

2022

HYBRID SUSTAINABLE ENERGY

**GREEN HYDROGEN
GREENPOWER**



MODERN HOME ENGINEERING

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Annex

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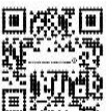
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1. Introduction

About Green Power resources

Green energy is renewable energy. Its energy made from naturally replenished resources like sunlight, flowing streams and cool breezes. It is also made from biogas, a by-product of modern life that is commonly released on dairy farms and landfills. These resources will not run out, Renewable gases can enable decarbonization of sectors that are difficult to mitigate, such as heavy industry and chemical raw materials. Renewable gases can also provide clean, distributable energy generation to support intermittent renewable technologies and help maximize the value of waste and use it to support the development of a circular economic the goal was to design creative devices and systems for hydrogen applications that will power green energy futures.

The Renewable Gas

We will build on the democratizing power of hydrogen.

Our vision is to live in a world where fossil fuels are no longer used and green hydrogen powers our lives via renewable energy sources, hydrogen generation process is a new knowledge and the process energy generation process by it is modern projects and researches In this paper we talk about generation hydrogen by physics methods using a water and

Electricity

Hydrogen has been a forgotten clean energy source for decades, particularly since it was first proposed as a renewable energy source, and has been sidelined by associated technologies such as hydrogen fuel cells, which have failed to catch up with other popular clean energy sources such as wind and solar today. However, thanks to some recent technological developments, and research efforts made by prominent international bodies as well as realizing the importance of alternative energy sources in government plans to confront the consequences of climate change, there may be an opportunity today to consider hydrogen as a source of alternative energy. More than ever. Renewable hydrogen production Green hydrogen production is based on a process called

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electrolysis. During which an electric current is passed to separate water molecules into hydrogen and oxygen atoms. When hydrogen is produced in this way, the only by-product is water, yet we can generate clean energy that can be used in industry, transportation, and more. However, the dilemma is that today's water electrolysis techniques are very expensive, and require highly purified desalinated water, which is difficult to obtain in desert areas.

To overcome this, conducts unique research in direct electrolysis of seawater to avoid the need for desalination or the use of pure water, in addition to conducting research aimed at producing new and durable materials for electrolyzes, which contribute to reducing the cost of these processes, and developing algorithms supported by custom artificial intelligence technology. To improve the performance of electrolyzes.

Research efforts are not limited to developing the electrolysis process only, but also include devising other ways to use hydrogen after its production and developing solutions for the hydrogen transfer process, which is the main challenge of this entire process. Since hydrogen cannot be transported easily, one proposed solution is to convert the hydrogen produced into fuels and chemicals, which can be transported more easily.

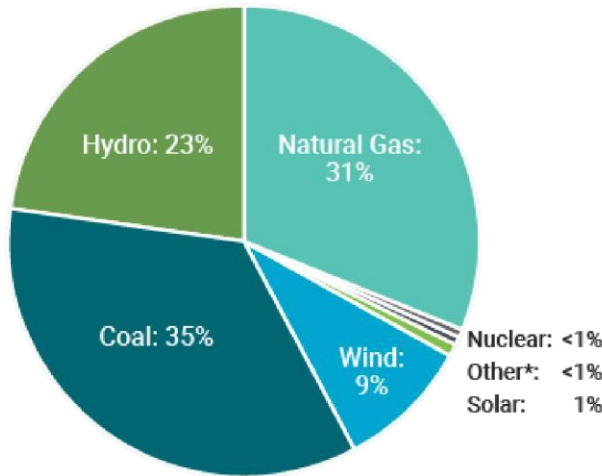
Green hydrogen can be converted into carrier molecules such as ammonia, methanol, and formic acid. Scientists research the production and use of various hydrogen-bearing molecules for industry, power generation and transportation applications.

There is no doubt that these efforts and developments in the production process will move the green hydrogen sector to a stage where it is more feasible from an economic point of view.

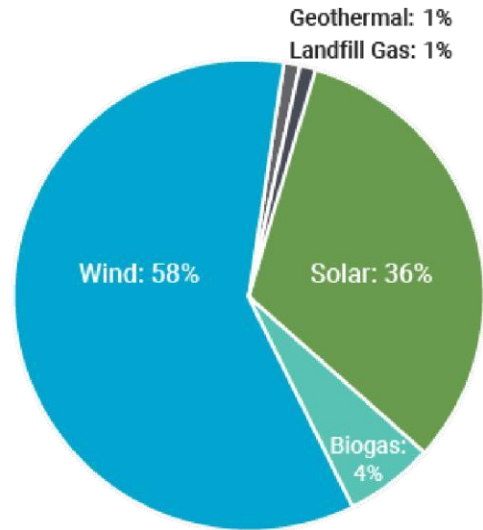




PSE Electricity fuel mix
Product Content*



PSE Green Power fuel mix
Product Content**



How it helps

Hydrogen is used in generation power by some type of process like:

The planet: By reducing methane leaks, companies can reach emissions, achieve climate goals and improve safety. Consider: methane is 80 times more effective at trapping heat than carbon dioxide after 20 years, according to the

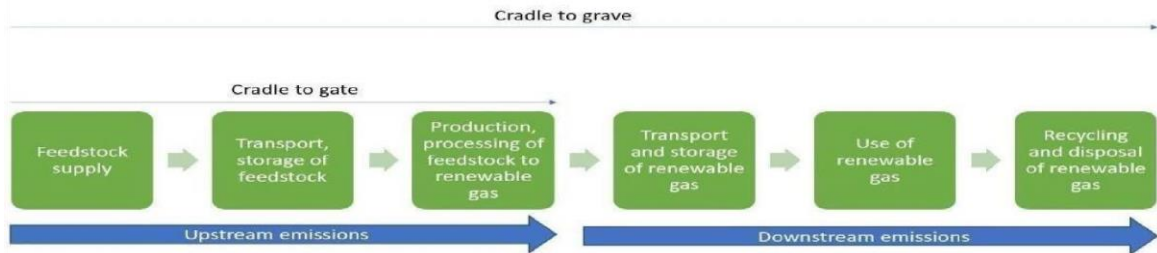




Environmental

Defense

Fund.



Hydrogen fuel cells to power airplanes and air taxis

Drone concept pictured above

Definition: A fuel cell works by converting stored chemical energy into electricity, just like a battery. The hydrogen fuel cell is one of the most common and can be used in aircraft propulsion systems. It can contain three to five times more energy than the electrical system of a battery of equivalent mass. Properly designed, the hydrogen fuel cell system weighs less and is more compact than an equivalent battery electrical system.



It can contain three to five times more energy than the electrical system of a battery of equivalent mass. Properly designed, the hydrogen fuel cell system weighs less and is more compact than an equivalent battery electrical system.

How it helps the planet: [Propulsion with hydrogen fuel cells](#) can reduce the impact of aviation's climate by 75 to 90%, according to a McKinsey hydrogen technology study. Unlike a combustion engine, a fuel cell assembly has no moving parts and can operate quietly and with higher levels of efficiency and reliability. This form of payment will be especially important as the future of transportation changes to long-haul air taxis.

Renewable hydrogen

Renewable hydrogen, or 'green hydrogen', is hydrogen that is produced using renewable energy sources and feedstock is with minimal or zero emissions. This can be done through electrolysis

Using renewable electricity or by using biogas SMR. Fossil fuel-derived hydrogen can have significant emissions and may not reduce emissions compared to direct coal or natural gas use.

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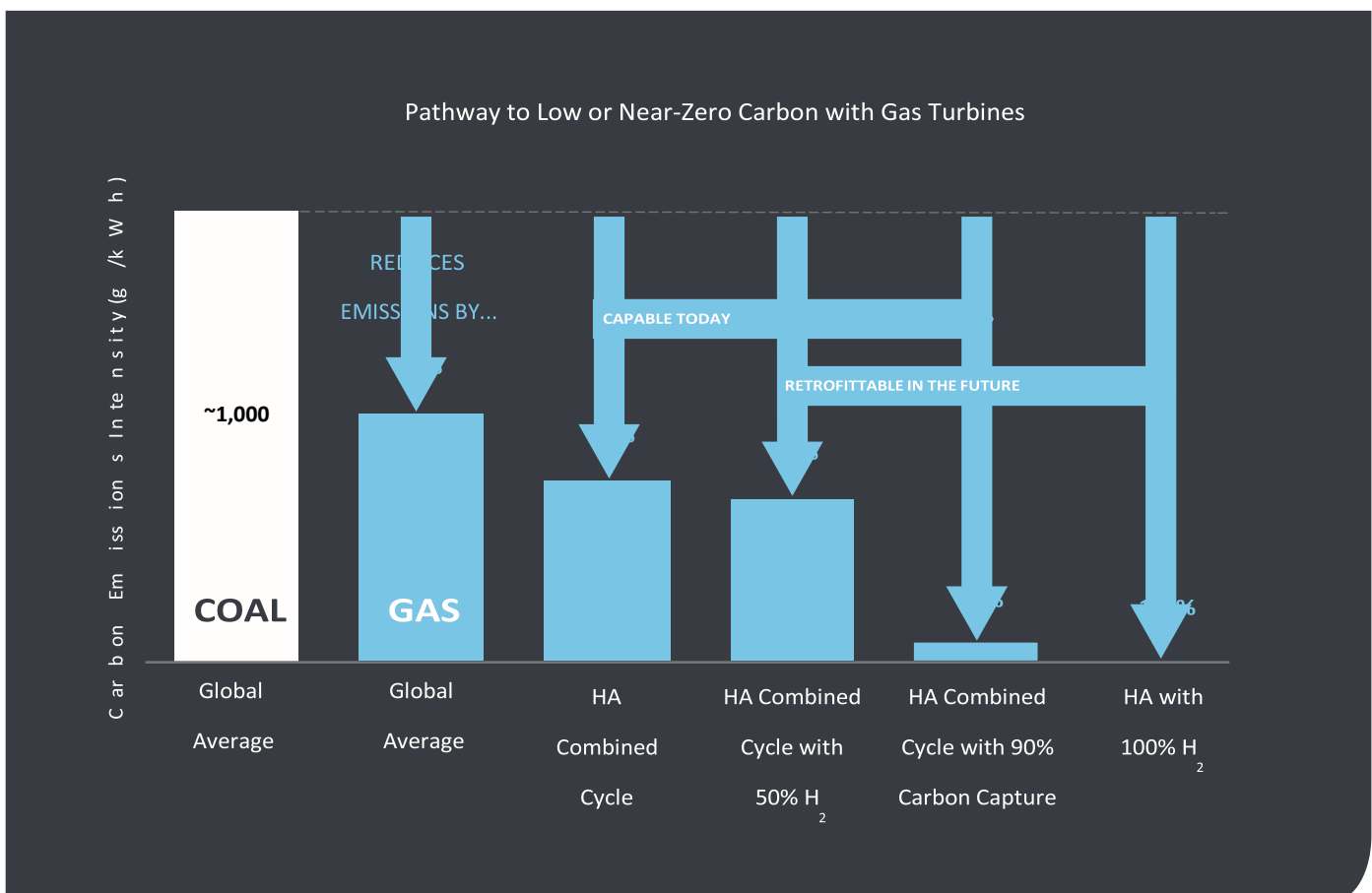


Electrolysis is a process in which water is split into hydrogen and oxygen using electricity. SMR is a process in which methane is reacted with steam and a catalyst to produce syngas, a mixture of carbon monoxide and hydrogen, which reacts further to produce carbon dioxide and hydrogen.

