

FREE ENERGY PLANET

A New World of Clean and Infinite Energy with Hydrogen,
S-Fuelcell Will Make It Happen.



S-Fuelcell

Hydrogen Fuel Cells Specialist At the Forefront of Korean Technology

S-Fuelcell Co., Ltd. has been leading Korea's fuel cell research and development since 1989.

Starting in November 2001,
it became the first specialized fuel cell company in the country.

S-Fuelcell possesses
proprietary technology in core areas of fuel cells,
such as fuel cell stacks, hydrogen extractors, and integrated system design.
Additionally, the company holds **proprietary technology in core areas of fuel a diverse
product range related to hydrogen energy, including fuel cell systems for
buildings and hydrogen power generation systems.**

ECOGENER

2018 - 2023 Challenge for Global No.1

- 2023 ● Launched 200kW hydrogen power generation system **First in Korea**
Launched 25kW single-module system **First in Korea**
- 2022 ● Acquired CE certification(5kW) **First in Korea**
- 2021 ● Selected as a hydrogen-specialized company
Demonstrated fuel cell in Europe(5kW) **First in Korea**
- 2020 ● Exported fuel cells to China(5kW)
- 2019 ● Developed battery hybrid system(5kW) **First in World**
Successfully conducted / IGFC trial run(50kW)
- 2018 ● Acquired PG10K 3-phase KS certification **First in Korea**
Listed on **KOSDAQ**

2014 - 2017 Full-scale Commercialization of Fuel Cells

- 2017 ● Released modular 10kW system **First in Korea**
- 2016 ● Released modular 6kW system **First in Korea**
- 2015 ● Obtained 5kW LPG fuel cell certification(KGS, KS) **First in Korea**
- 2014 ● **Established S-Fuelcell Co., Ltd.**
Acquired 5kW fuel cell facility certification(KS) **First in Korea**

2009 - 2013 Fuel Cell Product Commercialization and Market Penetration

- 2013 ● Received inspection approval for 5kW fuel cell system(KGS) **First in Korea**
Started sales of 5kW fuel cell system
- 2011 ● Released 1kW fuel cell distribution model
- 2010 ● Conducted field tests for 5kW fuel cell system **First in Korea**
- 2009 ● Installed and operated fuel cells inside an apartment **First in Korea**
Selected as the leading company for the development and verification of 5kW fuel cells

2001 - 2007 Beginning of Fuel Cells

- 2007 ● Developed 5kW hydrogen power generation system(SPM) **First in Korea**
- 2005 ● Changed company name from CETI to GS Fuelcell
- 2003 ● Developed 1kW fuel cell system **First in Korea**
- 2002 ● Developed 1kW fuel cell stack **First in Korea**
- 2001 ● Established fuel cell-specialized company CETI **First in Korea**

01

Understanding Hydrogen Energy

Hydrogen energy is



a clean energy source that doesn't emit pollutants.



