

Galena, Illinois



Photo: Main St, Galena, Illinois

Galena

CASE STUDY

SOLAR
OUTREACH



PARTNERSHIP

City of Galena: Solar Installation at Wastewater Treatment Plant

Located in northwest Illinois, Galena is a small community (population 3,429) with a geographic area of just over four square miles. Named for the rich concentrations of lead that became its primary economic output, Galena was chartered in 1841 and had become a bustling city by 1845. The booming mining industry, coupled with an ideal location—along the Mississippi River, between St. Paul, Minnesota, and St. Louis, Missouri—established a legacy that is still visible today: nearly 85 percent of the city’s buildings are listed on the National Register of Historic Places.

Galena is governed by a mayor and city council; the council consists of one alderperson from each of the city’s four wards and two alderpersons at large. Day-to-day operations are supervised and directed by an appointed city administrator. The local government, which has a budget of approximately \$10 million, employs twenty-eight full-time and nineteen part-time or seasonal workers; the forty-member fire department consists entirely of volunteers. The city’s major departments are administration, building, engineering, finance, fire, police, public works, utilities, and zoning.

Galena’s picturesque setting and welcoming spirit attract more than 1 million visitors annually and have contributed to its recognition as one of the best small towns in the country.¹ Galena certainly has much to celebrate—and, in 2012, it added yet another accolade, becoming home to one of the largest municipal solar installations in the state.



Aerial image of solar installation at WWTP

What makes Galena unique is that despite its small size, it managed to reduce energy costs, generate revenue, and advance environmental sustainability through employing solar technology. Strong local leadership, determined and knowledgeable city professionals, supportive partnerships, and desirable site characteristics resulted in a 368-kilowatt (kW) solar array on the city’s wastewater treatment plant (WWTP). The installation currently produces nearly half of all power consumed at the plant and is expected to save the city approximately \$50,000 annually.

A Practical Need for Energy Alternatives

In Galena, interest in alternative energy sources was spurred by a combination of existing commitments to sustainability and rising regional and national energy prices. In an effort to maximize reductions in energy costs, the city identified the largest municipal energy consumer: the WWTP, which represented approximately 12 percent of the city’s total energy costs (520,000 kilowatt hours [kWh] annually).

As a first step, the city sought to achieve maximum energy efficiency within the plant. Beginning in 2010, Galena invested \$15,000 in efficiency improvements, including

- Installing supervisory control and data acquisition (SCADA) technology, which allowed operators to shift the most energy-intensive processes to off-peak periods
- Installing variable-frequency drives in pump motors, to adjust the speed and frequency of pumping
- Lighting retrofits

Although these changes reduced energy consumption, yielding annual savings of approximately \$3,500, the city recognized that efficiency alone would not adequately reduce operating costs or stave off the impact of future rate increases.

Exploring alternative energy sources was a natural next step; it was also in line with the city’s existing sustainability commitments, which were reflected in the slogan “[My Green Galena](#).” While not a formal sustainability plan, this city-led initiative, launched in 2011, established sustainability



PV panel installation at WWTP

as the guiding principle for “organizing and managing the city to create a healthy environment, vigorous economy, and vibrant community.”² Collectively, the city’s sustainability efforts are designed to reduce the community’s impact on the planet’s natural systems and resources, including its carbon footprint. Successful projects initiated through My Green Galena include the following:

- Preservation of more than one hundred acres of natural area
- Retrofits of all traffic lights to high-efficiency light-emitting diodes
- Retrofits of all lighting in the police and fire departments
- Institution of pay-as-you-throw curbside garbage collection with unlimited recycling
- Provision of diverse recycling options for a range of materials, including medications, electronics, batteries, and compact fluorescent bulbs
- Paperless city council meetings
- Passage of a “dark skies” ordinance, to reduce light pollution

A Strategy for Solar

Research into the viability of using renewable energy for the WWTP suggested that the relatively flat, unobstructed land surrounding the facility would make the site a great candidate for solar. In 2011, city engineer Andy Lewis and city administrator Mark Moran proposed the idea to the city council, which unanimously supported seeking funding for a solar photovoltaic (PV) array at the plant.

