

***The Answer: Pathway to a Real
World Hydrogen Economy***

**By MICHAEL STRIZKI
President
*Renewable Energy Holdings***

www.hydrogenhouseproject.org



oms River Board of Education (NJ): HS North
Size of system: 605 kW





Argate Board of Education (NJ): High School
Size of system: 525 kW



Ground mounted array: Hopewell, NJ
Size of system: 10 kW



We are committed to developing educational programs that raise awareness about sustainability and the importance of renewable energy technologies...



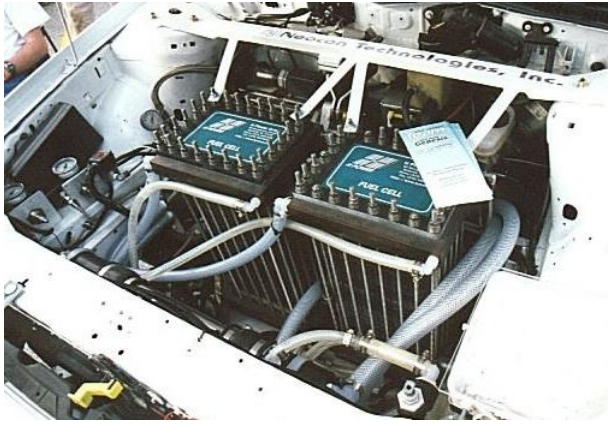
Elementary school field trip to the 1st solar-hydrogen home in North America

- Uses “H” generated from solar
- Record holder for range: 401 miles
- Top speed: 130 mph
Zero emissions
- Presidents Award for the Environment 2000



<http://www.genesis.rutgers.edu/>





Peugeot Fuel Cell Fire Fighting Vehicle



- fuel cell technology converts hydrogen into electricity
- water is the only by-product
- drive train does not require oxygen
- stores on-board oxygen
- zero emissions



- 4.2 kW fuel cell
- 12 hydrogen storage bottles
- top speed: 70 mph
- range: 400+ miles



NEW JERSEY
Venturer

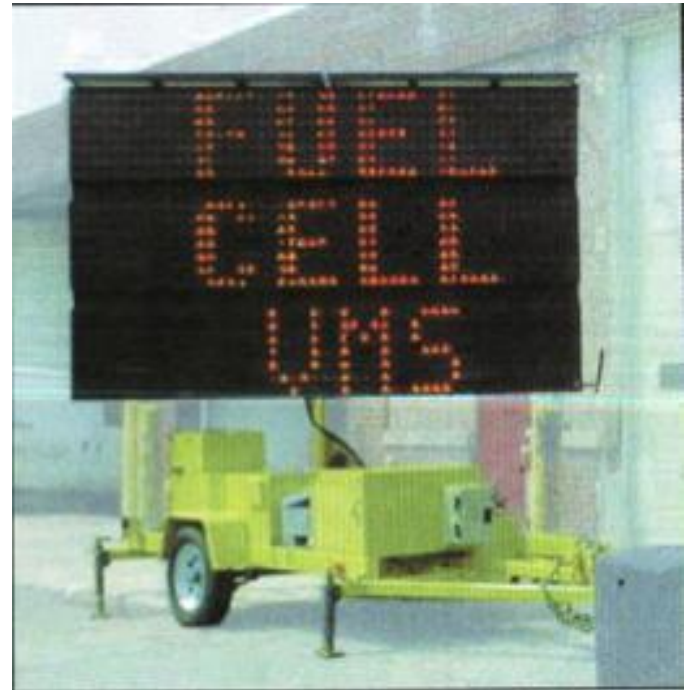
THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS



- 3 kW fuel cell stack
- 2X range of battery-only version
- reduced maintenance costs
- zero emissions



- First commercial purchase of fuel cells
- NJ DOT project
- 50 units
- Power PEM



Duffy Fuel Cell Electric Boat



Fuel Cell Powered Ocean Racer





CTC, Inc.
Public Safety Technology Center

JOULE BOX



The Joule Box is a portable power unit which provides solar, wind, battery and hydrogen power. It can be plugged into an 110v outlet, and can be configured to any size.

