

# Hudson Passive Project First Year Performance



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## Hudson Passive Project

**Architect:**

Barlis Wedlick Architect

**Passive House  
Engineering:**

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**Builder:**

Bill Stratton Builder



## Hudson Passive Project

- Single family home in Claverack, NY
- 1,568 sf
- 2 bedrooms on 2 levels
- Participated NYSERDA High Performance Development Challenge
- Occupied in October 2011 by couple with 2 large dogs



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## Specifications

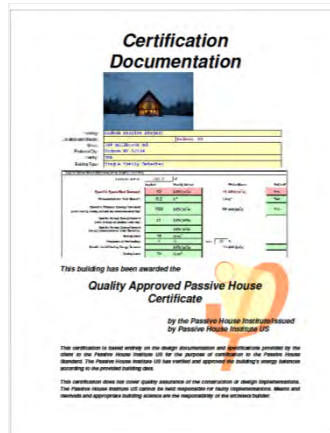
Slab insulation	12" EPS with high density EPS at perimeter
Foundation wall insulation	4" XPS
Exterior walls	12.25" thick EPS SIPs
Roof	12.25" thick Neopor EPS SIPs
Windows	Serious Materials double pane with intermediate film
Door	Custom with glass from Serious Materials
Roof windows	Fakro
Space conditioning	Mitsubishi heat pumps (2) + electric resistance baseboard backup (1 @ 4 ft)
Ventilation	Zehnder ComfoAir 200 HRV
Water heating	Steibel Eltron Tankless electric
Clothes dryer	Condensation dryer (ventless)



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## Certification



- Specific space heating demand: 12 kWh/(m2a)
- Specific Primary Energy Demand: 109 kWh/(m2a)
- Pressurization Test Result: 0.16 ACH50



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## Monitoring Goals

- Did the house meet the Passive House energy goals?
  - Heating/cooling energy
  - Total primary energy
- What is the relative importance of the various energy demands?
- How does performance compare to the energy model?
- Were the occupants satisfied; i.e. did the home perform as desired (comfort)?
- Were there any unforeseen problems with home operation or durability?



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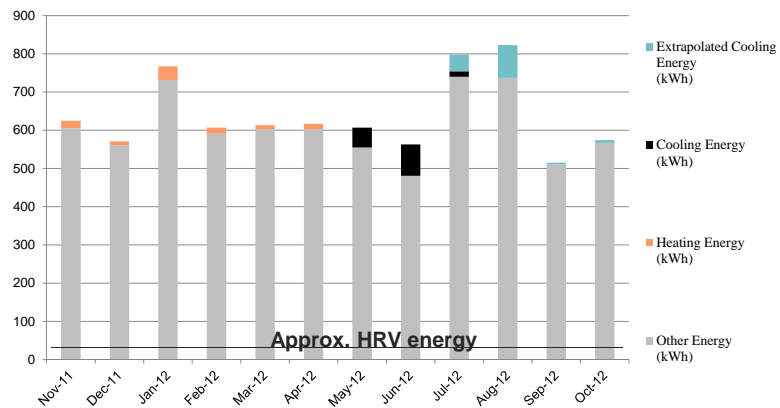
## Monitoring Points

- Total house energy (Wattnode Power Meter 3Y-208)
- Heat pump energy (Ohio SHW 2100)
- Battery powered data loggers
- Hourly intervals
- January 2011 to October 2012
- Electric utility bills

