

Today's Passive Buildings –

A Better Value for Utilities, Raters, and Developers



Tad Everhart

CertiPHIers Cooperative

tad@certiphiers.com

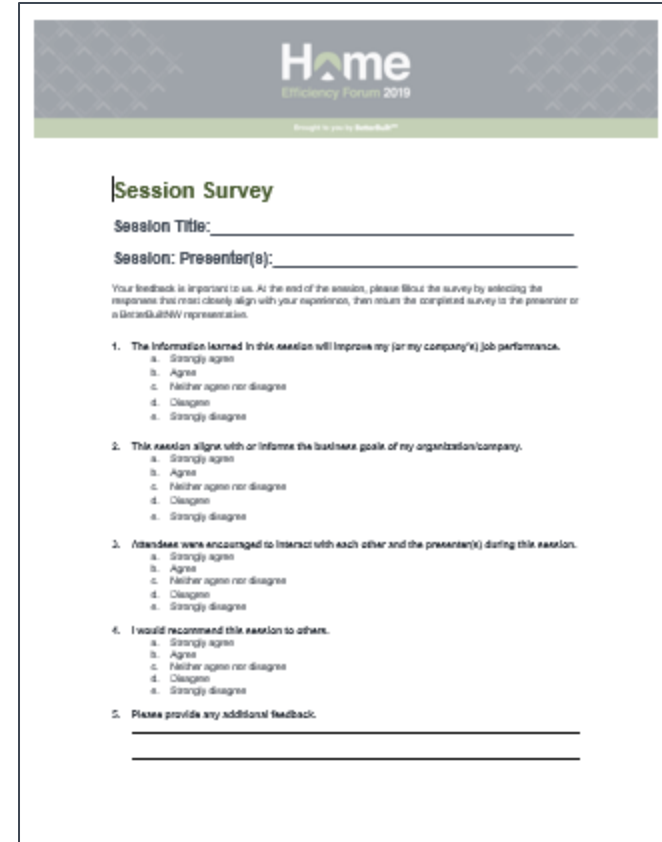
certiphiers.com



Session Survey Instructions

At the end of each session, you will be given 5 minutes to complete the session survey.

- Complete the survey using the mobile app or paper versions
- Provide the paper surveys to the room moderator or to the BetterBuiltNW table
- We appreciate your feedback



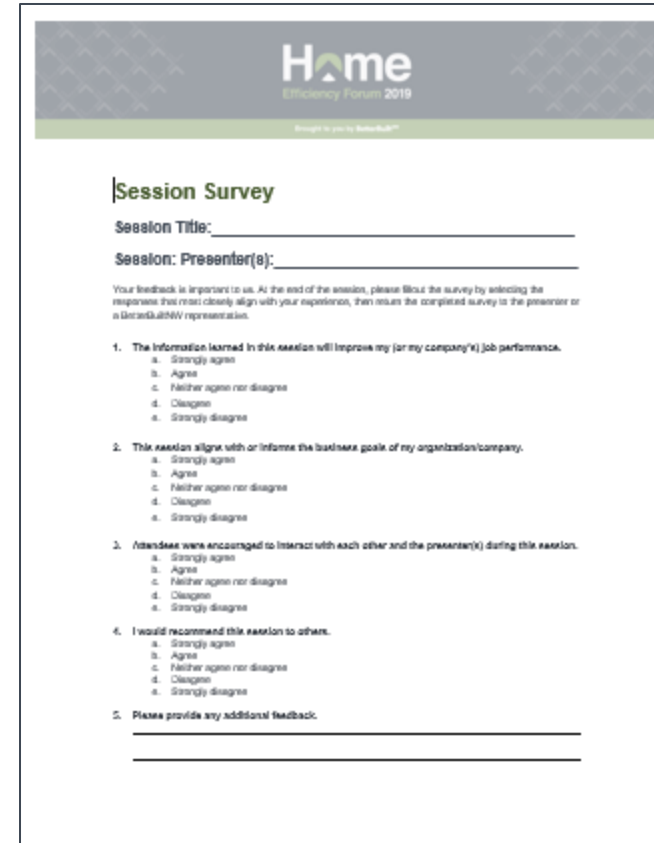
The image shows a survey form titled "Session Survey" for the "Home Efficiency Forum 2019". The form is designed to collect feedback from attendees. It includes fields for "Session Title:" and "Session: Presenter(s):". Below these fields, there is a paragraph explaining the importance of the feedback and instructions on how to complete the survey. The survey consists of five numbered questions, each with five response options ranging from "Strongly agree" to "Strongly disagree". The questions are:

1. The information learned in this session will improve my (or my company's) job performance.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
2. This session aligns with or informs the business goals of my organization/company.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
3. Attendees were encouraged to interact with each other and the presenter(s) during this session.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
4. I would recommend this session to others.
 - a. Strongly agree
 - b. Agree
 - c. Neither agree nor disagree
 - d. Disagree
 - e. Strongly disagree
5. Please provide any additional feedback.
 - _____
 - _____

Complete the Session Survey

Today's Passive Buildings - A Better Value for Utilities, Raters, and Developers

- Tad Everhart



The image shows a survey form titled "Home Efficiency Forum 2019" with the BetterBuilt logo. The form is titled "Session Survey" and includes fields for "Session Title:" and "Session: Presenter(s):". Below these fields is a paragraph of instructions: "Your feedback is important to us. At the end of the session, please fill out the survey by selecting the response that most closely aligns with your experience, then return the completed survey to the presenter or a BetterBuilt NW representative." The survey consists of five numbered questions, each with five response options: "a. Strongly agree", "b. Agree", "c. Neither agree nor disagree", "d. Disagree", and "e. Strongly disagree". The questions are: 1. "The information learned in this session will improve my (or my company's) job performance.", 2. "This session aligns with or informs the business goals of my organization/company.", 3. "Attendees were encouraged to interact with each other and the presenter(s) during this session.", 4. "I would recommend this session to others.", and 5. "Please provide any additional feedback." Below the fifth question are two blank lines for additional feedback.

Home
Efficiency Forum 2019
Brought to you by BetterBuilt™

Session Survey

Session Title: _____

Session: Presenter(s): _____

Your feedback is important to us. At the end of the session, please fill out the survey by selecting the response that most closely aligns with your experience, then return the completed survey to the presenter or a BetterBuilt NW representative.

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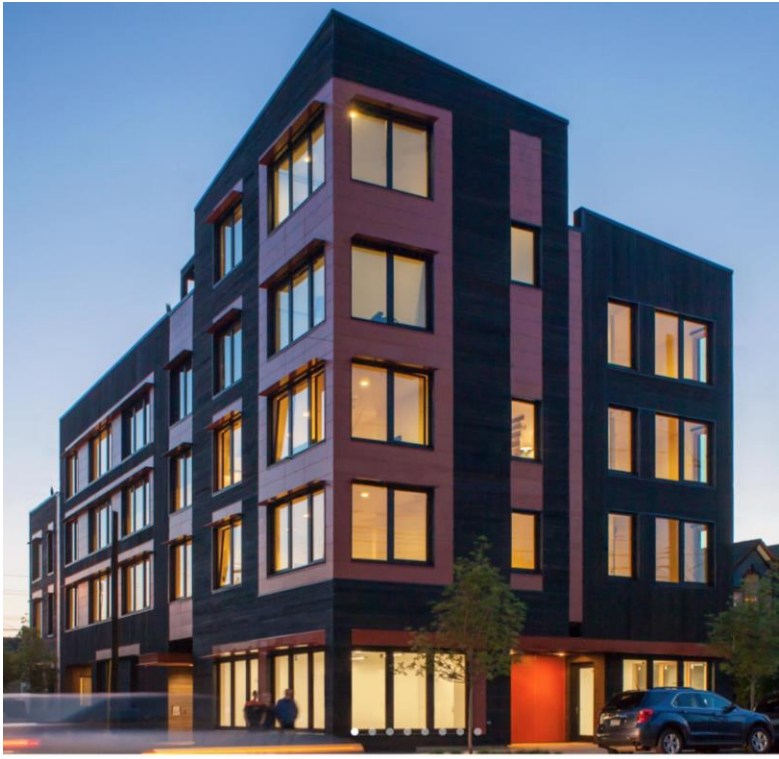
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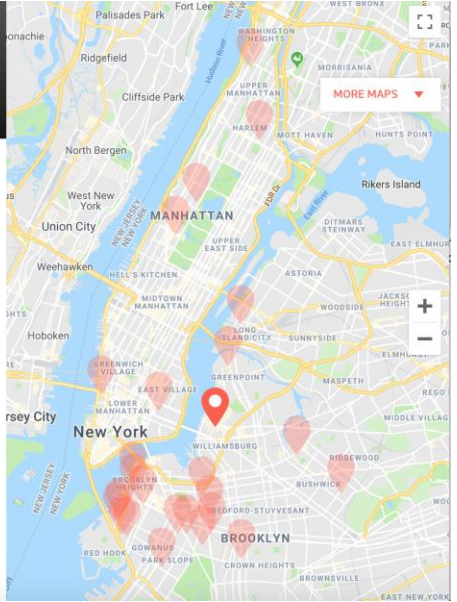
Passive House (aka Passivhaus or passive building)



