

In an age of Internet, mobile and connected devices, and with the proliferation of cloud computing and big data, daily life depends on data centers, which require power to operate. With more than 1 billion customers and 20 million businesses in 90 global marketplaces using its cloud services, Microsoft has been exploring ways to achieve net-zero carbon emissions for its global footprint as well as employee business air travel. In the last five years alone, Microsoft has led the technology sector with objectives to transform the entire energy supply chain of its data centers toward radically greater efficiency and reduced environmental impact.

Microsoft recognized an opportunity to evaluate a green data center strategy in Cheyenne, Wyo., where the combination of an existing Microsoft

in this case, a renewable fuel supply. FuelCell Energy power plants are capable of using onsite biogas as a fuel source to efficiently and cleanly generate power. The fuel cell plant was installed on the grounds of the facility immediately adjacent to the data plant. The fuel cells began supplying renewable power in late 2014.

The system is a win-win: It efficiently converts Dry Creek's waste into a renewable, carbon-neutral power solution that emits virtually zero pollutants.

Waste to Data

Methane, a greenhouse gas, is generated by the wastewater treatment process and must be captured to prevent its release into the atmosphere. The methane, or biogas, can be destroyed by flaring, but this generates pollutants and wastes a potentially valuable fuel source. Only about 10% of America's large-scale wastewater treatment plants utilize the biogas they create, which equates to flushing more than one gigawatt of renewable energy down the drain, enough to power more than 800,000 homes.

At Dry Creek, the renewable biogas is cleaned of sulfur and humidity, and supplied directly to the fuel cell plant. Inside the fuel cells, an electrochemical process reforms the biogas, generating electricity and usable heat in a manner that is virtually absent of the pollutants that cause smog and acid rain or aggravate asthma.

Off the Grid

The ability to capitalize on the biogas fuel supply from the adjacent wastewater treatment plant was a key aspect of this project. The fuel cell power plant supplies electricity to the data center, enabling it to symbolically "cut the cord" and operate independently of the electric grid. Any excess electricity that the data center does not use is supplied to the reclamation facility to reduce its electric costs.

Moreover, FuelCell Energy power plants are versatile in their ability to convert biogas into continuous power where the renewable biogas is produced, avoiding reliance on transmission lines and the associated costs. Even in the event of a grid outage, the data center and fuel cell plant will continue to provide uninterrupted power.

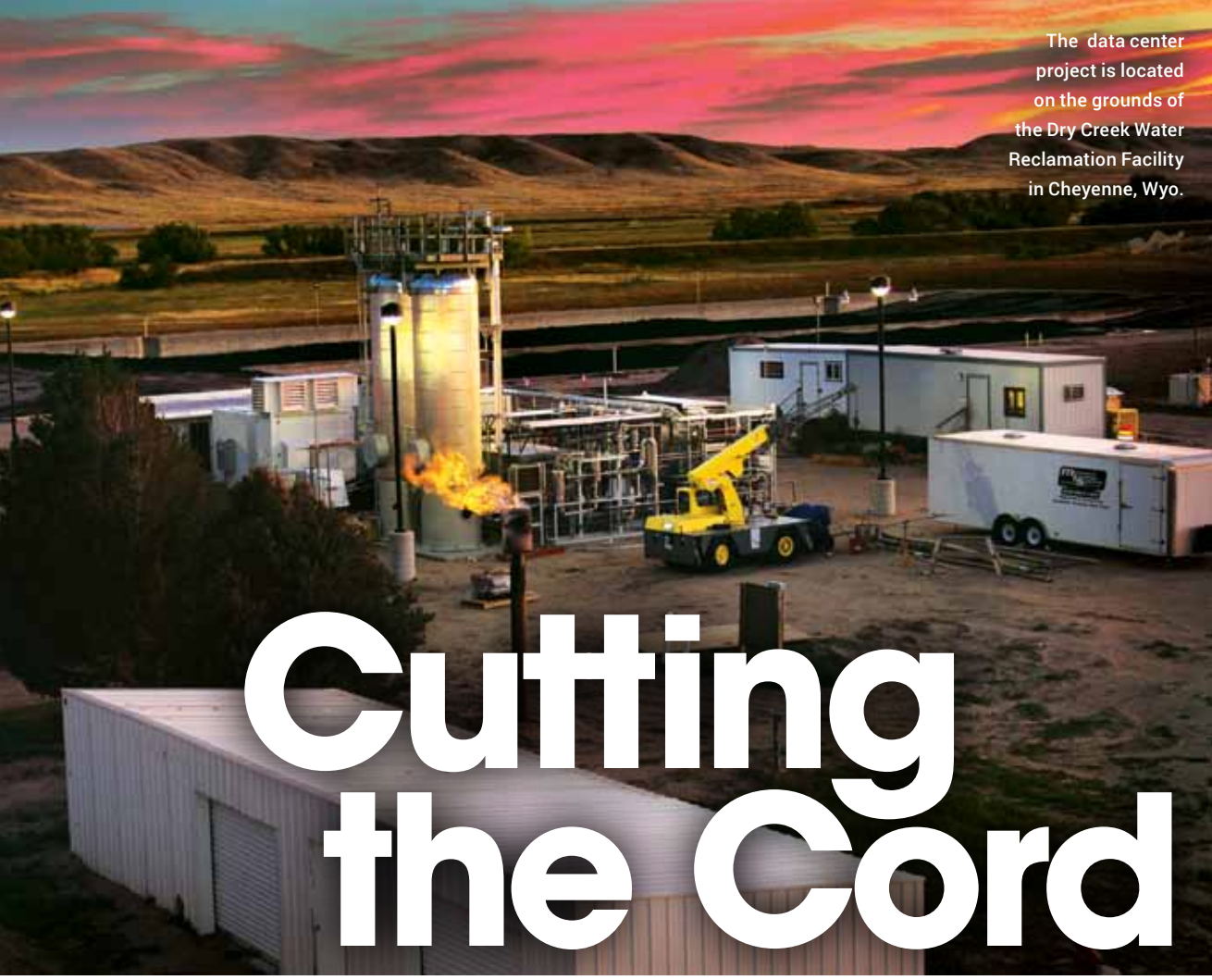
In addition to electricity, the fuel cell generates usable heat, which is reclaimed and supplied to the reclamation facility to assist with waste treatment processes and reduce natural gas consumption. Generating both clean electricity and usable heat from the same unit of fuel enhances efficiency and reduces emissions. This electrical efficiency is a key differentiator of the fuel cell configuration; compared with conventional methods, the fuel cell produces more electricity per biogas unit, yielding about 30% more electricity (versus, for example, a combustion engine). Applications such as these can achieve up to 90% total efficiency with an onsite combined heat and power (CHP) configuration.