Product Advantages

- Provides immediate power in emergency situations
- Extremely small footprint compared to energy produced
- Expandable to fit most power requirements
- Non-permanent installation, can be moved or relocated
- Qualifies for Federal and State tax incentive programs
- Made in the USA

Power Specifications

- 1,440 watts of electric solar power
- 100 amp hours of battery power¹
- 1,100 watts of hydrogen power²
- 1,000 watts of wind power³

Physical Dimensions

- 6' x 6' x 16' (including solar & wind attachments)
- 48" x 48" (actual footprint)

Component Specifications

- (4) 12v 100ah lead acid batteries (48v)
- (12) 120 watt solar modules
- (1) SMA 5,000w off-grid power inverter
- (1) ReliOn 1,100w hydrogen fuel cell
- (1) Proton P.E.M. hydrogen generator system (200psi)
- (1) Xantrex C40 charge controller
- (3) Maxwell 16v BMOD0500 ultra capacitor
- (4) 100lb 4K high pressure cylinders

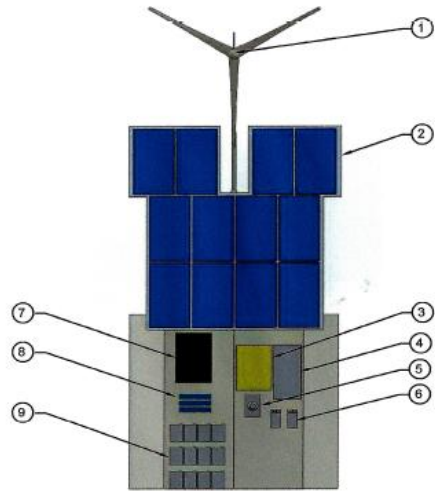
1. 100 amp battery packs can be added for more battery power
2. Hydrogen power is limited to the amount of stored hydrogen available
3. Wind power is rated at a wind speed of 5mph



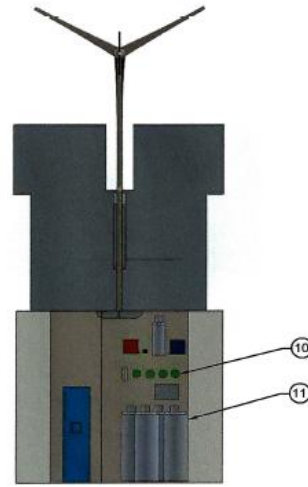
RENEWABLE ENERGY HOLDINGS

97 River Road Flemington, NJ 08822

Ph: (908) 788-7750 Fax: (908) 837-9021

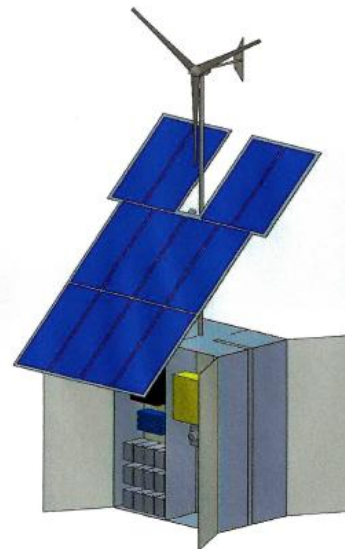


Front View



Back View

OPTIONAL CONFIGURATION	
ITEM #	DESCRIPTION
1	1.0 KW WIND TURBINE
2	14.4 KW SOLAR ARRAY
3	SMA 5.000W INVERTER
4	SERVICE PANEL
5	UTILITY METER
6	XANTREX C40 CHARGE CONTROLLER
7	RELION 1.1 KW FUEL CELL
8	ULTRA CAPACITOR BANK (48V)
9	BATTERY BANK (48V)
10	(4) PROTON P.E.M. HYDROGEN GENERATORS
11	(4) 100LB 4K HIGH PRESSURE CYLINDERS



Iso View



H₂ To GO

MOBILE/STATIONARY HYDROGEN GENERATION & POWER SUPPLY SYSTEM



SYSTEM FEATURES

- Comprised of H₂ Generator and H₂ Fuel cell to provided highly mobile H₂ production / storage and up to 2,000 W of power at 120 volts
- Highly mobile unit: Can be easily relocated to provide local power (less than 200 lbs)
- Ideal for plug-and-play type installations, providing immediate power or H₂ storage for back-up power
- Integrated logic controls for optimal operation and protection of PEM stack via On-Screen Diagnostics
- Real time display of power output from H₂ Fuel Cell to monitor performance
- Scalable to meet H₂ generation demand and storage needs
- System versatility provides power for multiple applications: appliances, electric vehicles, fuel cell, etc.