Multifamily Passive Buildings - popular



Mapping New York City's Booming Passive House Movement
By Jessica Dailey | @jessdailey618 | Apr 8, 2015, 6:40pm EDT



Passive Houses



R-951 Passive House; Photo by Timothy Bell Photography



Photo by Matthew Millman



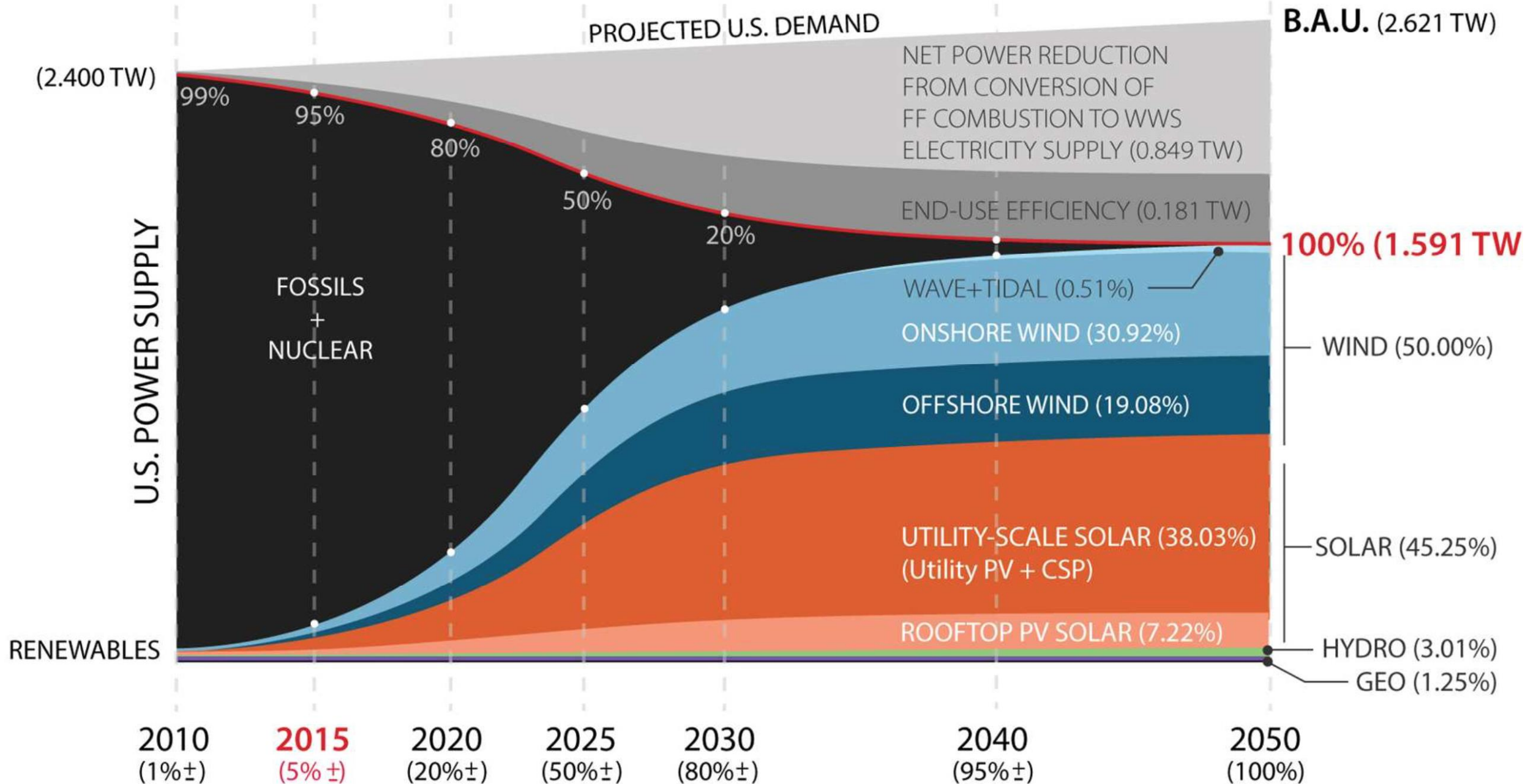
PHB passive house buildings

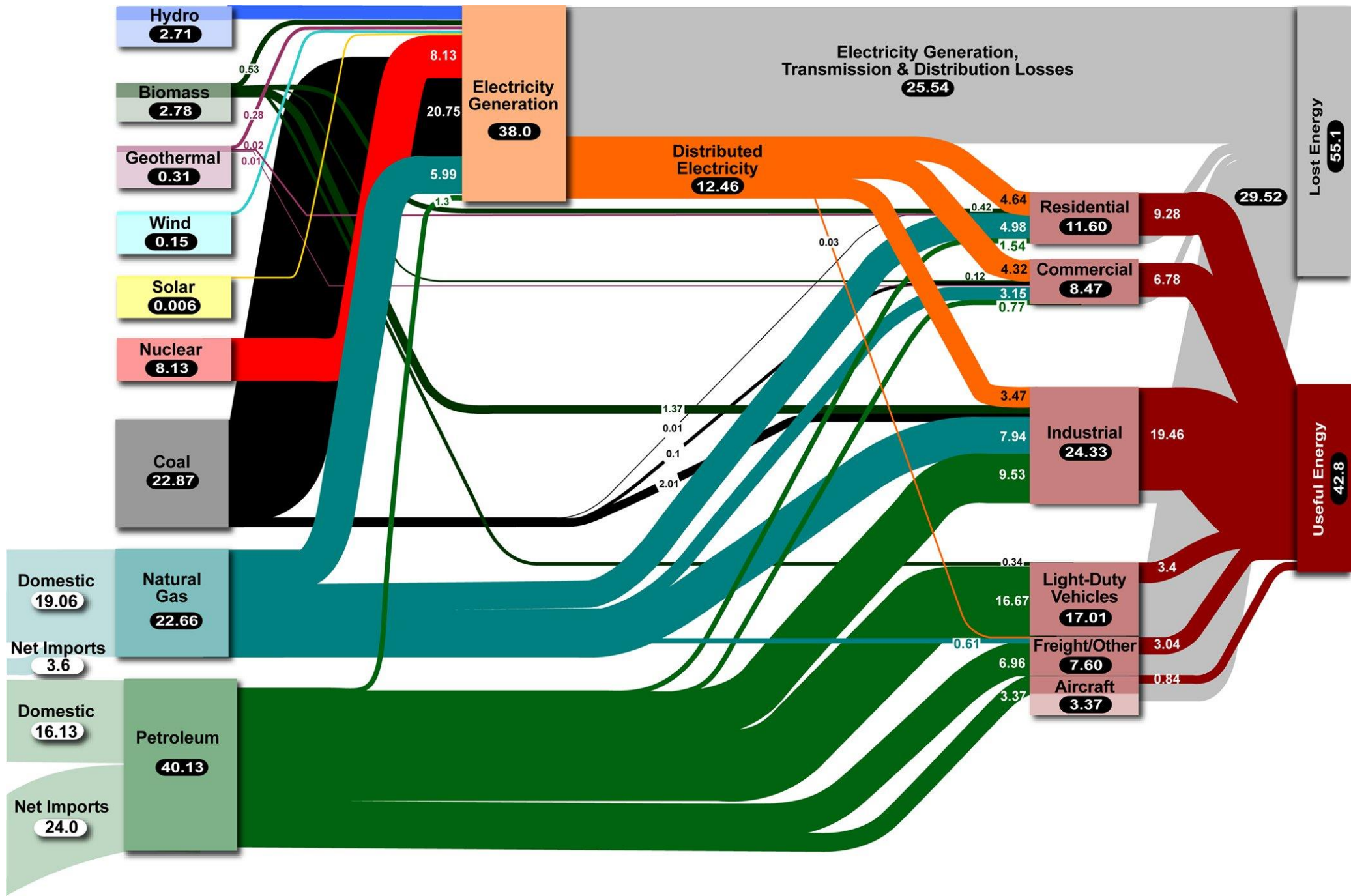


THE LATEST INFORMATION ON PASSIVE HOUSE BUILDINGS

Primary Energy Renewable (PER)

