

West Union, Iowa: Small town, big vision

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Imagine a town with a distributed-loop ground source heating and cooling system connected to 60 downtown buildings. LED street lights. An electric vehicle plug-in station. Porous paver streets and sidewalks combined with 36,000 sq ft of rain gardens. A new civic plaza to celebrate community pride and events. Dozens of storefronts being restored and upper-story housing opportunities being created.

Where is this place? The Pacific Northwest? New England? Europe? No, it's actually in Iowa. West Union is a community in the far northeast corner of the Hawkeye State filled with community pride and a determination not only to survive, but to thrive. This is the story of how a town with just under 2,500 inhabitants established itself as an international demonstration site for sustainable community practices, including a district geothermal energy system.

A Community Project

West Union is one of 48 Iowa cities and towns designated as a Main Street Iowa Community. The mission of the Main Street Iowa program is to improve local social and economic well-being by helping selected municipalities capitalize on the unique identity, assets and character of their historic commercial

districts. The program follows the Four-Point Approach® developed by the National Trust for Historic Preservation that emphasizes economic restructuring, design, promotion and organization. The national Main Street program is franchised to the Iowa Economic Development Authority (IEDA) Downtown Resource Center; West Union has its own organization called Main Street West Union whose mission is to preserve and enhance the vitality of its downtown through the education and encouragement of all citizens to work together to promote the community as a vibrant place to shop, work and live.

In 2007, West Union was in the early stages of conceptual design for a street and streetscape improvement project for its downtown district. City staff approached Main Street West Union with an interest in streetscape improvements and asked the organization to seek out funding opportunities. At this same time, IEDA's Community Development division was embarking on a journey to integrate green, sustainable practices into its various community programs and services, and learned about the West Union initiative.

In March 2008, the IEDA approached the city of West Union, Main Street West Union and others to become a pilot green demonstration community for

the purpose of implementing a variety of integrated, sustainable strategies as an inspiration and laboratory from which other communities could learn. IEDA asked the city to commit to the approximately \$4 million previously included in a city council resolution for the downtown street and streetscape project. IEDA indicated it would assist the city in leveraging funding for additional costs, if any, for project design and construction that resulted in a holistically integrated demonstration of model green, sustainable practices. Within days, the city sent a letter to IEDA signed by more than 20 local parties representing the city of West Union, West Union Chamber of Commerce, Main Street West Union, Fayette County, West Union Development, the *Fayette County Union* newspaper and local businesses expressing an interest in serving as a pilot green demonstration community.

Community Visioning Workshop

Encouraged by significant local and state interest, a two-and-a-half-day visioning workshop was held in West Union in June 2008. Its purpose was to encourage a more sustainable approach to community infrastructure redevelopment (both public and private), including the upcoming



The main intersection of downtown West Union features newly installed porous pavements, lighting, a civic plaza, traffic-calming measures and buildings preparing for façade restorations.

District Geothermal System Design Team and Consultants

- Conservation Design Forum
- IBC Engineering Services
- KCL Engineering
- Midwest Energy Solutions
- National Renewable Energy Laboratory Technical Assistance Program
- National Trust for Historic Preservation Green Lab
- Tom Osdoba, consultant
- TeKippe Engineering
- Tri-County Refrigeration

ing six-block streetscape project on Vine Street (the town's main street).

To support the visioning effort and facilitate the workshop, the IEDA hired Conservation Design Forum, a firm specializing in ecological restoration practices. In addition, IEDA brought to the table a variety of experts from the Iowa Department of Cultural Affairs, Iowa Department of Public Health, Iowa Department of Agriculture and Land Stewardship, and U.S. Department of Agriculture Rural Development. Others informing the process along the way included the Iowa Department of Transportation, Iowa Department of Natural Resources, Natural Resources Conservation Service and Upper Iowa University. Having these outside resources available exposed the community to state-of-the-art practices from around the country. A key outcome was the establishment of the following “first principles” for the pilot green demonstration project:

1. collaborative process
2. sustainable community investment
3. great setting for local business
4. healthy natural environment
5. beauty crafted into West Union
6. vibrant economy for Northeast Iowa
7. West Union's unique context
8. inspiration through education

This brainstorming process yielded numerous ideas for improving the eco-

nomics viability, safety, aesthetics and sustainability of the downtown core. Among these were suggestions for implementing a geothermal system to heat and cool buildings and melt snow and ice on streets and sidewalks.

Discerning a high level of interest in such a system, IEDA secured funding from the USDA Rural Community Development Initiative to hire IBC Engineering Services to conduct a feasibility study for the district system. The study examined four approaches to district geothermal including two that involved a hybrid geothermal system with supplemental heat that would serve as a snow-melt system for sidewalks and streets. The snow-melt system was ultimately ruled out due to its annual operating cost, but the city continued to explore a district geothermal system as one means of improving energy efficiency for downtown businesses and property owners.