Other renewable gases

Other renewable gases could provide a zero emissions alternative to fossil fuel use. Examples include Dimethyl ether and synthetic methane made using renewable hydrogen and carbon dioxide.

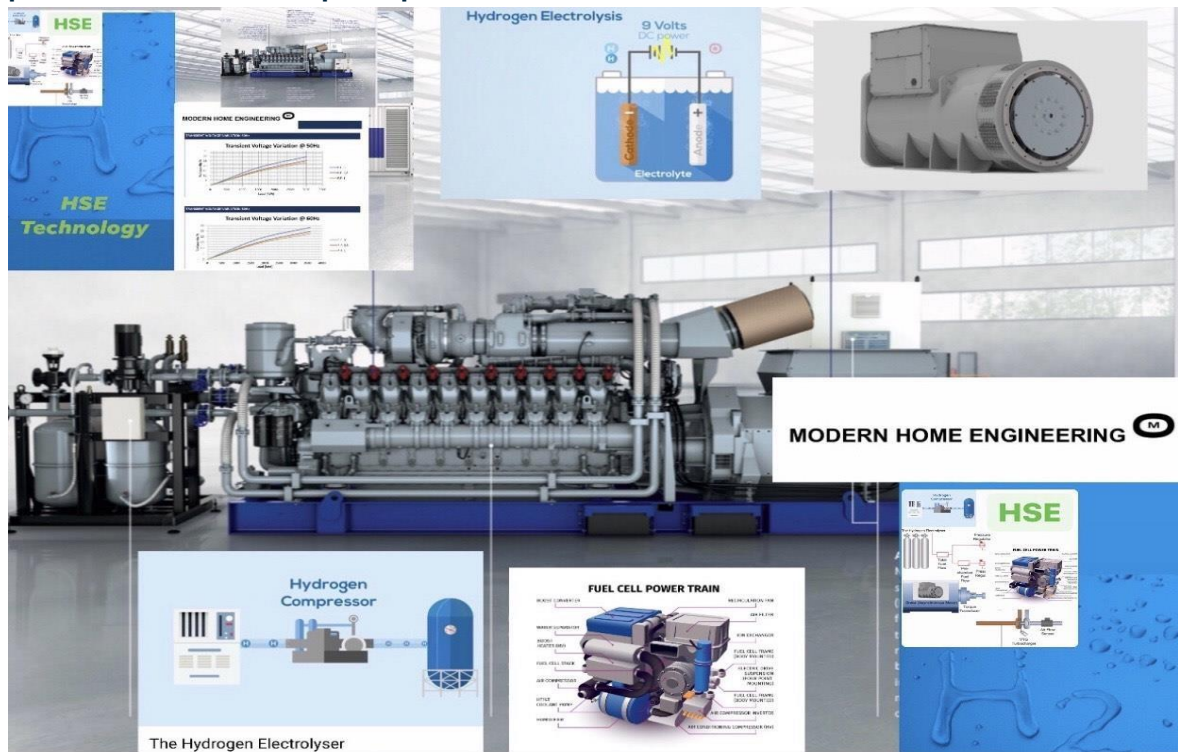
Technologies and markets for these gases are relatively immature but they may become commercially viable in the medium term.





HYBRID SUSTAINABLE ENERGY TEC. (HSE) :

The technology is based on the maximum benefit from the results of research and science related to energy sustainability, by designing an autonomous system, or depending on environmentally friendly resources, both economically and environmentally, The technology is based on designing power cells based on principles



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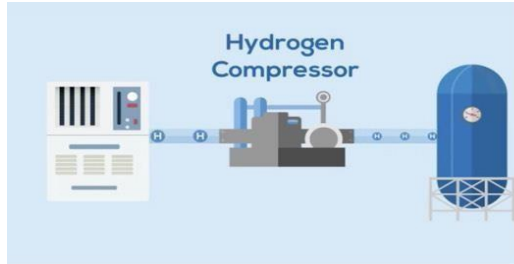
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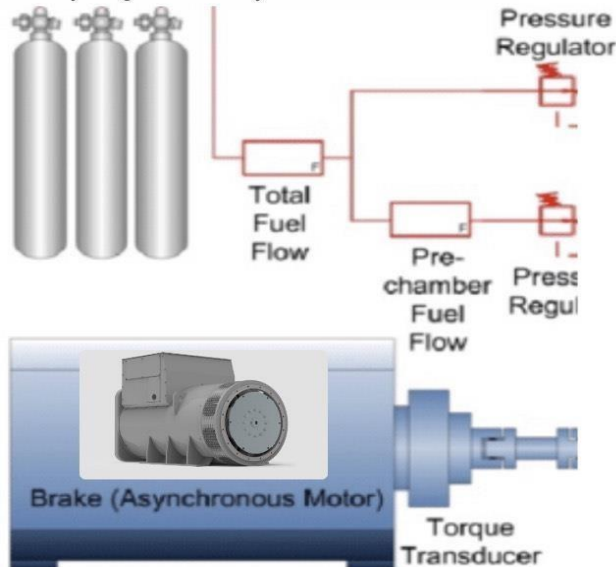




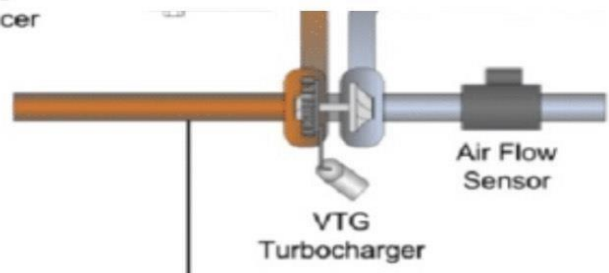
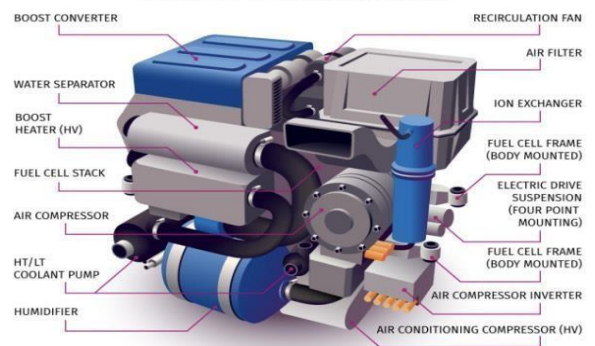
Background The details of the cell design vary according to the requirements of the system to be fed and the amount of energy in it with the stability of basic elements in all cells



The Hydrogen Electrolyser



FUEL CELL POWER TRAIN





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Solar H₂ Capabilities

Solar's gas turbines, packages and compressors are available for H₂ blend fuel now for both conventional and SoLoNOx combustion. Solar is committed to supporting the industry with a comprehensive development program leading to 100% capability on SoLoNOx by the year 2030 or earlier. The percent of H₂ blended with natural gas can have an impact on the gas turbine's emissions signature. For conventional combustion, the impact on NOx emission varies by the percent of H₂ and the other fuel constituents and will be determined on a project-by-project basis. For SoLoNOx combustion systems at the 15 ppm NOx (and

higher) warranty level, H₂ concentrations up to 20% should not impact the emissions warranty.

Customer Services

Solar Turbines provides continuing support for our customers to ensure their success with package upgrades, controls retrofits and engine and compressor modifications for hydrogen blend operation. In addition, Solar's Fleet Assessment Services (FAS) provides a consultative assessment and recommendation for hydrogen blend and carbon reduction fleet opportunities and asset optimization.

SOLAR'S H₂ CAPABILITIES



SOLONOX
Up to 20% H₂

- Refineries in United States Up to 20% H₂
- Chemical Plant Applications in China and Europe Up to 20% H₂



CONVENTIONAL COMBUSTION
Up to 100% H₂

- Steel Industry Applications in China Up to 65% H₂
- Propane Dehydrogenation Applications in Belgium Up to 83% H₂
- Refinery Applications in the United States Up to 37% H₂

HYDROGEN EXPERIENCE AND CAPABILITIES LEADING THE ENERGY TRANSFORMATION

Hydrogen (H₂) in gas turbine operation enables carbon reduction opportunities across a broad range of applications and industries. Gas turbines provide a stable base load and support increased renewable penetration. Solar Turbines has been providing solutions for H₂ rich fuels since 1985 and has logged over two million hours of operation, some units today using as much as 80% H₂ content.

In order to meet increasing energy demands from customers as well as carbon reduction targets set by companies and countries, increased global usage of H₂ is paramount. Solar is committed to continue increasing our H₂ capabilities and investing in H₂ technology, offering energy solutions that are clean, safe and reliable.

Within pipeline gas applications, H₂ will displace some portion of the natural gas in the pipeline. It is expected that the H₂ content of the gas will not exceed 20% for the near future. Within the industrial process market, H₂ content is greater than 20% and as high as 100%. This market may include fuel gas with significant levels of other gases than methane, leading to careful consideration of safety,

- 2+ Million Operating Hours
- High H₂ Experience Since 1985
- Carbon Reduction

especially for high carbon monoxide. The best solution candidate today for this market/fuel gas is a conventional combustion system.

Solar's H₂ Technology Experience

Solar has extensive experience and is a leader among turbine manufacturer's in high H₂ technology. As part of experience, 46 generator set packages are operating with nearly two million hours of accumulated experience and up to 65% H₂. Solar also has H₂ experience in refineries with over 40,000 hours with up to 37% H₂ in a conventional combustion system and with SoLoNOx™ (dry low emission combustion) using fuel with H₂ content up to 20%.