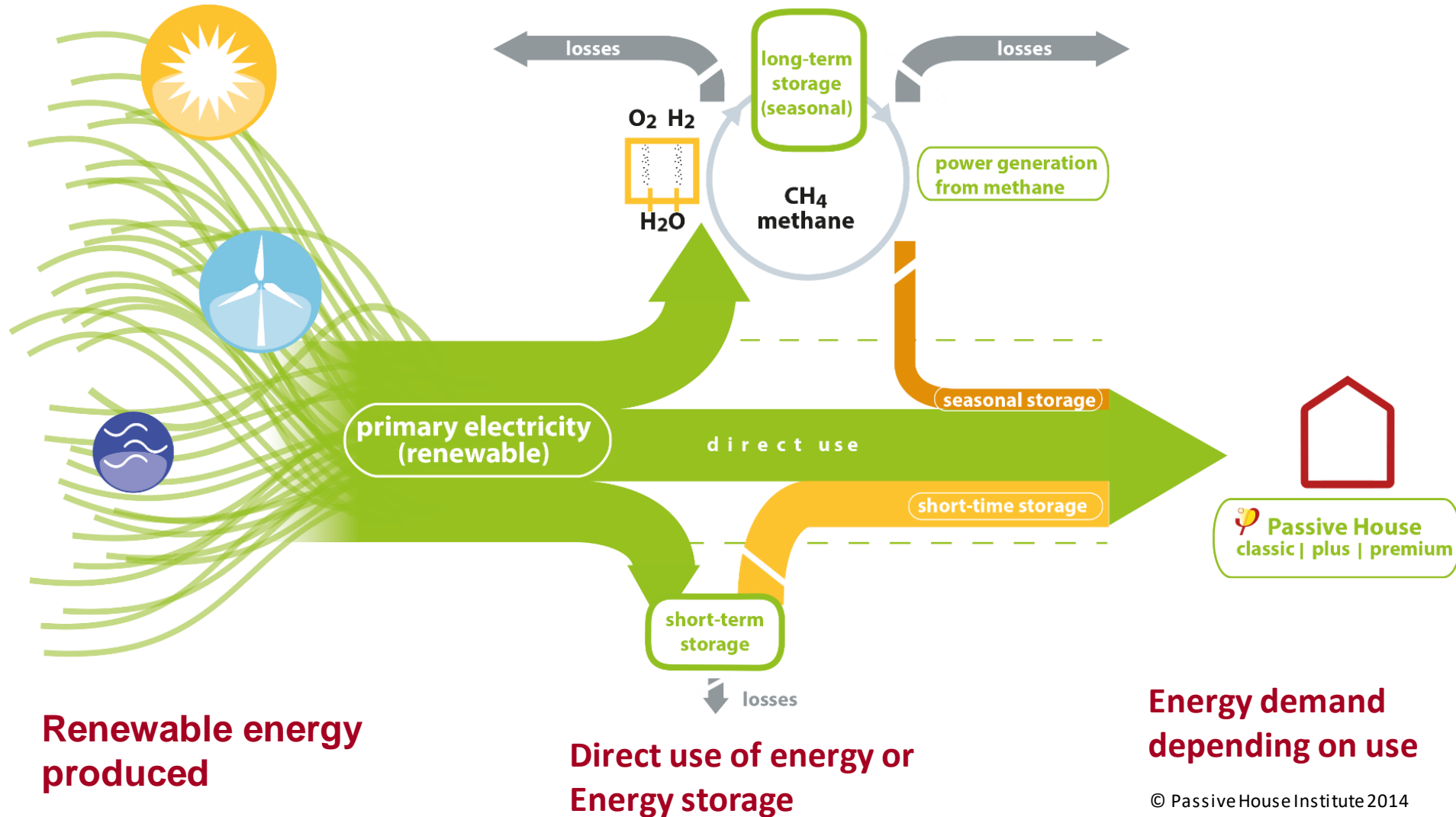




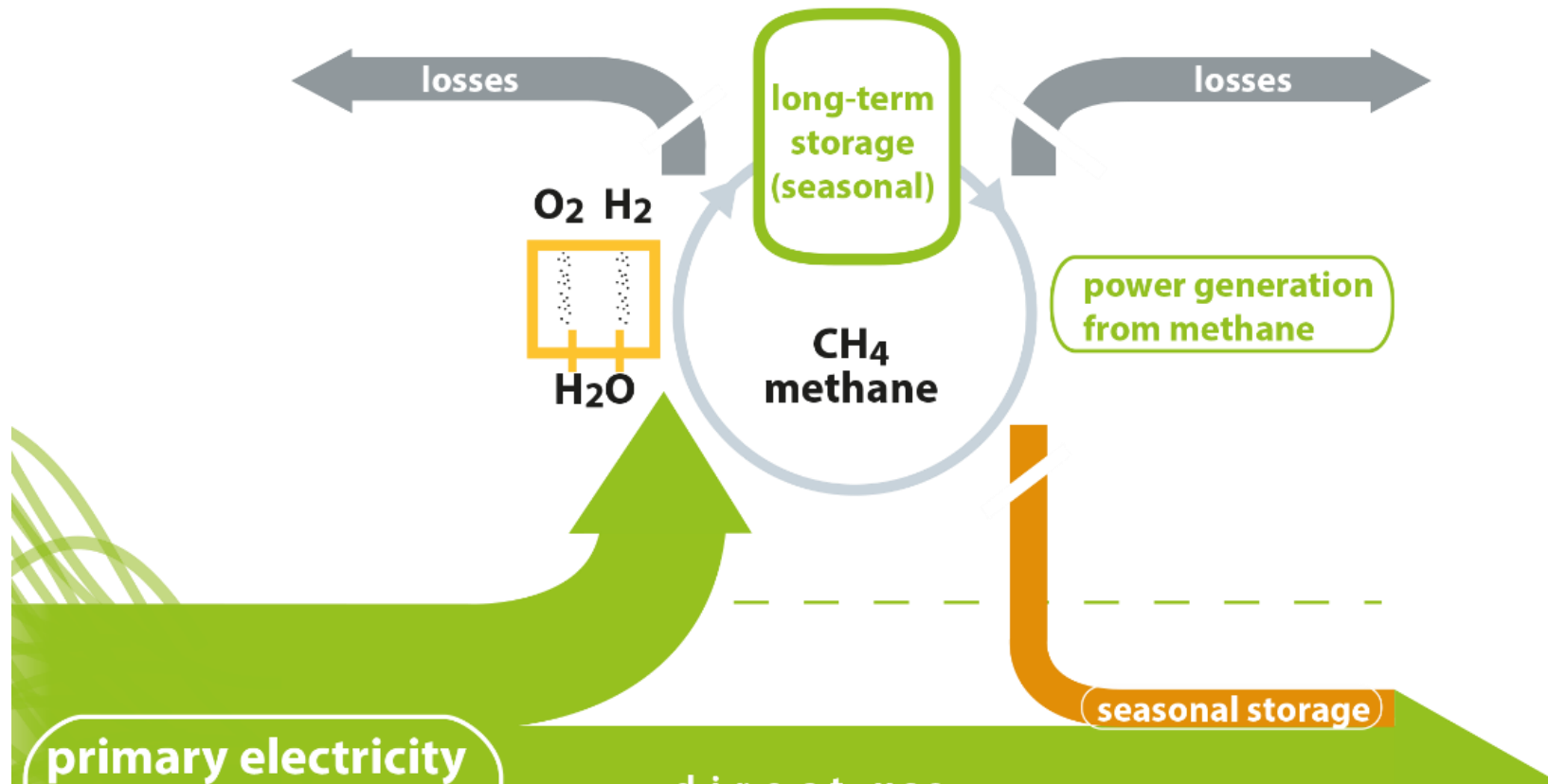


Primary Energy Renewable (PER)

Sustainability evaluation based on a **future scenario** in which **only renewable energies** are in operation.



PER is Ratio of **Primary Renewable Energy to**
Final Renewable Energy Demand in a Building
in a specific climate





Energy demand Reference: Treated floor area	Efficiency		Final energy		PER		
	Calculati on	User defined value	Contribution (final energy)	Final energy demand kWh/(m²a)	PER factor kWh/kWh	Effective PER factor (including biomass kWh/kWh	PER specific value kWh/(m²a)
	-	-					

The energy balance and design to
for efficient buildings and climates



22.8

Heating			100%			0.90	4.9
Electricity (HP compact unit)					1.55		
Electricity (heat pump)	2.21		77%	2.0	1.55	1.10	2.2
District heating: 20-Gas CHP (small) 70% CHP					0.85 1.2 0.97		
Wood and other biomass					1.10		
Natural gas / RE gas					1.75		
Heating oil / RE methanol					2.30		
Solar thermal system			23%	1.3	0.25	0.25	0.3
Electricity (direct)					1.55		
Other							
Aux. electricity (heating, wintertime ventilation)				2.1	1.55	1.10	2.3

Cooling and dehumidification							0.0