Simultaneously with the feasibility study, Main Street West Union worked closely with Black Hills Energy, provider of natural gas service to downtown customers, to conduct energy audits of approximately 85 percent of downtown properties. As a followup to the audits, IEDA awarded a pass-through grant to Main Street West Union to provide downtown properties additional energy efficiency improvement incentives

beyond the quality incentives already offered by Black Hills Energy and Alliant Energy, the local electric utility. Energy audits were performed, and some of the incentives (in the form of rebates) provided were for purchases of high-efficiency furnaces, boilers, lighting and insulation, but the next question was how to make the most of those audits and incentives.

To help property owners maximize their potential energy savings, IEDA, the city of West Union and Main Street West Union teamed up once again. In partnership with Cenergy, a Residential Energy Services Network (RESNET)-certified Quality Assurance Designee, training was provided to local insulation installation contractors as well as air-balancing and diagnostics training to local HVAC contractors that emphasized proper sizing and installation practices.

Building the District Geothermal Network

The community now had a feasibility study for the district geothermal system, completed energy audits, training for local HVAC firms and a financial incentive program. The next big pieces of the puzzle were funding the district geothermal infrastructure and assisting property owners in adapting their HVAC systems to utilize the district system.

Once again the city of West Union and IEDA teamed up, this time to hire an experienced grant writer to help project partners pursue funding for various components of the larger community vision. This turned out to be a very wise move. Thanks to the funding sources identified during the visioning workshop and the onset of federal and state stimulus programs in 2009, more than \$7.5 million of the \$10.2 million street, streetscape, civic plaza and district geothermal system was leveraged from outside sources.

In 2010, the project received \$1 million in Community Development Block Grants, \$1 million in DOE Energy Efficiency Conservation Block Grant funds, a \$100,000 Main Street Iowa Challenge Grant and \$500,000 in EPA Climate Change Showcase Community funds. Collectively, these funds covered the public infrastructure components of the district geothermal system and provided \$100,000 to help property owners in making energy efficiency improvements. The city now had funding for the public components of the district geothermal system, and building owners had energy audits and the prospect of energy efficiency incentives available from the local utilities, Main Street West Union and

DOE. However, no property owners had yet committed to using the system. Why? There were still too many unknowns.

Property owners didn't know how the system was going to be governed, what the rate structure would look like or the cost of the necessary building modifications, heat pumps and related accessories. As a consequence, they could not calculate the payback period or return on investment. Without this critical information, they were not comfortable committing to the new system.

In 2011, key steps were taken to provide reassurance to potential customers. The city continued to tighten the specifications for the district geothermal system well field to ensure the most efficient construction possible. Well field construction was bid out in late 2011, a contractor was selected in early 2012, and the well field was constructed between spring and early fall 2012. Meanwhile, IEDA applied to the USDA's Energy Audit-Renewable Energy Development Assistance program for funding to provide services that would result in a greater comfort level for downtown property owners to commit to use of the district geothermal system. The USDA application was approved, providing technical assistance and a

business case statement to each of 23 interested individual property owners. Technical assistance services provided in 2012 included

- air infiltration testing and energy efficiency improvement opportunities (with 25 percent of the cost to be matched by building owners);
- TRACE 700™ energy baseload calculations;
- a line schematic of recommended building HVAC system modifications;
- cost comparisons of installing and maintaining a system similar to each building's existing HVAC system versus installation of heat pumps and modifications to use the district system (based both on current utility rates and an average of current rates and historic rates);
- a first-cost and energy-savings value with and without incentives applied;
- simple payback period analysis;
- written design specifications and narrative for property owners committing to the system;
- analysis of district geothermal system operation, maintenance and administrative costs to calculate user fees for each property; and
- exploration of several system governance structures.



A film crew has been documenting the installation of the district geothermal system for a 30-minute video to be completed in 2013.



District geothermal system glycol tanks are located in the basement of the county courthouse building.

West Union will own the infrastructure and lease the system to a new limited liability company comprised of system users.

By fall 2012 the scope of the system and its governance structure became much clearer. Eleven property owners committed to using the district system once it became available in spring 2013; three additional property owners signed letters of intent to use the system in future years but not likely in 2013. The city of West Union will own the infrastructure and lease the system to a new limited liability company comprised of system users. The city has calculated an annual system usage fee based on committed load and the load calculations for those businesses to cover operations and maintenance, along with an evenly distributed fee among users to cover administrative costs.

The city has also established qualification requirements for any HVAC contractor installing or maintaining in-building systems connected to the district geothermal system. The user group will hire a third party to maintain and operate the system and work together to bid out group purchases of the heat pumps, affiliated equipment and installation services. The two local banks have unveiled an energy efficiency and façade improvement financial assistance program, making funding available at 0.75 percent above the prime lending rate for a period of five years, after which any remaining balance can be refinanced at prevailing rates.