SOLAR'S H₂ TECHNOLOGY EXPERIENCE (55 UNITS WITH 2M OPERATING HOURS)



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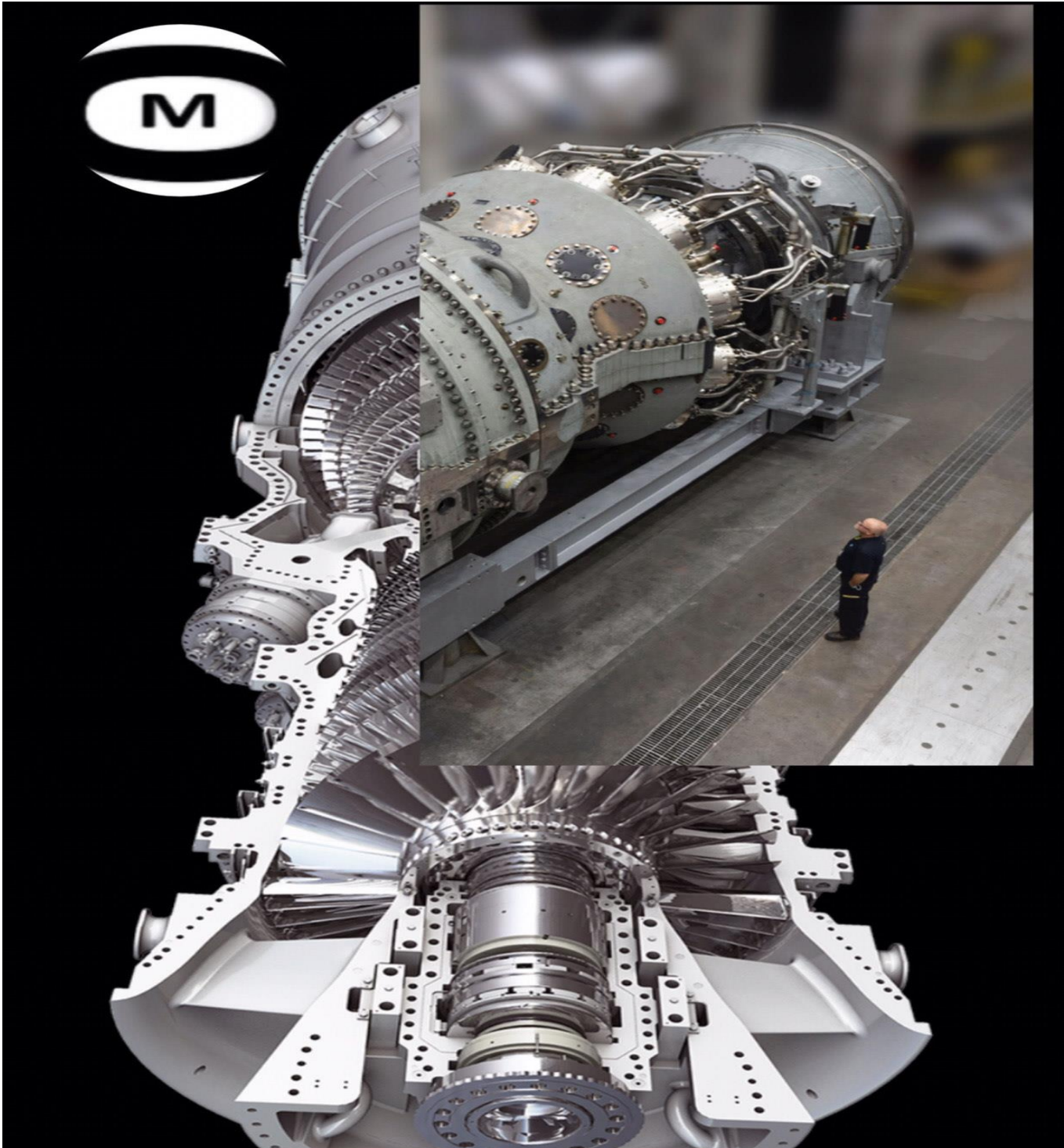
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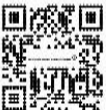


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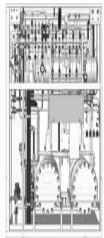
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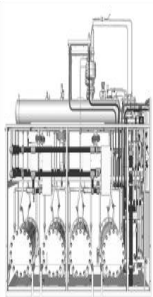




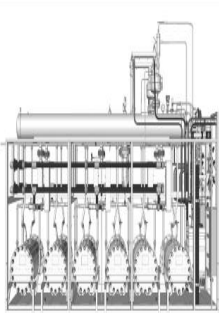
2.1 ELECTROLYSER The alkaline solution works as electrolyte in the



Up to 2 cell stacks 30 Nm³/h.



Up to 4 cell stacks 70 Nm³/h.



Up to 6 cell stacks 100 Nm³/h.

minimal maintenance.



	Optional	Standard
STACK AND BALANCE-OF-STACK (BOS)		
Cell stacks and Gas Generation System	*	*
Power rectifiers	*	*
Control Panel	*	*
Water quality monitoring system	*	*
Rectifier Cooling	*	*
BALANCE-OF-PLANT (BOP)		
Gas Cooling with Chiller	*	*
Electrolysis Cooling with Dry Cooler	*	*
Water Purification System	*	*
Instrument Air Compressor	*	*
Hydrogen Purification System	*	*

MODULAR AND FLEXIBLE

Stack configurations available in 1, 2, 4 and 6 stacks with nominal hydrogen outputs from 10 to 100 nm³/h, easily scalable to future needs.

Flawless safety record over decades.

ROBUST PROVEN TECHNOLOGY

* = standard

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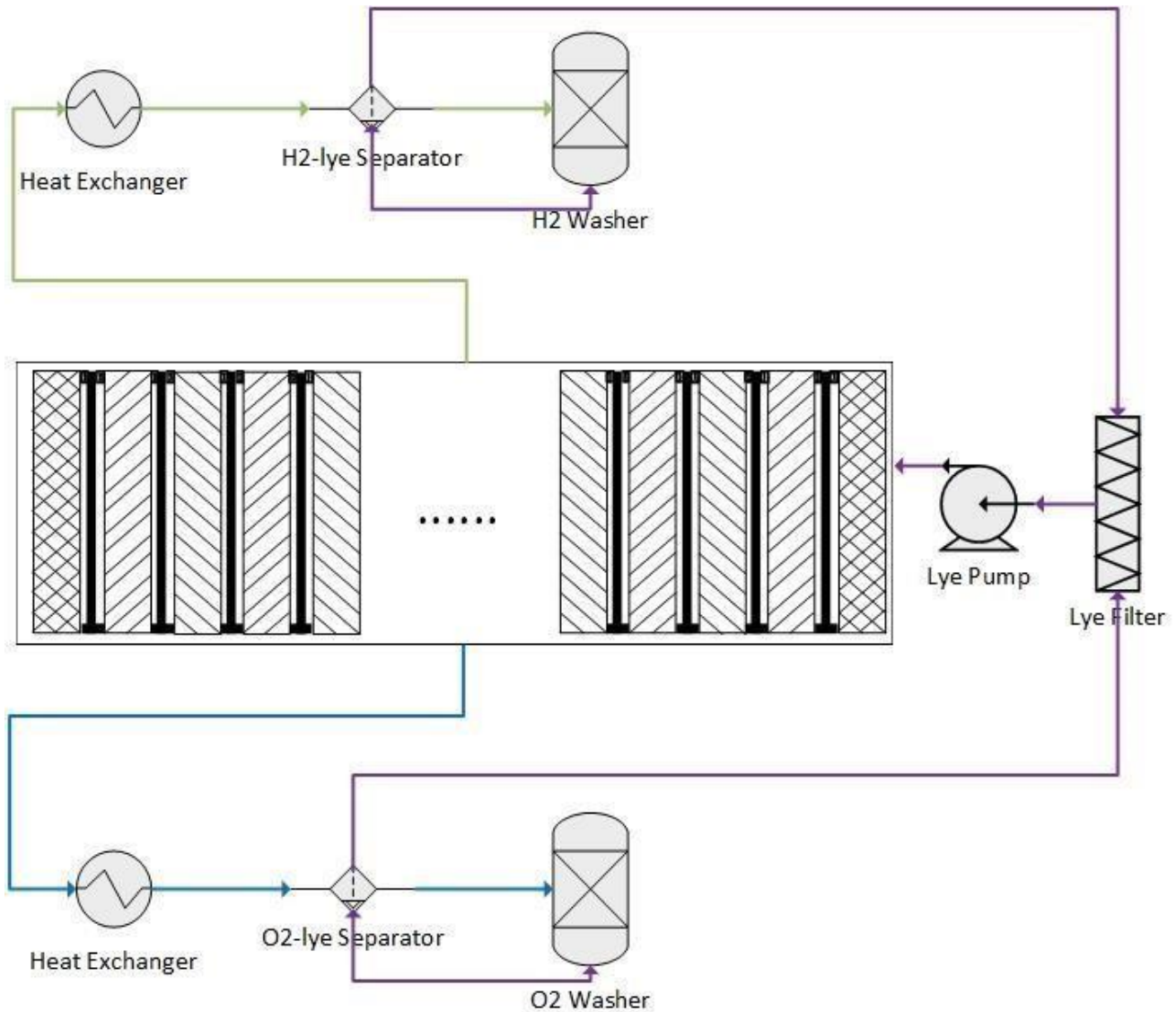
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cells. It leaves the cell with generated hydrogen and oxygen to the gas-lye separators and goes to the collection pipes. After filtering out the impurities, the solution is pumped back into electrolyzer.