It is easily accessible **anywhere on Earth.**

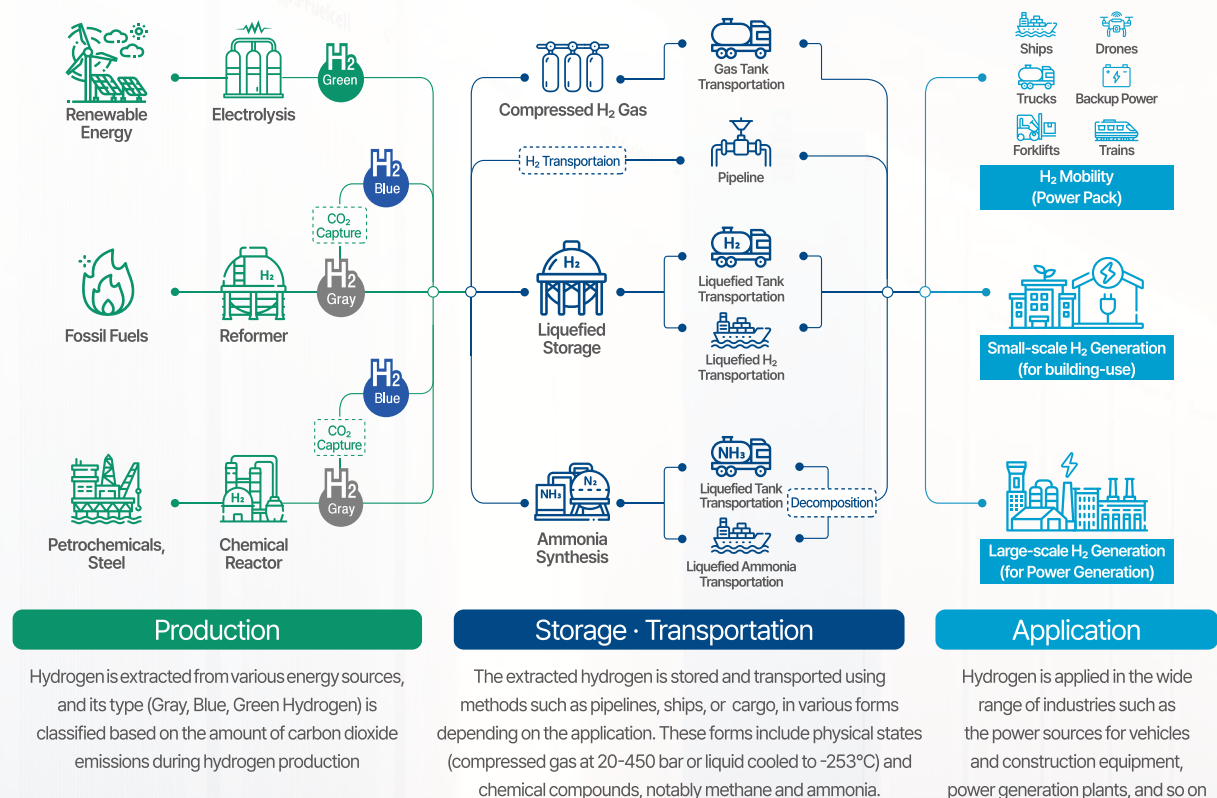


It offers **superior stability** compared to other fuels.



It is recyclable, preventing exhaustion and enabling **energy self-reliance.**

Hydrogen Energy Value Chain





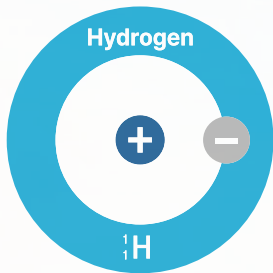
Hydrogen(H₂) is a safe energy source.

Is Hydrogen Energy Safe?

The hydrogen used in fuel cells poses no explosion risk.

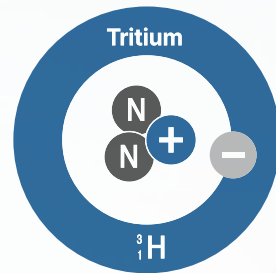
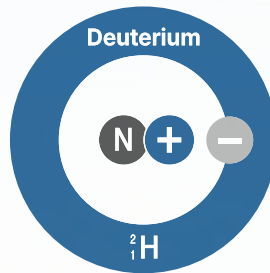
A hydrogen bomb uses nuclear fusion of hydrogen atoms and requires energy equivalent to an atomic bomb, so the hydrogen in fuel cells is not explosive.

Used as fuel in fuel cells



VS

Used in a hydrogen bomb (possible at temperatures of 100 million°C)



© Isotopes of hydrogen: Hydrogen, Deuterium, Tritium

+ Proton - Electron N Neutron

Hydrogen is safer than city gas(LNG), LPG, and gasoline.

Since hydrogen is the lightest element on Earth, it disperses immediately into the atmosphere when released. Therefore, it is much safer than commonly used LNG, LPG, and gasoline in our daily lives.