Project Evaluation and Upcoming Activities

Since West Union is serving as a pilot green demonstration community, a variety of approaches are being taken to evaluate the outcomes. Data is being tracked to assess the economic impacts of the overall project. A formal market analysis, completed prior to project initiation, identified high-performing sales categories in the community as

West Union District Geothermal System Timeline

Date	Activity
Spring 2008	Community visioning session held
Summer 2008-Spring 2009	District geothermal system feasibility study conducted
Summer 2008-Spring 2009	Utility provides checklist-based energy audits
Fall 2008-Ongoing	Main Street West Union establishes energy-efficiency incentives
2009-2010	Overall project design continues
2009-2012	Multiple funding applications submitted
Fall 2009	Community Development Block Grant awarded for district system
Spring 2010	DOE Energy Efficiency and Conservation Block Grant awarded
Spring 2010	EPA Climate Showcase Community Grant awarded
Fall 2011	USDA Renewable Energy Development Assistance Grant awarded
Winter 2011-2012	Well field construction out for bid
Spring 2012-Fall 2012	Well field constructed
Spring 2012-Fall 2012	USDA-funded technical assistance and business case services provided to initial group of 23 property owners
Fall 2012	First property owners commit to district geothermal system
Fall 2012	System users establish formal users' entity
Winter 2012-2013	System users bid for equipment and installation services as a group
Winter 2012-2013	City leases system to system user entity (proposed at press time)
Winter 2013	User entity contracts with third party to operate and maintain system
Spring 2013	District geothermal system begins operation
Summer 2013	West Union project documentary film released

West Union's District Geothermal System

- Closed loop, 300-ft-deep wells
- 132 wells (22 circuits) on courthouse square – 264 tons (installed)
- 252 future wells at Lions Park – 504 tons (future expansion – distribution lines and pump house already installed, but no wells at this time)
- 8-inch supply and return lines through streets
- 2-inch to 6-inch service lines stubbed into all 60 downtown buildings
- Circulation pump/controls in courthouse basement and pump house installed in Lions Park for future system expansion
- Approximately 60 buildings in project district with a total of approximately 330,000 sq ft, 11 commitments for 2013 startup, three commitments for future years

Source: IEDA.

well as underperforming sales categories where sales were being lost to other communities in the region, indicating potential niche development opportunities. Additional data being tracked and analyzed from before project conception to post-construction includes retail sales, building vacancy rates, property assessment values, building use changes (e.g., residential to retail, retail to professional services, etc.) and new businesses, business expansions and business closures.

To track potential changes in behaviors and attitudes about downtown West Union, the IEDA contracted with Urban Imprint in 2011. Study approaches include the Irvine Minnesota Inventory (a built-environment audit tool), pedestrian and vehicle observations, and residential and business surveys. The behavior impact information, combined with the economic and environmental impact analysis, will assist in guiding communities in targeting future sustainable community develop-

ment activities to generate the greatest impact. The behavioral and attitudinal impact analysis includes the following:

1. identify the significant social impacts of the green, sustainable practices implemented;
2. identify key changes in behavior, attitudes and preferences facilitated; and
3. provide targeted rationale and recommendations for future green, sustainable practices/programs by IEDA.

West Union's foray into community energy was begun prior to the release of IDEA's publication *Community Energy: Planning, Development & Delivery*.

Having this comprehensive guide in advance would have been helpful and might have stimulated additional possibilities. IEDA will continue to share its results with IDEA as the project becomes fully implemented in 2013. Further documentation will include a 30-minute video documentary, a white paper and a community energy efficien-

cy workshop to be hosted in West Union this summer. These efforts may inspire other small communities to think big as they develop their own vision for a more sustainable future. 



Jeff Geerts is a special projects manager with the Community Development Division of the Iowa Economic Development Authority (IEDA). He facilitates the incorporation of green sustainable community practices into each of the division's team areas so that environmental sustainability considerations are part of the everyday functions of the division and its services. Prior to joining IEDA, Geerts was a program planner with the Iowa Department of Natural Resources Energy and Waste Management Bureau, where his responsibilities included providing waste reduction and recycling assistance, working with the Iowa beverage container deposit law, and managing the Iowa Scrap Tire Program and the Iowa Waste Exchange. He holds a Bachelor of Science degree from St. Ambrose University in Davenport, Iowa, and a Master of Public Administration degree from Drake University in Des Moines. He can be reached at jeff.geerts@iowa.gov.



IDEA is pleased to announce the new IDEA Annual Innovation Award program, intended to showcase examples of technology, engineering and operational innovation within the district energy industry.

The first IDEA Annual Innovation Award(s) will be presented at the IDEA 104th Annual Conference and Trade Show, with the theme, *"Building on Efficiency, Delivering Value,"* in Miami, FL, June 2-5, 2013.

Are you proud of a recent accomplishment? Do you have something worth sharing with colleagues around the world? IDEA members are invited to participate in this new award program.

- Judging criteria will include:**
1. Innovation and Uniqueness
 2. Operational and Sustainable
 3. Replicable
 4. Economically and Environmentally Advantageous

Deadline: All submittals must be received by March 13, 2013

For details on the IDEA Innovation Award and how to submit your project for consideration, please visit www.districtenergy.org/idea-awards. Contact IDEA at 508-366-9339 if you have further questions.

