

Community Spotlight:

DANE COUNTY, WISCONSIN

Sunset at the Lewis Nine Springs E-Way, a seven-mile environmental corridor in Dane County, Wisconsin.

Credit: Impact Media Lab / AAAS

Dane County Turns Waste into Profit and Reduces Greenhouse Gas Emissions

While some companies and governments are vying for new oil drilling or coal-mining sites, Dane County is taking a completely different approach. Rather than looking for new sources of energy elsewhere, they are harvesting the waste in their own backyard – and will make a profit by doing so. Their solution? Landfills and cow manure.

Dane County, which includes the city of Madison, Wisconsin, has a long history of being innovative when addressing its energy supply needs. More than two decades ago, in 1995, the county began harvesting methane emissions from a landfill, using the gas to produce, on average, 29,000 megawatt hours (MWh) of renewable electricity per year – 80% of the annual electricity use for county operations. In part, this project was successful because the county was able to negotiate a particularly good purchasing agreement that set a favorable price of electricity. But with the agreement set to expire in 2019, government officials needed to come up with a new plan for the landfill.

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FACT BOX

Overview: With the goal of reducing greenhouse gas emissions and saving taxpayers money, Dane County, Wisconsin has been harvesting methane from its large landfill and surrounding farms to produce electricity and renewable natural gas. Harvesting methane from the manure provides locals with a valuable energy source and helps to reduce toxic algal blooms affecting nearby lakes in the process. As part of its Climate Action Plan, the County is aiming to fulfill one-third of its total energy needs from solar. Leading by example, the government is collaborating with a utility company to implement solar panels at the local airport.

Location: Dane County, Wisconsin

Community characteristics:

A county encompassing the mid-sized city of Madison and surrounding towns and rural areas.

Goals: Reduce greenhouse gas emissions, maximize county revenue

Responses: Capture methane emissions from landfills and cow manure to create electricity and natural gas, implement solar panels, develop a Climate Action Plan

Project status: CNG facility opened in 2019; county climate action plan ongoing

Key stakeholders: Clean Fuel Partners, county government officials, Gunderson Health System, local utility companies

Key resources: County funds, State of Wisconsin, U.S. Environmental Protection Agency

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The proposal included building a \$28 million facility next to the landfill to capture methane and convert it into renewable natural gas (RNG), which is then sold into the nearby pipeline. RNG is the cleanest burning transportation fuel available on the market. RNG is often considered carbon neutral because it comes from plant matter that once extracted carbon dioxide from the atmosphere, reducing the amount of greenhouse gas present in the air; in contrast, fossil fuels extracted from the ground add additional carbon to the atmosphere. Harvesting energy from landfills like this also stops methane (a powerful greenhouse gas) from being released into the atmosphere. For these reasons, the carbon footprint of RNG created from landfills is 88% less than traditional fossil fuel sources. The RNG facility, which opened in 2019,¹ will pay for itself after just four years of operation, at which point the county will start making a profit. The revenue will go back into the county's general fund, saving taxpayers money.

What's more, landfills can be a long-term source of energy. Although the amount and duration of methane production varies by landfill, in general they can continue to produce the gas for about 25 years after closure. A tool hosted by the U.S.

Environmental Protection Agency called the Landfill Emissions Model ([LandGEM](#))² can be used to estimate emissions rates for total landfill gas. John Welch, director of Dane County's Department of Waste & Renewables, has been managing the RNG landfill project. He notes that their landfill may still be open for another 10 years, and could provide usable gas for about another 25 years after that. In total, the project will yield an estimated 100 million gallons of clean transportation fuel.

Dane County has another valuable source of methane: cow manure. County officials originally sought to manage manure because phosphorus from the manure was leaching into nearby lakes, where it drove algal blooms. As a result, the lakes on some days during summer months had become blue-green, slimy and toxic. To address this issue, the government facilitated the development of two large biodigester facilities.

At each facility, cow manure from three large farms is processed in air-tight digester tanks, which are heated to about 100°F. Microbes in the tanks consume solids in the manure and release methane gas. Instead of floating into the atmosphere, however,



Director of the Department of Waste & Renewables John Welch (left) and County Executive Joe Parisi (right) overlook the recently completed RNG facility in Dane County.

Credit: Impact Media Lab / AAAS

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¹ County of Dane Wisconsin (2019). Dane County Executive Parisi and Partners Cut Ribbon on Landfill Biogas Project's Completion This Earth Week. Retrieved August 2, 2019 from <https://www.countyofdane.com/PressDetail/9755>

² U.S. Environmental Protection Agency (n.d.) *Air Emissions Factors and Quantification*. <https://www.epa.gov/air-emissions-factors-and-quantification/emissions-estimation-tools>

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the methane is captured and burned in generators, which create electricity. Each digester facility treats manure from more than 2,000 cows, producing roughly 16,000 MWh of electricity annually – enough to power 2,500 homes.

In 2010, the county received a \$6.6 million grant from the state of Wisconsin for the construction of the biodigester facilities. The county transferred the funds to private partners interested in investing in a biodigester. The recipients were Clean Field Partners, a private company, and Gunderson Health System, a healthcare company serving counties in Wisconsin, Minnesota and Iowa. The organizations paid for the remaining costs, which totalled roughly \$12 million per facility.

