ENERGY TRANSITION INITIATIVE
Islands

Playbook Lesson Learned
Phase 3: Project Preparation

Greensburg Implements High-Efficiency Building Codes to Achieve Long-Term Energy Savings

On May 4, 2007, a massive tornado struck Greensburg, an agricultural community of about 1,400 people in south-central Kansas. Since then, city and community leaders and residents have been committed to rebuilding the town as a model sustainable community.

When the tornado struck, 11 people were killed, and more than 90% of the city's structures, most vehicles, and the electricity infrastructure were destroyed or damaged. Homes and businesses were leveled, displacing most of the town's residents.

The LEED Platinum K-12 school in Greensburg, Kansas.
Photo from Joah Bussert, Greensburg GreenTown, NREL 19952

Challenge

Moving forward quickly to rebuild homes and businesses after the tornado was a high priority for Greensburg. Recognizing an opportunity to not just rebuild, but to rebuild in a way that would sustain the local economy for the long term, the city began working with technical experts from a variety of organizations to identify the best ways to achieve this goal—a common challenge for communities faced with the need to rebuild from the ground up in the wake of disasters.

Solution

One of the first steps the City of Greensburg took was to adopt a resolution in December 2007 that all city-owned buildings (more than 4,000 square feet) be designed to a U.S. Green Building Council Leadership in Energy & Environmental Design (LEED) Platinum level with a minimum of 42% energy cost savings compared to standard buildings built to code. With the help of energy modeling and technical expertise from NREL and others, buildings such as City Hall and a business incubator were successfully built to LEED standards. This inspired other public and commercial building leaders to elect to achieve the same goal for the Greensburg school and the Kiowa County Memorial Hospital, among others.

The city also explored the possibility of formalizing green building codes, but lack of knowledge about building codes was a major challenge for Greensburg. City leaders expressed concerns about how residents, business owners, and builders would respond to perceived higher building costs for green buildings, and about how the city staff would learn the new energy codes or program requirements.

To date, Greensburg's per-capita ratio of U.S. Green Building Council LEED-certified buildings is one per approximately every 129 citizens. In a town of 900 people, that's the highest per-capita concentration of LEED buildings in the United States.

City leaders relied on the expertise of the National Renewable Energy Laboratory (NREL)[1] and IBACOS. Both organizations analyzed and summarized the rapidly changing field of green building codes and green building programs for city leadership and offered several options for consideration, including:

- Explore a partnership with the Kansas Building Industry Association and National Association of Home Builders to conduct a voluntary pilot program applying the National Green Building Standard.
- Establish a voluntary Greensburg Green Building Program focused on encouraging use of energy-efficient and sustainable practices in homes and businesses.
- Encourage or incentivize architects and builders to use ASHRAE's Advanced Energy Design Guides, which spell out climate-specific design recommendations for achieving 30% energy use improvement when compared to ASHRAE Standard 90.1.
- Adopt 2006 International Energy Conservation Code as the basic energy code because it applies to the residential and commercial sectors and has reasonably achievable energy requirements.

> "The technical assistance provided by DOE and NREL staff assures that Greensburg's city and county governments, businesses, and other buildings will continue to save large sums of money for a long time to come."
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> — Daniel Wallach, Executive Director and Founder, Greensburg Greentown

After many discussions, the city approved a voluntary Greensburg Green Building Program in April 2009 that included partnering with the Kansas Building Industry Association to offer training, discount some services, and support public awareness about green building while giving builders a chance to understand green building techniques gradually. By seeking unbiased, third-party expertise on rebuilding with energy efficiency, Greensburg was able to explore numerous building energy code options, educate its leaders and residents on those options, and implement programs that led to the completion of numerous new and renovated buildings that meet or exceed the city's energy goals.

LEED-Certified Buildings in Greensburg

Greensburg boasts many LEED-certified buildings, including many "firsts" for Kansas and the country:

- City of Greensburg SunChips Business Incubator—the first LEED Platinum municipal building in Kansas
- Kiowa County Memorial Hospital—the first LEED Platinum critical access hospital in the United States
- Prairie Pointe Townhomes—the first residential LEED Platinum building in Kansas
- USD 422 Greensburg K-12 School—this LEED Platinum school is built to be 60% more energy efficient than standard code and generate electricity with an on-site wind turbine
- Kiowa County Courthouse—renovated with sustainable and energy-saving technologies while maintaining the structure's original design and achieving LEED Gold certification
- BTI-John Deere dealership—LEED Platinum facility that uses two wind turbines to generate 4.2 kilowatts (kW) and 1.9 kW of electricity and is a model for other John Deere dealerships.

Key Takeaways

Greensburg's efforts to rebuild green are paying off. When measuring the energy use of 13 commercial buildings (from 2010 through 2011), Greensburg buildings are saving a combined total of $200,000 in energy costs per year compared with average energy use of similar buildings. In addition, several major housing projects were

[1] *Rebuilding Greensburg, Kansas, as a Model Green Community: A Case Study*, National Renewable Energy Laboratory.

built with energy efficiency features, including the Prairie Point Townhomes, which earned the first residential LEED Platinum rating in Kansas. Completed in July 2008 by Kiowa County, this low-income rental development was evaluated by NREL and IBACOS using the Home Energy Rating System Index, which projected that the homes would use 41% less energy than a standard home built to the 2003 International Energy Conservation Code. In addition, the complex, like the entire town of Greensburg, is powered by a community wind farm.

Faced with the daunting challenge of recovering and rebuilding sustainably after disaster, Greensburg provides an example—not only for communities recovering from disaster, but for any community striving to build a more sustainable future. Kaupuni Village, an affordable housing complex for low-income families in Oahu, Hawai'i, offers another example of building sustainably from the ground up on a much smaller scale. These examples provide lessons learned and may help others to avoid common pitfalls and barriers as they strive to integrate sustainable building practices into their strategic energy planning.

Lessons Learned

- Determine gaps and opportunities by comparing current local codes with the latest international standards.
- Educate key stakeholders, including city and business leaders and residents, about the benefits of the proposed changes and why updated codes should be used to meet the community's goals.
- Explore partnerships with reputable building organizations to leverage their expertise and resources.
- Demonstrate success with highly visible public buildings that can serve as living laboratories for incorporating energy efficiency and renewable energy into building designs.

Another LEED Example: Hawai'i's Kaupuni Village

Kaupuni Village is another example of the successful execution of a LEED-certified affordable housing community. Located on Oahu, Kaupuni Village comprises 19 single-family homes and a community center. Not only are the structures built to achieve net-zero energy and use 40% less energy than a standard home, but the entire community was built as a fully self-sufficient and sustainable environment in keeping with traditional Hawai'ian cultural values.

Set in the Waianae Valley of Oahu, Kaupuni Village is the first net-zero energy affordable housing community in Hawai'i.
Photo by Kenneth Kelly, NREL 20154

This lesson learned is one of many provided in the Energy Transition Initiative Islands Playbook—an action-oriented guide to help island communities successfully initiate, plan, and complete a transition to a clean energy system and eliminate dependence on imported fuels. See the full Islands Playbook at **www.eere.energy.gov/islandsplaybook**.

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The Energy Transition Initiative leverages the experiences of islands, states, and cities that have established a long-term vision for energy transformation and are successfully implementing energy efficiency and renewable energy projects to achieve established clean energy goals. Through the initiative, the U.S. Department of Energy and its partners provide government entities and other stakeholders with a proven framework, objective guidance, and technical tools and resources for transitioning to a clean energy system/economy that relies on local resources to substantially reduce reliance on fossil fuels.