**HYDROGEN GENERATION SYSTEM
SPECIFICATIONS - H₂ TO GO**

- Completely self contained H₂ Generation System
- Highly efficient Proton Exchange Membrane (PEM) stack
- Low power consumption with high output
- Stack consumes 230-240W of power
- 8 Volts & 30 Amps Stack Requirement (independent of power supply)
- Multiple units can be used in conjunction to increase H₂ production
- Power input can be from any source: Renewable or Grid Tied

SYSTEM OUTPUT

- Produces 99.9999% pure H₂
- Rated to 600 cc per minute at 250 psi (single stack)

**MOBILE / STATIONARY H₂ POWER SUPPLY
SYSTEM SPECIFICATIONS**

- System comprised of:
 - (2) Metal Hydride H₂ Storage Tanks
Capacity: 900 SL each
 - (1) 2,000W Fuel Cell
 - (1) 2,000W DC to AC Inverter @ 120V

STORAGE TANKS

- Can be filled from either H₂ To Go generator or standard bottled H₂ sources.
- Can be scaled to meet requirements
- Are certified as "Air Shippable"

FUEL CELL

- Converts H₂ fuel to DC current
- Consumes 26 SL/min of H₂ at max output

INVERTER

- Converts DC power from Fuel Cell to AC power: 2,000W @ 120volts

SYSTEM OUTPUT

- 2,000 Watts @ 120 volts

The Solar Hydrogen System

Don't be in the dark the next time the power goes out.

Integrate hydrogen generation and storage components to an existing photovoltaic (PV) solar system and have the freedom to produce clean, safe, and reliable electricity when few others can.

Although stand-alone PV solar systems are a step in the right direction they remain subordinate to the electrical utility grid. When power outages occur PV solar systems automatically shut down leaving owners dependent on electricity produced from generators burning nonrenewable fossil fuels.

Take control of when, where, and from what source your energy is produced. Upgrade to technology once reserved for astronauts and own a self-sustaining renewable energy facility.

Be among the first to take the next step.

Contact Renewable Energy International, Inc. (REI) to discuss the possibilities with an expert

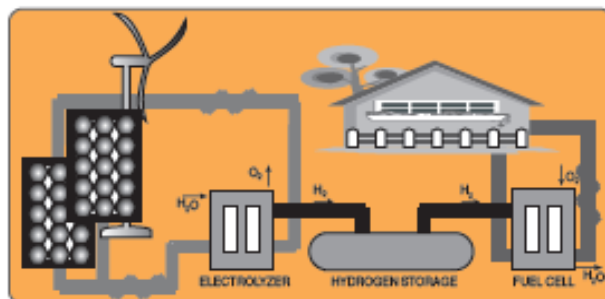
28 Snydertown Road
Hopewell, NJ 08525
Tel 609-731-1990
Fax 609-466-8049
RenewableEnergyInternational.com

"Hydrogen and fuel cell technologies have the potential to solve the major energy security and environmental challenges that face America today - dependence on petroleum imports, poor air quality, and greenhouse gas emissions."

US DEPARTMENT OF ENERGY
Energy Efficiency And Renewable Energy

The safety facts about hydrogen:

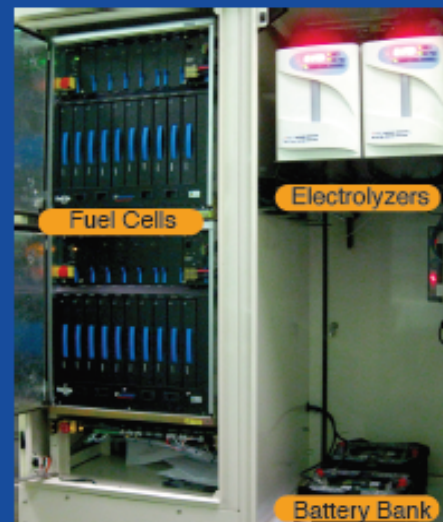
- it is less flammable than gasoline and natural gas
- it is lighter than air and diffuses rapidly
- it is non-toxic and non-poisonous
- it can be stored safely
- produces only heat and pure water when combusted
- it's use does not pollute the atmosphere or groundwater



How it works.