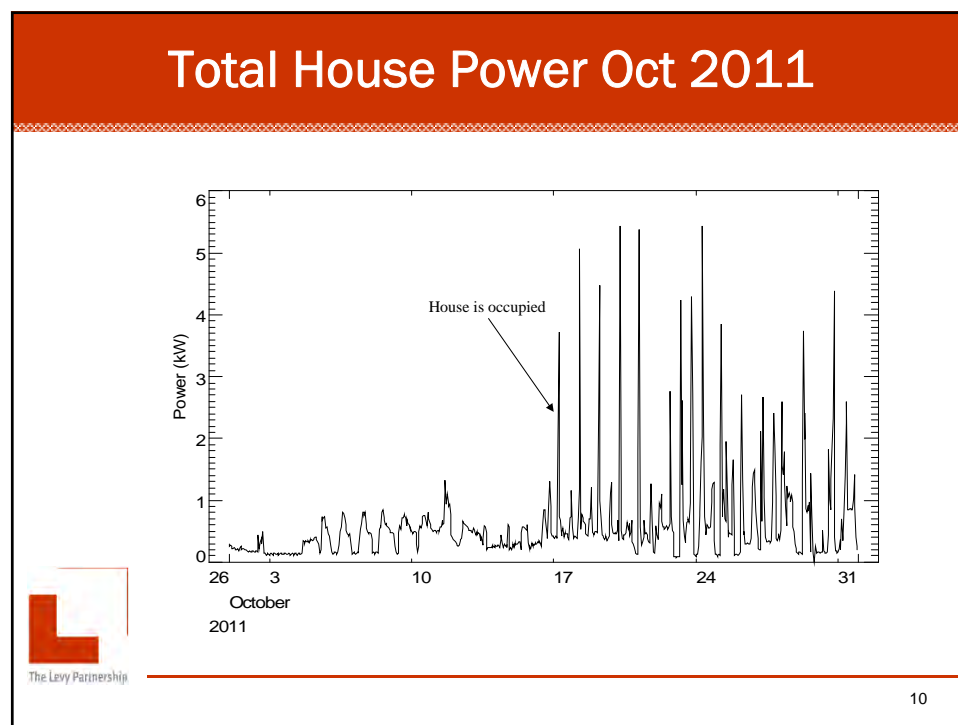
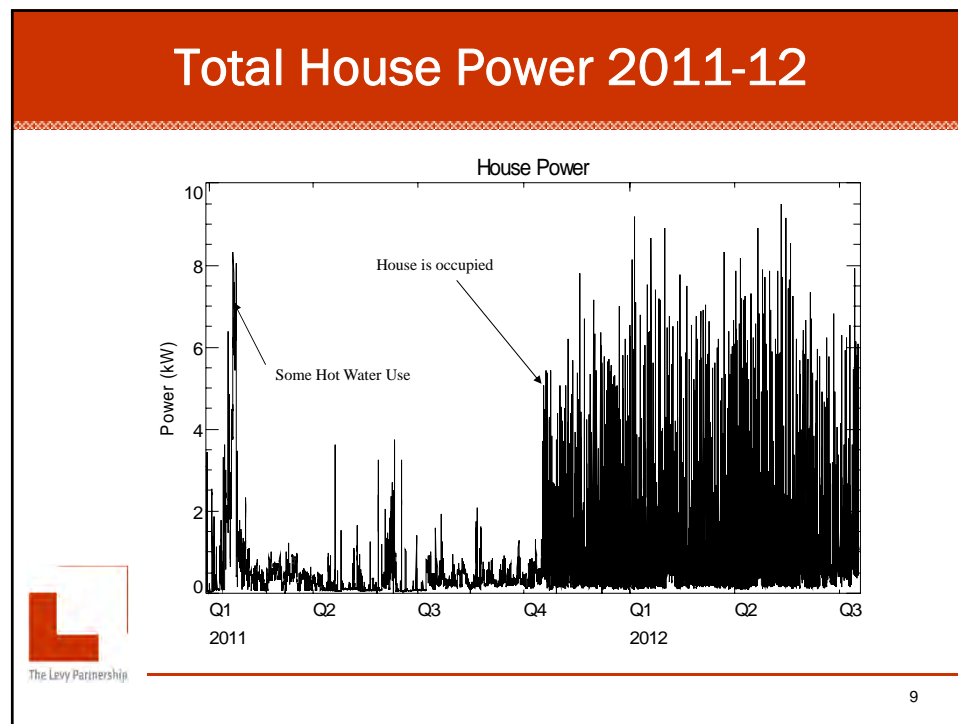


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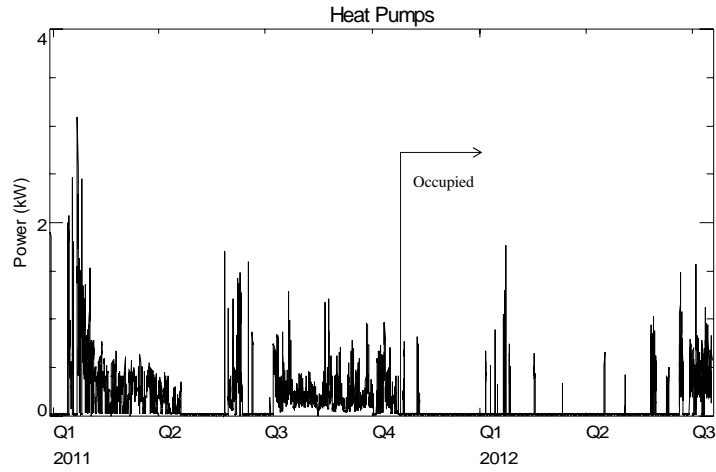
## Monthly Energy