Relative Risk Evaluation by Fuel

Hydrogen	City Gas(LNG)	LPG	Gasoline
Autoignition temperature	2	3	4
Fuel characteristics	2	3	4
Flame temperature	1	2	4
Combustion velocity	3	2	1
⋮	⋮	⋮	⋮
Total	33	39	42
Relative risk	1.03	1.22	1.44
1			

Safety order: 1>2>3>4, evaluated based on 15 criteria

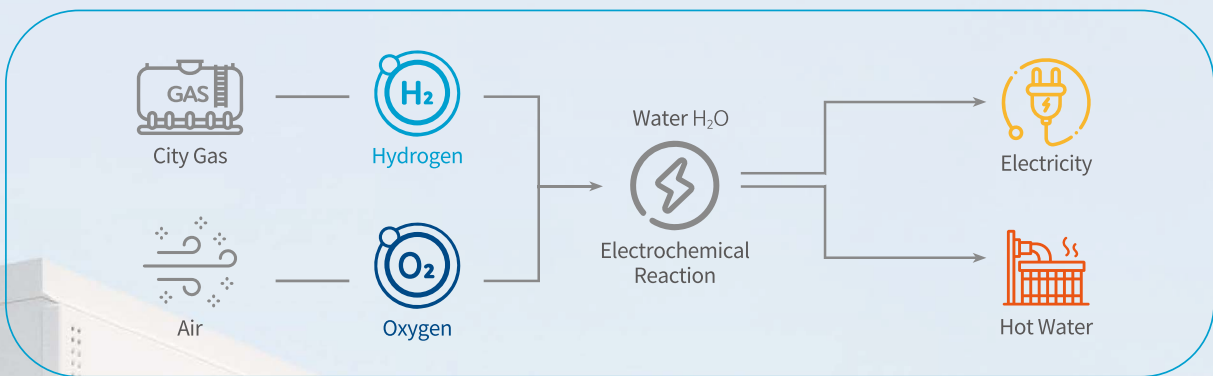
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Introduction to Fuel Cells

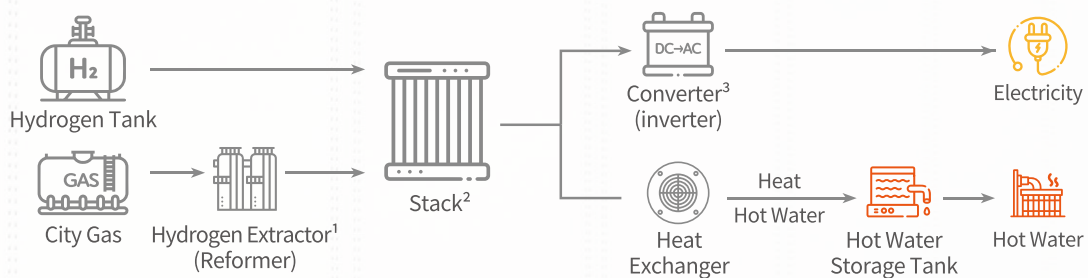
What is a fuel cell?

It **generates energy** through a chemical reaction between hydrogen and oxygen (from the air), and it is **a clean energy source that doesn't emit harmful substances (such as SOx, NOx, etc.)**.



Fuel Cell System Composition

Fuel cells can provide both electricity and heat simultaneously, and they are high-efficiency generation systems with an overall efficiency exceeding 90%.



1. Hydrogen Extractor(Reformer): A device that converts fuels (such as LNG, LPG, etc.) into hydrogen
2. Stack: A device that uses hydrogen and (from the air) oxygen to generate electricity and heat
3. Power Converter (Inverter): A device that converts the direct current produced by the stack into alternating current

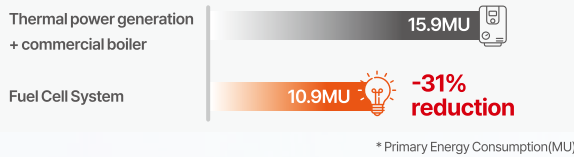


Effects of Introducing Fuel Cells

Fuel cells, a renewable energy source with the advantages of high efficiency and eco-friendliness, result in approximately a 31% primary energy reduction and about a 45% carbon dioxide reduction compared to other energy sources.

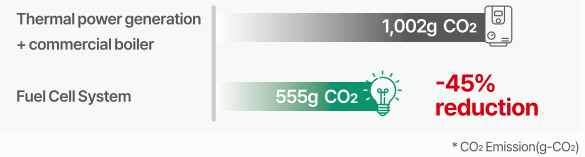
High Efficiency

- Reduces primary energy consumption by 31%
- Compared to other renewable energies, it is the most efficient.