Electricity cooling (heat pump)					1.00		
Auxiliary electricity cooling, ventilation summer					1.00		
Electricity dehumidification (heat pump)					1.00		
Auxiliary electricity (dehumidification)					1.00		

DHW generation			100%			0.51	8.2
Electricity (HP compact unit)					1.25		
Electricity (heat pump)	3.87		47%	2.9	1.25	1.20	3.5
District heating: 20-Gas CHP (small) 70% CHP					0.85 1.2 0.97		
Wood and other biomass					1.10		
Natural gas / RE gas					1.75		
Heating oil / Methanol					2.30		

PHPP v9.6 –
PER sheet
for Dr. Ebbel
& Feist’s
Passivhaus
in Olympia
climate

Primary Energy Renewable Factors-

Climate Matters when meeting different loads in a building with 100% Renewable Electricity

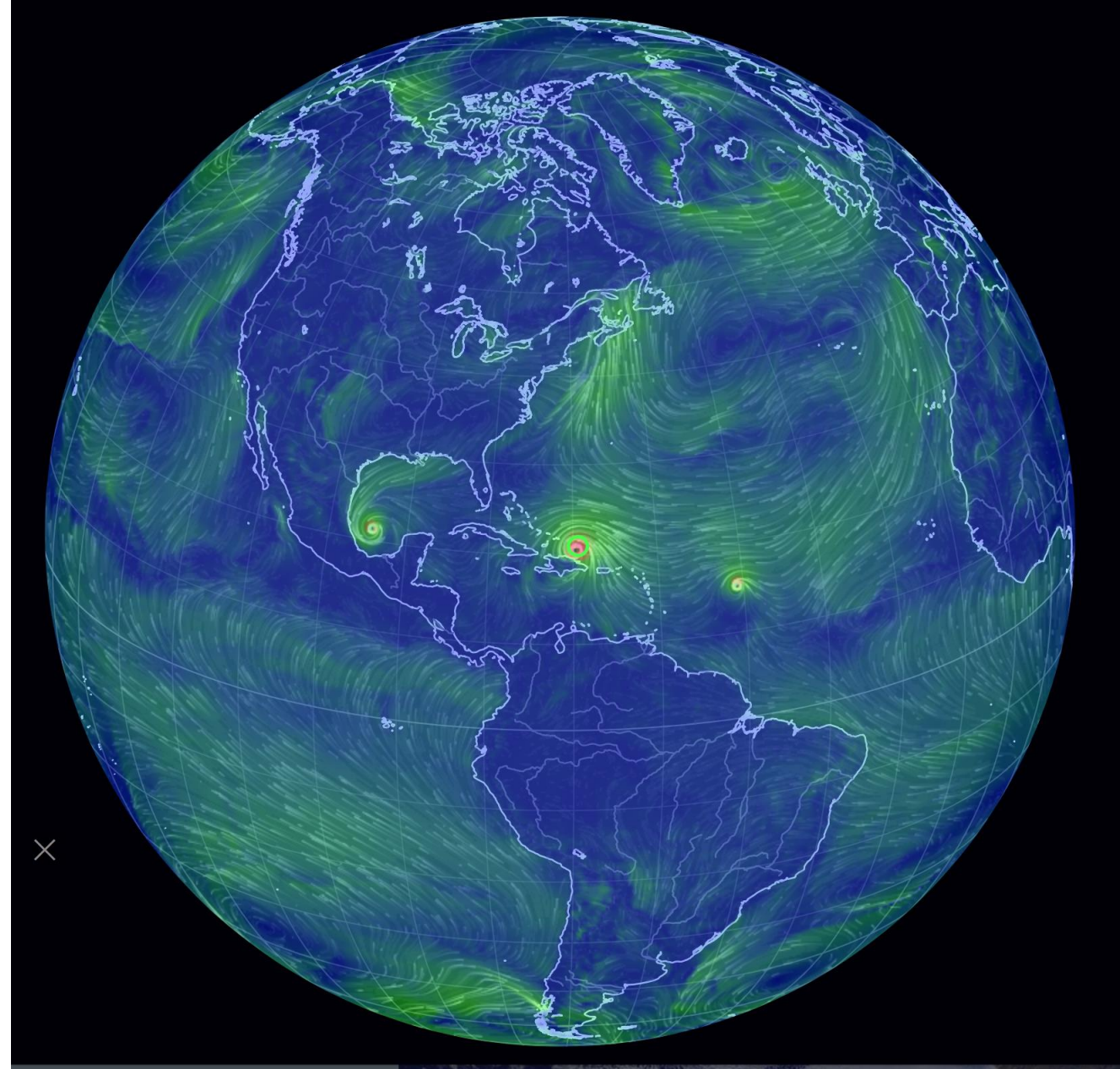
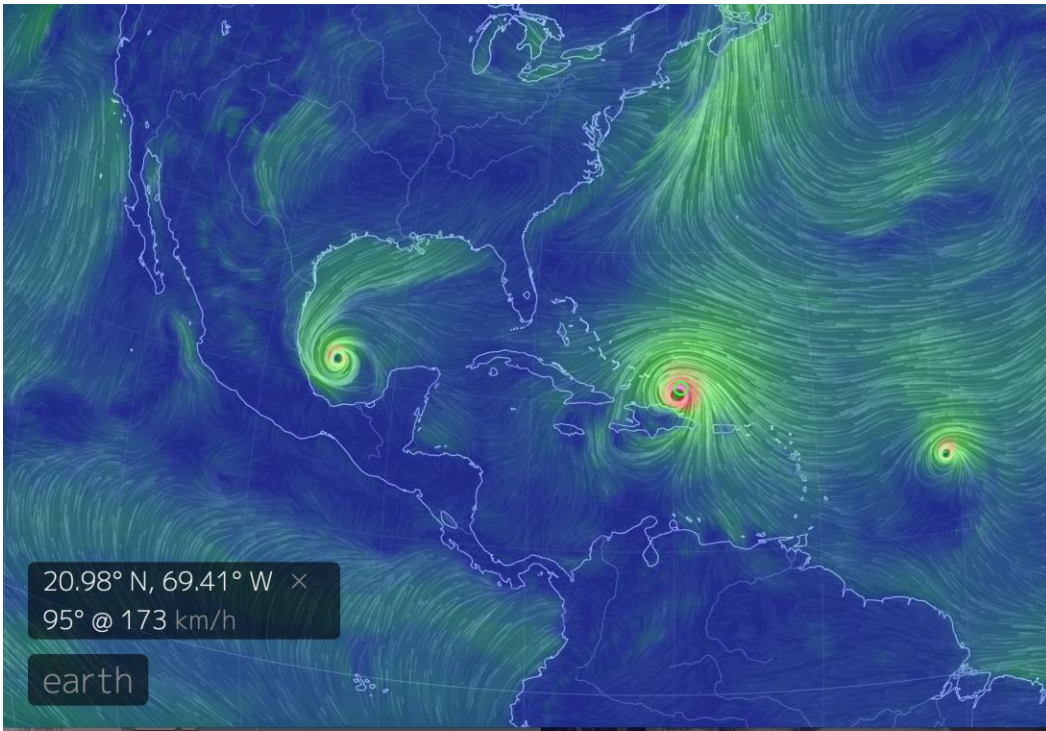
Application	Seattle	Spokane	Portland	Boise	Reno	Los Angeles
Electric Space Heating [PE:2.60]	1.55	1.70	1.60	1.90	1.85	1.50
Gas Space Heating or DHW [PE:1.10]	1.75 (methane from renewable electricity)	1.75	1.75	1.75	1.75	1.75
Electric DHW [PE:2.60]	1.20	1.25	1.25	1.20	1.25	1.20
Lighting, fans, plug, etc. [PE:2.60]	1.25	1.25	1.25	1.20	1.25	1.20
Cooling [PE:2.60]	1.00	1.00	1.00	1.00	1.00	1.15

