



Dubuque, Iowa

A White House Climate Action Champions Case Study

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Executive Summary

Dubuque, Iowa is a community of approximately 58,000 located along the bluffs of the Mississippi River where Iowa, Illinois, and Wisconsin meet. Since 2006, the City Council has made becoming a more sustainable, resilient community their top priority. A community-created vision, Sustainable Dubuque, seeks to ensure that, “Dubuque is a viable, livable, and equitable community. We embrace economic prosperity, environmental integrity, and social/cultural vibrancy in order to create a more sustainable legacy for generations to come.” In 2013, the Council took the bold step of adopting the 50% by 2030 Community Climate Action & Resiliency Plan. The plan details actions that every sector can take to reduce the community’s GHG emissions 50 percent below 2003 levels by 2030.

A major component of the Sustainable Dubuque initiative was the reconstruction of the waste water treatment plant. When city leaders began seeking proposals for the reconstruction of the aging plant, the twelve Sustainable Dubuque principles became the lens through which proposals were reviewed. The new Water & Resource Recovery Center was completed in 2013. Shifting from incineration to anaerobic digestion and implementing a new combined heat and power system has resulted in considerable economic savings for the City of Dubuque while also reducing environmental impact and creating economic opportunity for local businesses. By making sustainability the focus of the project, Dubuque took community planning challenges and made them into opportunities to foster the City’s development of environmentally friendly infrastructure.

Climate Action Champion

In 2013, the City partnered with non-profit Green Dubuque to develop the *50% by 2030 Community Climate Action Plan*. Over 70 percent of the plan’s recommended actions, which encompass energy use, waste management, transportation, and green buildings, are already either complete, in progress, or the funding and policies have been put in place to accomplish them. In 2011, Dubuque had already reduced its GHG emissions five percent below 2003 levels.

In 2015, Mayor Roy D. Buol signed the Compact of Mayors, committing Dubuque to continue to focus on climate mitigation while shining a new light on adaptation and resiliency. Public and private partnerships, which began with the Sustainable Dubuque Community Task Force, are leading the way to position Dubuque as a Climate Action Champion:

- Between 1999 and 2011, six Presidential Disaster Declarations were issued as a result of flash flooding in Dubuque’s most at-risk neighborhoods. The Bee Branch Watershed Flood Mitigation Project is a multi-faceted approach to “daylight” a creek, reduce storm water volume, create green space through the neighborhood, and improve the health of the residents by creating more resilient housing. The \$200 million flood mitigation project will protect 1,400 homes and businesses and prevent an estimated \$582 million in damages over its 100-year design life.
- Through the Smarter, Sustainable Dubuque partnership with IBM Research, Dubuque has given residents access to individualized data so that they can make more informed decisions about the way they use resources. Pilot volunteers have reduced water use by almost 7%, reduced electricity use by 3-

11%, and increased waste diversion by 5%. Data regarding travel habits has informed the redesign of The Jule public transit system, resulting in 28% increase in ridership in five years.

Project Spotlight: “*Aqua est vita. Water is life.*”

In 2012, the City of Dubuque partnered with local engineering and biogas production companies to renovate the aging Waste Water Treatment Plant into what would be renamed the Water & Resource Recovery Center (WRRC). Plant manager Jonathan Brown describes the significance between the name change: “*Aqua est vita. Water is life, in Latin. Resources are those other things we need for life. Recovery is bringing those resources back for our use. Center, the place where it all happens.*”

The twelve Sustainable Dubuque principles formed the framework for the RFP to upgrade the wastewater treatment plant in 2012. At the beginning of the design phase, the project team identified seven solids management alternatives to replace the 40-year old incinerators the plant was using. The \$68 million renovation, which was completed in 38 months, transformed the way previously-wasted materials are utilized, and opened up economic opportunities for the City of Dubuque local businesses.

