

# Green Building Roundtable:

## Passive Energy Design and Construction

September 11, 2009



# Green Building Roundtable: Passive Energy Discussion Framework

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**8:00 AM** **Passive House Overview – How these standards compare with LEED and other standards?**

Elements of Passive House Standards  
Performance Characteristics

**8:30 AM** **Passive Energy Building Retrofits – What are the top five elements of effective retrofits?**

Key metrics for energy efficient building design

*Break*

**9:00 AM** **Commercial Applications – How can you apply these standards in commercial settings?**

Commercial Short film on Rolf Disch – Solar Architect’s Passive Energy Mixed Use Building and Neighborhood

**9:30 AM** **Why Passive Energy Design and Construction? – Seeing Green**

Why should commercial and industrial sectors be interested?  
How do these passive energy concepts translate into business benefits?

**9:45 AM** **Great Ideas...Now how do I fund them? – Finding Green**

Federal Funding Programs for Efficiencies and Deep Energy Retrofits

**9:55 AM** **Resources**

# Passive House (Passivhaus)

## What is a Passive House?

A home that saves up to 90% of space conditioning costs through:

- super-insulated, virtually air-tight building – consistent temp. control
- Heating via passive solar gain and internal gains from people, electrical equipment, etc.
- Avoidance of heat gain and reduction of cooling load through shading and window orientation
- Energy recovery ventilators for balanced fresh air supply (and great IAQ)

**Any remaining heat demand is provided by an extremely small source.**

Comprehensive system relying on passive energy vs. active systems.



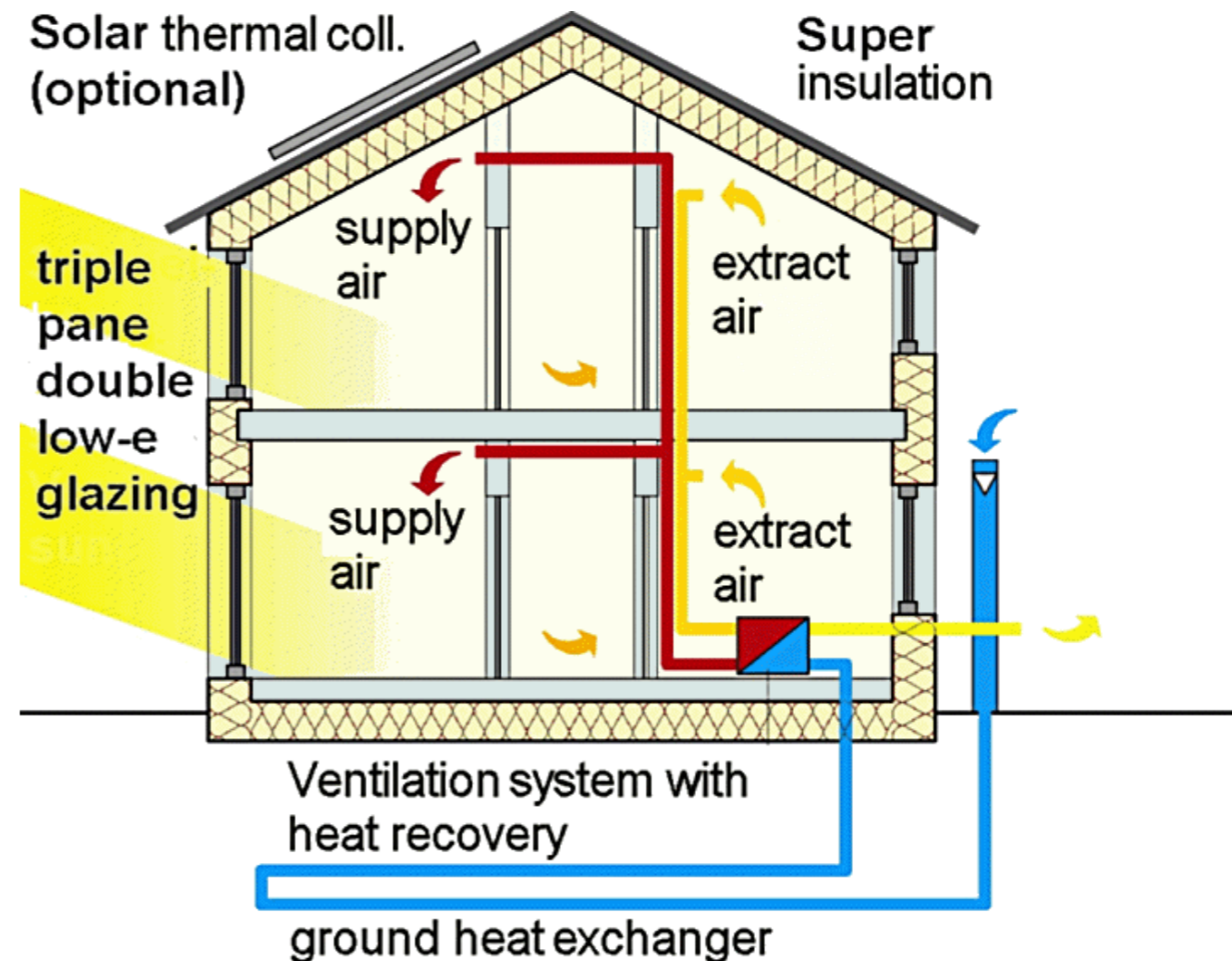
# Passive House Performance Characteristics