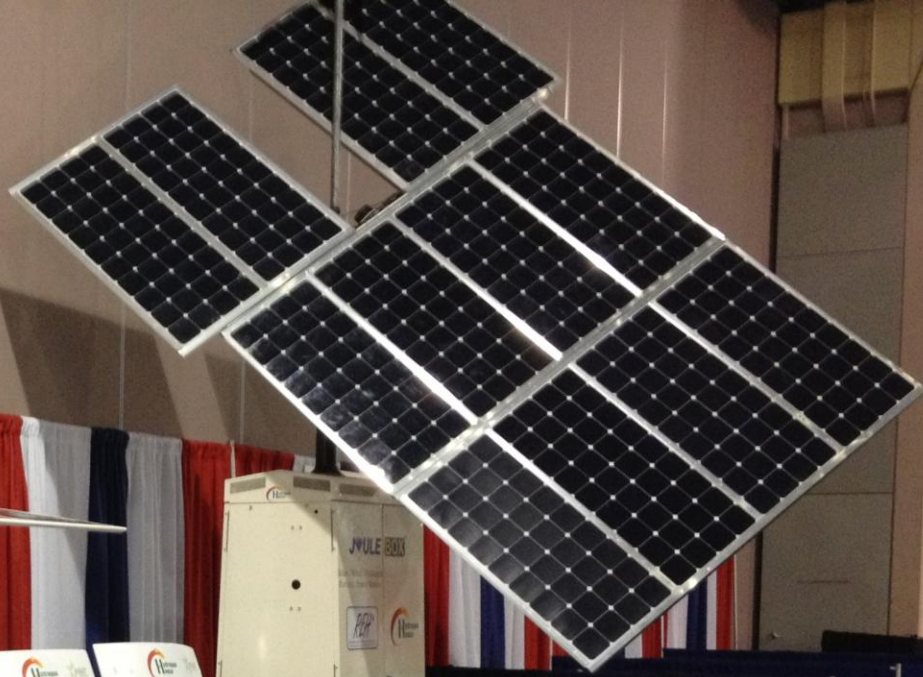
During the summer a photovoltaic (PV) solar system supplies more electricity than a home can use. That surplus can be utilized to power an electrolyzer, which separates water into hydrogen and oxygen. Once produced the hydrogen is stored at low pressure in certified tanks. When needed, during emergencies such as power outages, a fuel-cell consumes the stored hydrogen combines oxygen and generates electricity.

The REMS Unit



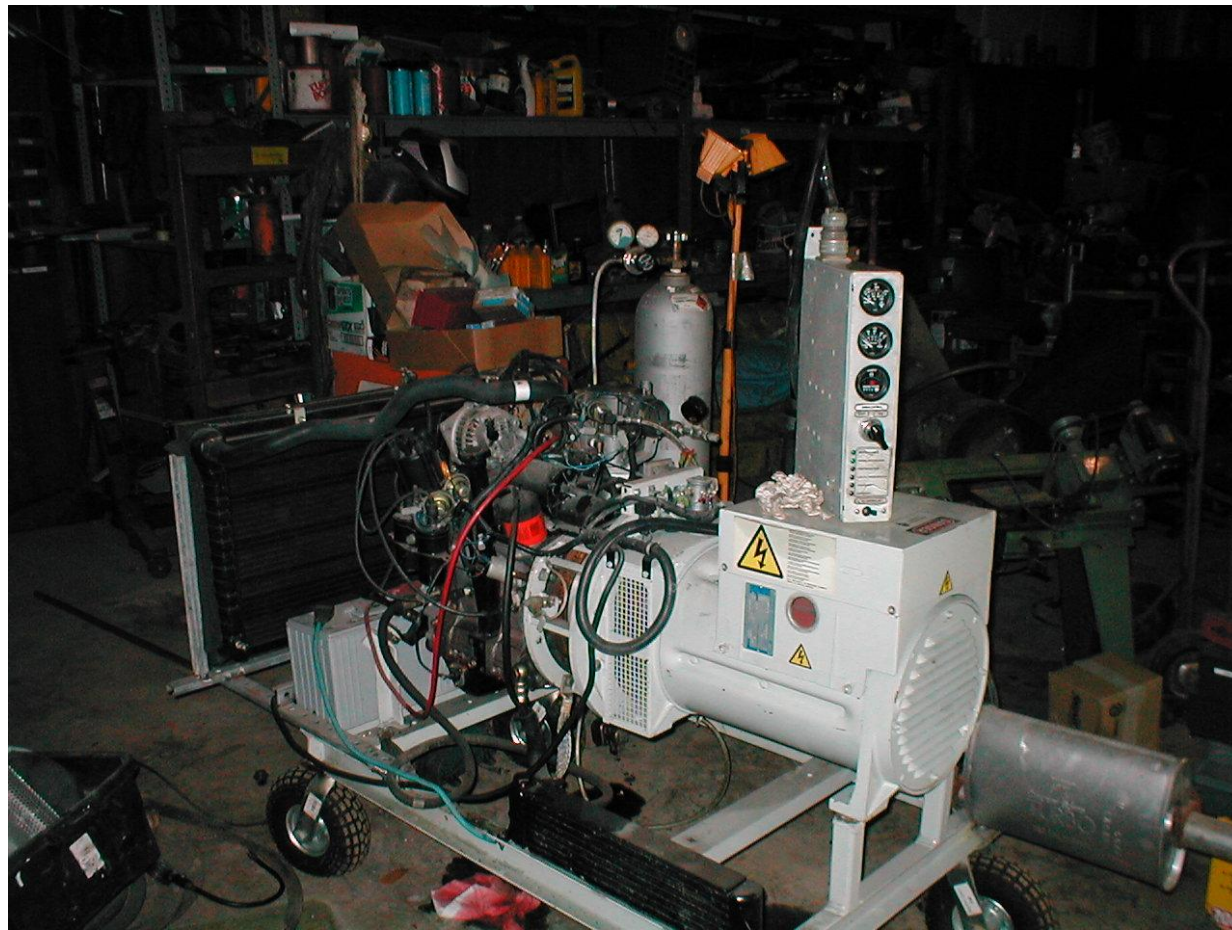
The renewable energy management system (REMS) unit is a compact hydrogen generation system designed and engineered by Renewable Energy International. This particular unit will be commissioned at a home in the Cayman Islands along with a thirteen-kilowatt PV solar system and two hydrogen storage tanks. This system can supply the home's specific energy demands for ten days.

