From harnessing virtual reality to feeding wind power into natural gas pipelines, utilities are forging the path to the future. **By Christina Kelly**

Technology continues to make possible what seemed impossible only a few short years ago. We’re wearing it. We see it in the skies as aerial drones give us a bird’s-eye view of the terrain. We’re planning to take regular people into space for a look at the cosmos. And we’re creating huge 3-D printers to map the earth in such a way to reveal natural resources like never before.

It’s the stuff of science fiction, except in many cases, it’s just around the corner. In the natural gas industry, innovation has changed the way business as usual takes place—and in some cases, is having a profound impact.

**Virtual Reality — The Next Big Thing**

In the 1990s, the gaming industry exploded with games featuring virtual reality, a computer technology that replicates an environment, real or imagined, and simulates a user’s physical presence and environment for user interaction.

As the technology has evolved, so have the uses, not just in entertainment, but in medicine, the military and, most recently, for training, allowing professionals to conduct it in an environment where they can improve skills without the consequence of failure of a vital operation or injury to an employee.

It’s how Detroit-based DTE Energy plans to train some of its employees to handle dangerous situations. In a partnership announced in May with Vectorform, a company that creates digital experiences for some of the world’s largest brands, DTE plans to use VR for high-consequence training. This will allow DTE technicians to train in simulated work environments that include performing gas line shut-offs—all from the safety of their offices.

Tony Battle, manager for DTE Technical Training, said the utility is just getting started, and at press time, planned to pilot the simulation during the September-October timeframe.

“We’re in the development phase of a project to prove out the virtual reality concept in the utility space,” said Battle. “Significant effort has gone into the analysis, design and development of the product thus far, and we have received great interest and support from our executive and business unit customers.”

DTE has about 3,500 field personnel who inspect and repair natural gas systems and other infrastructure. Battle said the goal is to promote a safe and effective workforce by using VR to place the employee in dangerous situations in a VR world first to learn how to work in such an environment.

Vectorform CEO Jason Vazzano said his company is excited by the possibilities...
of using the company’s technology for training in a safe setting so employees can learn skills critical for their jobs.

“We are excited to drive an industry first, in integrating the HTC Vive into the energy company’s high-consequence and life-critical training programs,” Vazzano said. “This application is leading the way for energy companies nationwide to focus on performance and safety.”

Allowing technicians to walk around and train in a lifelike virtual space—without exposure to the real-world dangers they’d typically encounter—takes the pressure and anxiety out of the training, and leaders from both companies believe the training will be more effective.

Battle said that if the VR training does prove to be successful, he believes it can be used throughout the utility industry.

“This is especially true in areas that pose a challenge in terms of difficult-to-replicate environments, particularly those that have significant safety implications,” Battle said.

Full Steam Ahead — Turning Waste Heat into Energy
Few people would think of Amelia Island, about 30 miles northeast of Jacksonville, Florida, as a hotbed of technology. The island is 13 miles long and about four miles wide at its widest point. Many of the jobs on the island come from tourism, shrimp and two paper and pulp mills.

However, an agreement between Chesapeake Utilities, Florida Public Utilities and Rayonier Advanced Materials has led to the creation of the Eight Flags Energy Combined Heat and Power plant on the island, which began generating electricity for FPU in June and producing steam for Rayonier Advanced Materials in July. Fueled by natural gas, the CHP plant generates 20 megawatts of power for Amelia Island customers.

“The innovation was born from a joint opportunity involving Chesapeake, FPU and Rayonier,” said Jeff Householder, FPU president, who came to the utility in 2010. “Rayonier Advanced Materials was interested in additional steam—and in continuing to generate its own power. We were trying to find opportunities for economic development while adding load to the natural gas pipeline we were constructing to serve Amelia Island.”

