



From Aging Foreclosure to ENERGY STAR®

One Milwaukee home's energy efficiency transformation

CASE STUDY

Energy efficient homes are affordable homes. To prove this point, Focus on Energy's Affordable Housing Program joined forces with a Milwaukee community group in summer 2008 to rehabilitate a century-old home on the city's south side.

The impressive results—50-percent savings on total energy costs and 70-percent savings on heating costs—demonstrate the dramatic savings that can be achieved when builders and contractors set out to improve the energy efficiency of an existing home armed with aggressive goals and a comprehensive plan.

BUILDING ON EXPERIENCE

Recognizing that energy efficient housing brings immediate benefits to limited-income families, Focus on Energy created the Affordable Housing Program specifically to help builders and remodelers rejuvenate the performance of existing older homes.

The idea is not only to help people with limited incomes afford to buy homes, but to make it easier for them to afford the monthly energy bills after they move in.

The program builds on the wealth of construction and energy-related experience Focus on Energy has gained through its award-winning Home Performance with ENERGY STAR® Program. Home Performance with ENERGY STAR helps homeowners improve the comfort, safety and affordability of existing homes by making cost-effective energy efficiency improvements. Participating consultants inspect homes to identify problems such as moisture, leaks and drafts. Then, they recommend solutions to those problems and follow up with performance testing to ensure the installed measures are effective.



This century-old home on Milwaukee's south side now stands as a model of energy efficiency and affordability.

The Affordable Housing Program expands on this "building-as-a-system" approach by focusing on major building rehabilitations and emphasizing the importance of a comprehensive energy efficiency plan, with specific energy savings goals, early in the design process.

Participating builders and remodelers receive financial incentives as well as training on energy efficient building practices and products.

REMODELING A MILWAUKEE BUNGALOW

In July 2008, Layton Boulevard West Neighbors, Inc., a community-development corporation whose mission is to stabilize and revitalize city neighborhoods, began renovating a two-story, single-family bungalow in Milwaukee's Layton Blvd West Neighborhood association. The home was the first in the association's Turnkey Renovations Program, which aims to purchase vacant, foreclosed homes and renovate them to improve energy efficiency and restore original craftsmanship.

The bungalow was built in 1910. Its age and condition made it a perfect candidate for energy efficient renovations.

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The power is within you.

“Old windows, furnaces, water heaters, faucets and inadequate insulation lead to very expensive utility bills for the owner or tenant,” said Jeremy Belot of Layton. “Deteriorated interior and exterior conditions can also help keep a property vacant and without a buyer.”

To complete the project affordably, Layton assembled a coalition of project partners to donate equipment and services, including Focus on Energy, We Energies, Wisconsin Energy Foundation, Johnson Controls, The Home Depot, Lagina Plumbing, Hot Water Products and Community Warehouse. Layton’s goal was to make the home an asset to the neighborhood by transforming it into a model of energy efficiency and selling it to an owner-occupant at an affordable price.

Development plan

Offer to purchase (foreclosure)	\$35,000
Project costs	\$85,000
Target sale price	\$117,000
Donations - Approx.	\$26,000

The energy assessment

Like any successful home rehabilitation, this project began with a comprehensive energy assessment. Building-performance consultants visually inspected the residence and performed tests to evaluate and measure the home’s air tightness, insulation levels and heating systems.

Performance testing yielded the following results:

Table 1: Pre-test results

Standard	Pre-Test Results
Building air tightness 0.35 cfm @50 per sq. ft. of surface area	4,560 cfm @50
Mechanical ventilation, whole house	None
Mechanical ventilation, spot	None
HERS index	153



A high-efficiency boiler and solar thermal water-heating system replaced a 1960s-era hot water boiler (62 percent efficiency) and 0.52 EF natural-draft water heater.

In addition to building-shell leaks and combustion-safety issues, the home lacked adequate insulation in key areas. R-7 insulation had been used in the open-joint attic, and the consultants found cavities in the cathedral ceiling’s rafter insulation. Beneath the vinyl siding, empty-framed wall cavities contained R-5 foam, and the cement-block foundation was uninsulated. Windows in the home were single-glazed, double-hung and lacked storms.

The hot-water boiler, a 1962 model with an energy efficiency rating of 62 percent, lacked exhaust ventilation. Similarly, the aging natural-draft water heater boasted an Energy Factor (EF) of 0.52. Clearly, this home afforded plenty of opportunities to improve its efficiency and affordability.

Formulating a plan

The consultants’ challenge, then, was to prescribe and administer an array of energy efficiency upgrades that would increase the home’s performance. The team’s primary goals were to reduce heating costs by 70 percent and total energy costs by 50 percent while improving the home’s comfort, safety and durability.

Table 2: Pre-test results vs. goals

Standard	Pre-Improvement	Goal for this Home
Building air tightness 0.35 cfm @50 per sq. ft. of surface area	4,560 cfm @50	1,600 cfm @50
Mechanical ventilation, whole house	None	50 cfm continuous
Mechanical ventilation, spot	None	20 cfm continuous
HERS index	153	80



Solar collectors supply the home's new solar water-heating system.

