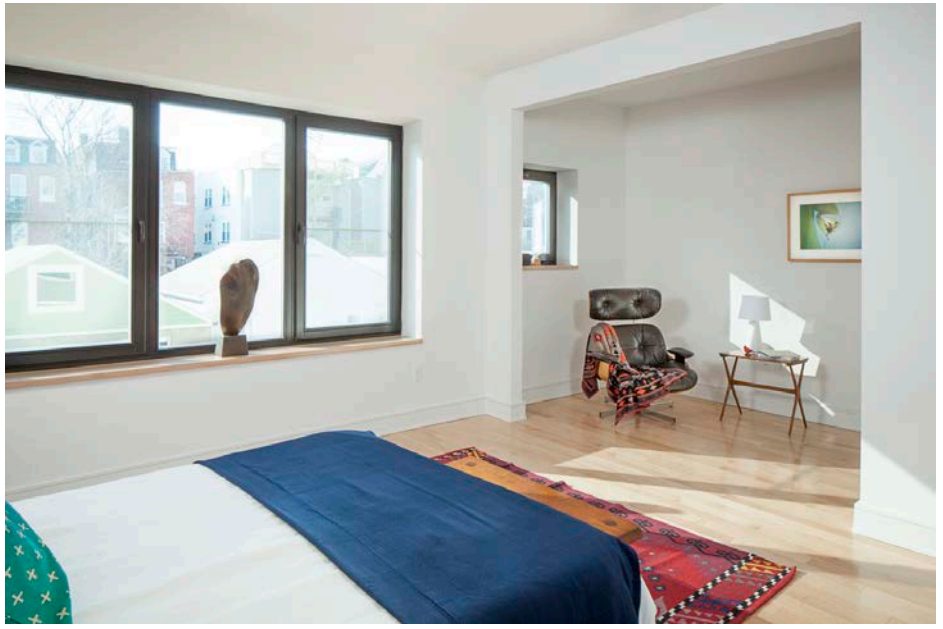

Existing Stone Foundation Wall
GWB
High Density Spray Insulation Foam
Reinforced Concrete Slab
Rigid Foam
Existing Footing
GWB
High Performance Vapor Retarder
High Density Cellulose
Rigid Foam Insulation
Window Head
5/8" GWB Return

