HYDROGEN HOUSE

Renewable energy starts at home

Imagine a house that gets all of its energy for heating, cooling and cooking from batteries. Sounds like a pain changing all of those giant D-cell batteries every year, doesn't it? Mike Strizki likens the system he uses at his home in Hopewell, N.J., to batteries that never go bad. Batteries as reliable as the sun.

In fact, the sun is a key player in Strizki's home. Sunlight energizes the 56 solar panels that provide energy to Strizki's 3,000-square-foot house. More than half of the energy collected by the panels is converted to hydrogen, the element that makes up 70 percent of the sun's composition. So while the solar panels provide energy to the house when the sun is shining, the hydrogen is stored for use in cloudy weather when it is converted back to electricity. Strizki stores enough hydrogen to keep him warm all winter, and to keep his hydrogen-fueled car running throughout the year. His monthly utility bill? Zero.


The Stritzki's home in Hopewell, N.J.

Strizki's home is the first of its kind – an existing home, retrofitted for self-sufficient solar and hydrogen power – and, he believes, the first of many to come. Everything in the house runs on electricity and needs no external power supply.

Swagelok Company was instrumental in helping Strizki realize his goal of building a home that emits no greenhouse gas to the atmosphere. Swagelok brought its expertise to the project, including design assistance, AFS ball valves, gauges, manifolds, hundreds of feet of stainless steel tubing, fittings and other components.

Strizki's goal is to show how renewable energy sources can provide all the power needed by an average American home. Strizki is chief technology officer of the Hopewell Project, a New Jersey-based nonprofit corporation dedicated to the promotion of renewable energy through practical action. Through the success of his Solar-Hydrogen Residence, as it's referred to by the Hopewell Project, he hopes to raise awareness of the fact that clean, safe, reliable and renewable home energy resources are feasible now. That awareness is building: the house was home to a dedication ceremony attended by government officials, environmental activists, energy entrepreneurs and other guests. The Hopewell Project has been widely covered by ABC News, CNN, CNBC, National Public Radio, The Christian Science Monitor and has been talked about across the Internet.


The comtrol panels at the Strizki's home.

Getting Involved

Swagelok's involvement in the project began when Tracey Simpson, owner and president of Penn Fluid System Technologies, the Swagelok distributor in Huntingdon Valley, Pa., heard about Strizki's plans.

"When I spoke to Strizki and he described his project in detail, I saw it as an opportunity Swagelok couldn't pass up," Simpson says. "We're involved in lots of interesting areas. Space missions and deep-sea explorations use Swagelok. Since we're also developing products for the alternative fuels market, I knew we had to be involved here, too."

At the point when Swagelok became involved, Strizki already had his solar panels, storage batteries, hydrogen electrolyzer, generator and tanks, but not the connection equipment nor the expertise to tie it together. Swagelok provided the equipment – including all points of connection and all of the fluid controls – as well as the assistance to pull it together as efficiently as possible.

Shedding Light on Residential Hydrogen Heating

The Solar-Hydrogen Residence works like this: Photovoltaic solar panels absorb sunlight, converting its energy into electricity. During the sunny months, this energy directly provides heating and air conditioning as well as powering appliances, filling the hot water tank and providing energy to cook. At the same time, though, 60 percent of the electricity is diverted to an electrolyzer that pulls hydrogen from water. This hydrogen is stored in 10 1,000-gallon tanks on Strizki's property, which employ Swagelok process and control systems. When energy from the stored hydrogen is needed, the hydrogen flows through more Swagelok tubing and fittings to a fuel cell where it is converted back into electricity. Swagelok components, design and expertise keep Strizki warm in his Solar-Hydrogen Residence in the winter and cool in the summer, all without relying on the traditional power grid nearly every other home in the country depends on.

In all, Swagelok provided 300 feet of 1/2-inch tubing, 16 AFS ball valves, 10 gauges and many other components to the Solar-Hydrogen Residence.

Design, Expertise and Reputation

"Mike Jeffrey, director of operations at Penn FST, worked with Strizki to get a firm grasp of the project," says Simpson. "Not only did he do the CAD work to determine flow rates, pressure drops and other critical information, he also helped me select the right Swagelok components and provided a layout from which to work."

"Swagelok brought a total system approach and did whatever it took to get the job done," says Strizki. "I gave them copies of my blueprints and they made suggestions for making them better."

For instance, the 10 hydrogen tanks are arranged alongside one another in two banks of five. The tanks in each bank are connected in parallel with each other with Swagelok tubing, each tank also outfitted with a Swagelok AFS ball valve. Strizki's original design called for straight tubing between the tanks.

"We revised the design to include expansion loops in the tubing between tanks," says Simpson. "Expansion loops minimize the effects of temperature changes in the weather – and the resulting pressure changes of the hydrogen in the tubing – or any shifting the tanks may experience if, say, their cement pads settle and shift their positions over time."

Swagelok also provided subassembly on two control panels used for controlling the system. One is installed in front of the hydrogen tanks and the other is in front of the equipment shed that houses the electrolyzer and fuel cells.

Swagelok's reputation and delivery on that reputation made it easy for Strizki's home to be approved by building code inspectors. "The involvement of Swagelok went a long way in getting the backing of the inspectors," Strizki says.