PER – PHI's Goal & Functional Definition

- **Goal** - A tool to aid designing the most energy efficient buildings in a world 100% powered by renewable energy.
- — Measures how efficiently we meet particular energy loads in a building with primary renewable energy.

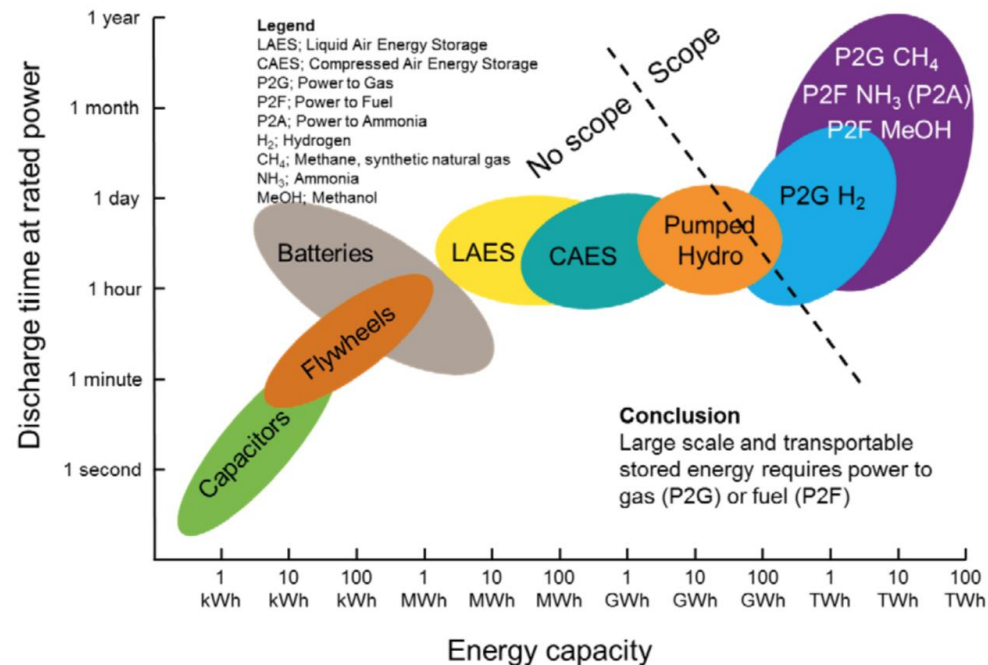
Why is PER the best whole-building operating energy metric?

- We must reduce peak loads on the grid *and* dependence on renewable energy storage, especially long-term (seasonal) storage.
- Two reasons:
 - Environmental - For society/biosphere
 - Financial - For building owner/tenants



Caveat on Guidance: PER's Limitations

- *It is difficult to make predictions, especially about the future.* (Danish proverb)
- PER is a work in progress, and PHI continues to refine it.
- PER measures thermodynamic efficiency, not economic efficiency. Physics; not Finance.



Vox



TWEET



SHARE

Storing electricity for a long time is the holy grail of sustainable energy

Long-duration storage is, as I've **written before**, a kind of a holy grail in energy. Let me review why.

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> Share a map

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ISPT

Institute for Sustainable Process Technology

Power to Ammonia

Sparks fly over ultra-high voltage power lines

Celebrated as the answer to long-distance electricity transmission, China's enthusiasm for UHV lines is weakening,