RENEWABLE ENERGY HOLDINGS



Experience

30 kw Hydrogen IC engine



HYDRA

Solar Hydrogen Powered Portable Power and Water Purification Plant



HYDRA H₂O purification plant produces the highest quality water while the hydrogen generator splits water into hydrogen & oxygen; Co-Inventor & CTO Mike Strizki takes a drink of HYDRA purified water



PROGRESSIVE
ATLANTIC CITY
BOAT SHOW

**Ultimate
Green
Machines**

HYDROGEN POWERED

Duffy POWERFLIGHT
Duffy ELECTRIC BOATS
Trojan
POWERED

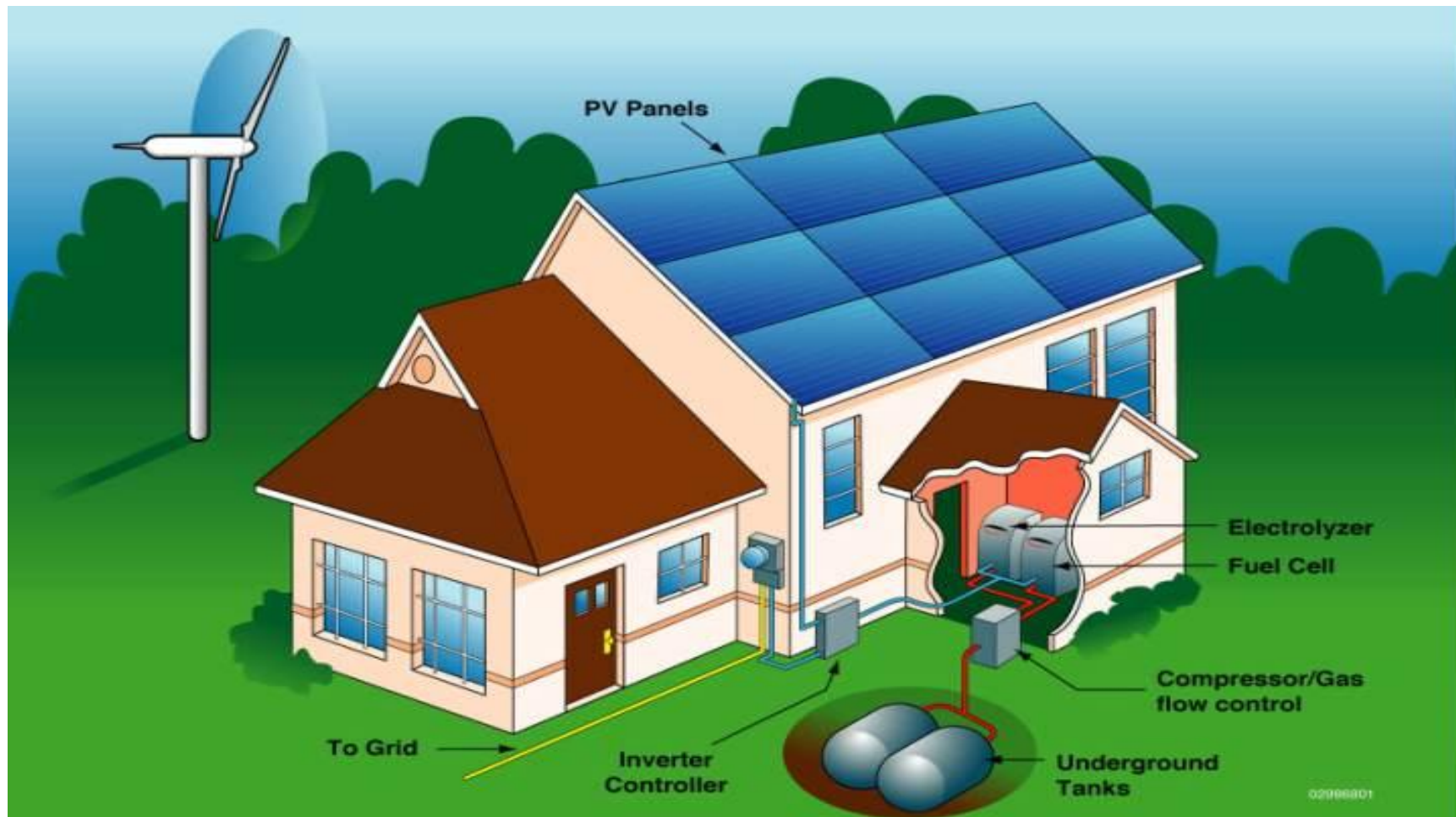
GENESIS
AIV
GENESIS
1
H₂

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Grid Independent Solar Hydrogen Home Project