Eco-Friendly

- Reduces carbon dioxide emissions by 45%
- 2 tons (annually) of CO₂ reduction per 1kWh



Types of Fuel Cells

Fuel cells are applied in various sectors including residential, commercial, transportation, and portable power. In particular, the Polymer Electrolyte Membrane Fuel Cell (PEMFC) is the most commercialized fuel cell and is mainly used for homes, buildings, and vehicles.

	Portable	For Buildings	For Transportation	For Power Generation
Application	 ~50W	 1~25kW	 80~200kW	 100~400kW
Applied Fuel Cell Type	DMFC	PEMFC		PAFC MCFC SOFC

DMFC : Direct Methanol Fuel Cell / PEMFC : Polymer Electrolyte Membrane Fuel Cell
PAFC : Phosphoric Acid Fuel Cell / MCFC : Molten Carbonate Fuel Cell / SOFC : Solid Oxide Fuel Cell

Type	Low-Temperature Fuel Cells			High-Temperature Fuel Cells	
	DMFC	PEMFC	PAFC	MCFC	SOFC
Electrolyte	Direct Methanol	Polymer Electrolyte Membrane	Phosphoric Acid	Molten Carbonate	Solid Oxide
Operating Temperature	25~80°C	25~80°C	200°C	650°C	600~1,000°C
Catalyst	Platinum	Platinum	Platinum	Nickel	Nickel
Fuel	Methanol	Hydrogen, Natural Gas	Hydrogen, Natural Gas	Natural Gas	Hydrogen, Natural Gas
Efficiency (Natural gas/%LHV)	-	35~40%	40~45%	50~60%	50~60%
Efficiency (Hydrogen/%LHV)	-	50%	50%	52%	52%
Applications	Portable	Transportation, Residential, Buildings	Power Generation	Power Generation	Buildings, Power Generation

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Fuel Cell System

ECOGENER

Eco-Friendly Hydrogen Fuel Cells



5kW / 6kW

10kW

☑ Fuel Cell System Specifications

Model	ECOGENER NG/PG 1K	ECOGENER NG/PG 5K	ECOGENER NG/PG 6K	ECOGENER NG/PG 10K
Rated Output (Electricity/Heat)	1kW/1.4kW	5kW/7.0kW	6kW/8.4kW	10kW/14kW
Size(W×D×H)	600 × 550 × 1,500 mm	650 × 1,300 × 1,550 mm		1,300 × 1,300 × 1,550 mm
Hot Water Temperature	Max 55°C(May vary based on hot water usage)			
Fuel	City Gas(LNG) or LPG			
Fuel Consumption	LNG : 0.25m ³ /hr/kW, LPG : 0.13m ³ /hr/kW			
Efficiency(LHV)	Electric Efficiency 35%, Overall Efficiency over 90%			
Features	Water-independent System, Automatic Operation, Web-based Operation, Load Operation(50%, 75%, 100%)			
Output Voltage	220V(Single Phase)	380V(Three Phase)		
Startup Time	Within 60 minutes			
Application	Apartments, Villas, Commercial Spaces, Buildings, Studio Apartments, and other buildings with city gas supply			

*Product image and size may vary from the actual products.

☑ Largest Capacity Fuel Cell System for Buildings



Model	ECOGENER NG 25K
Rated Output (Electricity/Heat)	25kW/35kW
Size(W×D×H)	1,700 × 850 × 1,800 mm
Hot Water Temperature	Max 55°C(May vary based on hot water usage)
Fuel	City Gas(LNG)
Fuel Consumption	0.25m ³ /hr/kW
Efficiency(LHV)	Electric Efficiency 35%, Overall Efficiency over 90%
Features	Water-independent System, Automatic Operation, Web-based Operation, Load Operation(50%, 75%, 100%)
Output Voltage	380V(Three Phase)
Start-up Time	Within 120 minutes
Application	Apartments, Villas, and other buildings with city gas supply

*Product image and size may vary from the actual products.