Peaks, PER & NZEBuildings

Tomas O'Leary nails it
January 5, 2015



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MIND THE (WINTER) GAP

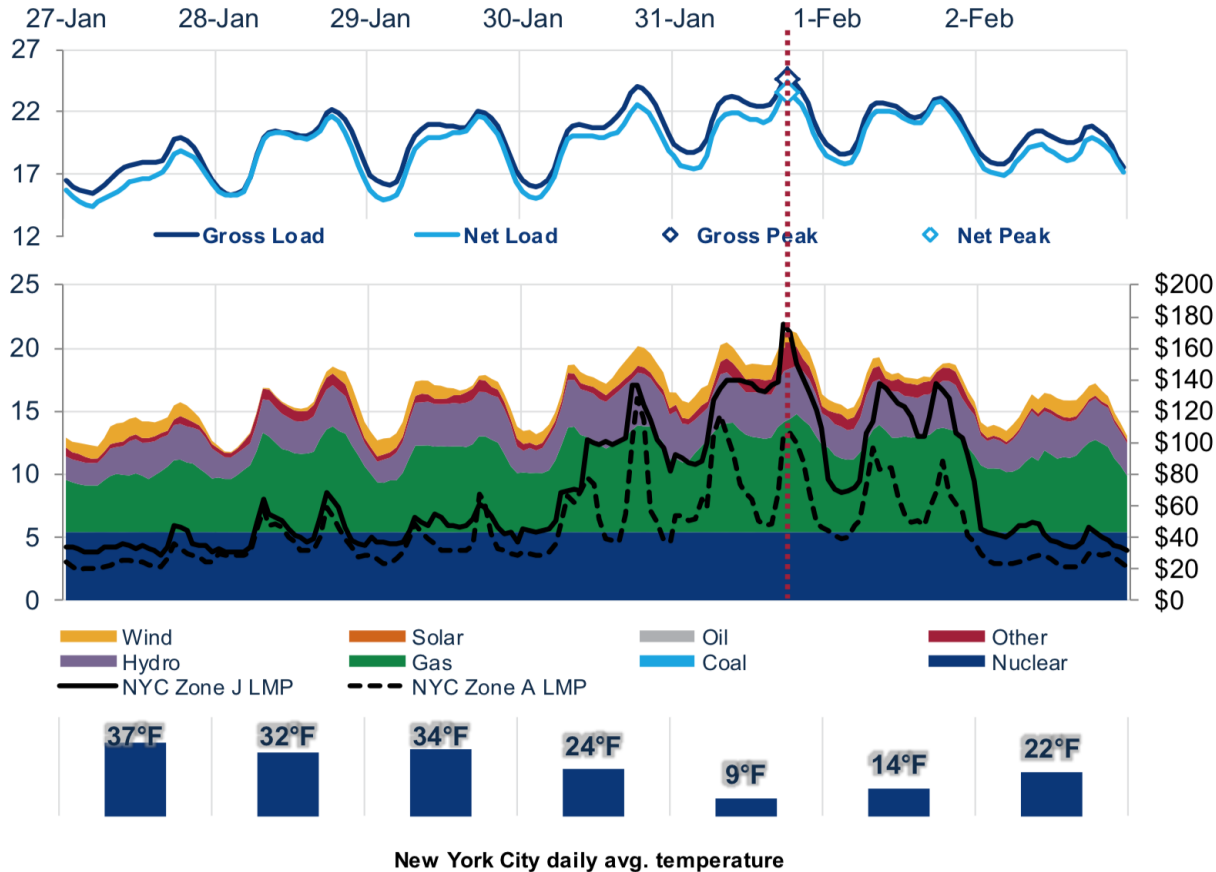


© Passive House Academy 2015



Wood McKenzie: Performance review: Nuclear, Fossil Fuels, and Renewables during the 2019 Polar Vortex

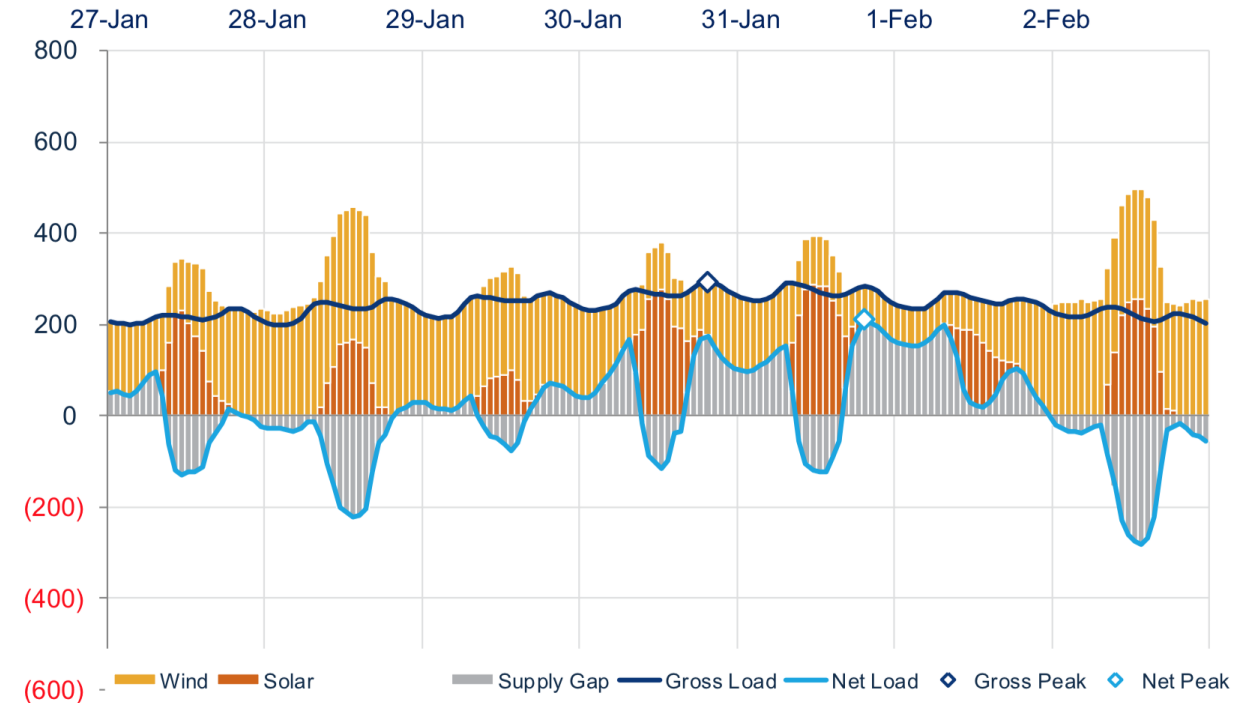
Load, generation (GW), weather and DA-LMP



Aggregate footprint at 75% wind & 25% solar

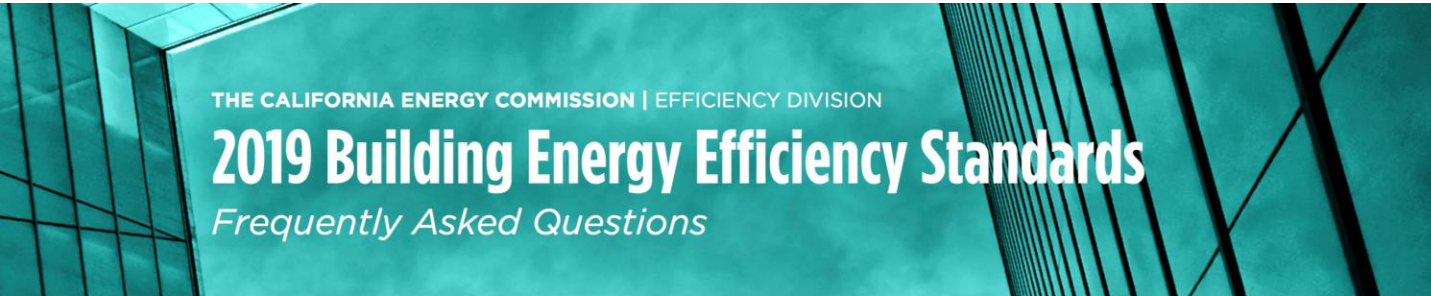
Load, generation, and imbalances (GW)

Peak (MW)			ICAP (MW)			Consecutive hours	
Gross Load	Net Load	Peak Reduction	Solar	Wind	Battery	(-) net load	(+) net load
292,559	208,524	84,034	287,595	290,583	250,229	24	32



California: No longer dreamin' Getting real in 2020:

http://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_Standards_FAQ.pdf



The effective date of the 2019 Building Energy Efficiency Standards is January 1, 2020

What are Building Energy Efficiency Standards?

Building energy efficiency standards are designed to reduce wasteful, uneconomic, inefficient or unnecessary consumption of energy, and enhance outdoor and indoor

Standards ensure that builders use the most energy efficient and energy conserving technologies and construction practices, while being cost effective for homeowners over the 30-year lifespan of a building.

Looking beyond the 2019 standards, the most important energy characteristic for a building will be that it produces and consumes energy at times that are appropriate and responds to the needs of the grid, which reduces the building's emissions.