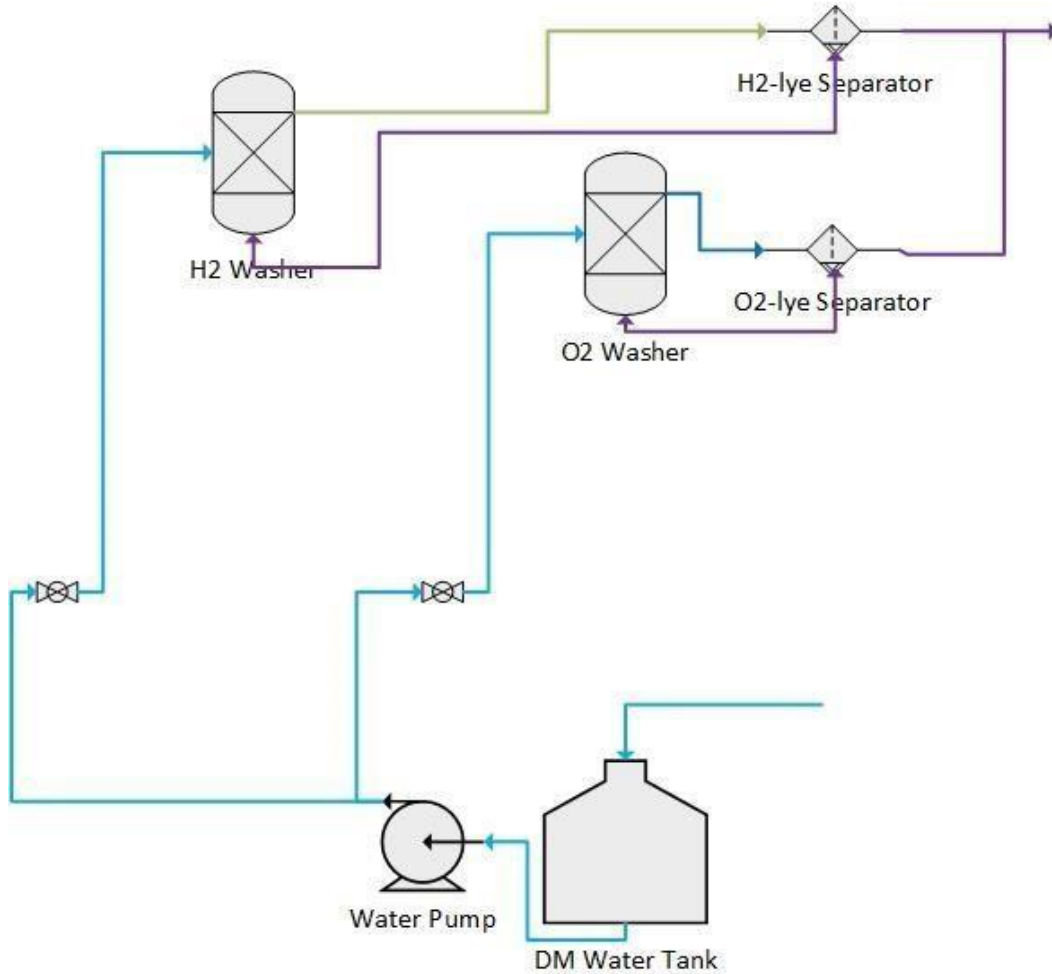
Supplementary of the DM water:

The DM water is fed into both the hydrogen washer and oxygen washer for supplementary of DM water in the hydrogen generating system by the DM water pump. Additionally, the DM water



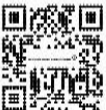


supplementary system can also be used to deliver lye from the lye tank to the O₂ separator for the purpose of supplementary of lye solution if necessary.



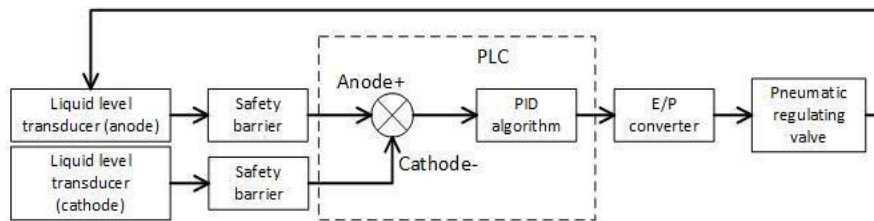
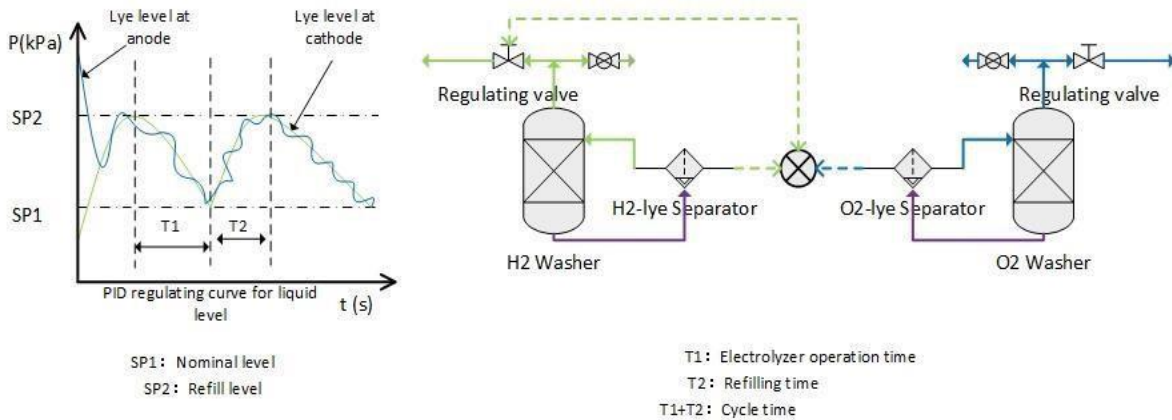
Preparation of lye:

The function of lye is to improve the electrical conductivity for water electrolysis. Under normal operation condition, the consumption of lye will be nearly zero. Generally, the supplementary of lye will be needed only one time each year, if necessary, with a small amount of lye. For preparation of lye solution, solid caustic potash is added into the lye tank that is filled with two-





third of DM water inside and then the lye pump starts to agitate that helps to dissolve the caustic potash in the DM water.



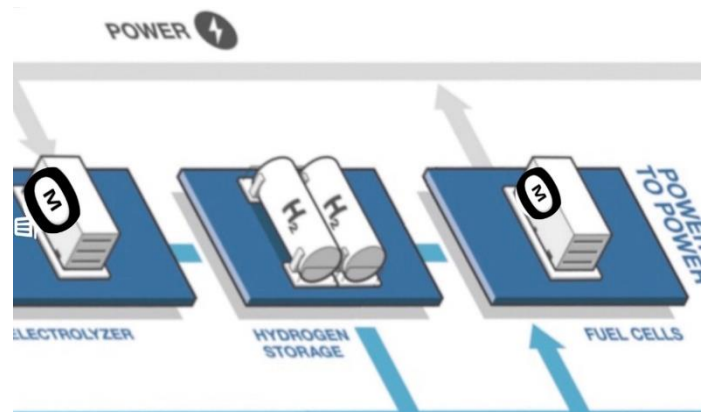
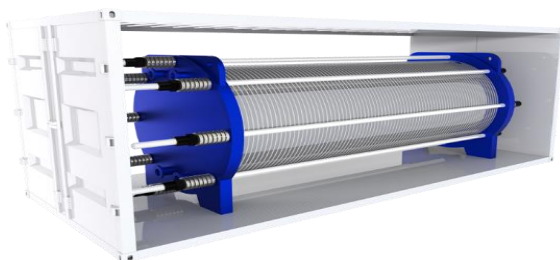
General

- 1) The BUYER should perform civil engineering design for the architecture of PLANT, in accordance with its national corresponding standards and codes.
- 2) The SELLER should provide to the BUYER detailed technical specifications on all equipment, skids and / or modules, including the loads, foundations, pipe connections and cables connection between skids and / or modules.
- 3) The BUYER may ask the SELLER to provide the international corresponding standard and code for the engineering design on the PLANT and in accordance with his own actual condition, the BUYER can be entitled to accept the standard or refuse the standard to be adhered to. The BUYER has assigned supposing the process design and erection design on the PLANT to the SELLER, it is regarded automatically that the BUYER accept the corresponding standards, which are applied to the engineering design on PLANT by the SELLER.





2.2 FUEL CELL



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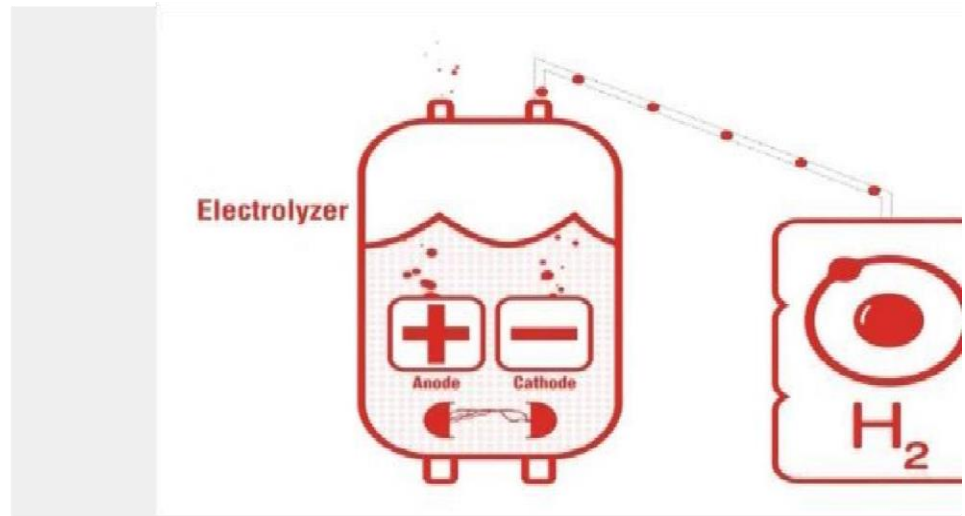
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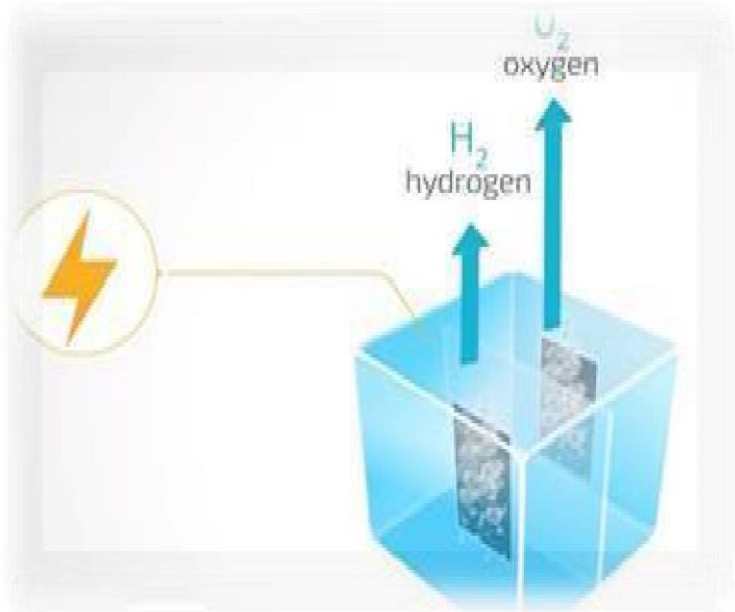
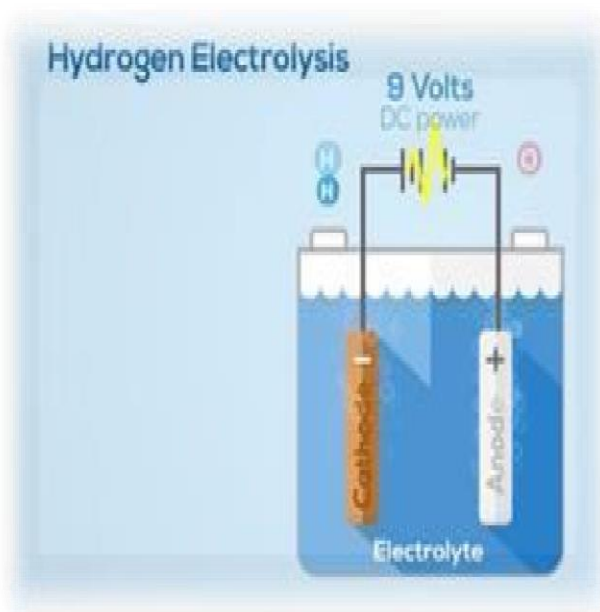