## ***Super insulation:***

- High R-Value or Low Thermal Heat Loss Coefficient - R-Values of 38 - 52 on all external walls, slab foundation and roofs.
- Construction Reducing Thermal Bridging
- Airtight Construction

## ***High Efficiency Windows:***

- R-Value of just over 7 (U-value of  $<0.20$ ) using triple pane windows with two low-e coatings and Argon gas (Energy Star window in the US will be closer to the 0.30)
- Super-insulated frames
- “Warm Edge” spacers between the panes of glass



# Passive House Performance Characteristics cont....

## ***Mech. Ventilation w/ Heat Recovery***

- HRV or ERV recover 75% to 95% of the heat by passing warm exhaust air past the incoming cold air without mixing - only fresh air is vented into the home and no air is recirculated.

## ***Inno. & Efficient Heating Technology***

- Small heat pump
- Small condensing gas burner
- Small combustion unit for biomass fuel
- Compact unit for all in one heating, ventilation and domestic hot water

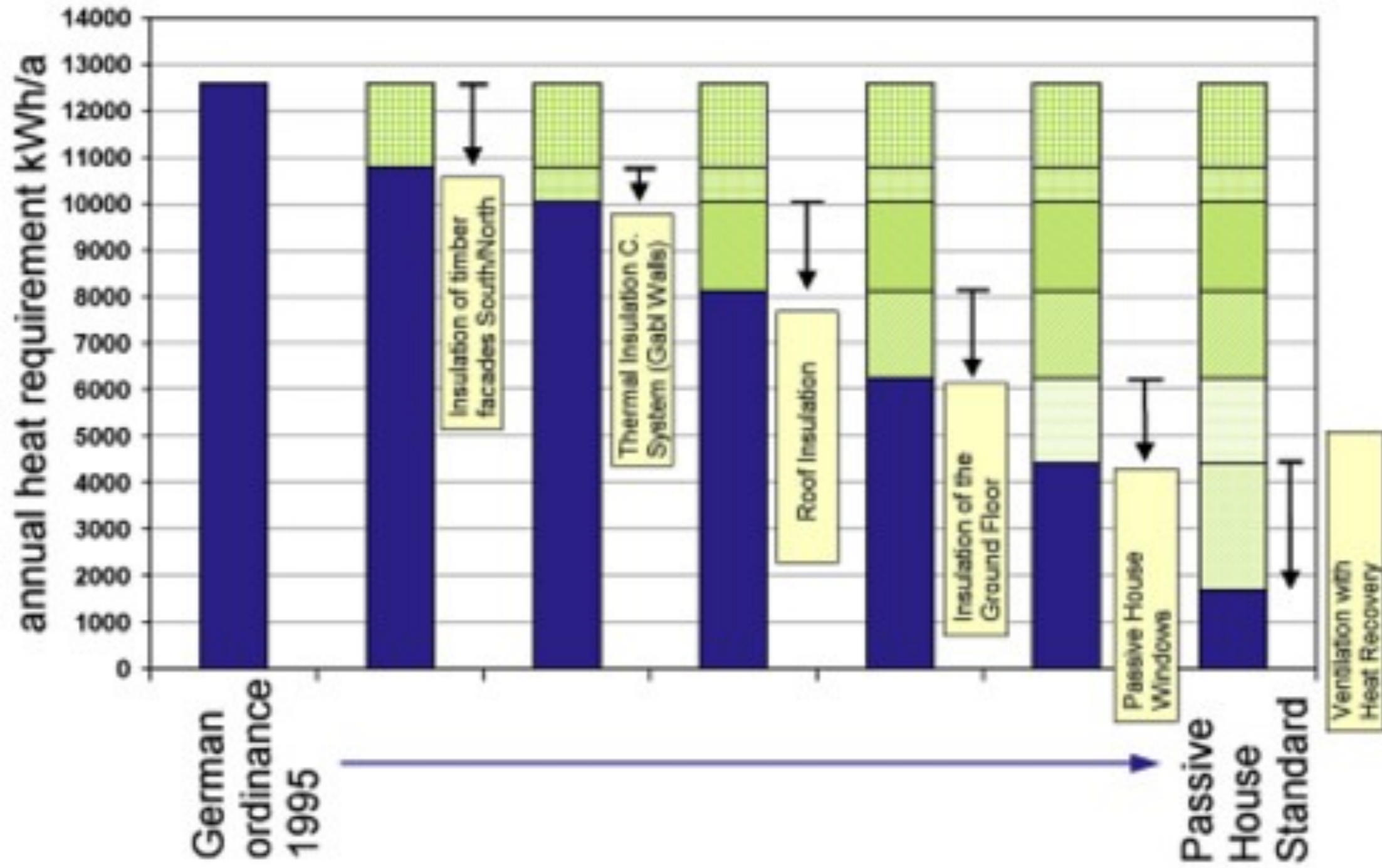


# Passive House



# Passive House

Passive house settlement (Hannover-Kronsberg)



# The Path to Passive Energy

- \* MA Zero Net Energy Buildings Task Force
- \* MA Stretch Code
- \* European mandate
- \* US Passive House Institute





# Plus-Energy Homes

**Produce more energy from renewable energy sources over the course of a year, than it imports from external sources.**

This is achieved using some combination of:

- Micro-generation technologies (wind, geo, solar PV, solar thermal)
- Low-energy building techniques (passive)
- careful site selection and placement

With Net-metering, these buildings become decentralized power suppliers.

Total disconnect from the grid possible (but need storage)



# Passive Energy Funding Opps.

Energy Star Rebates for Homeowners (envelope improvements, roofing, HVAC upgrades, boilers, renewable energy systems, fuels cells and more)