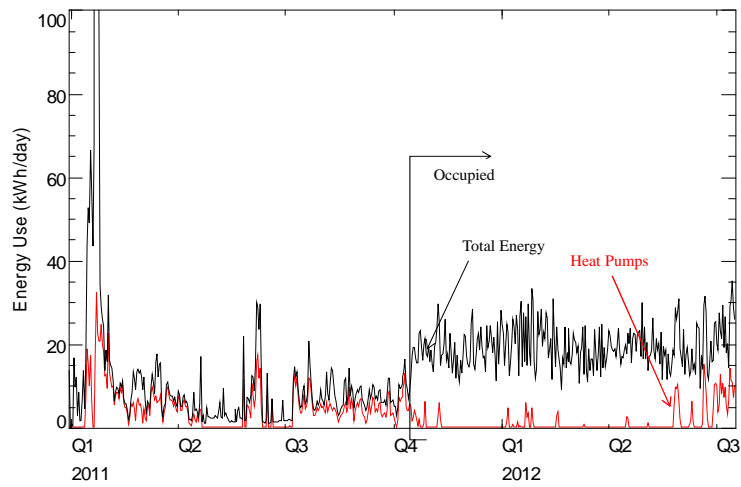
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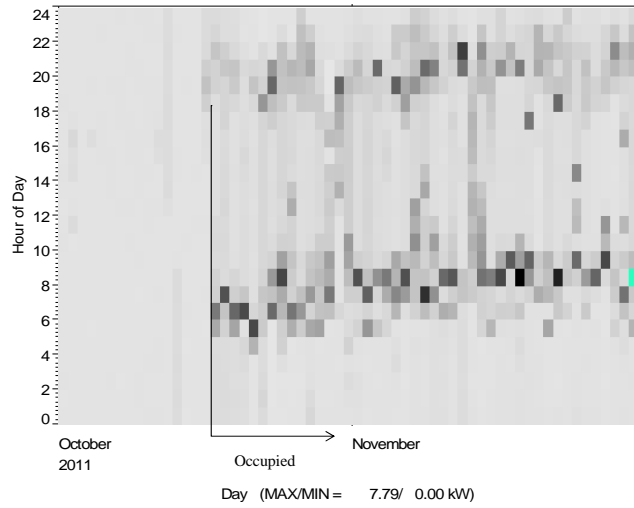
## Heat Pump Power 2011-12



## Total and Heat Pump Power 2011-12



## Shade Plot Other Energy Oct-Nov 2011



## Energy Usage Compared to REM/Rate

	Utility Bills	Weather Normalized Utility Bills	REM/Rate (Passive House Design As Built)	Weather Normalized Bills vs. REM/Rate Passive House Design	REM/Rate Analysis (Original Design)	Weather Normalized Utility Bills Passive House Design vs. REM/Rate Original Design
<b>Units</b>	(kWh)	(kWh)	(kWh)	n/a	(kWh)	n/a
<b>Heating</b>	106	116	1,871	-94%	15,210	-99%
<b>Cooling</b>	289	150	978	-85%	909	-83%
<b>Other</b>						
<b>DHW</b>	-	-	3,429	-	3,400	-
<b>Misc.</b>	-	-	5,906	-	5,715	-
<b>Total Other</b>	7,285	7,285	9,335	-22%	9,115	-20%
<b>Total</b>	7,680	7,551	12,184	-38%	25,233	-70%



## Energy Usage Compared to PHPP

Units	Actual Consumption		PHPP Predicted	Compared to PHPP Predicted	PH Criteria	Compared to PH Criteria
	(kWh/yr)	(kWh/m2-yr)	(kWh/m2-yr)		(kWh/m2-yr)	
Heating energy	106	0.7	12	-94%	15	-95%
Total site energy	7,680	52.7	40	+31%	44.4	+19%



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## Homeowner Comments

- The thermostat was set at about 60 °F during the period between completion of the house and occupancy.
- We did not have any overheating problems in the shoulder seasons or otherwise.
- Temperature distribution in the house was pretty even; slightly warmer upstairs and in the bathrooms.
- HRV was used 100% of the time. We used the setting adjustments from 1 (typical) to 3 (cooking) as needed. You can hear it slightly when on speed 3.
- IAQ was excellent.
- Did not install the electric resistance heater in the main room.
- Did install one electric baseboard heater in the bedroom but never turned it on except once the dogs activated it by accident.
- The condensation clothes dryer works but is about 30% slower than an exhaust dryer.



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## Compared to Your Previous Homes:

System	Rating	Comment
<b>Overall performance</b>	Much better	
<b>Heating system</b>	reasonably comfortable	Quiet, reacts fast and fulfills the heating need, but I loved the radiant floor heat I had in a previous house.
<b>Cooling system</b>	very comfortable	Worked well; we left air conditioning on for our two large dogs. Did not open the roof windows – they may have provided more natural cooling. Nor did we install the trellis to shade the lower front window.
<b>Hot water system</b>	completely satisfied	Great hot water system. Gets hot instantly and never runs out. Takes longer to fill the tub but that does not bother us.
<b>Lighting system</b>	not satisfied	Need more and better location of fixtures
<b>Quiet indoor environment</b>	completely satisfied	Unbelievably quiet. Even the dogs can't hear us coming up to the house when they are inside
<b>Draftiness</b>	completely satisfied	No drafts



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## What are You Most Pleased With?

Which aspect of your home have you been most pleased with?

- Low utility bills
- Good indoor air quality
- Very durable

What are your favorite technologies or systems in this home?

- The HRV – air quality is great
- The hot water system
- Induction cooktop



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