

Hydrogen Filling Station and related renewable energy projects



Renewable Filling Station

In a joint project with the U.S. Department of Energy, the Las Vegas Valley Water District, and Proton Energy Systems, the Center for Energy Research developed a refueling station for renewable hydrogen that was powered by solar energy.

The Center for Energy Research and Proton Energy Systems worked together to:

- Develop the requirements for the fueling system
- Survey potential sites
- Select a site located at the Las Vegas Valley Water District
- Devise a site plan
- Design the fueling system layout
- Support the site permitting process
- Analyze the system's performance
- Complete the conversion of some vehicles to hydrogen fuel
- Monitor various experimental performance parameters

Initially, a conventional pressure (200 psia) electrolyzer was installed. This was followed by a high pressure (1200 psia) electrolyzer. Both of these systems have the capability of operating totally off solar-generated electricity (photovoltaics), totally from grid power, or some combination of both sources. After that, a larger unit was installed during the next phase of the project, driven by grid electricity.

Due to curtailment of Federal funding for this type of work, the hydrogen filling station closed, effective July 1, 2010.

Conversion of Vehicles to Hydrogen Fuel

As part of this project, the Center for Energy Research converted of two utility vehicles to hydrogen fuel:

- The vehicle pictured below left initially used a gasoline-fueled internal combustion engine, which was converted to use hydrogen. The direct-injection method was used to pump hydrogen into the cylinder of the engine.
- A Ford pickup truck also was converted to use hydrogen as a fuel.

One vehicle -- initially all electric -- was converted to a fuel-cell/electric hybrid vehicle



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Hydrogen Generation






In addition, work was performed on various methods of hydrogen generation, including:

- A **photo-electrochemical electrolyzer** cell to generate hydrogen
- A **single-cell PEM electrolyzer** , developed to improve the performance of individual cells and cell stack by optimizing the fluid dynamics and heat transfer behavior inside the cell.





Modeling Hydrogen-Based Systems

- The Center for Energy Research develops models of hybrid energy systems that use renewable energy as energy sources -- solar, wind, and hydro-electric power.
- This hydrogen-based system – which consists of an electrolyzer, storage tank, and fuel cell -- can be used for seasonal storage of energy.
- In addition, short-term storage based on battery and super-capacitors has been studied.
- In related work, UNLV hosted a workshop on hydrogen safety and related codes and standards.
- This was followed by a road-mapping exercise to outline approaches to hydrogen development for the state of Nevada.



Sponsors and Project Participants

<p>U.S. Department of Energy (DOE)</p>	<ul style="list-style-type: none"> • Grant & review of Hydrogen Filling Station (HFS) Project • Safety inspection 	
<p>University of Las Vegas, Nevada (UNLV)</p>	<ul style="list-style-type: none"> • Research & development • Data collection and analysis, • Financial management • Equipment installation, operation and maintenance, • Vehicle conversion and testing. 	
<p>Proton Energy Systems and Air Products and Chemicals, Inc.</p>	<ul style="list-style-type: none"> • Design of the HFS • Equipment supplier • System Installer • Operation and maintenance 	 
<p>Las Vegas Valley Water District</p>	<ul style="list-style-type: none"> • Engineering design • Design of electrical system for the HFS • Fleet services • Maintenance • HFS user. 	

Sponsors and Project Participants

<p><i>Springs Preserve Las Vegas, NV</i></p>	<ul style="list-style-type: none"> • <i>Public information</i> • <i>Vehicle use</i> 	 <p>SPRINGS PRESERVE www.springspreserve.org</p>
<p><i>Green Valley Electric Henderson, NV</i></p>	<ul style="list-style-type: none"> • <i>Electrical system installer for the HFS</i> • <i>Some portion of the Solar Electrical System subcontract with Arizona Public Service (APS)</i> 	
<p><i>Southern Nevada Water Authority (SNWA)</i></p>	<ul style="list-style-type: none"> • <i>Energy management</i> • <i>Project management</i> • <i>Engineering</i> • <i>Project engineer for the solar photovoltaic (PV) system.</i> 	
<p><i>Arizona Public Service (APS)</i></p>	<ul style="list-style-type: none"> • <i>Design and installer of the solar PV system</i> 	
<p><i>Colorado River Commission (CRC)</i></p>	<ul style="list-style-type: none"> • <i>Maintenance of the solar PV system</i> 	

Sponsors and Project Participants

<i>NV Energy</i>	<ul style="list-style-type: none">• <i>Renewable energy incentives</i>	
<i>Kell's Automotive & Marine (KAM) Las Vegas, NV</i>	<ul style="list-style-type: none">• <i>Internal combustion engine conversions</i>• <i>Testing</i>	

For More Information

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