Why is a healthcare organization investing in biodigesters? Gunderson Health System did it for energy and climate reasons, after setting its corporate sustainability goals in 2008. The organization wanted to offset all its fossil fuel use with renewables. The biodigester makes up about 15% of their energy use, while the rest comes from geothermal, biomass, wind and solar.

In addition to producing energy, each biodigester prevents more than 3,700 pounds of phosphorus runoff from reaching the waterways of Dane County every year. [According to Gunderson](#),³ annual algae growth will drop by an estimated 370,000 pounds in the surrounding watershed as a result of its biodigester project. Dane County has been reaching out to farms and other companies that may be interested in participating in similar projects. While still in the assessment phase, county officials are aiming to facilitate the development of up to four additional biodigesters.

These projects to reduce emissions have been largely top-down initiatives led by the county, but the projects have also garnered widespread support from residents.

The recently completed RNG facility in Dane County. The facility converts methane harvested from a nearby landfill into renewable transportation fuel.

Credit: Impact Media Lab / AAAS

³ Gunderson Health System (n.d.). *Turning cow waste into energy*. Retrieved August 5, 2019 from <http://www.gundersenenvision.org/app/files/public/5326/envision-case-studies-middleton-dairy-digester.pdf>



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“Our landfill project, it’s going to make the county millions and millions of dollars a year, after the four-year payback. It’s going to lower greenhouse gas emissions,” says Welch. “It’s really hard for anyone to see a negative in it, so we’ve gotten this tremendously positive response from the public.”

Surveys of Dane County show that residents acknowledge that climate change is real and a problem, and that they want action. In 2011, they elected Parisi as their County Executive, and he has been a key leader of many climate change-related projects.

“With the change of government at the federal level and at the state level in Wisconsin, there was less than no help for addressing climate change. So we felt it was important for us to maximize our efforts on the local level,” says Parisi. “We decided a couple years ago to create an office specifically for addressing issues of renewable energy and climate change.”

The Dane County Office of Energy and Climate Change was created in 2017. The department director, Keith Reopelle, has been collaborating with more than 100 stakeholders – business owners, environmentalists, educators, utility representatives, volunteers and more – to develop Dane County’s [2019 Climate Action Plan](#).⁴ Ten working groups, which focus on issues such as renewable energy, transportation, agriculture and forestry, collectively identified more than 70 recommendations. While the recommendations are vast in scope, Reopelle says the three main themes of the plan are: increasing efficiency, transitioning to 100% renewable energy, and improving the transportation sector via electrification and compressed renewable gas.

The county has already replaced roughly one-fifth of its fleet of vehicles with ones that run on RNG. So far, it has 75 vehicles, including 17 fuel-hungry snow plows, running on the cleaner energy source. As more old vehicles are retired over the coming years, the county plans on replacing these as well.

A key component of Dane County’s Climate Action Plan involves widespread adoption of solar power. Already, the Office of Energy and Climate Change has identified government-owned land where solar panels can be sited, including the Dane County Regional Airport. They’ve made an agreement with Madison Gas & Electric (MGE) whereby the company will deploy enough solar panels on the airport’s 50 -acre lot to generate 8 MW of electricity. Just like the other projects in Dane County, this one is expected to lower costs for taxpayers. “How much money we save is yet to be



A tractor moves piles of trash at the Dane County Landfill. Because of the new RNG facility, the county can harvest methane produced by decomposing trash in the landfill and convert it into renewable transportation fuel.

Credit: Impact Media Lab / AAAS

⁴ County of Dane Wisconsin (n.d.). *Climate action plan*. <https://climatechange.countyofdane.com/Climate-Action-Plan>

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determined,” says Reopelle. “But the initial analysis that has been done shows that we’ll be able to buy solar for less than what we’ve been paying for fossil fuels.”

As part of its Climate Action Plan, Dane County is aiming to meet one-third of its entire energy needs with solar, which is equivalent to 1,200 MW; however, only 1% of the county’s total energy budget currently comes from solar, meaning a lot more solar panels need to be installed to achieve the Climate Action Plan goal.

Another part of the climate change response in Dane County involves creating [extensive bicycle infrastructure](#)⁵ in and around Madison, including miles of bike trails, special protected street crossings, a bike-share program, bicycle training programs, and many other features. And [research at the University of Wisconsin](#)⁶ has shown that increased cycling leads to health benefits: a lower risk of heart disease, lung disease and some cancers. Both cleaner energy and cleaner transportation are making the people of Dane County healthier.

When it comes to climate change projects, Dane County officials do not shy away. David Merritt, Director of Policy and Program Development, is confident that the district can meet its goal. “We’re all about projects here,” he says. “Whether it’s solar, wind, biogas – you have to walk the talk.”

“How much money we save is yet to be determined,” says Reopelle. “But the initial analysis that has been done shows that we’ll be able to buy solar for less than what we’ve been paying for fossil fuels.”

⁵ City of Madison (2019). Bike Madison. <https://www.cityofmadison.com/bikeMadison/>

⁶ Grabow, MD., et al. (2012). Air quality and exercise-related health benefits from reduced car travel in the midwestern United States. *Environmental Health Perspective* 120:(1), 68-76. <https://doi.org/10.1289/ehp.1103440>

A grove of young aspen trees at Lake Farm County Park in Dane County, Wisconsin.

Credit: Impact Media Lab / AAAS

