energy upgrade™ CALIFORNIA in Los Angeles County

ENERGY UPGRADE

case study

Green Idea House

Location: 1556 Prospect Avenue, Hermosa Beach

Home: 53 years old (built in 1959); 2,100 square feet, includes an 800-square-foot addition in 2012

Project Cost: Approximately $420,000

Rebates: $8,000 via Energy Upgrade California in Los Angeles County and $2,000 via Green Label

Incentives: $500 Energy Champion Incentive (U.S. Green Building Council-LA and Leadership Hermosa Beach)

Energy Savings (modeled): 45%+

Energy Savings (actual): 74% average energy savings compared to the original home (based on bills from first two months of occupancy)

Tax Credits: Solar system

Tax Deduction: $38,000 via Reuse People

Robert, Monica, and Carter Fortunato pose with their 2012 LA County Green Leadership Award.

BACKGROUND

Ten years ago, Robert and his wife Monica Fortunato noticed soot accumulating outside their newborn son's bedroom window at their 1959 Hermosa Beach home. From that day forward, their ambition to create an economical, carbon-emissions-free, zero-net-energy home was born. Now, as this goal becomes a reality through a state-of-the-art remodel and retrofit, the Fortunato family has turned their home into a case study for **Southern California Edison's Net Zero Energy Initiative**. Their Green Idea House serves as a model to help others achieve the California Public Utility Commission's net zero energy residential home construction guideline by 2020.

SUMMARY

In March 2012, Robert, Monica, and their ten-year-old son Carter moved back into a remodeled and upgraded home, which is 800 square feet larger than the original. While the project is not entirely completed, the family is already enjoying harvesting 80 kilowatts of energy more than they are using per month from rooftop solar panels. The remodel goes beyond the typical energy upgrade. The Fortunato home is now entirely electric (no gas or combustible appliances, no HVAC units), and features innovative green technologies such as passive solar heating and cooling, a thermal chimney, advanced insulation, solar panels, heat pump hot water heaters, rainwater harvesting, shower drain water heat recovery, phase change material drywall, sustainably harvested lumber, recycled tiles, and sustainable stucco/plaster. When finished, the Fortunato's home will harvest far more energy than it uses.

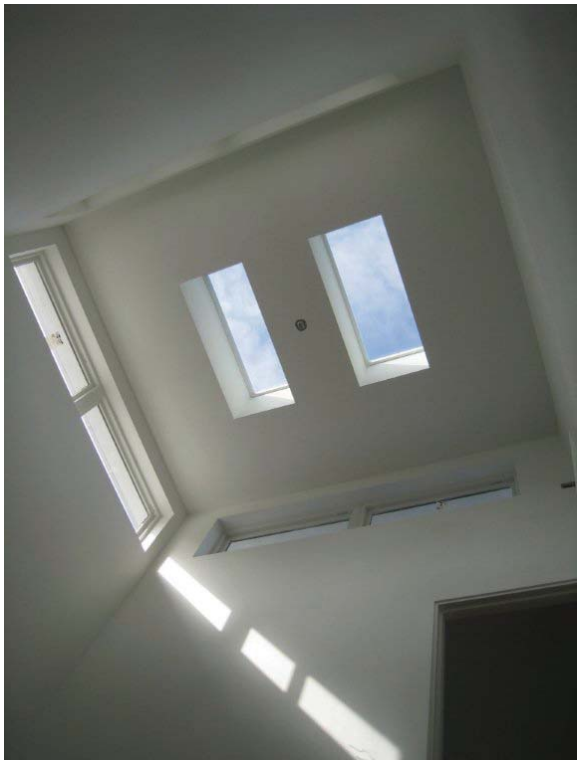
Green Idea House: *Front view of the Fortunato's modern Hermosa Beach home.*

Original home: *The Fortunato's original 1959 "post and beam" California home.*

An "Upgrade in Action" tour of the Fortunato's home.

"We really wanted to prove that a truly green home can be built, and that it is accessible to everyone."

