Moving Toward Zero Energy Affordable Housing

Over the years, we in the home performance field have learned that housing for low- and moderate-income people can be made significantly more affordable by improving its energy efficiency. This learning has come from demonstration projects and from work on programs—such as the Weatherization Assistance program—that have also helped us to develop new techniques and technologies that are now used in upscale housing. But can projects with low-income housing be used to teach us something about zero-energy housing? The participants in a project in a reemerging community of shuttered factories and vacant lots are saying yes.

The Claretian Associates, a nonprofit organization established by an order of Roman Catholic priests and brothers, are building highly energy-efficient homes on the south side of Chicago, in a neighborhood known as South Chicago. This community was once the home of U.S. Steel's South Works plant, a factory that supplied the steel used for America's industrial expansion from 1880 through most of the twentieth century. The South Works plant employed about 20,000 workers in the 1940s, but by the 1980s it had dwindled down to a few hundred employees, and it closed entirely in 1992. Most of the other industrial plants in the community have either gone out of business or left for warmer climates.

Claretian Associates are planning to build 25 new homes in South Chicago. Twelve of the homes will have PV systems, with technical assistance on the PV panels from Spire Solar. (The state of Illinois covers roughly half the cost of PV on most residential projects. Much of the remaining cost of the PV in this project is being supported by the city of Chicago's Department of Environment.) The first two South Chicago homes, which have PV panels, have been completed and families have moved in. The homes are being monitored by Steven Winter Associates, Incorporated (SWA), of Norwalk, Connecticut, with funding from DOE's Zero Energy Homes program. "This is the first urban affordable housing studied under the program," says Robb Aldrich, an engineer at SWA. He will remotely monitor all of the homes when they are completed.

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Aldrich says that during the first 36 days of monitoring, the 1 kW PV systems produced an average of 2.86 kWh per day, but he expects greater average production over the year, because most months in Chicago are sunnier than October and early November. He conservatively estimates that the panels will produce 1,100 kWh per year.

The 1 kW solar system will not supply all of the home's electric energy needs. In fact, Spire Solar and Aldrich expect that the system may supply only about one-quarter of the electricity consumed by the household. However, the Zero Energy Homes program is as interested in how much energy the household consumes as it is in how much energy the PV system produces.

All 25 homes in the project have high levels of energy efficiency designed into them. The contractor for the project, South Chicago Workforce, has worked with the Illinois Department of Commerce and Economic Opportunities (DCEO) and the city of Chicago's Department of the Environment to reduce the energy use of the homes as much as possible. Dave Sullivan, the executive director at South Chicago Workforce, teamed up with Maureen Davlin of DCEO and Paul Knight of Domus Plus. They have worked together before, using envelope measures and high-efficiency mechanical systems on multifamily building rehab, although at the time DCEO was known as the Illinois Department of Commerce and Community Affairs, or DCCA (see "Green Products Brighten Multifamily Rehab," *HE* Nov/Dec '00, p. 34).

The Claretian Associates are using structural insulated panels (SIPs) in the South Chicago project to give the homes tight, well-insulated envelopes. They are also installing sealed-

What's in the Homes?

All of the 25 Claretian Associates homes in the South Chicago project have

- structural insulated panels (SIPs) with wall R-values of 24.7 and a roof R-value of 42.5;
- windows with U-values of 0.30;
- 92.5% AFUE sealed-combustion condensing gas furnaces;
- a 75 CFM, 60% heat recovery ventilator with a 40W fan or an AirCycler system (see "Clean Breathing in Production Homes," *HE* May/June '01, p. 29 for more on the AirCycler and mechanical ventilation); and
- fluorescent lighting (both linear and CFL), and an Energy Star-compliant refrigerator.

In addition, 12 of the homes will have PV systems. Each of these 1.2 kW DC systems will produce 1 kW of AC power.

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combustion condensing gas furnaces with an annual fuel utilization efficiency (AFUE) of 92.5%. "We concentrate on minimizing space-heating loads through insulation and air sealing measures," Davlin says. "We can then install smaller furnaces that are high efficiency and sealed combustion. At the same time, we have to be attentive that we don't take back the energy savings through higher electric usage." The homes also include Energy Star–compliant appliances and fluorescent lighting. (For more details, see "What's in the Homes?")

The first two homes had HERS ratings of 91.4 and 90.6, earning the Energy Star Homes designation, which only requires a score of 86. Blower door tests on the first two homes showed air infiltration levels of 352 and 379 CFM_{50}, or about 0.9 ACH_{50}. The cost of the homes is also reasonable by Chicago standards. The 1,700 ft^2 single-family homes will go for between $123,000 and $165,000. The 2,800 ft^2 two-flats will be sold for between $196,500 and $230,000. The prices will vary depending on the buyer's income and family size.

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SIPs were used in the South Chicago project to give homes tight, well-insulated envelopes.

Proponents of solar energy are pleased with the project so far. Mark Burger of Spire Solar says that the project "shows that houses with photovoltaics can look just as good as comparable nonsolar homes when they are well designed and well constructed."

The 25 new homes are only part of the revitalization of the South Chicago community. Kathy Kelleher, project manager for Claretian Associates, says that the city of Chicago is currently providing approximately $80 million in public improvements for the neighborhood. But learning more about the opportunities for affordable zero-energy homes will serve all communities.

—James Cavallo

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For more information:

Check out the Web site of the Claretian Associates, www.claretianassociates.org, or attend Robb Aldrich's session at the 2004 Affordable Comfort Conference in Minneapolis, Minnesota.