The city submitted a funding proposal to the [Illinois Clean Energy Community Foundation](#) (ICECF), an inde-



High-efficiency PV panels at WWTP

pendent organization that supports energy efficiency, renewable energy, and the protection of natural areas across the state. The ICECF approved the proposal and awarded the city \$800,969—the largest grant the foundation had ever issued for a renewable energy project. The ICECF’s support covered nearly 60 percent of the estimated \$1.5 million cost of the 368 kW array.³

The city attributes its success in receiving the award to two primary factors:

- Earlier investments in energy efficiency at the plant demonstrated the city’s commitment to responsible energy management, and its willingness to pursue every available option before seeking outside support. Of particular interest to the foundation were the SCADA improvements and the variable-frequency drives installed in the pump motors. Since SCADA makes it possible to shift energy-intensive processes to off-peak times, the technology would be especially beneficial in maximizing the daytime use of solar-generated power.
- As demonstrated by My Green Galena, the city had supportive elected leaders and a proven commitment to sustainable practices.

Partnerships for Success

Following the grant announcement, the city secured the remainder of the required funds through a combination of bonds (\$330,000) and city capital (\$197,313) and issued a competitive bid for the design and installation of the array. Because the land available for the PV arrays was limited to 1.5 acres, the bid request emphasized the need for high-efficiency panels with the maximum possible watts-per-square-foot rating.

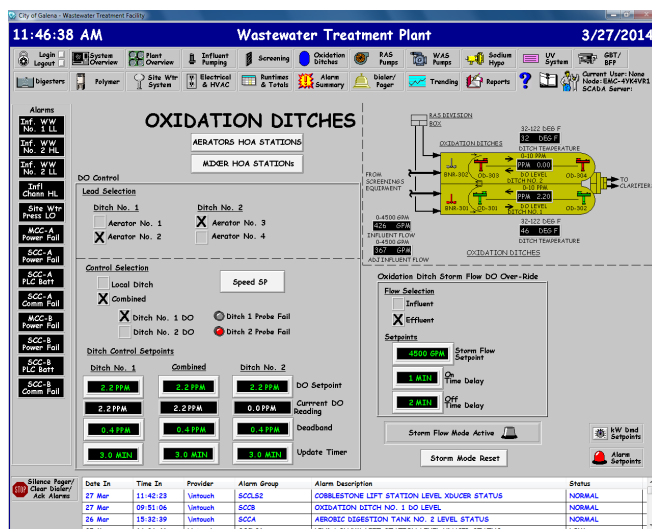
Funding Breakdown

Total project cost: \$1,328,282

- Grant funding (Illinois Clean Energy Community Foundation): \$800,969
- City cash: \$197,313
- City bonds: \$330,000 (to be repaid over ten years, at 2.4 percent interest)

The city received nine applications and selected [Eagle Point Solar](#), of Dubuque, Iowa, to complete the installation. Eagle Point Solar had an established reputation in the region for residential and commercial projects, but the Galena facility was its largest installation at the time. City staff worked with Eagle Point Solar to identify monocrystalline PV modules (15.21 percent efficiency rating), produced by Solar World, as the most appropriate for the location.

Since the time of the installation (2012), Eagle Point Solar owner Barry Shear has observed a growing trend in which municipalities—and even utilities—are moving toward solar. “Solar energy is good for utilities, it’s good for the city, and it’s good for consumers. There’s no one that doesn’t benefit from solar distributed generation,” said Shear.⁴ Furthermore, Shear sees cities like Galena, which have access to open land, as having an added advantage: “Municipalities that want to control energy costs and meet sustainability objectives can’t do better than solar. And those with wastewater treatment plants have an excellent opportunity, as they are typically located in areas with available ground space.”



SCADA display screen

[Jo-Carroll Energy](#), a member-owned energy cooperative that provides electric, natural gas, and Internet service to more than 25,000 homes and businesses across northwestern Illinois, was an engaged and highly supportive partner throughout the project. Not only did the installation offer the potential to offset demand on an increasingly strained power grid and contribute to state renewable-energy portfolio standards, but it also aligned with the utility’s mission to increase quality of life for its members and engage in responsible environmental stewardship.