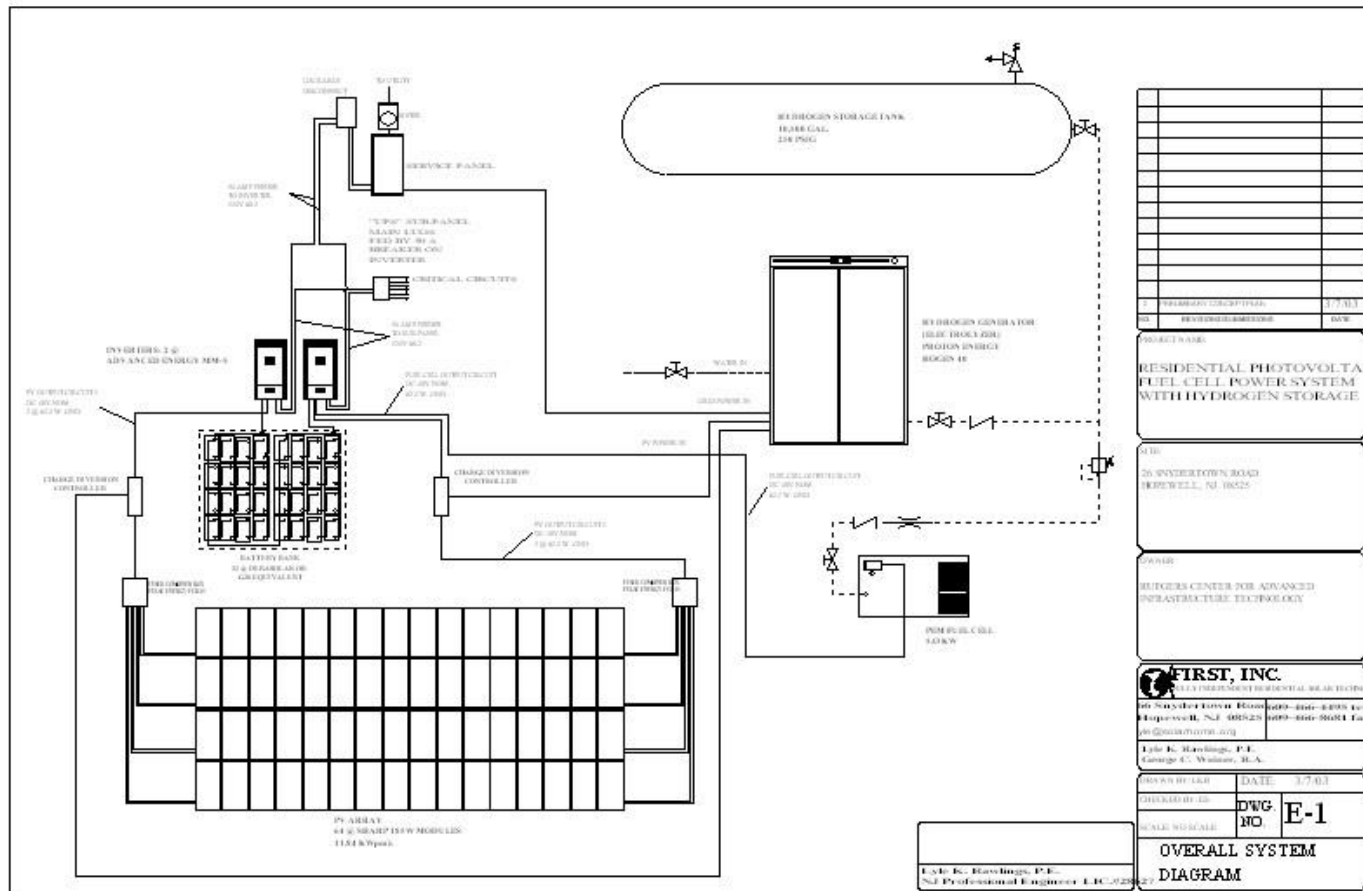


NREL Solar Hydrogen Home Vision



Source: NREL

Solar Hydrogen Home System Layout



NO.	DESCRIPTION	DATE
1	ISSUED FOR PERMIT	1/7/01
2	REVISED DRAWING	NOV

PROJECT NAME:
RESIDENTIAL PHOTOVOLTAIC FUEL CELL POWER SYSTEM WITH HYDROGEN STORAGE

OWNER:
 26 WYBRIGHTOWN ROAD
 BRIDGEWELL, NJ 08525

OWNER:
 HUDGENS CENTER FOR ADVANCED INSTRUMENTATION TECHNOLOGY

FIRST, INC.
 3000 S. WYBRIGHTOWN ROAD
 BRIDGEWELL, NJ 08525
 908-666-8400
 908-666-8401
 908-666-8402

DESIGNED BY:
 Lyle K. Hastings, P.E.
 George C. Watson, R.A.

