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Road to 100: How a demolished Kansas town became a model of DOE renewables resilience

The destruction wrought by a 2007 tornado gave the federal government an opportunity to build up a fully renewable town in a conservative part of the country.

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This is the third of a four part series based on Utility Dive visits to cities that produce more renewable power than they consume. All four installments can be found here.

GREENSBURG, KANSAS — On May 4, 2007, an almost two-mile wide tornado flattened the town, killing 12 people, decimating 95% of the town's buildings and leaving the rest severely damaged. The mass force of the wipeout and the tragic destruction it left garnered national attention from the news media, Hollywood and the federal government, including the U.S. Department of Energy.

"The Department of Energy's interest was twofold, I would say," former National Renewable Energy Laboratory Senior Project Leader, Lynn Billman, who led the DOE's recovery efforts in Greensburg, told Utility Dive. "They saw it as an opportunity to demonstrate a fully high efficiency, fully renewable town from the ground up. And since Greensburg had been basically wiped by 90%-plus, they thought this would be an interesting experiment. ...

They were also interested to see what would happen in a conservative part of the country."

Falling wind prices in the gusty state made renewable energy attractive from a cost perspective, but DOE's involvement made the city's sustainability ambitions even greater.

Rebuilding from the ground up

Greensburg's tornado was ranked an EF5, meaning wind speeds reached over 200 miles per hour. The town of around 1,400 people dropped to a population of below 800 — where it remains today — in the years after the storm.

"We all lost everything. It didn't matter your social economic status. We were all homeless," former Mayor Bob Dixson told Utility Dive. "And so we had the opportunity in that first few weeks to start the process of thinking about rebuilding a town. And there was never a question of whether we were going to do it or not. It was just 'How are we going to do it?'"

Greensburg, Kansas, from above before the tornado hit.
City of Greensburg

The city after the tornado hit.
City of Greensburg

Almost every building in the city was reduced to rubble after the storm.
FEMA

Meanwhile, the wheels were already turning at the federal level. NREL hit the ground quickly, not wanting to lose their opportunity to demonstrate the value of efficiency and renewables. But people weren't ready to listen quite yet.

"One of the lessons learned was that if the Department of Energy shows up a week after a natural disaster and says, 'Hey, we're here to help you with your energy,' they are not going to be paid any attention to whatsoever because people are worried about getting emergency electricity, getting fresh water, finding a doctor and so on," said Billman.

Within six weeks, the town was in conversations with power providers, anxious to get their power sorted out and ready to sign a long-term contract, according to Billman.

"And I said 'Holy smokes,' we're going to lose an opportunity to influence a wind-powered system here if they're going to commit to taking in the next 20 years worth of electricity," she said.

But the city was then brought into conversations with developer John Deere Renewables — whose assets are now owned by Exelon — and turbine supplier Suzlon, seeking to site 10 turbines totaling 12.5 MW.

The city entered an agreement with the developers to site the wind. Greensburg consumes around one-fourth to one-third of that power at any given time, so the city is able to claim 100% renewables. The city gets the renewable energy credits and sells the excess power to the Kansas Power Pool, which has a peak load of 20% renewables. Energy costs are down $4,209 annually, according to DOE.

Greensburg's 10 turbines, at 1.25 MW each.
Catherine Morehouse, Utility Dive

But the city did not stop at 100% renewable energy. Energy consumption itself is curtailed through "passive" solar installations, which soak up even more of the city's energy, as well as ultra-efficient building design.

Every building larger than 4,000 square feet was built to Leadership in Energy and Environmental Design (LEED) platinum standards, using up to 75% less energy than a typical building and saving a combined $200,000 annually, according to NREL. Rebuilt residential homes save an average of 40% of their electricity.

Insulation, ground-based heating and cooling pumps, as well as daylighting strategies to minimize lightbulb use are all easy drivers of efficiency used in the Greensburg case, according to an NREL report on the buildings' performance. And some rubble from the storm was even reused — 75,000 of Greensburg city hall's bricks are reclaimed from the rubble of the storm.

Catherine Morehouse, Utility Dive

Kiowa County

Water also became central to the city's plan, with emphasis on conservation and stormwater management. Native plant species now line sidewalks to mitigate stormwater runoffs and water is reused for irrigation and toilet flushing in some buildings.

"It did really launch stronger interest at Department of Energy in ... the resiliency question about electric grids and about

communities in view of natural disasters," Billman said. The lab's work in Greensburg influenced other natural disaster projects, including efforts in New York after Superstorm Sandy and other communities using a combination of federal and local funds, she said.

"Natural disaster response, natural disaster rebuilding, sustainable communities, all that kind of thing got a big shot in the arm from the successes at Greensburg."

Selling wind and solar to an oil and gas town

Since and during the city's rebuilding, Greensburg has gotten a lot of attention. Rebuilding the city became even more complicated when the Discovery Channel used the city to help launch its Planet Green channel through a series on Greensburg created by Leonardo DiCaprio.

The show was bringing in advertisers through product donations, which would prove advantageous for the city. But its Chamber of Commerce was "chomping at the bit to rebuild, rebuild, rebuild," said Billman. Others in the town whose primary industries are agriculture, oil and gas were put off by the political message, said Dixson.

"People had to get past the thinking of 1968 powder blue, double knit bell bottom pants, with a tie-dyed shirt and hair down to the middle of your back, possibly on mind-altering chemicals, hugging a tree," he said. "And on the high Plains, that's what we perceive environmentalism to be because that's what we saw in the news … For 50 years, nothing was ever talked about, about being good stewards of our environment, and at the same time being financial stewards."

Ultimately, the financial practicality of a Hollywood partnership along with projected savings from reduced energy consumption and cheap power won over the town's leadership. Framing the transition as a practical financial decision, rather than a purely carbon footprint-oriented one was huge, said Dixson and Billman.

"We also appealed to the sense, in a farming community, of relationship with the land, respect for resources, not wanting to waste things," said Billman. The interest in wind was almost emotional, she said, in that there was a sense of strength drawn from the fact that wind would power, not destroy them.

The city has won dozens of awards and been recognized nationally for its sustainable rebuilding.
Catherine Morehouse, Utility Dive

Since then, the city has won several awards for sustainability and green leadership, and city leaders involved in the rebuild have been asked for advice in cities across the country struggling to rebuild.

"I've had people ask me over the years when I've been out speaking 'Wouldn't it have been awful easy just to pack up the tents and leave?' And I said, well, there's two things wrong with that.

Number one is it's our home," said Dixson. "And the other thing is, people would say, 'Well, you're just a small town in the middle of nowhere.' And I said, 'Well, you got that wrong too. We are in the middle of everywhere.'"