[http://www.energystar.gov/index.cfm?c=tax\\_credits.tx\\_index#c2](http://www.energystar.gov/index.cfm?c=tax_credits.tx_index#c2)

Tax deductions for new or existing commercial buildings (\$1.80/sq.ft) that achieve 50% energy reductions and meet ASHRAE 90.1-2001. Also partial deductions for Building system improvements (envelope, lighting, HVAC)

[http://www.energystar.gov/index.cfm?c=tax\\_credits.tx\\_comm\\_buildings](http://www.energystar.gov/index.cfm?c=tax_credits.tx_comm_buildings)

Industrial Energy Assessment Assistance

<http://www1.eere.energy.gov/industry/saveenergynow/>

Recovery Act Funding Opportunities for Industrial Efficiency Projects (\$256m)

<http://www1.eere.energy.gov/industry/financial/>

Federal Incentives for Renewables and Efficiencies in Massachusetts

<http://www.dsireusa.org/incentives/index.cfm?re=1&ee=1&spv=0&st=0&srp=1&state=MA>

MA EOEEA DOER Energy Audit Program for Municipalities

[http://www.mass.gov/Eoeea/docs/doer/pub\\_info/ea-pon-announce-121108.pdf](http://www.mass.gov/Eoeea/docs/doer/pub_info/ea-pon-announce-121108.pdf)



# Passive Energy Funding Opps. Cont...

MA State RE Tax Incentives for Residential and Commercial

[http://www.mass.gov/?pageID=eoeewaterterminal&L=4&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Renewable+Energy+Funding+and+Incentives&sid=Eoeea&b=terminalcontent&f=doer\\_renewables\\_massachusetts\\_incentives&csid=Eoeea](http://www.mass.gov/?pageID=eoeewaterterminal&L=4&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Renewable+Energy+Funding+and+Incentives&sid=Eoeea&b=terminalcontent&f=doer_renewables_massachusetts_incentives&csid=Eoeea)

Demand Response Program (ISO New England - >100kW reductions)

[http://www.iso-ne.com/genrtion\\_resrcs/dr/index.html](http://www.iso-ne.com/genrtion_resrcs/dr/index.html)

UMASS Lowell – Industrial Assessment Center (EE for small-med sized companies >500 employees, <\$100m annual sales, no in-house energy expert, annual energy costs between \$100K and \$2.5m)