DATE:	1/7/01
DWG. NO.:	E-1
SCALE:	AS SHOWN
OVERALL SYSTEM DIAGRAM	

Lyle K. Hastings, P.E.
 N.J. Professional Engineer, L.I.C. 022842



14 kW PV panel array

Hydrogen Home 's Solar Control System



Battery Storage Bank



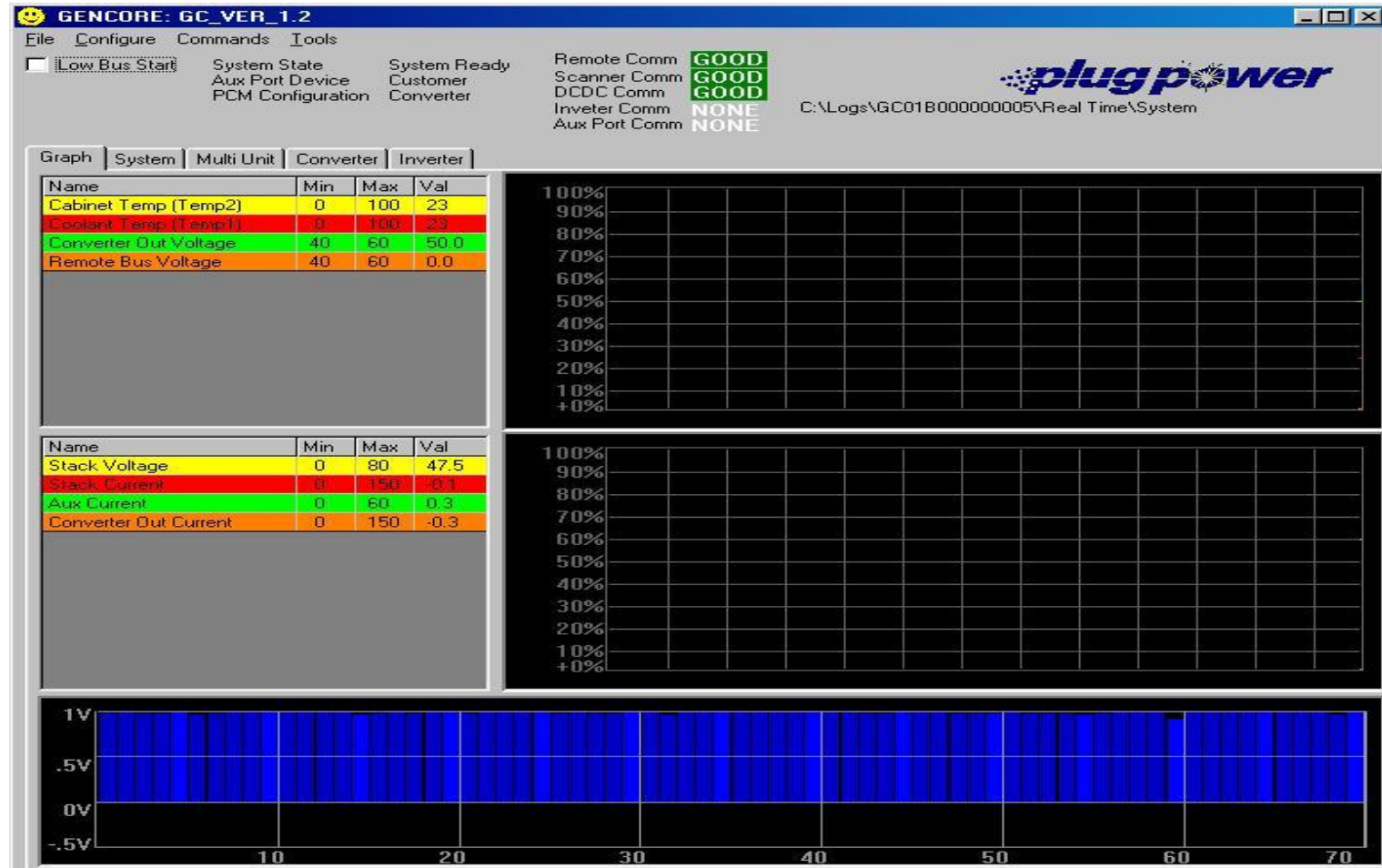
Fuel Cell and System Layout



6 KW Plug Power Fuel Cell



Plug Power Monitoring Software



Solar Hydrogen Home Electrolizer



- The electrolyzer is a HOGEN[®] 40 hydrogen generator with a maximum hydrogen production rate of 44scfh high purity hydrogen gas with a maximum delivery pressure of 200psig. The electrolyzer is capable of being powered by the utility grid and/or a DC renewable energy input source.

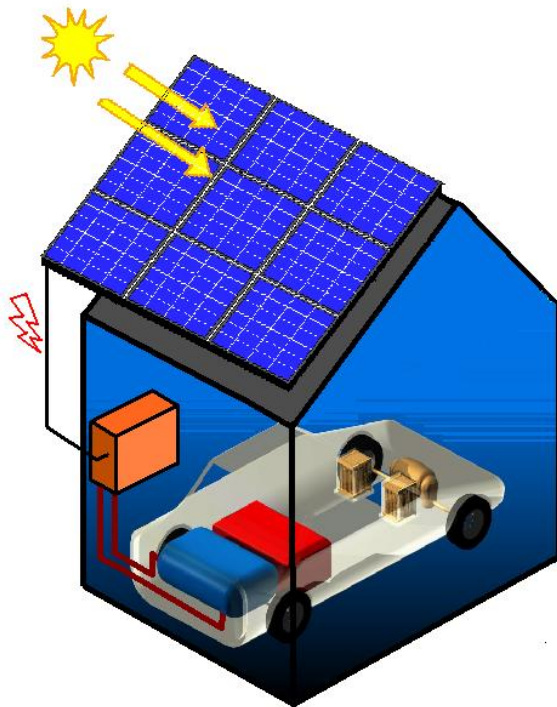


Hydrogen Storage

Standard propane tanks 200psi 10,000
gallons



Home Fuel Cell Vehicle Refueling Station



Hydrogen Heating

- **Model #GFH6000**
-
- **Green Flame Heater**
- **Hydrogen fueled**
- Save on heating costs. The 100% heating efficient designs require no outside venting, so all the heat stays in the room.
- Humidifies dry air adding to the heating and comfort effect so you use less fuel.
- Provide Easy, economical installation, with no vent or chimney required, and a built in pressure regulator, installation is an easy job*. (*Professional installation recommended)
- Safe and clean burning, Vent Free Gas Space Heaters are design certified by the American Gas Association and meet or exceed all government safety performance standards.