2.1.1 WHAT IS A FUEL CELL?

Fuel cells are not new. In fact, the first reference to hydrogen fuel cells appears in 1838 in the December issue of The London and Edinburgh Philosophical Magazine and Journal technology to unlock a carbon-neutral future



of Science. Almost 200 years later, the world is recognizing fuel is key





Electrolysis of water Water electrolysis is a well-established technology that has been used for nearly a century for various applications in industry, and is also considered an essential process that can also be used to elucidate the mechanism of

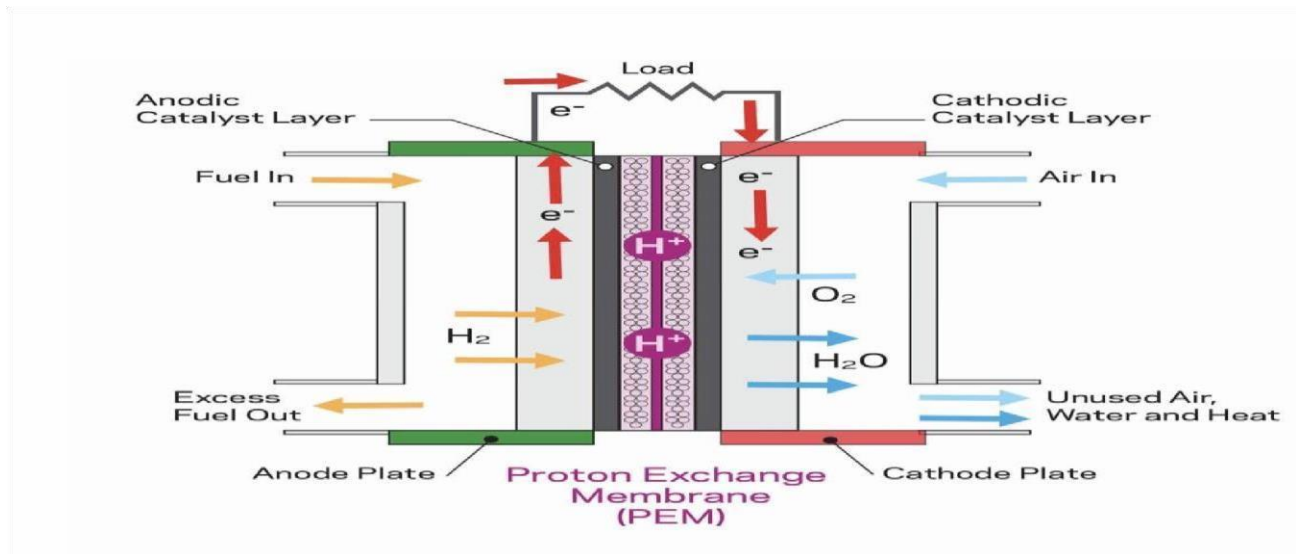
hydrogen production by water electrolysis and other various mechanisms, and it is expected that hydroelectric transformers will occupy an increasingly prominent place in the near future. For the decentralized production of hydrogen in particular, and this article will talk about the mechanism of hydrogen production by electrolysis. Hydrogen production mechanism by electrolysis Low cost alkaline water electrolysis is a sustainable and stable method, using renewable energy inputs, but preventing hydrogen/oxygen mixing and efficient use of unstable renewable energy is a major challenge.



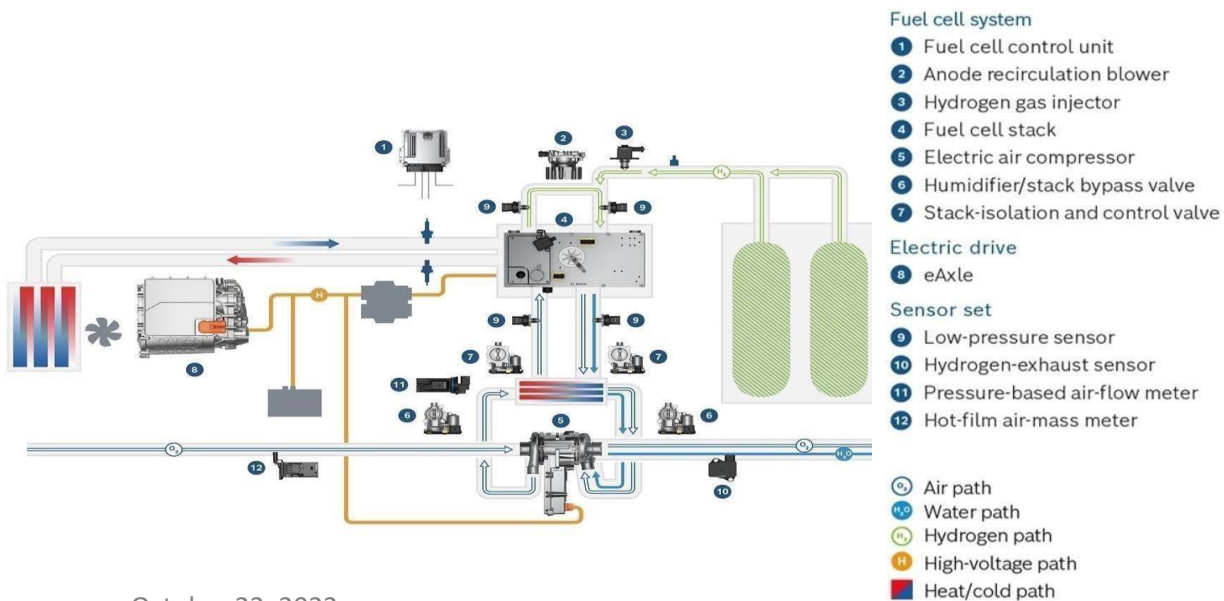


2.1.2 How does a fuel cell work?

A fuel cell is comprised of two electrodes and an electrolyte membrane. The electrodes are called a cathode and an anode, and they sandwich the electrolyte membrane between them. Within that system, a series of chemical reactions occur to separate the electrons from the fuel molecules to create energy.



The fuel, typically hydrogen, is fed into the anode on one side while oxygen is fed into the cathode on the other. At the anode, the hydrogen fuel molecules are separated into protons and electrons that will travel different paths toward the cathode. The electrons go through the electrical circuit,

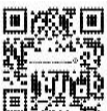


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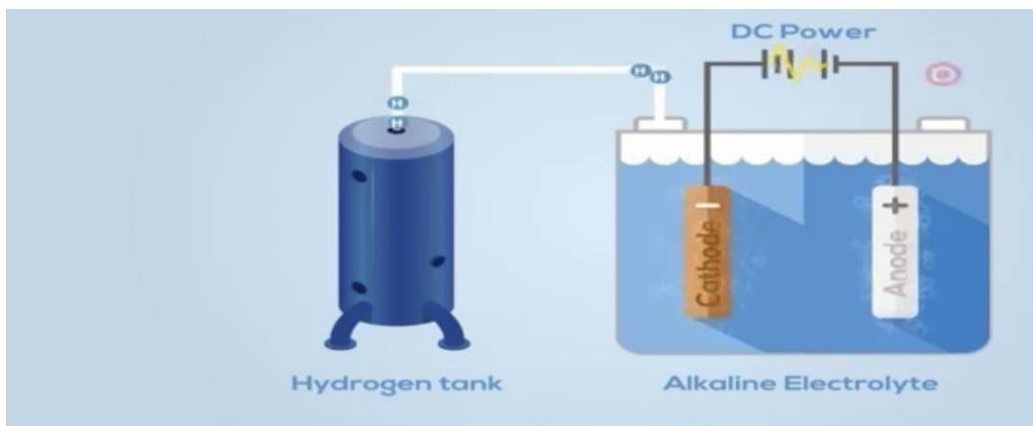


creating the flow of electricity. The protons travel through the electrolyte to the cathode. Once at the cathode, oxygen molecules react with the electrons and with the protons to create water molecules.

