

## **City of Topeka Energy Star Case Study**

### **Introduction**

The office of Housing and Neighborhood Development (HND) handles all of the housing needs for the City of Topeka. HND has many programs that are designed to help low- and extremely-low-income families. One aspect of their program is to fund non-profit Community Housing Development Organizations (CHDOs), which is where HND first became involved with Energy Star. These non-profit groups often pay the entire utility bill for the tenants. One of the issues raised by the CHDOs was that the inefficient heating equipment and leaky construction of the houses that were purchased and rehabbed was causing the heating bills for these units to be extremely high, which ultimately reduced the CHDOs capacity to provide housing. To address this problem the City of Topeka encouraged the non-profits to build new housing and asked that they consider building to Energy Star standards. As an incentive in the competitive bidding process for HOME funds, the City of Topeka agreed to give an additional point in the scoring process if the project included Energy Star certification.

Since then, the City of Topeka has actively supported Energy Star. The mayor of Topeka proclaimed October as Energy Star Awareness Month to promote the use of Energy Star products in order for citizens to save money by conserving energy and thereby making housing more affordable. The proclamation was made by the mayor during a live television broadcast of the city council meeting. This proclamation was based on the increased affordability and sustainability of buildings with Energy Star products, the City of Topeka's Department of Housing and Neighborhood Development's (HND) status as a participating jurisdiction of the HOME program which encourages the use of Energy Star products and practices, and the City's objective to revitalize existing affordable housing and create new and improved sustainable housing.

### **Construction Details**

Last year, the HND funded a total of ten units, six of which were 1BR units with 550 square feet, and the other four were 2BR units with about 850 square feet. The buildings are duplexes with unit types A and B. Each unit consists of a central room with kitchen and living area and a separate bedroom and bath. All units are handicap accessible. The bathrooms have a five foot turning radius for wheelchairs and also store the washer and dryer. In the near future, the City of Topeka will be breaking ground on a \$2.8 million project that will include 20 newly constructed housing units, all of which will be Energy Star certified and available to low income individuals.

Insulation used in HND's Energy Star certified housing include R-50 blown cellulose in the ceiling and R-19 blown cellulose in the wall as compared to the 2003 IRC which requires R-38 ceilings and R-18 walls for Climate Zone 11. Windows are Energy Star rated with a U-value of 0.32. Heat is provided by high efficiency heat pumps with 16 SEER and 9.0 HSPF. Water heaters are conventional electric type with an Energy Factor of 0.91. Interior lighting is composed primarily of Energy Star labeled CFLs.

### **Benefits**

Since July of 2007, a unique Energy Star comparability study has been conducted in the City of Topeka. The focus of the study was two all electric duplex buildings with identical floor plans. The two units, A and B, in one of the buildings were built to Energy Star standards while the units in the other building were not. It should be noted that the non-Energy Star units were fitted with the same Energy Star rated windows and high efficiency heat pumps as the Energy Star units, thereby making efficiency gains more difficult for the Energy Star units. Both buildings were oriented in the same direction and located within two blocks of each other to eliminate weather as a variable.

Through the first sixteen months of the study, the two Energy Star units used a combined 11,866 kWh of electricity compared to 27,620 kWh for the two non-Energy Star units. Thus, the Energy Star housing units achieved a 57 percent reduction in power consumption compared to the non-Energy Star units. On a cost basis over the same 16 month time period, the electric bills for the two Energy Star units totaled \$1,183.28 compared to \$2,162.46 for the non-Energy Star units. On a one year basis, the electricity costs were further broken down by unit. Unit A of the non-Energy Star building had a one year electricity cost of \$829 compared to \$455 for its Energy Star counterpart. For unit type B, the non-Energy Star unit had a one year electricity cost of \$827 compared to \$347 for the Energy Star unit. Collectively, the Energy Star units achieved a 46% reduction in energy costs compared to the non-Energy Star housing units. The non-Energy Star units did not have a blower door test, slab insulation, or any of the extras that are required to meet Energy Star standards (lighting, HVAC, insulation levels, etc).

	Energy Star Units	Non-Energy Star Units	Savings from Energy Star
<b>Electric utility data for 16 months of operation (types A and B combined)</b>			
Total Electricity Usage	11,866 kWh	27,620 kWh	15,754 kWh
Total Electricity Cost	\$1,183.28	\$2,162.46	\$979.18
<b>1 Year Electric Cost Per Unit Type</b>			
Unit Type A	\$455	\$829	\$374
Unit Type B	\$347	\$827	\$480

### Costs

In an effort to reduce building costs, several strategies were employed during the process of building the Energy Star homes that were not previously used for affordable housing. First, extra care was taken during site selection to minimize cost associated with site preparation. The bidding process was also more intensive for the Energy Star homes and helped to decrease costs. Thirdly, HND funded ten homes all at once within close proximity to each other which allowed bulk pricing of materials and significantly reduced costs associated with the rating process. The close proximity of the buildings allowed for a more efficient HERS rating process by eliminating travel time between sites. These streamlined building practices allowed the City of Topeka's HND to build these ten Energy Star certified affordable housing units at a cost of \$94 per square foot. Prior to adopting Energy Star and streamlining its building process, the cost to build affordable housing in the city of Topeka was \$122 per square foot. On a level playing field, however, there is naturally an added cost for performing a HERS rating, upgraded insulation levels and installing a higher efficiency heat pump. The costs of these measures collectively add up to between \$2,000 and \$4,000 per unit. With the annual savings achieved from these measures, the payback period for attaining Energy Star certification is less than 10 years.