To achieve these goals, the builder and contractors developed specific recommendations and scopes of work outlining their efficiency strategies—in much the same way that traditional builders draw up and plan for structural and cosmetic features such as closet space and kitchen countertops.

Plans into action

Armed with a comprehensive plan that included aggressive goals for achieving specific standards, the builder and consultants set about renovating the home. Their efforts included:

Water conservation

- Installed water-efficient plumbing fixtures throughout the home.
- Disconnected downspouts from the storm sewer to reduce the risk of sewer-system overflows and basement water leaks. Two downspouts were connected to rain barrels; two others were directed toward a rain garden.

Basement reconstruction and refinishing

- Installed a solar water-heating system connected to roof-mounted solar collectors.
- Installed a high-efficiency Munchkin boiler rated at 95-percent efficiency that also provides heat for hot water when the solar hot-water system cannot meet demand.
- Sealed air leaks in basement walls and around doorways.
- Tuck-pointed basement walls to eliminate airflow through foundation walls.
- Filled gaps and penetrations near floor joists and the foundation with caulk and foam.
- Installed weatherstripping on doorways.
- Painted walls and floor.

Windows and light fixtures

- Installed ENERGY STAR qualified low-e, argon-gas-filled Pella and Silverline windows.
- Installed ENERGY STAR T9 Circuline fluorescent lighting fixtures and compact fluorescent light bulbs in remaining fixtures.

Heating and insulation

- Installed a programmable thermostat capable of maintaining separate temperature schedules for weekdays and weekends.
- Installed rigid insulation onto exterior of exposed foundation. Blew foam insulation into gaps between rigid insulation and foundation block walls, then coated with stucco.
- Added cellulose insulation in attic (R-50) and dense-pack into wall cavities.

Kitchen, bathroom, living room and dining room

- Expanded kitchen by eliminating a window and pantry. Installed custom wood cabinets designed to make better use of space and provide additional storage.
- Remodeled bathroom—installed new fixtures and a toilet and added a new shower and cabinets for additional storage. Tiled flooring and replaced the old glass-block window.
- Restored craftsmanship—cleaned, refinished and repainted walls, trim, and flooring, including the staircase; cleaned radiator pipes and painted to restore original appearance.

The home's new solar water-heating system provided project partners a valuable opportunity beyond simply boosting energy efficiency. Johnson Controls installers received training from Hot Water Products personnel and subsequently installed the system to complete their renewable energy certification.

Verifying the results

Upon completing the work, the building-performance consultant returned to measure the impact of the energy efficiency upgrades. He found that not only did the results exceed the goals set at the start of the project, but the home earned an energy score typically reserved for the most efficient new homes.

As Table 3 shows, the home is considerably more airtight than before the renovation, and now includes mechanical ventilation for safety.

Table 3: Post-test results vs. goals

Standard	Initial Evaluation	Goal for this Home	Post-Test
Building tightness 0.35 cfm @50 per sq. ft. of surface area	4,560 cfm @50	1,600 cfm @50	1,500 cfm @50
Mechanical ventilation, whole house	None	50 cfm continuous	83 cfm
Mechanical ventilation, spot	None	20 cfm continuous	83 cfm
HERS index	153	80	72

The home is also significantly more efficient than the HERS reference home.

Table 4: Projected benefits to homeowner

Type of Energy	Before	After	Percent
Estimated annual heating costs	\$2,650	\$751	70%
Estimated total annual energy costs	\$4,036	\$1,994	51%

Note: The energy saving estimates do not include savings from the solar hot water system.

Estimates show that the team met its goals of reducing annual heating costs by 70 percent and total annual energy costs by 50 percent (see Table 4). This translates into impressive monthly savings for the homeowners that will add up dramatically over time.

Projected savings from energy costs:

5 years \$10,200
 10 years \$20,400
 15 years \$30,600
 30 years \$61,200

Table 5: Change in average energy use

Type of energy	Before (avg. per day)	After (avg. per day)	Percent
Natural Gas (therms)	12.4	4.7	62%
Electricity (kilowatt-hours)	10.3	5.2	51%

Given this savings and the builder's total energy conservation investment of \$21,225, the improvements are expected to pay for themselves in about 11 years.

“AN ENERGY BREAKTHROUGH”

Together with Focus on Energy's Affordable Housing Program and a group of project partners, Layton Boulevard West Neighbors, Inc. transformed a nearly 100-year-old home foreclosure into a model for energy efficiency. The home now stands as a prime example of the savings that can be achieved when renovators set out to revitalize a home with comprehensive energy plan to guide them.

“It's an energy breakthrough,” said Keith Williams, the energy consultant who conducted before-and-after tests to determine the home's energy rating. “The house is a lot tighter, the insulation level is a lot higher and the heating system is extremely more energy efficient,” he said.

LEARN MORE

To learn more about Focus on Energy's Affordable Housing Program and how energy efficiency improvements can dramatically improve the comfort, safety, durability and affordability of existing homes, please contact Focus on Energy at **800.762.7077** or visit **focusonenergy.com**.

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