From the use of renewable energy, the hydrogen production mechanism occurs by electrolysis at the cathode by reducing water; as the anodic Ni(OH)₂ is oxidized at the same time to NiOOH, the subsequent oxygen production includes the reduction of the cathodic nickel oxhydroxide, and this can be expressed by the following equation:

$\text{NiOOH} \rightarrow \text{Ni(OH)}_2$ the production of NiOOH

During electrolytic hydrogen production can be combined with the zinc anode to form a battery of zinc with NiOOH-Zn, and the discharge product, Ni(OH)₂, can be used in the electrolytic hydrogen production mechanism once Others, the electrolysis of water is generally performed at room temperature under acidic or alkaline conditions, whereby the electrolysis of water is performed under the acidic state in an electrolyze with a PEM proton exchange membrane; It is called PEM, and although PEM water electrolysis systems offer many advantages, such as high energy efficiency, high rate of electrolytic hydrogen production, and compact design, their use faces many challenges due to the high cost of catalysts and membranes



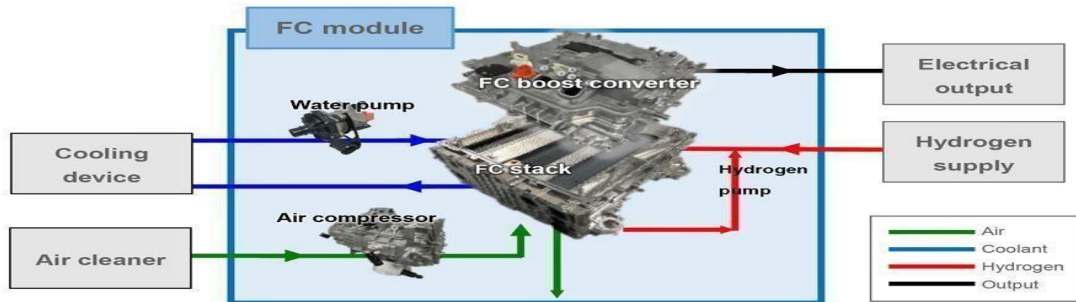
The Hydrogen Electrolyser

The effect of pressure on the electrolysis of water The speed of pressure on the water molecule determines the amount of energy required, so an increase in pressure will mean that more energy will be required, and the same amount of voltage can be used by increasing the electric current, and this depends on the amount of electrolyte at the anode / cathode used in the generator, and if one could make an atmospheric medium such as a car battery, the electric current would not change with respect to the medium but to the atmosphere; Where water molecules cause

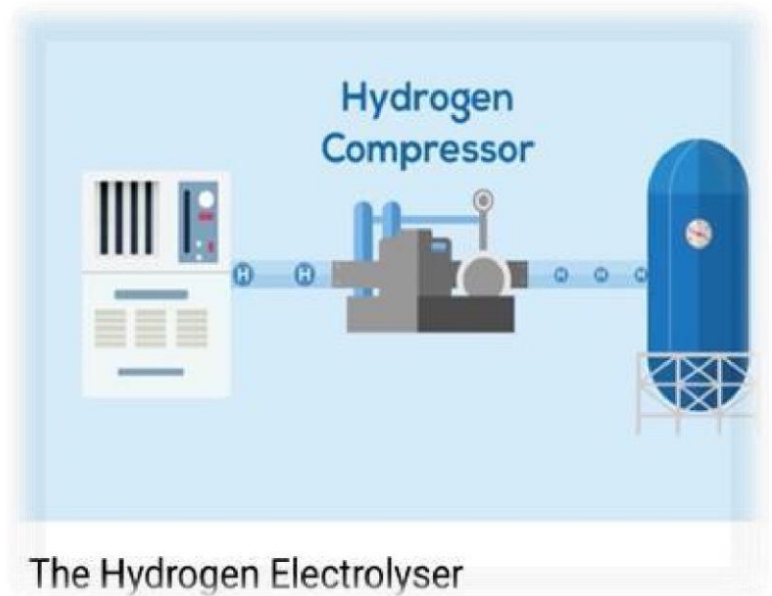


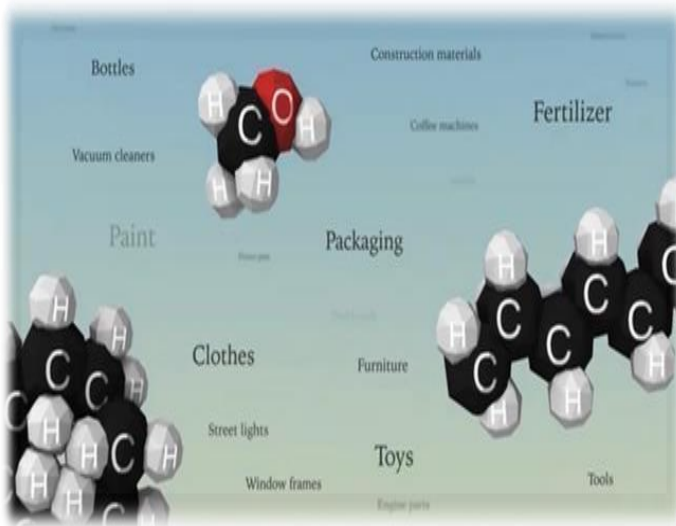


refraction and/or reversal reflexes that will make the lightning energy more exciting than it actually is but will increase the strength of the electric current somewhat, by passing through the water molecule in the air and then bouncing back, and then continuing to measure Lightning force with respect to the number of times the bolt's energy is amplified in the multitude of a series of reflexes down a path Electron , the higher the humidity, the higher the energy.



HYDROGEN GENERATOR





Clean energy

A fuel cell is a clean energy source with the only byproducts being electricity (power), heat and water. A single fuel cell alone only produces a few watts of power; therefore, several fuel cells can be stacked together to create a fuel cell stack. When combined in stacks, the fuel cells' output can vary greatly, from just a few kilowatts of power to multimegawatt installations.



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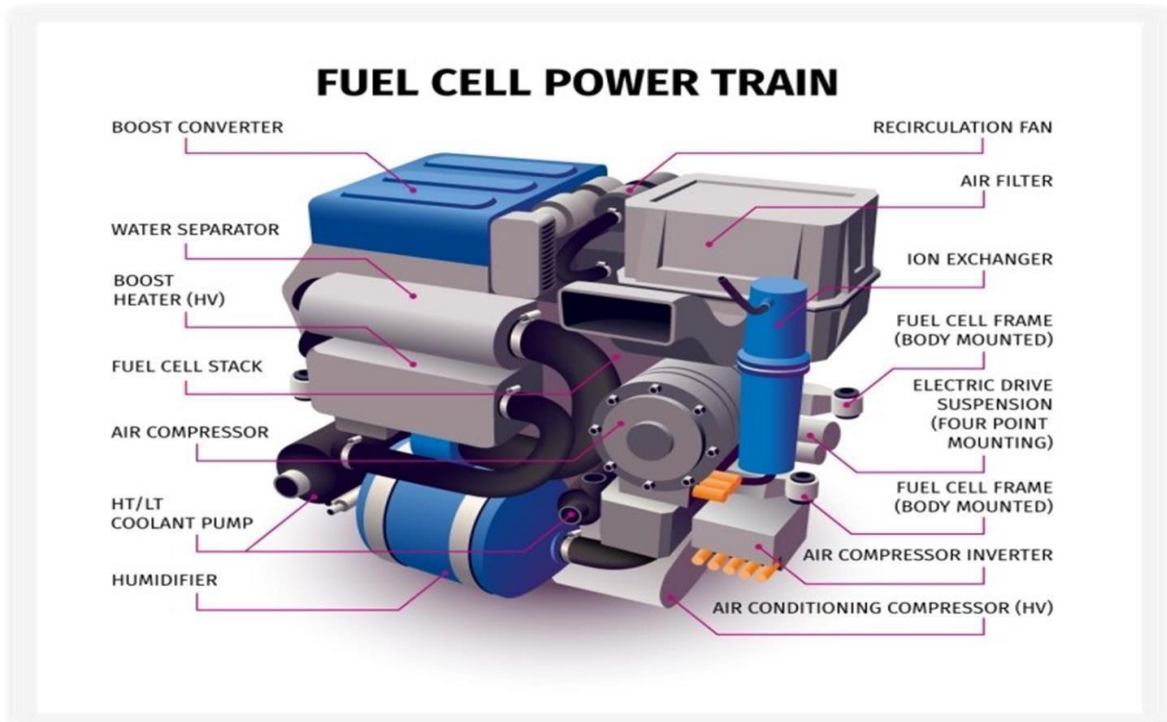
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2.2 ENGINE & TURBINE: INCREASED INTEREST IN HYDROGEN ENGINES



Hydrogen and hydrogen engines have received a lot of attention in business, media, and government circles. For good reason - the need to reduce global greenhouse gas emissions and reach the destination zero is greater than ever. Hydrogen fuel is one of the most promising non-fossil energy carriers.

In the electricity sector, energy-to-hydrogen and hydrogen-to-energy technologies such as hydrogen combustion turbines are rapidly developing. In the transportation sector, initial interest has focused on fuel cell hydrogen electric vehicles, or FCEVs. Recently, hydrogen vehicles powered by internal combustion engines have received increasing attention, especially among medium and heavy-duty trucking applications.





Hydrogen engines can enable your journey to Destination Zero by using carbon-neutral hydrogen fuels like FCEV, and using technology familiar to car manufacturers, fleets and drivers.

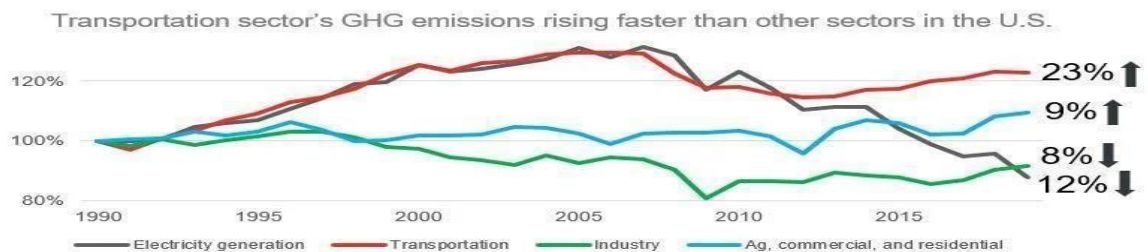
HYDROGEN ENGINES AND FUEL CELLS

Hydrogen engines and hydrogen fuel cells are very different technologies that achieve a similar function— powering a vehicle using hydrogen.

They are two complementary technologies that serve different applications and respond to different end user requirements.

Fuel cells are a new and advanced technology. Hydrogen engines are just modified internal combustion engines. The hydrogen-fueling infrastructure developed for the applications of one can serve the applications of the other. And any development towards more economical onboard hydrogen storage is entirely applicable to both.

Four of the technologies to power transportation sector with zero carbon fuels



Source: United States Environmental Protection Agency. (December 2021). U.S. Transportation Sector Greenhouse Gas Emissions. [PDF file]. Retrieved from <https://www.epa.gov/>
¹ Using green hydrogen
² Using renewable electricity

ENVIRONMENTAL BENEFITS OF HYDROGEN ENGINES

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Vehicles with hydrogen internal combustion engines can operate without any carbon dioxide emissions coming from hydrogen fuel, directly or indirectly, depending on the hydrogen source used.

Hydrogen generated by electrolysis using electricity from solar panels or wind turbines, for example, enables carbon dioxide-free driving. In addition, hydrogen fuel does not release any particulate matter, carbon monoxide, or volatile organic compounds.