Robert Fortunato – Green Idea House owner



Thermal chimney's ventilating skylights

ENERGY UPGRADE MEASURES

Wes Harding of **Harding Construction and Sustainable Solutions** served as the Energy Upgrade California in Los Angeles County Participating Contractor for the Fortunato's upgrade.

Common upgrade measures used for the Green Idea House are:

- **Energy-efficient lighting fixtures:** The home has minimal use of canned or incandescent lighting. **Wattstopper** lighting control fixtures are used in every room.
- **Energy-efficient windows:** The home's original windows were replaced with dual-paned windows with better U-values.
- **Low-flow fixtures:** **TOTO USA**
- **Crawlspace Insulation:** Knauf's **Eco Batt Fiberglass**, which has no petroleum in the binder and contains recycled content, was used to insulate the ceiling, floors, and crawlspace.
- **Wall insulation:** An alternative to foam insulation with high toxicity, **Green Fiber** blown-in cellulose insulation was used between the framing members (many of which are reused 2 x 4s). Instead of non-permeable plywood, Celotex Premium Insulating Sheathing by **Blue Ridge Fiberboard** was utilized, which is comprised of ground-up pulp from recycled products and is formaldehyde-free and naturally permeable. Together with the blown-in insulation, the wall systems achieve an insulation value that helps the building get to net zero energy use.
- **Air sealing:** Knauf's **Eco-seal**, which is a water-based sealant with great bond strength, low odor, and low volatile organic compounds (VOCs).

INNOVATIVE MEASURES

In addition, the Green Idea House exceeded the typical upgrade by incorporating the following innovative green measures:

- **Passive solar heating and cooling:** The need for air conditioning was eliminated by a 5-foot roof overhang that shades the home in the summer. In winter, the southwest sun-orientation heats the living spaces. The thermal garage is also heated passively via a window in the insulated garage door. The heat is used to increase the efficiency of the GE heat pump hot water heaters.
- **Daylighting:** The optimal design and placement of skylights and windows eliminates the need for artificial lighting during the day.
- **Thermal chimney:** A thermal chimney in the stairwell ventilates the house and eliminates the need for air conditioning. With no energy, warm air rises naturally through venting skylights and a window at the top of the stairwell.
- **Phase change material drywall:** **ThermalCORE** phase change drywall was used on the ceilings throughout the house and on the living room wall. The dry wall regulates room temperature by absorbing heat during the day and releasing heat at a rate of 22 BTUs per square foot in the evening when it cools down in the house. One half inch of this dry wall has the same thermal effect as a foot and a half thickness of brick.

Water tanks in the passively heated garage

Hot water expert Gary Klein shows the upstairs Power Pipe Drain Water Heat Recovery Unit.

- **Heat pump water heater:** A typical tankless water system is at best 95% efficient. Instead, two **GE** heat pump water heaters with an efficiency of 238% (at the same cost or lower than tankless) were installed in the thermal garage. One serves to heat domestic hot water (middle in photo), and the other serves as the home's heating system (left in photo). The tank on the right is the old gas hot water heater from the home. Stripped of its insulation and burners, it acts to preheat the city water to ambient temperature, a savings of 20°F worth of energy use, with no wattage at all.
- **Hydronic radiant baseboard heating system:** The remodel was originally planned to include radiant floor heating, but at a high cost of $24,000, the Fortunatos felt that this feature would not represent an economical upgrade option for average homeowners. Instead, the Fortunatos used a **Runtal** baseboard heating system, with **Uponor** piping manifolds and controllers ($12,000). The **Runtal** heaters are comprised of 40% recyclable content and are made in the United States.
- **Rainwater harvesting tank and pumps:** A water catchment system captures rainwater in a 1,200-gallon **Norwesco** tank retaining rainwater on the property and channeling it into the landscaping with **Grudfos** pumps.
- **Shower drain water heat recovery system:** When complete, two hot water heat exchangers will be used in the Green Idea House. Upstairs, **RenewABILITY's Power Pipe** recycles the hot water from the shower to heat the pipes containing cold water (vertical drop). Downstairs, the **Eco-drain** hot water heat exchanger (horizontal drop) will be used.
- **Durability:** A **Hohmann and Barnard** flashing and moisture barrier was used to properly seal doors and windows and to mitigate the effect of the site's marine climate.
- **Sustainable stucco and plaster:** On the exterior of the home, the Green Idea House uses 60% recycled concrete with **Merlex** stucco and **Vero Antiqua** lime plaster. The plaster has 28% lower embodied energy and incorporates 65% recycled marble aggregates from local sources.
- **Low-toxicity and low-VOC products:** The inside of the home was painted with low-toxicity and low-VOC **Sherwin-Williams** paint. Non-toxic caulks and adhesives were used for throughout the project.
- **Recycled tiles:** The home features recycled tiles from **Oceanside Glass** and **Stone Peak**.
- **FSC-certified lumber:** Forest Stewardship-Council or FSC-certified lumber was used as much as possible.
- **TPO roofing:** The flat, light gray roof has a 0.46 reflectivity factor. The entire TPO roof was mechanically attached and thermally bonded. As a result, the entire roof can be recycled at the end of its natural life.
- **Photovoltaic solar panels:** At a cost of $18,000 after rebates, 26 photovoltaic solar panels that were manufactured in the United States by **SolarWold Panels** were installed on the

