RELIABLE 24/7 HYDROGEN POWER

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RAISE Energy Solutions utilizes its proprietary hydrogen fuel production technology by providing electric power from appropriately sized turbine generator sets. The hydrogen fuel is generated from water and replaces natural gas as the fuel source for its turbines in the production of electric power. In the case of steam turbine power plants, hydrogen fuel is supplied to the steam boilers which are modified on-site to combust hydrogen.

The on-demand fueling process is accomplished using a very efficient water dissociation process. Acceptable sources of water include city water, fresh water, brine and even sea water. Of course, hydrogen from water is a renewable fuel that produces no greenhouse gases.

RAISE Energy Solutions HYDROSYNE™ fuel systems employ a unique approach to splitting water into hydrogen and oxygen. The hydrogen production technology relies heavily on vibrational energy initiated and maintained by ultrasonic waves.

Advantages	Substantially reduced fuel costs
	No greenhouse gas emissions
	Small footprint for equipment
	Online monitoring of turbine and fuel system for performance and safety
	Lifetime warranty for **HYDROSYNE™** fuel system

Highly Reliable Turbine Gen Sets

Think about how many hours of continuous operation are possible for well maintained turbines. Many airlines are operating the same jet engines that have been in service for over 20 years. The key to having reliable continuous turbine production of electrical power is having a proper maintenance program that replaces parts and components before they wear out. This program is available from our turbine vendor partners.

Small Footprint

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Turbines are housed in separate containers with the adjacent fuel system supplying 24/7 hydrogen fuel

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SAFETY PROTOCOLS

Similar safely measures that are found in a natural gas fuel system are found in our fuel systems. HYDROSYNE™ hydrogen fuel is more stable than traditional hydrogen as it will only combust when introduced to a flame. This fuel has been safely pressurized up to 1,500 PSI. (We operate at 30 -250 psig)

Unlike traditional hydrogen, HYDROSYNE™ fuel will not embrittle metal.

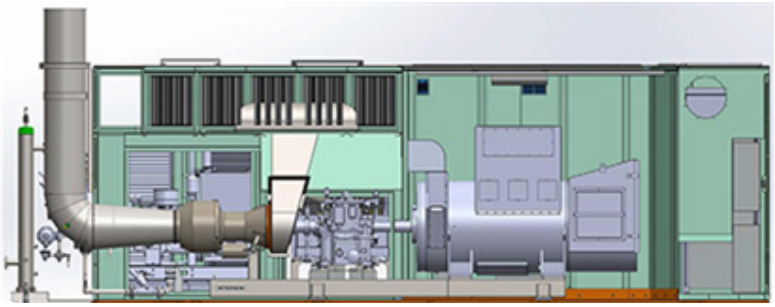
Sensors have been built into the fuel system to automatically shut off production if any of its systems are outside specified tolerance levels. Fuel system collects operational data 24/7 and has notification metrics built-in to notify HYDROSYNE™ if system needs servicing.

MORE ECONOMICAL THAN TRADITIONAL METHODS OF PRODUCING HYDROGEN

Historically, there have been four main sources for the commercial production of hydrogen: natural gas, oil, coal and electrolysis; which account for 48%, 30% 18% and 4% of the world's hydrogen production respectively. Bulk hydrogen is commonly produced by the steam reforming of methane or natural gas. The production of hydrogen from natural gas has been the cheapest source of hydrogen until now. Steam reforming consists of reacting steam (H_2O) at high temperatures (700–1100 °C) with methane (CH_4) in the presence of a catalyst to yield syngas which is a mixture of hydrogen (H_2) and carbon monoxide (CO).

The carbon monoxide gas then undergoes the "water-gas shift" reaction where CO reacts with more steam in the presence of a catalyst to produce more hydrogen as well as carbon dioxide. Aside from the cost of natural gas, the downside of this process is that the major byproduct is carbon dioxide which is an undesirable greenhouse gas.

Electrolysis uses electricity to generate hydrogen from water; however, the process is very inefficient. Industrial electrolyzers are archaic in design and follow the "brute force" of the Faraday method. The higher efficiencies necessary for a "Hydrogen Economy" are simply not possible when a Faraday-type device is constructed and operated.