Low-load buildings' Financial Advantage – Avoid Peaks



Tad W Everhart
Acct # *****0000

Earn a rebate on your bill by shifting
energy use during tomorrow's Peak
Time Event

Tuesday, August 6
4pm to 7pm



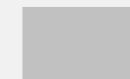
Peak Time Rebates rewards you for shifting your energy use

PGE customers like you are making a big difference for Oregon. When everyone uses a little less energy during Peak Time Events, it helps keep the overall cost of electricity affordable for everyone. Plus, you can earn a rebate on your bill.

Tad W Everhart
Acct # *****0000
Wednesday, Aug 28. Peak Time Event

You received \$1.53 for saving 1.5 kWh

Your 8/28 use



1.2 kWh

Your typical use

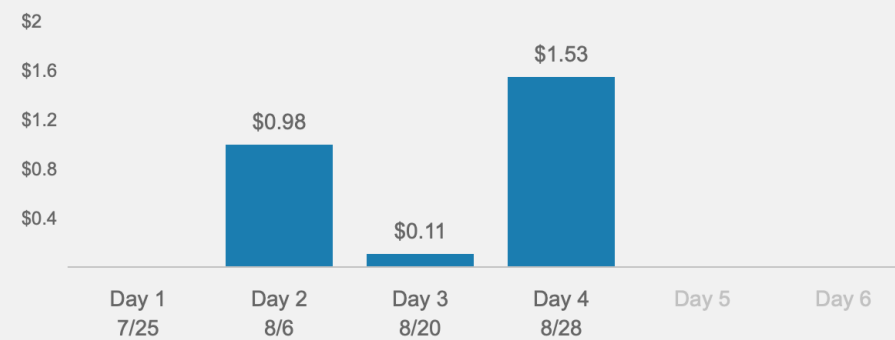


2.7 kWh

Nice job! During the 8/28 Peak Time Event from 4 pm to 7 pm, you used 1.5 kWh less electricity than you've typically used and received \$1.00 for each kWh you saved. Look for a rebate on your next bill.

Your day-by-day earnings breakdown

You've received \$2.62 so far for shifting your electric use



Comparing PER & NZEB

Primary Energy Renewable is a design tool; not a goal.

By accounting for all energetically relevant factors, PER helps us design buildings to best fit the future renewable energy grid.

PER is a design optimization metric.

Net Zero Energy Buildings is a goal.

NZEB may be simply arithmetic equivalence of a building's annual onsite energy production and consumption *without regard for the grid, short-term storage, and long-term (seasonal) storage*.

Simple and appealing.

The right goal?

A useful design tool?

Higher Quality More Choices Greater Competition



- [Eco Windows](#) (Thanks to John Rountree at [Rountree Architects.](#))
- [Ikon Windows](#) (Thanks to Jane Sanders at [Jane Sanders Architect.](#))
- [Minnkota](#) (Thanks to Patrick Clark at [Wooden Haus Supply.](#))
- [Pinnacle](#) (Thanks to Chris Miksic at [Montpelier Construction.](#))
- [Westeck](#) (Thanks to Cody Belton at [Akira Living.](#))
- [Wythe Windows](#) (Thanks to Buck Moorhead at [Acme Architecture.](#))

- [Accurate Dorwin](#)
- [Alpen Windows](#)
- [Barema](#)
- [Bieber Windows & Doors](#)
- [CDM Drewno](#)
- [Dynamic Architectural](#)
- [Euro Clime](#)
- [Fenstur](#)
- [Gealan](#)
- [Harman Fensterbau](#)
- [Ikon Windows](#)
- [Internorm](#)
- [Kalwall](#)
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- [Wausau Windows & Wall Systems](#)
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- [Wasco](#)
- [Wicono](#)
- [Zola](#)

VENDORS

One- and Two-Room Systems

[Lunos](#)
[Vents-Us](#)

[Panasonic](#)
[Zehnder America](#)

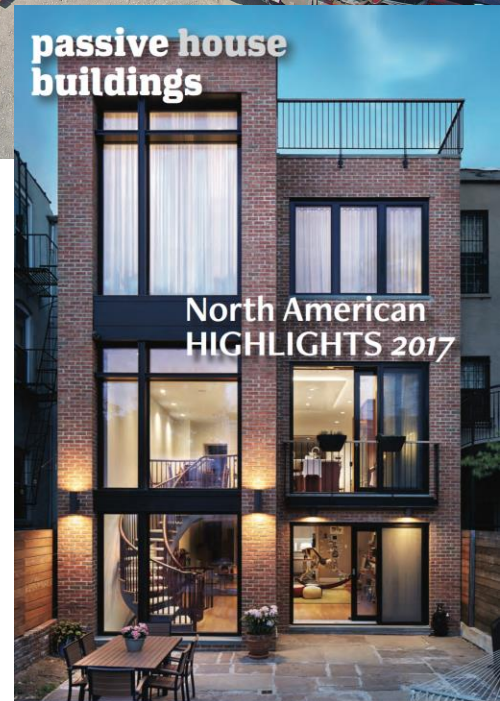
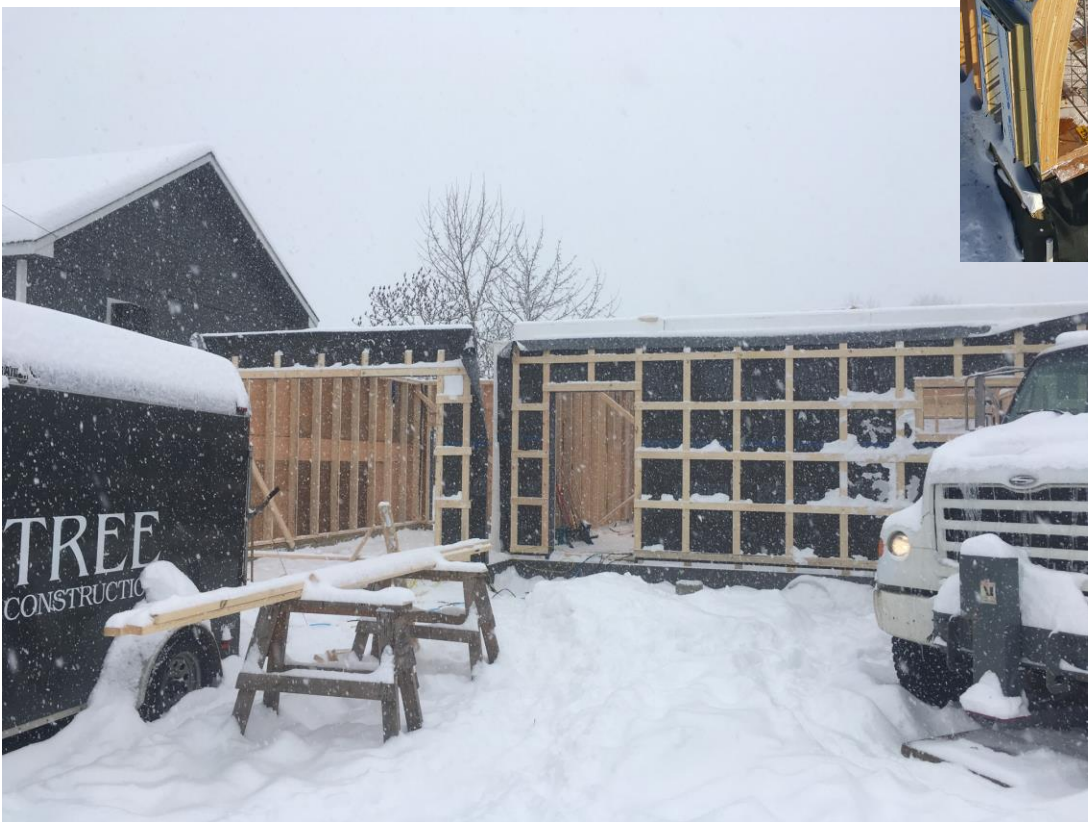
[Ventacity](#)

Whole House Systems

[Aldes American Aldes](#)
[Ecoair by Rehau](#)
[Jablotron](#)
[Lunos](#)
[Panasonic](#)
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[Ultimate Air](#)
[VentilationUSA](#)



For more information, see "Factory Building Surging" at <http://passivehousebuildings.com/magazine/north-american-highlights-2017/>

BC Passive House

Pemberton, BC (2 hours/100 m. North of Vancouver)

<http://www.bcpassivehouse.com>

F, R, & W panels

50% commercial & 50% residential

Conventional to Passive House

PH: Stud service cavity wall w/ext.I-joist & fiberboard

10 or more buildings in 2018

15-20 employees

24-unit PHI-certified MF under construction

"A lot of customers come to us requesting high performance, but only about 10% initially request Passive House."