To establish a two-way power transfer between the WWTP and Jo-Carroll Energy, the city invested in power grid upgrades and entered into a standard interconnection agreement with Jo-Carroll Energy. This agreement allows the city to feed energy produced by the array into the power grid. With the assistance of the utility, the city also established a power purchase agreement (PPA) with Dairyland Power Cooperative, the local power generator that sources Jo-Carroll Energy. The PPA set the rates and terms by which the city would sell energy produced at the WWTP to Dairyland Power during peak daytime hours (\$0.41 per kWh), and purchase it back at night (\$0.31 per kWh). The total



VFD controls

cost for the upgrades was \$45,000, which was financed by the ICECF grant.

Jesse Shekleton, director of engineering at Jo-Carroll Energy, noted that “early involvement of the local utility is a key to success in projects such as these.” Local utilities can be instrumental in site selection, early impact studies, and navigating an ever-changing landscape of state and federal policies. This involvement, said Shekleton, “can help . . . identify potential problems, avoid costs, clarify contracts and responsibilities, and provide professional design input to optimize performance.”

As the local energy distributor, Jo-Carroll Energy was primarily responsible for the following aspects of the project:

- Conducting a system impact study to assess feasibility and ensure the installation would not negatively affect the existing electric system
- Reviewing design plans for the installation
- Managing the interconnection agreement and facilities
- Liaising with Dairyland Power to establish the PPA

Widespread interest and support for the project resulted in a smooth process and minimal challenges. The entire process—from grant submission to panel installation—took approximately one year to complete and was aided by the active involvement of several partners. As city engineer Andy Lewis noted, “any technical or logistical issues were overcome by a team approach involving the city staff, electrical consultants, Eagle Point Solar and Jo-Carroll Energy.” For example, the city worked closely with Jo-Carroll Energy to establish the interconnection agreement, but had not anticipated the amount of time that would be required for that phase of the process. For future projects, the city plans to start working on interconnection agreements as early as possible.

Current Status and Future Plans

The solar array at the WWTP, one of the largest municipal arrays currently in the state, came online in August 2012. Data from the first year of operation show better-than-expected performance during the day: the array meets approximately 43 percent of the plant’s power needs, allowing for the sale of nearly half of all power produced to the local utility. Annual energy savings as a result of the installation total approximately \$50,000, which means that a ten- to twelve-year payback period is within range. Over the course of twenty-five years, the city expects the project to yield a net gain of approximately \$730,000.

At-a-Glance: Galena’s Wastewater Treatment Plant Solar Installation

- The installation consists of 1,444 monocrystalline, 225 watt panels arranged in seven arrays and facing 180 degrees south at a 30-degree angle.
- The panels are mounted on aluminum racking, with 8.5-foot-deep reinforced concrete foundation columns.
- Three 100 kilowatt inverters convert direct current to alternating current and ensure resilience to extreme weather or other unique events.
- The array is rated to provide 368 kilowatts (approximately 484,000 kilowatt hours).
- The installation has a forty-year lifespan and is warranted for twenty-five years.
- The array is expected to avert 920,000 pounds of greenhouse gas emissions and to save \$50,000-\$60,000 per year; the estimated payback period is ten to twelve years.
- The total project cost was \$1,328,282, with an installed cost per watt of \$3.63.
- The installation has a publicly accessible, web-based Suntrol monitoring system.⁵

Given the success of the WWTP program, Lewis is optimistic about the future of solar in Galena: “The project is helping considerably to offset power costs. We hope this situation will improve each year as we tailor our operations to make better use of solar-generated power.” Some improvements being considered include maintenance plans, to ensure maximum performance (such as quickly removing snow or cleaning dust from panels); renegotiation of the rates at which power is purchased through the PPA; and improvements to the time-of-day controllers to maximize yield during peak solar generation.