Above picture represents component parts of Turbine system inside container

Typical substation shown above which HYDROSYNE power system would connect to

TRACK RECORD

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RELIABILITY

RAISE Energy licenses and warranties the production of its hydrogen cells for 25 years under our power purchase and/or lease agreements.

The fuel system comes with its own reverse osmosis system to remove, iron and other dissolved solids or impurities from city water that will be processed to become fuel gas.

Water pumps and gas compressors are the only moving parts of the HYDROSYNE™ fuel system.

Picture of HYDROSYNE Fuel System that supplies approximately 500 liters per minute of fuel

RAISE Energy Solutions' hydrogen fuel technology has been developed over a 15 year period and has undergone several refinements and improvements. There have been over 500 fuel production modules in use through this period.

CASE STUDY

RAISE Energy Solutions has installed a 1.5 MW system in Belize. It has replaced a series of 30kw Capstone gas turbine generator sets. The **HYDROSYNE™** system utilizes an modified 1850 HP Cummins diesel genset. The system is operating an 600kw average load fueled 100% by seawater. The system consumes approximately 400 liters of water per day and has a 5% parasitic load factor in generating its own fuel. The system can generate electricty, or potable drinking water, or a combination of both.

Industrial gas turbines are currently in operation in over 100 countries around the world. Industrial gas turbines operate on a wide variety of fuels, including hydrogen, natural gas, distillates, NGL, LNG, coal-seam methane, and renewable fuels, such as landfill and sewage gases. Around the world, more and more people are recognizing the benefits to the environment and the favorable economics of renewable fuels. With low emissions and quiet operation, gas turbines provide clean, sustainable energy solutions for customers, helping to protect the health of workers and job sites, and respecting residents of communities and neighborhoods around the world. This is even more the case utilizing hydrogen fuel.

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SIZE OF FUEL SYSTEM

Space required: A 25 kW fuel system fits within a 4' x 4' x 4'H cabinet. A 500 kW fuel system fits within an 8' x 8' x 10'H container. These systems can be used in parallel and are scalable. All equipment is monitored with Critical Alarming - Event Data-Graph and Complete Logging of all parameters.

SITE CONFIGURATIONS

(based on 28% generator efficiency):

	Production of Fuel (per minute)	Number of **RAISE Energy** Hydrogen Production Modules	
Installation Size	Liters / **Cubic Feet**	Model PPS**C**721	Model **COMUTL 196**
Up to 25 KW	30 / 1.06	1 module	
50 KW	60 / 2.12	2 modules	
100 KW	120 / 4.24	1 pod of 4 modules	
500 KW	2,000 / 70.63		1 module
1 MW	4,000 / 141		2 modules
5 MW	20,000 / 706		1 pod of 9 modules
10 MW	40,000 / 1,412		2 pods of 9 cells modules
50 MW	200,000 / 7,063		10 pods of 9 cells modules

Technical Information (Per Module)	Model PPS**C**721	Model **COMUTL 196**
Water Supply to Reverse Osmosis (R/O) Unit	0.56 gallons/hour	17.2 gallons/hour
Filtered Water from R/O to H2 Production Module	0.14 gallons/hour	4.3 gallons/hour
R/O Water Blowdown	0.42 gallons/hour	12.9 gallons/hour
Nominal Fuel Gas Flow Rate to Generator (standard liters/minute)	65 liters/minute	2,000 liters/minute
Nominal Fuel Gas Flow Rate to Generator (standard cubic ft./minute)	2.3 ft3/minute	70.6 ft3/minute
Fuel Gas Composition	96% H2, 4% O2	96% H2, 4% O2
Power Output at 28% Engine Generator Set Efficiency	29.7 kw	914 kw
Less Parasitic Load for Water Pumps, H2 Production Module, Gas Compression & Control System	1 kw	31 kw
Net Power Output to External Load or Grid	28.7 kw	883kw
Skid Dimensions – L x W x H	4 ft. x 4 ft. x 4 ft.	8 ft. x 8 ft. x 10 ft.

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