However, hydrogen engines have the potential to release some nitrogen oxides, an at

HYDROGEN AS A FUEL FOR GAS TURBINES

Burning hydrogen is a potential pathway to decarbonize gas turbines by replacing natural gas fuel with hydrogen, which has no carbon, and therefore, no CO₂ in the exhaust. One area to consider when burning hydrogen is that more NO_x may be produced compared to natural gas.

Most (~95%) of the hydrogen produced today is produced using natural gas via the Steam Methane Reforming process, with the resultant CO₂

Released to the atmosphere. This is called “grey” hydrogen.

Adding a carbon capture system to this process results in “Blue” hydrogen.

So-called “green” hydrogen is produced by electrolyzing water into hydrogen and oxygen using renewable energy as the power source.

A gas turbine does not care which

Morphemic pollutant that can contribute to the haze sometimes seen over large





MODERN HOME ENGINEERING

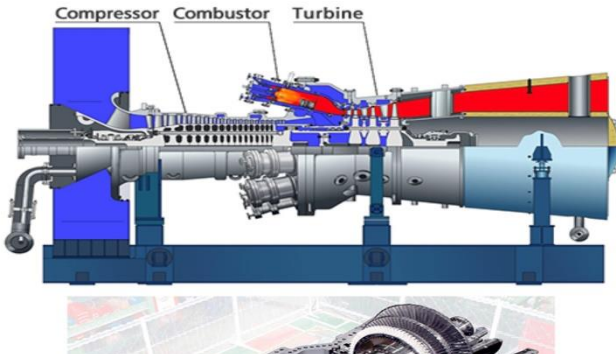
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cities during the summer months. Post-treatment systems are used to eliminate most NOx emissions.



CUMMINS X15™ FOR MOTORHOMES



YOU DESERVE A DIESEL. One with proven reliability and more power than any other diesel engine available for motorhomes. Cummins X15 fits that description and is the most popular heavy-duty diesel engine on the road. Plus, it's a prime example of American ingenuity as it's designed in Indiana and built in Jamestown, New York.

PERFORMANCE

- **Stronger In The Hills** – With torque ratings up to 1950 lb-ft, maximum torque is available over a wider rpm range than earlier products.
- **Proven Performance** – Proven platform that's the most popular heavy-duty diesel for not just RVs but commercial trucks as well.
- **Better Downhill Control** – The most powerful engine brake in the industry with up to 600 braking hp.
- **Reduced Noise** – Quieter operation, especially at idle,

SUPPORT

- **Peace of Mind** – With a standard 5-year/100,000-mile base warranty and optional full engine and aftertreatment coverages for up to eight years, we've got you covered.
- **Cummins on Every Corner** – Over 3,700 authorized locations across North America to support parts and service needs.
- **One Source for Service** – Your local Cummins Sales and Service location supports both Cummins engines and Cummins Onan generators.

X15 RATINGS

Engine	Maximum HP (kW)	Governed Speed (RPM)	Peak Torque LB-FT (N•M) @ RPM
X15 605	605 (451)	2100	1950 (2508) @ 1100
X15 565	565 (422)	2100	1850 (2508) @ 1100

X15 TYPICAL MAINTENANCE INTERVALS

Maintenance Item	Miles/Kilometers*	Months*
Oil and Filter	20,000 MI 32,000 KM	12
Fuel Filter	60,000 MI 96,500 KM	12
Valve Lash Check	500,000 MI 800,000 KM	60
Crankcase Breather Filter	Maintenance Free	

* Whichever occurs first. Consult your chassis and engine Owners Manuals for more information.

X15 SPECIFICATIONS

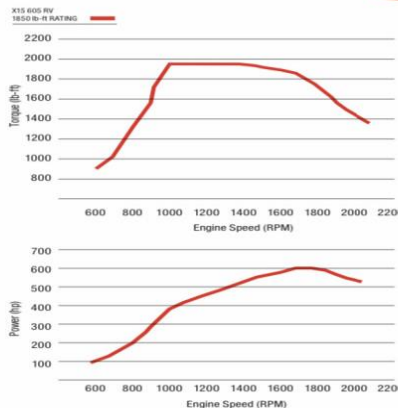
Configuration	Inline 6	
Displacement	912 CU IN	14.9 L
Lube Oil Capacity	48-54 QT	45-51 L
Idle Speed	600-800 RPM	
Optional Compression Brake	Up to 600 HP @ 2100 RPM	
No Load Governed Speed	2130 RPM	
Maximum Overspeed Capability	2625 RPM	
Engine Weight (Dry)	2961 LB	1343 KG
Aftertreatment Weight	187-247 LB	89-112 KG
Biodiesel Compatibility	Up to B20	

POWERING YOUR DRIVE AND YOUR RELAXATION.

Cummins covers all your power needs by also offering a range of generators for the RV market.



X15 MAXIMUM TORQUE AND HORSEPOWER



GET THE LATEST INFORMATION.

Visit rv.cummins.com to learn more about Cummins X15 engines and Cummins generators.



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Box 3005
Columbus, IN 47202-3005
U.S.A.

cummins.com

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2.3 ALTERNATOR:

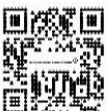
While the battery is essential for starting your car when it is off, the alternator keeps your car alive when the engine is running. The alternator powers most car's electronic components while you're driving around or idling, including your headlights, electric steering, power windows, windshield wipers, heated seats, dashboard instruments, and radio. The alternator supplies all of them with direct current (DC) power. Your alternator is also responsible for charging your car battery while driving.

The alternator works by turning mechanical energy into electrical energy. When your engine is on, it powers a drive belt that rests on a pulley attached to the alternator. The pulley turns the alternator's rotor shaft, which spins a set of magnets around a coil. These spinning magnets generate alternating current (AC) around the coil, which is then channeled to the alternator's rectifier. The rectifier converts that AC power into DC power, which activates your electrical systems.

Alternators typically last the lifetime of your vehicle, but that does not always happen. General wear and tear, heat damage, overuse, exposure to water, faulty parts, or frayed wires can put your alternator out of commission before your car heads to the scrap yard.



ALTERNATOR





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F: +44 (0) 1572 771161
E: info@meccalte.co.uk
www.meccalte.com

23rd May 2022

To whom it may concern,

Mecc Alte UK Limited, 6 Lands' End Way, Oakham, Rutland, LE15 6RF, as manufacturers of A.C. alternators, hereby confirm that Modern Home Engineering, Khartoum, 11111, SUDAN, are an authorized manufacturer of diesel generators using the Mecc Alte range of A.C. alternators.

Modern Home Engineering also has Mecc Alte full support for warranty and genuine spare parts in accordance with our official guidelines, terms and conditions of our warranty procedure.

With Best Regards

Mr Jonathan Stokes
Sales & Marketing Director NEMEA

V.A.T. No. GB 690 7302 32. Registered in England No. 3320100. Registered Office: 22-24 Ely Place, London EC1N 8TE. EORI Number: GB690730232000



6 Lands End Way, Oakham, Rutland
LE15 6RF, England
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Fax: 00 44 1572 771161
Reg. No. 3320100 VAT No. GB 690 7302 32

POWER FROM WITHIN

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Arcole, 17th March 2022

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Khartoum

SUDAN

To whom it may concern

This is to certify that

MODERN HOME ENGINEERING

located in Khartoum - Sudan

has been appointed as LINZ ELECTRIC approved importer and distributor for Sudan since March 2022.

Moreover, we certify that MODERN HOME ENGINEERING is one of our approved Service Points in the Sudanese territory for the rotating electrical machineries we manufacture, that is as alternators and welders.

MODERN HOME ENGINEERING will provide spare parts and aftersales service for the a/m machinery and in coordination with Linz Electric S.p.A.

For Warranty Terms and Conditions reference is made to Linz Electric General Terms and Conditions of Sale specified on Linz Electric Price List.

LINZ ELECTRIC S.p.A. LINZ ELECTRIC S.p.A.

LINZ ELECTRIC S.p.A. V.le del Lavoro 30 - 37040 ARCOLE (VR) ITALIA - C.F./P.IVA IT01954820237
Tel. +39-045-7639201 - Fax +39-045-7639202 - info@linzelectric.com - www.linzelectric.com
Capitale Sociale € 4.000.000,00 I.v. Registro Imprese di Verona n. 01954820237 Mec. Import VR008916 - C.C.I.A.A. VR207789

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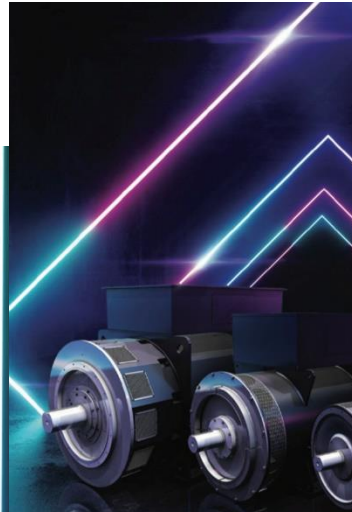
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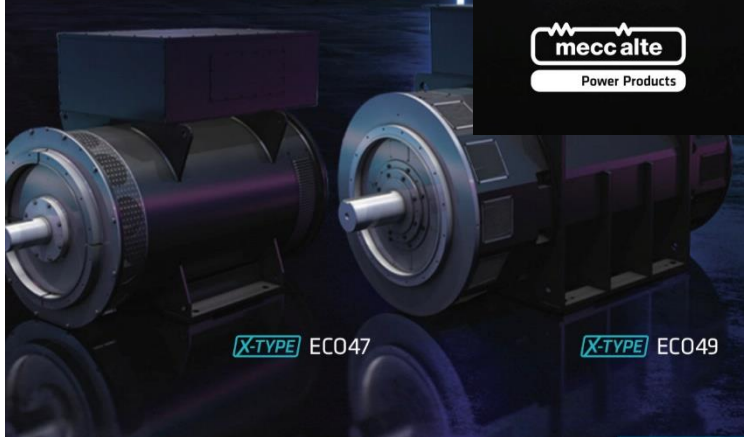


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The **X-TYPE** Series



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Association of Electrical and Mechanical Trades.