- A dual purpose safety pilot system protects against oxygen depletion and any interruption in the fuel supply. If either occurs, the gas is shut off to the burner, turning the heater off. (Note: Hydrogen will not make CO2 gas and never depletes oxygen in the room due to "Oxygen to water collapse vacuum factor"
- Provides heat during power outages. No electricity required, making them ideal as back up emergency heat.
- Clean, quite odorless operation
- Easy to use top mounted controls, push button ignition. No matches required.
- Decorative safety grill and tinted glass
- Low heat 4,400 BTU's (12 Gallons per hour H2)
- High heat 6,000 BTU's (17 Gallons per hour H2)
- Heater Dimensions 21.5" H x 13.5" W x 7" D



Hydrogen Cooking

- **The incredible moist**
- **flame of hydrogen!**
-
- **The hydrogen cooking**
- **revolution is here!**
-
- **Many people get into the hydrogen age just because of the i**
-
- **Just imagine cooking with a flame that bastes meat and vegetables in a continuous blanket of moisture. When hydrogen gas burns it produces water vapor and high heat. Steak and lobster is always moist and juicy and vegetables are cooked to perfection and do not wilt away. Many people claim that even economical cuts of meat turn out moist and tender because the incredible nature of the hot and moist hydrogen flame!**



Solar-Hydrogen Process

ENERGY FLOWS

