Thousand Home Challenge - Case Study
Larry & Suzanne Weingarten, Salinas CA

The House on Hummingbird Hill

Built in 2006
1,800 ft²
3 levels
3 bedrooms
2 baths

THC Status:
13th Project in North America to officially meet THC; 5th in California
Meets Option B allowance
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Project Summary

• Off-grid home on rural site
• SIPS (roof R-38, walls R-25, floor R-32)
• 0.63 kW Photovoltaic array (south facing), with generator for battery charging
• Walk-in basement, thermally isolated (includes water heater museum)
• Solar hydronic heating, wood backup
• Solar thermal hot water, propane backup
• Propane cooking, clothes dryer
• Passive cooling & ventilation
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Homeowner Priorities

- Quiet
- Low maintenance
- Energy efficient
- Affordable
- Comfortable
- View of Monterey Bay
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Innovative Heating Design

Wall radiant solar heating
Passive circulation
Heats with 80°F water, low Δ T
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Systems Integration - DHW

Solar hot water storage
Waste water heat recovery
Minimized Electrical Loads

- Two inverters; the larger, less efficient one is used only for large loads
- Reduced standby & low load AC minimizes need for inverters
Minimized Electrical Loads, cont.

- Both 24V DC & 120V AC systems
- Switched GFI reduces phantom load, keeps inverter in sleep mode
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Window Design Strategies

• Careful attention to daylighting, reducing solar gain & glare
• Translucent material in window cavity reduces glare
North facing home defies passive solar design principles

View of back of home and south facing roof with solar thermal & .63 kW PV array
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Energy Use, kWh/year

OPTION B ASSUMPTIONS: 1,800 ft² FFA, 2 occupants, fossil heat, Salinas weather station, 2,767 HDD (base 65)

OPTION B (Wood heat)

OPTION A (25% of Pre)

Current Use 9-15-11 to 9-15-12

Pre-Upgrade (Wood est)

Annual use 40% less than OPTION B allowance of 5,276 kWh

3,207 kWh site energy use

OPTION A

(25% of Pre)

Heating (wood)

Propane (Dryer, cooking, DHW)

Hot Water

All Else

Gasoline (generator)

Total kWh/yr

0 2,000 4,000 6,000 8,000
Further Energy Reductions

- New chest-type refrigerator & freezer (2010)
- *Original propane refrigerator used ~100 gals/year (~2,500 kWh)*
Implications for Other Homes

- Design strategies can have a huge impact
- Assumptions can be successfully challenged: solar orientation & window/glazing strategies
- Even high-performance homes can achieve significant reductions, often at low upgrade cost
- Effective solar thermal “combi” space & water heating
- Innovative ways to minimize electric loads, inverter use
- Radiant heating area – and cost – could be reduced
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For More Information

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- [www.waterheaterrescue.com/pages/whh/pages/hummingbird-home.html](http://www.waterheaterrescue.com/pages/whh/pages/hummingbird-home.html) (including construction photos)
- [www.homeenergy.org/show/article/nav/solar/id/696](http://www.homeenergy.org/show/article/nav/solar/id/696)

3-Part Home Energy Magazine Documentary-Interview:

- [www.homeenergy.org/show/article/nav/renewableenergy/page/2/id/679](http://www.homeenergy.org/show/article/nav/renewableenergy/page/2/id/679)
- [www.homeenergy.org/show/article/nav/renewableenergy/page/2/id/696](http://www.homeenergy.org/show/article/nav/renewableenergy/page/2/id/696)