

Houston innovator plugs in to the future of power

By Chris Tomlinson | August 19, 2016 | Updated: August 20, 2016 2:07am



Photo: James Nielsen, Staff

The creative spark of invention comes from a deep curiosity about how something works and then asking, "How can I make it better?"

Donald Williams sold offshore power generation systems to oil and gas companies in his home country of Venezuela. He understood the engineering behind his products and soon found himself asking why they couldn't generate more power with less fuel. He pondered whether the thermodynamics of air conditioning could boost a generator's productivity.

He left his employer, Houston-based Stewart & Stevenson, to start his own company, but the political turbulence created when Hugo Chavez became Venezuela's president in 1999 forced him to flee. Caracas' loss, though, was Houston's gain, because Williams has solved his puzzle, engineering a natural gas-fired generator and air-conditioning system that burns extremely

cleanly and cuts energy bills by about 40 percent.

This summer, Houston-based M-Trigen moved from making prototypes of Williams' PowerAire system at its Houston plant and moved to commercial production. The units are about the size of a large refrigerator and burn natural gas or propane to power central air conditioners, a hot water heater, a clothes dryer, a water distillation system and can even warm a swimming pool while generating enough electricity to power a typical 3,000-square-foot home.

"This is how the electric grid is going to evolve," Williams said.

The idea for what he calls a tri-generation system started in 2008, when Williams wanted to improve on tried-and-true systems that generate electricity by burning fuel and then use the exhaust heat for other purposes. The missing element was cooling, and after five years of tinkering, he deployed a prototype in 2013 in an NRG-sponsored experimental home alongside cutting edge equipment from Siemens and General Electric. He won a Department of Energy cash prize to further develop his invention.

"The tri-generation system used in the M Street home, which incorporates cooling, heating and power production, is the first of its kind," an Energy Department white paper said. "The air conditioner is removed from the home's electrical load, resulting in a sizable electric savings"

Williams said the goal of the PowerAire is not necessarily to take homes or businesses off the electric grid, though it could, but to play an intermediary role in the grid of the future, when homes will carefully manage and even generate power. He compares this evolution to computing, which originally relied on a central computers with hundreds of terminals but ultimately moved toward millions of network-connected personal computers.

The PowerAire is modular, with DC to AC inverters and batteries built in, so owners can plug in solar panels or wind turbines in addition to relying on the natural gas generator or the electric grid. A control module can choose the least expensive source of power at any moment, using inexpensive wind power from the grid at night, firing up the natural gas generator in the mornings and evenings, and tapping solar panels during the day.

The PowerAire is modular, with DC to AC inverters and batteries built in, so owners can plug in solar panels or wind turbines in addition to relying on the natural gas generator or the electric grid. A control module can choose the least expensive source of power at any moment, using inexpensive wind power from the grid at night, firing up the natural gas generator in the mornings and evenings, and tapping solar panels during the day.

"With all of this renewable power coming into play, there was an opening here for a product that can balance those renewables," Williams said. "There's revenue opportunities at three levels, at the wholesale power level, at the power management level and at the retail level."

M-Trigen has installed prototypes in homes and small businesses across Texas to perfect the technology, collect data and earn industry certifications, including a UL safety rating. Next month the company will begin installing 24 units at Great American Business Products, a Houston-based company that wants to replace its diesel backup generators and reduce its electricity bill.

M-Trigen's main competitors are natural gas fuel cells that generate electricity and are used primarily in California where companies get tax breaks because of their very low emissions. Williams invites the comparison because unlike fuel cells, his generators can vary their electricity production depending on demand and generate the same levels of nitrous oxide and sulfur dioxide with far lower carbon dioxide thanks to a patented catalytic convertor and carburetor.

"Our road map is to get to zero carbon emissions," Williams said.

The company expects to generate \$2 million in sales in 2016 and is raising \$2 million in seed money with plans for a formal Series A share offering in 2017. The big push at the moment is to perfect commercial production to lower the cost with plans to make it comparable to backup power systems and high-efficiency air conditioning units, which run about \$12,000.

The units can pay for themselves within three to seven years, though, from lower monthly energy bills and tax credits, Williams said. Running the generator on natural gas is cheaper than buying electricity from the grid.

Natural gas and electric utilities in France and the Caribbean are testing units, and interest is particularly high in Latin America and Africa places where people have access to propane deliveries but not the electric grid. Williams said he plans to keep assembling the system in Houston and build a strong customer base among the 60 million natural gas users in the U.S., particularly in areas prone to power outages like the Gulf Coast.

The units can also help shave demand when power prices peak and provide backup power for renewable energy.

"We don't believe the solution for solar and wind is a battery pack. We believe the solution is some form of fuel," Williams said.

M-Trigen is an example of the Houston startups that will lead the next generation of energy companies. By some estimates, the U.S. has enough natural gas for the next 300 years, and renewable sources of energy are becoming more affordable. Finding hybrid high-efficiency systems is the key to having the best of both worlds.



Chris Tomlinson

Business Columnist

HEARST *newspapers*

© 2013 Hearst Newspapers, LLC.