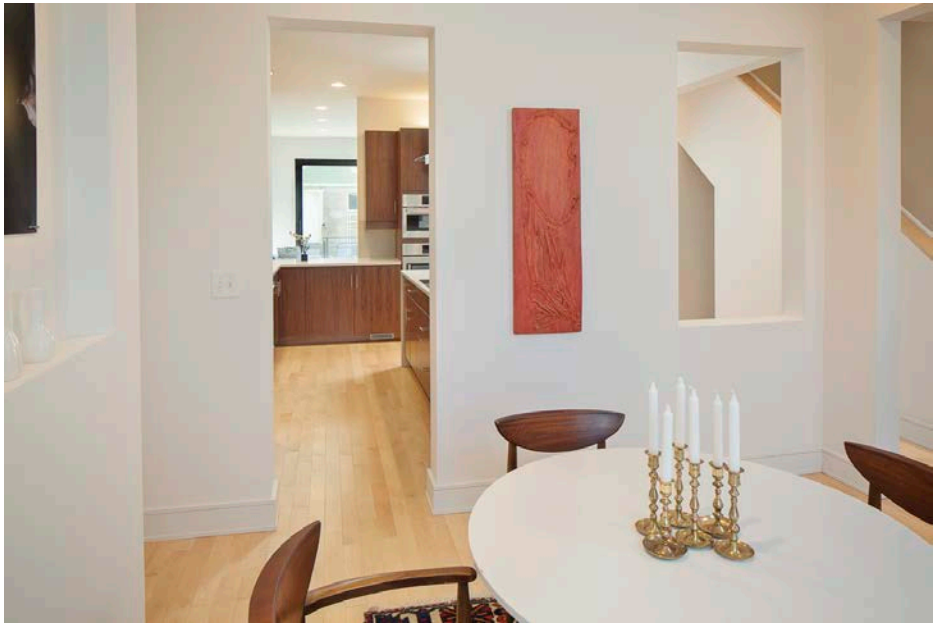
Cost is $184.00 per Square foot





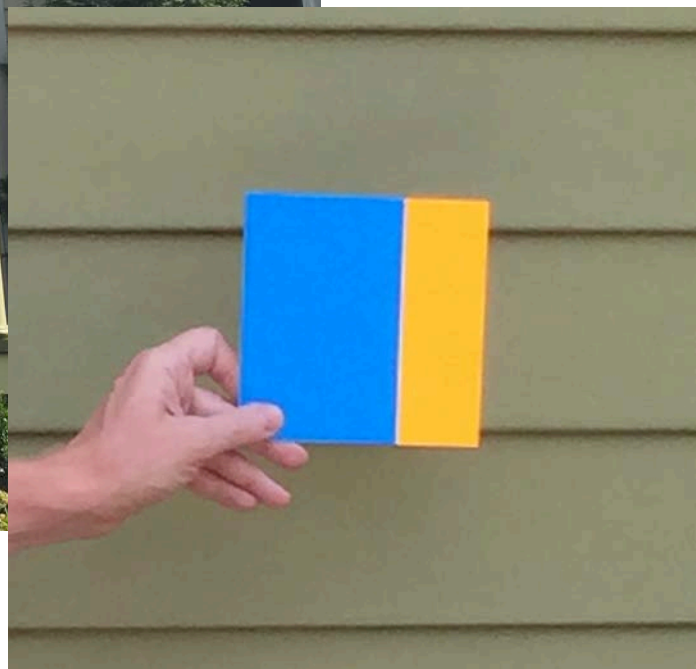






1.5

ACH50



Effective Leakage Area: 28 square inches +/-

5722 Walnut Street

Gross Sq Ft:	3042.25
Total Energy (kBTU):	220148
EUI (kBTU/GSF):	72.36
TFA (approx):	2176
Primary Energy (PH):	146.43
EUI Source Energy:	104.72

Dimensions:

18.75	43	806.25
20.25	43	870.75
20.25	43	870.75
11.5	43	494.5

Electric (kWh)		kBTU
14,000	3.412	47768
0	3.412	0
	Cost:	$1,960.00
Gas (MCF)		
169	1020	172380
	Cost:	$1,859.00

Source Energy:

Electric:	2.7	128973.6
		0
Gas:	1.1	189618
TOTAL:		318592
	Annual Cost:	$3,819.00

5724 Walnut Street PREDICTED by PHPP

Gross Sq Ft:	3042.25
Total Energy (kBTU):	28746
EUI (kBTU/GSF):	9.45
TFA (approx):	2176
Primary Energy (PH):	35.67
EUI Source Energy:	25.51

Dimensions:

18.75	43	806.25
20.25	43	870.75
20.25	43	870.75
11.5	43	494.5

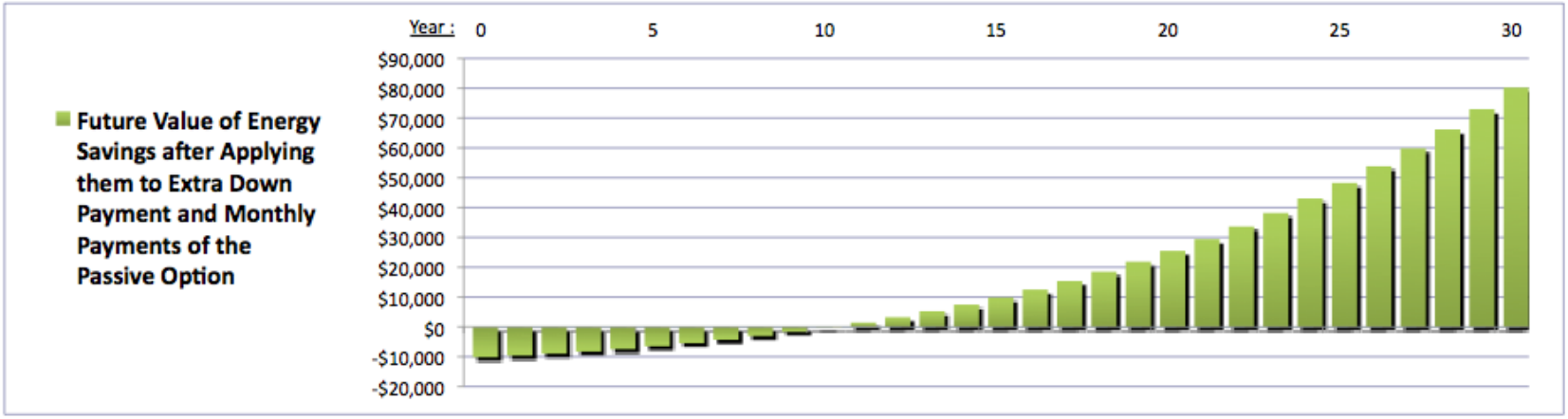
Electric (kWh)		kBTU
8,425	3.412	28746.1
0	3.412	0
	Cost:	$1,179.50
Gas (MCF)		
0	1020	0

Source Energy:

Electric:	2.7	77614.47
		0
Gas:	1.1	0
TOTAL:		77614
	Annual Cost:	$1,179.50

Cost of Home Options	Cost of Baseline Home	Cost to Upgrade to Passive House	Cost of Passive House
	510,000	10%	561,000

Energy Cost, Baseline Home ($ per month)	320
Annual Rate of increase in Energy Costs Projected	3%
Energy Cost Reduction from Passive House Approach (%)	71%



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When the value reaches zero, it's all gravy - and the energy savings each month will add up to a substantial sum!

The ARTISANS GROUP Design Build

INFORMATION PRESENTED BY:


thoughtful
balance
ARCHITECTURE THAT WORKS