Monica and Carter Fortunato attach reclaimed 80-year-old redwood shiplap on their home.

rooftop by **Mediterranean Solar**, with the capacity to produce 6.5 KW of electricity. At the end of the solar panel's 40-year cycle, the manufacturer removes the silica from the panels and recycles them.

- **Local and recycled reused materials:** The living room ceiling was made from 80-year-old redwood saved from a Los Angeles structure. Recycled permeable **Stepstone** pavers were used from the driveway to the stairs.
- **Recycle/reuse of demolition waste:** The project recycled an impressive 97.5% of the demolition waste and incorporated salvaged materials into the remodel through thoughtful deconstruction by the **Reuse People** and **RER**. The Fortunatos reused lumber from their existing home on the remodel, reused their old home's foundation ($40,000 savings), and repurposed their broken patio into the backyard's garden walls. As a result, thousands of dollars in dump fees were avoided. Materials that could not be recycled into the project found new homes through ads placed in newspaper and on the internet.

BLOWER DOOR TEST

Compared to their 1,300 square foot house's very high blower door test-in score of 1,959 (completed by the **Building Doctors**), the blower door test-out for the home produced a low score of 376, proving the high energy savings of the retrofit. Jim Creech, a building science professional of **RHA**, who completed the test-out said, "I've tested over 500 buildings and this is, by far, the best test score I've ever seen!"

GREENPOINT RATING

Administered by **Build It Green**, a GreenPoint Rating verifies that a home has been built or remodeled according to proven green standards. GreenPoint Rater **Charisse Bartholomew** of **Healing Spaces by Design** anticipates that the Green Idea House will achieve a GreenPoint Rating of more than 182 points when the project is complete (see table at left).

GIVING BACK TO THE COMMUNITY

The Fortunatos are using their Green Idea House to engage and educate the community about the innovative green building measures. Work crews from **Youthbuild**, a non-profit organization that teaches trade skills to at-risk inner-city teens helped deconstruct and install portions of the project. The Green Idea House has hosted several tours, including an "Upgrade in Action" home tour on February 11, 2012, organized by Energy Upgrade California in Los Angeles County and sponsored by Energy Champions, the U.S. Green Building Council – LA (South Bay Branch), and Leadership Hermosa Beach. The City of Hermosa Beach has also assisted the Fortunatos by encouraging green remodeling and construction to City residents.

GreenPoint Rating Comparison

Categories	GPR Whole House Label Requirements	Green Idea House (anticipated)
TOTAL POINTS	**Min. 50**	**182+**
Energy Efficiency	Min. 20	65+
Resource Efficiency	Min. 6	44+
Water Efficiency	Min. 8	33+
Indoor Air Quality	Min. 5	28+

Note: Green Idea House GPR points are estimates.

RESOURCES FOR MORE INFORMATION

Green Idea House Blog:
www.greenideahouse.com/

Energy Upgrade California:
www.EnergyUpgradeCA/LACounty