<http://www.ceere.org/iac/index.html>

CHP for the Northeast – Assessment and Analysis Support

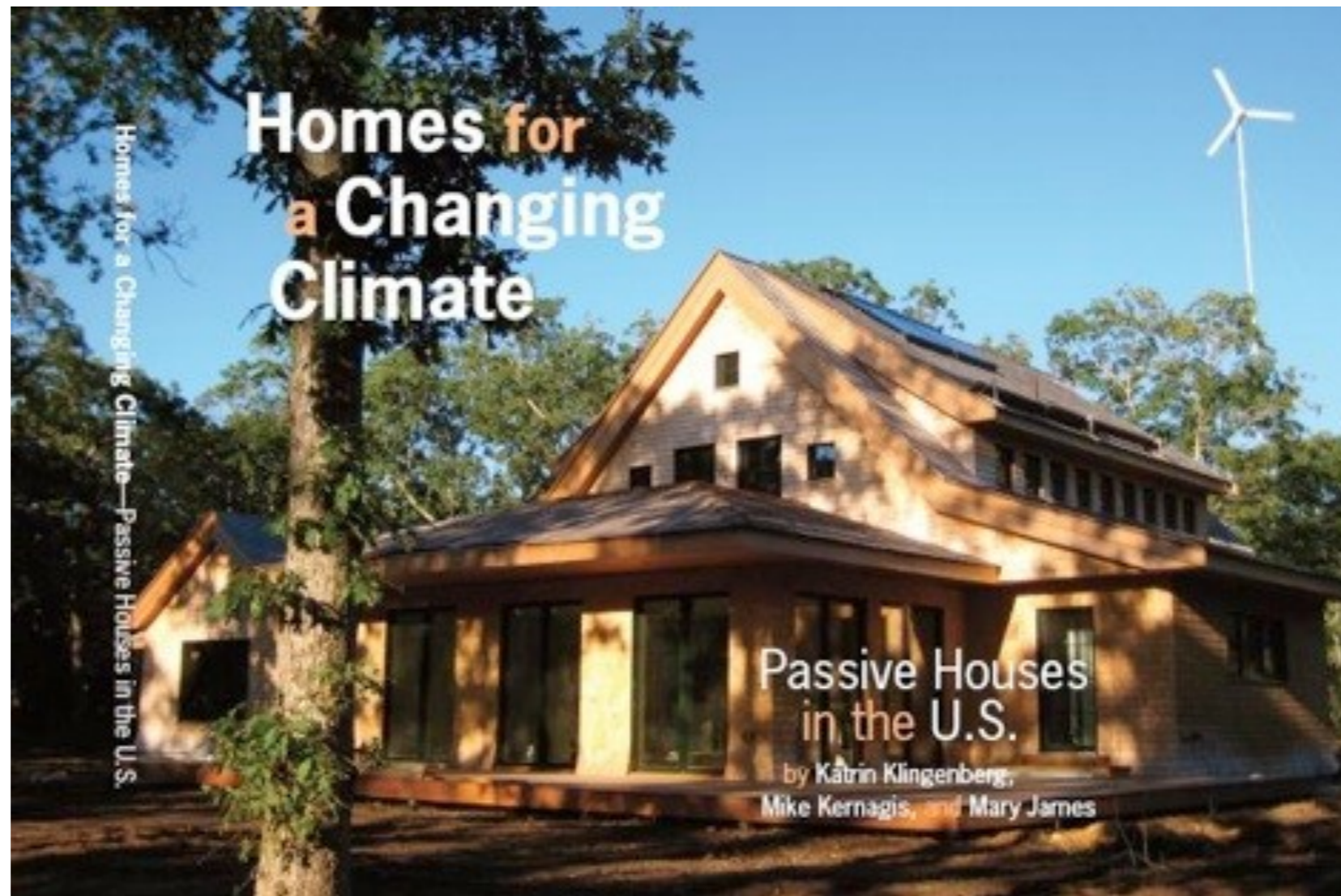
<http://www.northeastchp.org/nac/services.htm>

National Grid Whole Building Assessment Program

[http://www.nationalgridus.com/non\\_html/WBAMOU\\_Final\\_5\\_22\\_09.pdf](http://www.nationalgridus.com/non_html/WBAMOU_Final_5_22_09.pdf)



# Passive House Resources



US Passive House Institute – information, design tools, good overall resource  
(US Passive House Conference – Illinois, Oct 16-18) –  
**Passive House Institute US – Certification Program:**  
<http://www.passivehouse.us/passiveHouse/PHIUSHome.html>



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Passive house overview -

[http://www.passivhaustagung.de/Passive\\_House\\_E/passivehouse.html](http://www.passivhaustagung.de/Passive_House_E/passivehouse.html)

Chart showing energy consumption traditional vs. passive

<http://www.terrapass.com/blog/posts/passive-energy-yields-aggressive-carbon-cuts>

Passive Solar Heating and Cooling – good summary of elements

[http://www.iklimnet.com/save/passive\\_solar\\_heating.html](http://www.iklimnet.com/save/passive_solar_heating.html)

Rolf Disch Solar Architect - <http://www.rolfdisch.de/>

Overview of Passive Solar concepts <http://passivesolar.sustainableSources.com/>

Markey - Waxman Bill Summary - [http://www.architecture2030.org/news/news\\_072209.html](http://www.architecture2030.org/news/news_072209.html)

BAC and Tufts Solar Decathlon project – using water filled glass windows for passive solar gain

<http://www.livecurio.us/>

Others??