Combined Heat & Power



The City partnered with Unison Solutions, a Dubuque-based biogas conditioning manufacture, to design a system that would shift from previously-utilized incineration technology to innovative anaerobic digestion. The plant, completed in 2013, is the first in Iowa designed to meet EnergyStar requirements. The switch enabled the facility to harness biogas for digester heating and electricity generation.

The anaerobic digestion process produces methane gas. The biogas is captured and cleaned before being used to power micro turbines to produce electricity and heat for the facility. The process powers a system with electrical generation capacity of 600 kilowatts (kW), and is currently producing more than 70 percent of the electrical needs of one of the municipality’s largest energy users. The administration and laboratory building includes an effluent heat recovery system. It is expected that the plant will be electrically self-sufficient within five years.

The improvements have been recognized by elected officials. “Innovative techniques in design, construction, and management of this facility are expected to cut heating and cooling usage by 25-30% compared to the former plant,” said Mayor Roy D. Buol. The facility’s electricity demand has dropped by 50-40%, from 1000 kilowatts down to just 500-650 kilowatts with 70 percent of this demand being produced on-site giving a total demand reduction of over 70-75 percent.

Additional Technology Improves Efficiencies and Opens New Opportunities

In addition to biogas recovery, UV disinfection has replaced chlorine use, resulting in beneficial environmental impacts as well as decreased operational costs. The plant also added a septage receiving station to increase opportunities for biogas production and to protect the regional environment.

Over 10.5 tons of biosolids were previously incinerated per day at the facility. However, the design of the new plant took into consideration its location in the midst of an agricultural community. “Farmers in Iowa have been using biosolids for generations. There are places in Iowa getting 10 to 15 percent increase in yield, and the soil is better at withstanding drought,” said Brown. The biosolids are now used to produce 3.5 tons of soil amendment per day, which is then used to fertilize local corn and soybean fields. This new operation has created a new funding stream for the City.

The facility was built with additional capacity to process high-strength waste through production or manufacturing processes. Local companies can now take their waste products to the WRRRC to be processed instead of shipping the product as far as 90 miles away. This has reduced Hormel’s cost per gallon for treatment/disposal by 60%. Processing these high-strength organics should result in \$240,000 in additional revenue to the WRRRC this year.

Lessons Learned & Future Opportunities

Early delays meant the original equipment for Bio-Solids removal was needed to be in operation longer than projected. The lesson here is keep up on all maintenance until units are out of service even if costs go up because of it.

Wind and heavy rain storms (14+ inches in 12 hours) caused significant delays and expenses. While weather cannot be controlled, strong insurance minimized the financial impact.

The WRRRC is currently producing more methane than can be used at the facility. The City is researching methods to use this excess methane to increase revenues and further reduce operating costs.

Learn More

www.cityofdubuque.org/wrrc

www.sustainabledubuque.org

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Project Impact & Co-benefits

- The new facility used 400 kilowatts less per year, which results in 4,715 metric tons of CO2 equivalent not going into our atmosphere.
- The WRRRC operates at 60-65% of capacity, meaning there is considerable capacity to meet residential and industrial growth.
- The upgrade results in the removal of 10 tons of oxygen demand per day, improving the Mississippi River quality.
- The upgrade is one component of a 2011 consent decrees settlement between the City and the U.S. Department of Justice and the EPA.

At A Glance

Project Duration

The 38-month design and construction process culminated in an October 2013 ribbon cutting.

Project Cost

\$68 million

Funding Partners

Iowa Department of Natural Resources, Iowa Finance Authority, U.S. Environmental Protection Agency

Population Served

58,000 residents

Community Type

Municipality

Partners

Unison Solutions (biogas conditioning), Strand Associates, Inc. and IIW Engineers (project design), Miron Construction (general contractor)

Project Costs and Funding

The \$68 million reconstruction was funded by State Revolving Funds (SRF) and sanitary sewer user fees paid by customers. One of the three micro turbines was funded by an industry with local connections to fulfill an EPA-required Clean Air Consent Decree. The total cost of the turbine was approximately \$350,000.