Eight Flags Energy operates with a Solar Turbines Titan 250 gas turbine generator set coupled with a Rentech heat recovery steam generator. The steam is purchased by Rayonier Performance Fibers for its pulp and paper mill. FPU, a subsidiary of Chesapeake Utilities, is buying the power for distribution to its retail electric customers on Amelia Island.

Householder said the system generates electricity through a 20MW gas-fired turbine, producing a large amount of waste heat. The plant recovers the waste heat—heat that would otherwise be allowed to escape—which is then run through a steam generator and piped to the paper mill. Emissions are significantly reduced.

“We’re pretty happy with it,” said Householder. “This is power we can depend on. It’s environmentally friendly, and it’s saving millions of dollars to our customers in the long run. If you are a combo utility with gas, there’s no reason why this can’t work elsewhere.”

The plant is expected to generate a $3.7 million margin in 2016, and a $7.3 million margin on an annual basis.

According to the Environmental Protection Agency, a CHP system increases energy efficiency, lowers a facility’s operating costs and contributes to lower emissions. In a 2012 report, Combined Heat and Power: A Clean Energy Solution, the EPA states that a 50 percent increase in CHP systems within a 10-year time frame could yield a savings of 150 million metric tons of CO₂—the equivalent of removing 25 million cars from the road.

Power to Gas — A 100 Percent Renewable Energy Future
Science fiction begets science reality with a new technology that converts electricity from renewable sources into hydrogen gas.
As some industry leaders have said, it’s like spinning gold from straw.

Power-to-gas technology uses electricity from renewable sources, and then uses an electrolyzer-based method to create carbon-free hydrogen gas by breaking down water into hydrogen and oxygen. From there, the hydrogen can be converted into synthetic, renewable methane, which can then be stored. The resulting natural gas can be used to power vehicles, fuel cells, micro-turbines and other equipment.

For several years, German engineers have been testing the power-to-gas technology—a method that could make a 100 percent renewable energy possible, according to E.ON and its wholly owned subsidiary Uniper. E.ON is developing power-to-gas technology as an innovative method for storing surplus energy from renewable sources that include wind and solar to balance long-term fluctuations in power generation.

Now that technology has come to the United States. Southern California Gas Co. has joined with the Energy Department’s National Renewable Energy Laboratory and the National Fuel Cell Research Center to launch demonstration projects to create and test a carbon-free, power-to-gas system for the first time in the U.S. The technology converts electricity into gaseous energy and could provide North America with a large-scale, cost-effective solution for storing excess energy produced from renewable sources.

Should the project prove to be successful, the technology could enable natural gas utilities across the country to use their existing pipeline infrastructure to store and deliver clean, renewable energy on demand.

Jeffrey Reed, director of SoCalGas Business Strategy and Development, said the technology could help California meet its environmentally focused energy goals while helping the country with cost-effective storage from renewables.

Reed said renewables are limited to when the wind blows and the sun shines. By converting the renewables, the excess power can be stored until it’s needed.

The energy industry has focused on developing batteries to store excess energy, but battery capabilities are limited to short-term storage and are expensive. Power-to-gas offers longer storage capacity and uses existing natural gas infrastructure, saving an enormous amount of money, according to Dr. Martha Symko-Davies, director of Partnerships for Energy Systems Integration for NREL.

“As we reach high levels of renewable energy on the grid, storing the electricity generated by solar power and other variable energy sources will help unlock greater use of these renewable resources in the U.S. and throughout the world,” said Symko-Davies. “This project will examine a unique way to reduce the capital cost of energy storage.”

The projects are located at the NFCRC at the University of California, Irvine and NREL’s laboratories in Golden, Colorado. The power-to-gas demonstrations will also assess the feasibility and potential benefits of using the natural gas pipeline system to store photovoltaic and wind-produced energy.

“We see this project as an important step forward in our efforts to reduce the carbon footprint of natural gas and support the integration of ever-increasing amounts of renewable electricity by developing new storage resources,” said Reed. “Power-to-gas is still in the development stage but offers great promise for the future.”

"