Collective Carpentry

Invermere, BC (interior BC; 10 hours and 520 miles from Vancouver or 3.5 hours and 172 miles from Calgary— all times are summer travel)

<http://www.collectivecarpentry.com>

R & W panels on slabs

20% Commercial & 80% Residential

PH: Stud service cavity wall w/ext. I-joist/C-joist & fiberboard

10 or fewer buildings in 2018

Less than 5 employees

Valemount Passive House PHI-certified

“We’re starting to get more interest from builders in our region—making us a better value because lower shipping time & cost, but at same time we are now shipping to USA”







Factor Building Panels

Squamish, BC (One hour/40 miles North of Vancouver)

<https://www.factorbuildingpanels.ca>

R & W panels on slabs

Mainly Residential

PH: 2X6 to 2X10 Stud service cavity wall w/ext. fiberboard

10 or fewer buildings in 2018

Less than 5 employees

CNC cutting machine & LVL plates

“When we launched four years ago, we had to take on the GC role. We are still willing to do so and will supply panels directly to homeowners, but prefer to work with a GC.”

Have and will export to USA.





Phoenix Haus

Denver, Colorado (formerly in Detroit)

<https://www.phoenixhaus.com>

R & W panels on slabs

Advertised standard homes w/ prices

PH: Stud service cavity wall w/ext. fiberboard

2018: Third North American factory to achieve PHI building system component certification

Invested in German-built trailers that lower at the site allowing specially-constructed steel racks holding panels vertically to be staged at site without requiring trailer remain at site.

“Lots of builders exhale in relief with us.”



BUILDERS & DESIGNERS

Gain access to use in your projects!

Phoenix Haus' prefabricated building system, trademarked 'The Alpha', has been certified through The Passive House Institute in Darmstadt, Germany.

The Alpha, organized into 30 unique connections, can be used in multiple 'plug & play' applications.

Phoenix Haus is looking for long-term collaborations with professionals in the Rocky Mountain Region (CO, ID, WY, MT, UT & NM)



Build SMART

Lawrence, Kansas (40 minutes/40 miles West of Kansas City, Kansas)

<https://www.buildsmartna.com>

W & R panels (on slabs)

Second North American factory to achieve PHI building system component certification

Explosive growth in multifamily production in 2016-2018

More information from Paul Grahovac



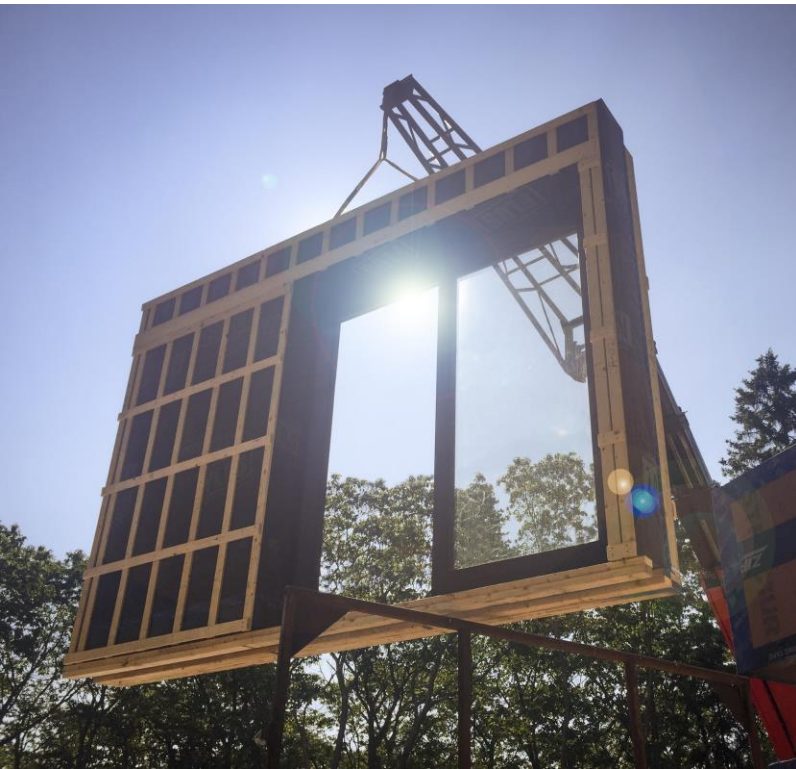
Ecocor

Belfast, Maine (2 hours & 100 miles North of Portland, Maine)

<https://www.ecocor.us>

Advertised standard homes w/ prices

First North American factory to achieve PHI building system component certification



GO Home (by GO Logic)

Belfast, Maine (2 hours & 100 miles
North of Portland, Maine – the
Epicenter of North American factory
Passive House production)

<http://thegohome.us>

Advertised standard homes w/
prices

Finish options

Phased out site enclosure
construction

W & R panels (on slabs)

100% single family residential in
2018



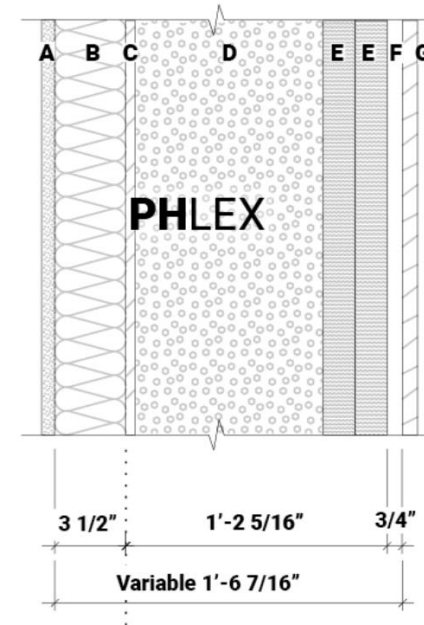






PHlex™

Flexible Passive House Approach



A. INTERIOR FINISH

Custom specifications

B. SERVICE LAYER

Dimensions to support services, additional insulation, and fastenings

C. AIR AND VAPOR CONTROL LAYER

OSB with taped seams (shear layer)

D. STRUCTURAL FRAMING & INSULATION @ 24" O/C

PHflexible framing and cellulose insulation depths

E. EXTERIOR INSULATED SHEATHING AND DRAINAGE PLANE

Flexible exterior dimensions

F. RAINSCREEN

Flexible exterior dimensions

G. EXTERIOR CLADDING

Flexible exterior dimensions

PHLEX WALLS ARE FULLY CUSTOMIZABLE TO
FIT YOUR PROJECT NEEDS

Contact us for more information

VENDORS

THANK YOU FOR YOUR CONTRIBUTION

[JustBioFiber](#) (Thanks to James Bowles)

[Method Homes](#) (Thanks to Joe Giampietro at [NK Architects.](#))

[Blueprint Robotics](#) (Thanks to Patrick Clark at [Wooden Haus Supply.](#))

Floor, Roof and Wall Panels

[BC Passive House](#)

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[Super SSR Block](#)

<https://apogeepassivehouse.com/products/factory-built-passive-house-walls-roofs-and-floors/>