The cost per square foot may seem high, but one must consider that all of the most expensive features of the house (i.e. bathroom, kitchen, laundry room, utilities) are packed into a small footprint which causes the price per square foot to increase. Also, HND does not receive donated materials and service as does Habitat for Humanity, so the cost of building affordable housing for HND is significantly higher.

Total Construction Cost	Added Cost for E*	% Cost Increase	Annual Savings	Payback (yrs)
\$ 51,700	\$ 3,000	6%	\$ 427	7.0

## **Project Funding**

For new construction in the ten and 20 unit projects, HND partnered with non-profit organizations that own the properties and agree to rent the properties out for at least 20 years. At the end of the 20 year affordability period, the non-profit owes HND half the amount that HND put into the home. For example, if HND puts in \$102,000 into a project, at the end of twenty years, the nonprofit will owe HND \$51,000. HND then takes that money and invests in building more affordable housing. For infill projects, HND starts out as the owner and builder of the project and then sells the housing to families with less than 80 percent of the area median income. For these projects, HND assists the family with the down payment, pays some of the closing fees, and will partially forgive their soft second mortgage by 50%. A soft second mortgage is typically used with a publicly sponsored program and allows homeownership with relaxed mortgage terms to lower income citizens.

## **Challenges**

One of the challenges faced by HND has been trying to promote the Energy Star program to the Home Builders Association. It has been difficult because many builders believe that they build a good solid energy efficient home and do not need an Energy Star label to prove it. However, upon inspection of these buildings, the builders are often shocked when blower door testing and duct blaster testing is performed and they see all of the leaks that they did not know existed. One of the reasons for encouraging the Home Builders Association to promote Energy Star is because they build the market priced homes that will become the affordable housing units of the future. Sixty years down the road, families that are renting or buying those affordable homes will have a house that is well-insulated and they will have lower utility bills due to increased energy efficiency.

## **Rater Involvement**

In the rating process, raters review plans before construction and make recommendations to the builders on how to improve the energy efficiency of the design. Once projects break ground, the raters perform a total of three inspections during the construction process to evaluate footings, insulation, and equipment in each unit. Once construction is complete, the rater performs the duct-blaster and blower door test. The plan review before the project starts and the duct-blaster and blower door tests cost \$350 which includes the cost of documenting the project for Energy Star Certification. The three inspections performed during construction cost \$50 dollars each for a total of \$150. If a unit fails an inspection then each re-inspection costs \$50. In total, the City of Topeka usually pays about \$500 per unit for rater involvement.

Raters typically spend approximately 2 hours reviewing the plans and entering the data into the RESNET software. The three inspections usually take about a half hour each, and the final duct and blower door tests take about 1 hour for a total inspection time of 2.5 hours on site. Including the plan review, the rater spends about 4.5 hours working with each unit.

Prior to using Energy Star building practices, the City of Topeka used a less exhaustive process to show that their affordable housing units met local energy requirements. In this process, building specs including insulation values and materials were input into computer software to determine compliance. No blower door test or duct blaster test was performed. Over time, it became clear to HND that the testing procedures required for Energy Star certification could play a key role in reducing energy consumption and meeting their mandated mission of helping low income families save money.

## **Energy Initiatives**

One of the activities during Energy Star Awareness Month was the first annual Energy Star Expo. Booth space at the Expo was provided free or charge and 15 vendors attended including representatives from the appliance, construction material, solar, and wind industries, insulation manufacturers, and local Energy Star builders. Attendees included representatives from the local power company, energy raters, and the EPA. Media coverage for the event was broadcast on two local TV stations. The Expo was free to the public and there were about 100 attendees for the first Expo with plans to increase attendance in 2009 for the Second Annual Energy Star Awareness Expo.

The focus of 2009's Expo will be slightly different from the previous year. The City of Topeka is inviting representatives from the banking and finance industry to help people learn about loans that are available to anyone for Energy Star upgrades and other energy efficiency measures. Also, the city plans to invite a tax expert to talk to people about the tax credits that are available for building Energy Star. Also attending will be representatives from the Kansas Housing Resource Corporation which has a weatherization program that received \$55 million from the economic stimulus package. One of KHRC's planned activities during the Expo is to register qualified residents to have their homes insulated.

Future plans for HND include expansion into the existing homes market to perform gut rehab of units. The City is also planning several new and exciting ways to expand awareness and builder participation in Energy Star that will debut during the next Energy Star Awareness Month.

## **Contact Information**

Warren Woodruff, (785) 368-4450, wwoodruff@topeka.org



Topeka receiving the 2008 Energy Star Affordable Housing Award.



Duplex affordable housing units



Duplex affordable housing units



Energy Star Expo 2008