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(فنزويلا) H-25 مشروع توربينات الغاز سلسلة



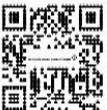
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SOLAR SOLUTIONS BONDED MOUNTING TECHNOLOGY

DURABLE BONDING OF PV MODULES TO MOUNTING SYSTEMS WITH Sikasil®



SOLAR SOLUTIONS NEW HORIZONS IN SEALING AND BONDING FOR PHOTOVOLTAICS

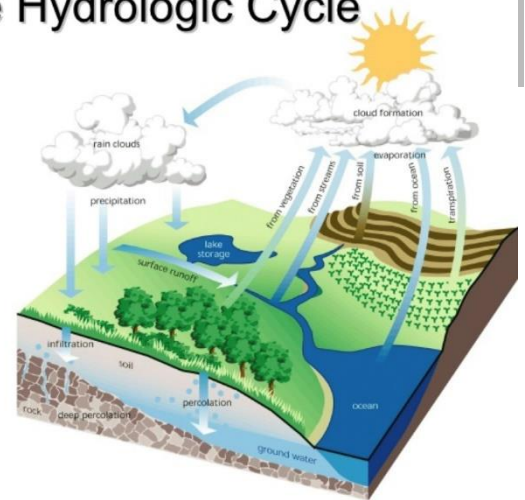
PRODUCT SPECIFICATIONS FOR DG500 (60 HZ)



Natural Gas Rating	500 ekW
Fuel Type	Natural Gas
Emissions/Fuel Strategy	U.S. EPA Certified for Stationary Emergency Application
RPM	1800
Frequency	60 Hz
Voltage	120/208, 120/240, 277/480, 346/600 VAC
Engine Model	Cat® CG18 In-line 6, 4-cycle Natural Gas
Fuel System	Gas mixer, Venturi
Aspiration	Turbocharged - Air-to-Air Aftercooled
Governor Type	Electronic
Displacement	18.1 l
Compression Ratio	10.5:1
Bore	145 mm
Stroke	183 mm
Length	3581 mm
Width	1854 mm
Height	2083 mm

The Hydrologic Cycle

- Water evaporates from plants, soil, streams, and the ocean
- It then condenses to form clouds
- Water falls to the surface as rain or snow
- Some of the water forms rivers and flows back to the oceans
- Some of it percolates down through the soil to the zone of saturation



Animation

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Development status

Our hydrogen combustion technologies can be applied to a wide range of gas turbines from small to large frame in the 30MW to 1280MW class.



* Table of hydrogen mixing ratio for each gas turbine model



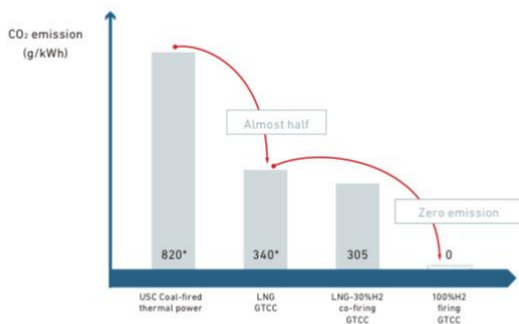


100% hydrogen power generation — achieving a complete hydrogen-fired gas turbine

The dream of a CO₂-free society—100% hydrogen thermal power generation

The values below are emissions per unit indicating CO₂ emission volume when generating 1kWh of electricity.

- Standard coal-fired power generation: 863g-CO₂ /kWh
- Ultra-supercritical (USC) coal-fired power generation: 820g-CO₂ /kWh
- GTCC power generation: 340g-CO₂ /kWh
- Hydrogen 30% mixed-combustion gas turbine: 305g-CO₂ /kWh



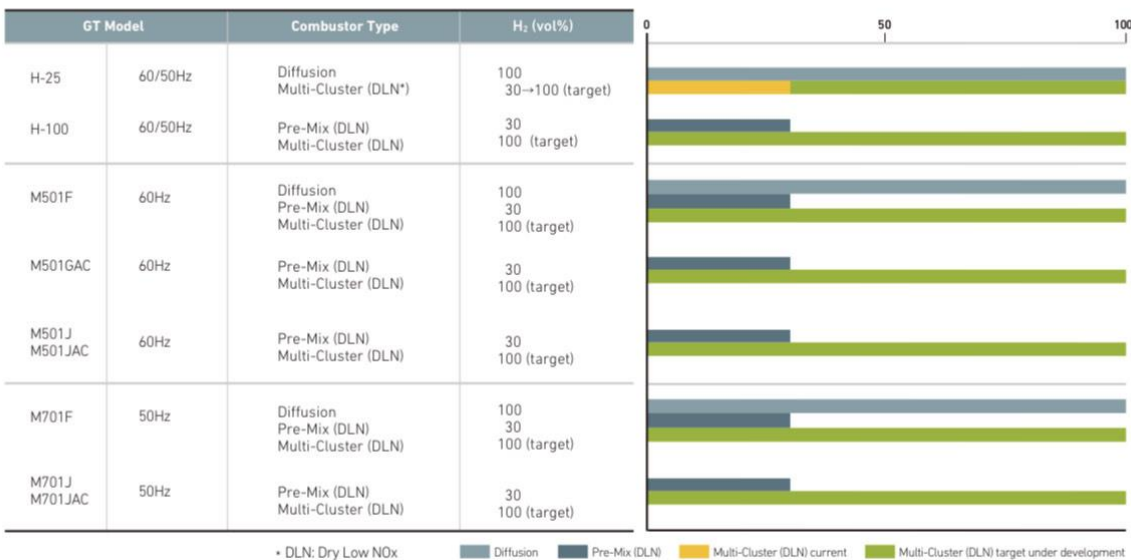
*Source: METI Web Site(https://www.meti.go.jp/committee/kenkyukai/energy_environment/jisedai_karyoku/001_haifu.html)

Development Status of Hydrogen Combustion Technology

As Mitsubishi Power has successfully achieved mixed-combustion power generation at 30% hydrogen, Satoshi Tanimura's next objective is CO₂-free power generation, or 100% hydrogen power generation technology. However, with a high concentration of hydrogen, the risk of flashback rises, as does the concentration of NO_x. A combustor for hydrogen-fired power generation demands technology that enables efficient mixing of hydrogen and air, and stable combustion.

"There are important conditions concerning the mixing of hydrogen and air as well," said Tanimura. "It is difficult to mix hydrogen and air in a large space, and using a rotational current and mixing them well requires a rather large space. This is what pushes the risk of flashback upward. In order to mix hydrogen and air in a short period of time, it has to be done in as confined a space as possible. The problem is that in this case the fuel nozzle jets and flame are in closer proximity, making flashback increasingly likely. We thought about how to deal with this, and it occurred to us that we needed to disperse the flame and reduce the fuel spray particle size. The key technology to this method is the fuel delivery nozzle. We upgraded the design, which normally features eight nozzles, and created the distributed lean burning, or multi-cluster combustor, which incorporates many nozzles. We reduced the size of the nozzle opening and injected air, and then sprayed hydrogen and mixed them. As this method does not employ a rotational current, mixing is possible on a smaller scale, and low-NO_x combustion can be accomplished."

Hydrogen is an excellent fuel, but difficult to handle. Changing thinking in mixing methods by upgrading the nozzle. That's the kind of challenges engineers are wrestling with in the battlefield of development.

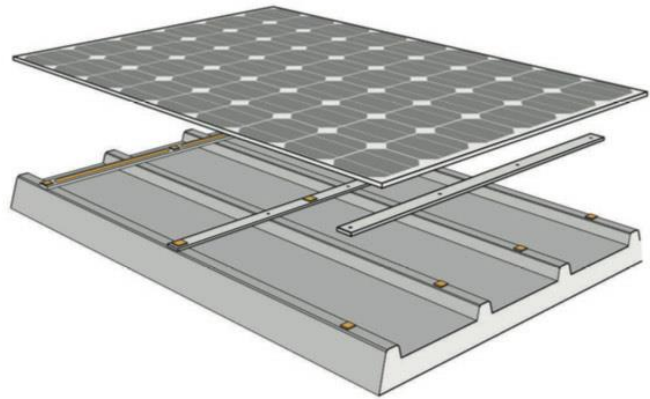




ESPECIALLY ON LIGHT WEIGHT ROOFS, bonded frameless modules show their greatest benefits. The bonding technology allows the construction of simplified BAPV systems for diverse roof constructions. It enables the usage of roofs as an energy provider with the most limited material consumption. Thanks to its simplicity, the limited material usage and material handling, it facilitates a faster and more cost effective way of roof installation by even increasing the aesthetical appeal.

Best recommended Sika products

Sikasil® SG-20	Structural one-part silicone adhesive
Sikasil® AS-70	One-part high performance structural silicone adhesive



SYSTEM BENEFITS

- Reduces system costs thanks to material and time savings
- Eliminates heavy mounting constructions on roofs
- Shortens installation times on existing roofs
- Allows installations on light weight roofs
- Minimized material handling
- Facilitates self cleaning of modules by frameless systems



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DG500 (60 HZ) STANDARD EQUIPMENT

EXHAUST

Dry exhaust manifolds, insulated and shielded

FUEL SYSTEM

Gas train with Zero Pressure regulator

ECU controlled shutdown solenoid

Airfuel Ratio Control, Venturi type Air-Gas mixer, throttle controlled valve

CONTROLS

EMCP 4.2B

Integrated Voltage Regulator (IVR)

TELEMATICS

PL444 Product link 4G LTE Telematics

GENERATOR

Anti-condensation space heater

SR5

GOVERNING

Electronic Governing

STARTING/CHARGING

24V starting motors

GENERAL

Paint - Caterpillar Yellow except rails are gloss black

Operation and maintenance manuals

Parts book

DG500 (60 HZ) OPTIONAL EQUIPMENT

AIR INLER

Air inlet adapters

COOLING

Inlet/Outlet connections

EXHAUST

Flexible fitting

Elbow, Flange

Muffler and spark-arresting muffler with companion flanges

Exhaust expander

TELEMATICS

PLG 601 & 641 Product link Telematics

GENERATOR

Permanent Magnet Excitation

Low voltage extension box

Generator air filter



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- Finite Element Analysis (FEA)
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- Power and Process System Design
- Pipe and Pumping System Analysis
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- Thermal Power Generation System Design
- Water Hammer and Fluid Transient Analysis



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- 3D Modeling/Rendering/ Virtual Walk-throughs
- ASME Pressure Part
- Pressure Piping Design and Registration PROCESS ENGINEERING + Water Balances
- Opportunity Studies
- Process Calculations
- Emissions Calculations
- Energy Audits and Studies
- Steam and Power Balances
- Pump & Slurry System Calculations
- ELECTRICAL ENGINEERING:
 - Layouts + Module Design
 - Area Classification
 - Power System Studies
 - Electrical Buildings Design

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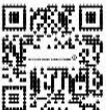
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