The installation has prompted interest in additional arrays throughout the city, most notably on a newly relocated city hall. The city has also expressed interest in selling Solar Renewable Energy Credits (SRECs), in order to generate additional revenue and thus reduce the project payback period. SRECs are performance-based incentives that provide energy credits for every 1 megawatt of solar power produced. The credits can then be traded on an open market; typically, they

are purchased by utility companies that are required to meet state-determined renewable energy goals. (Although Illinois does have a renewable energy portfolio standard, Galena currently can not sell SRECs as Jo-Carroll Energy is not within the territory that would allow sale of these credits.)

Lessons Learned

Galena's installation is an excellent model, especially for smaller communities looking to get started with solar. Undertaking installations on municipal buildings allows a city to lead by example, to demonstrate the viability and value of solar within the region, and to underscore local commitment to sustainability. The project has garnered widespread attention across the region, and the city frequently hosts officials from surrounding communities who are interested in exploring solar. Eagle Point Solar, the project contractor, also regularly shares project information with potential clients.

Communities interested in pursuing solar will benefit from some of the key takeaways from Galena's experience:

- Assess municipal buildings and property to find the most suitable location for solar. In Galena, the WWTP was not only the largest municipal consumer of energy, but was also located in an area that could accommodate a sizable installation.
- Fully engage local utilities as early as possible. Although Jo-Carroll Energy, the local utility, provided substantial support and assistance, the city realized in retrospect that the partnership should have been initiated earlier in the development process.
- Maximize energy efficiency before investing in renewables. Such investments help ensure that the energy produced by an eventual solar installation will be used most effectively. In Galena's case, previous efficiency improvements were also key to obtaining foundation support for the installation.
- Once the decision has been made to pursue solar, research solar options thoroughly. Because Galena city staff made a point of educating themselves about various PV panel options, they were able to incorporate requirements for high-efficiency panels into the bid for proposals and select the most appropriate installer.

A final broad point: supportive local leaders are crucial when launching a new initiative. Galena's leaders not only supported the initial efforts to reduce energy consumption, but followed through on the grant application and final installations. Even though the city has

not adopted a formal sustainability plan, the commitments expressed through the My Green Galena initiative demonstrated clear commitment to sustainability, and helped the city obtain funding for the installation. As summed up by Galena mayor Terry Renner, "The project was a good solution to help decrease our energy costs, at the same time reducing greenhouse gases. It is all part of Galena becoming a more sustainable community."

Solar a Rising Priority among Community-Owned Utilities

For Jo-Carroll Energy, a member-owned energy cooperative serving more than 25,000 accounts across northwestern Illinois, environmental stewardship is a core value. As a regional power distributor, Jo-Carroll Energy purchases all energy used on its grids and strives to support renewable options that reduce demand for fossil fuels.

In recent years, members of the cooperative have shown increasing interest in pursuing renewable energy, solar in particular. In addition to the solar installation on the wastewater treatment plant in the City of Galena, Jo-Carroll Energy supports net metering at twenty-nine residential solar arrays and eight wind turbines. In early 2015, a community solar farm was installed at the cooperative's Elizabeth headquarters whereby members may purchase subscriptions towards an installed panel and receive monthly bill credits based on the energy produced.⁶

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Endnotes

1. A complete list of honors can be found at http://www.cityofgalena.org/en/our_community/awards_and_accolades/.
2. City of Galena, “Sustainability”; http://www.cityofgalena.org/en/our_community/sustainability/.
3. As initially proposed in the fall of 2011, the project was for a 330 kW system. During the bidding process, in January 2012, decreases in the cost of PV panels resulted in a lower bid price, which made it possible to increase the size of the system to 368 kW.
4. Unless otherwise noted, all quotations are from interviews conducted with the individuals listed under “Contacts.”
5. Performance data are available at <http://www.suntronic.com/en/page/city-of-galena-waste-water-treatment/total>.
6. More information about Jo-Carroll Energy’s South View Community Solar Farm may be found at: <https://www.jocarroll.com/content/South-View-Solar-Farm-FAQ>

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