Green Blueprint

This onsite CHP configuration eliminates up to 2.9 tons of CO₂ emissions per year in comparison with the Wyoming electric grid—the equivalent of taking about 610 cars off the road.

Also, by locating the power plant and the data center together, Microsoft and FuelCell Energy created a simplified and efficient power distribution infrastructure. "Our objective is to transform the way our data centers do business, with greater energy efficacy and a lower environmental impact," said Christian Belady, general manager of data center services for Microsoft. "By bringing together the power plant with the data center, we are actually simplifying the power distribution infrastructure and improving efficiency in the distribution of power."

This project proved the potential for much greater



The data center project is located on the grounds of the Dry Creek Water Reclamation Facility in Cheyenne, Wyo.

Cutting the Cord

By Tony Leo

Wyoming wastewater treatment application fuels onsite renewable biogas-powered data center

data center project, a source of renewable fuel from the local Board of Public Utilities wastewater treatment facility and technical support from the University of Wyoming and Western Research Institute (WRI) seemed right for an advanced clean power data center project. For Microsoft, an ideal project partner needed to provide an energy solution that was readily available, carbon-neutral, minimally pollutant, scalable and affordable. Introduced through WRI, Microsoft identified FuelCell Energy, a manufacturer of large-scale stationary fuel cell power plants, for an environmentally sustainable power generation solution. The fuel cells provide continuous power—a critical requirement of a data center—and the fuel cells convert renewable biogas into ultra-clean power that supports the aggressive sustainability targets of Microsoft, including its goal of carbon neutrality.

Application

The first task was to find an uninterrupted source of biogas, which was accomplished by siting the data center on the grounds of the Dry Creek Water Reclamation Facility in Cheyenne. Microsoft has versatile data plant architecture that facilitates siting data centers close to a power source or, in

30 Anniversary 1985-2015

How long before you know something is wrong?

Countless industries depend on Sensaphone for the most comprehensive environmental remote monitoring systems available. When you need to be absolutely sure your remote site is stable, secure and monitored around the clock, *there's no substitute for certainty.*

Call today for your **FREE** application guide and catalog

SENSAPHONE
REMOTE MONITORING SOLUTIONS

For more information visit www.sensaphone.com
or call toll free **877-373-2700**

MADE IN USA

WRITE IN 121

SOME THINGS SHOULD NEVER BREAK.

WHY SHOULD YOUR MEMBRANES BE ANY DIFFERENT?

Aqua UltraFiltration™
Membrane System

Seven Bore Design. No Fiber Breaks. No Air Scouring.
A reliable combination under the most extreme conditions.

www.aquauf.com | 1-815-654-2501

AQUA-AEROBIC SYSTEMS, INC.

WRITE IN 123

emissions reductions when deployed at full scale. For Microsoft, it is an opportunity to transform its supply chain with a simplified energy supply, one in which the renewable fuel is created and used at the same location. As a whole, alternative energy projects like Dry Creek create a blueprint for greener and cleaner data centers.

For the wastewater industry, this sustainable model highlights a market opportunity and lays the groundwork for future collaboration between power-consuming data centers and the continuous supply of energy-rich biogas from the wastewater treatment process. **w&wd**

Tony Leo is vice president of application engineering and advanced technology development for FuelCell Energy. Leo can be reached at tleo@fce.com.

Pollardwater

FLOW TESTING

HydrantPro

Pollardwater is your complete source for Flushing and Flow Testing operations.

We are both a manufacturer and a distributor for 50,000+ items used in your field operations. We employ specialists in every aspect of Water Operations, whether you need help with Chemicals, Dechlorination, Flow Testing, Pumps, Valves or any other equipment, we have the right products and personnel to help you get the job done right the first time.

Call today or go online to request your free catalog!
800-437-1146 • www.pollardwater.com

WRITE IN 124

HALOGEN VALVE SYSTEMS, INC. A **FORCE FLOW** Company

CHLORINE & SO₂ SHUTOFF

Emergency Valve Actuator
Replaces Gas Scrubber • Gas Detector or Manual Activation
Fire Code Approved for Toxic Gases • Fail-Safe Battery Operated System
(925) 686-6700 • (800) 893-6723
www.halogenvalve.com

WRITE IN 122