☑ Hydrogen Power Generation System



Model	ECOGENER HG 1~50K
Rated Output (Electricity/Heat)	1~50kW / 0.7~35kW
Size(W×D×H)	50K : 1,000 × 1,800 × 1,700 mm
Hot Water Temperature	Max 50°C (May vary based on hot water usage)
Fuel	Pure Hydrogen(H ₂)
Fuel Consumption	0.75m ³ /hr/kW
Efficiency(LHV)	Electric Efficiency 50%, Overall Efficiency over 90%
Features	Quick Startup(within 3 minutes), Low Noise(45dB or less), Zero Emissions of SO _x , NO _x , CO, CO ₂
Output Voltage	220V(Single Phase), 380V(Three Phase)
Start-up Time	Within 3 minutes
Application	Hydrogen Power Generation, Hydrogen Stations, Commercial Building Backup and Emergency Power Systems

*Product image and size may vary from the actual products.

☑ Battery Hybrid System



Model	ECOGENER BH 5K
Rated Output (Electricity/Heat)	5kW/7kW(Fuel Cell Output: 3.5kW/5kW for Base Load)
Size(W×D×H)	Custom-made
Hot Water Temperature	Max 55°C(May vary based on hot water usage)
Fuel	City Gas(LNG) or LPG
Fuel Consumption	LNG : 0.25m ³ /hr/kW, LPG : 0.13m ³ /hr/kW
Efficiency(LHV)	Electric Efficiency 35%, Overall Efficiency over 90%
Features	Grid-independent Operation, SOC(Battery Charge Level) Following Operation, Instant Peak Load 7 kW(Electric) Response
Output Voltage	220V(Single Phase), 380V(Three Phase)
Start-up Time	10msec
Application	Backup and Emergency Power Systems for Buildings

*Product image and size may vary from the actual products.

04

Installation Cases



Eulji Twin Tower 2019 / 48kW / NG6Km



G-Square 2020 / 180kW / NG6Km



Faculty and Staff Mutual Aid Association Bldg. 2017 / 35kW / NG5K



Corporate Training Center 2018 / 100kW/FP-100i



Private Power Generation Project 2017-2019 / 800kW/FP-100i



05

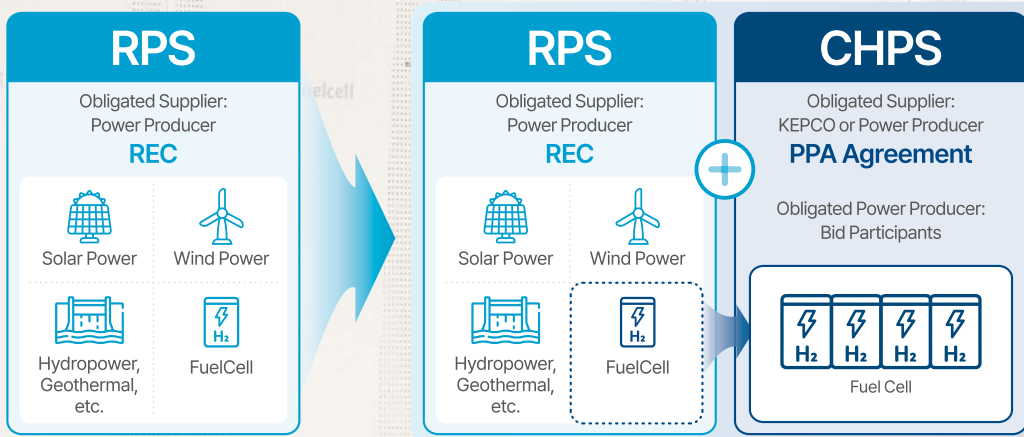
Clean Hydrogen Power Generation Fuel Cells

CHPS solution

CHPS : Clean Hydrogen Portfolio Standard

Clean Hydrogen Portfolio Standard (CHPS)

- Separation of hydrogen generation from RPS to establish a support system compatible with the characteristics of renewable energy and hydrogen generation, promoting the use of clean hydrogen in hydrogen generation
- Mandatory purchase of electricity by Korea Electric Power Corporation (KEPCO):
Operation of a bidding market, signing of a differential contract linked to fuel costs with the successful bidder
- A certain percentage of mandatory use is planned for power producers considering the economic viability



RPS

Renewable energy Portfolio Standard



REC

Renewable Energy Certificates

Clean Hydrogen Power Generation Fuel Cell System

ECOGENER 200K



☑ Large-Capacity Hydrogen Power System / High Efficiency (Electrical Efficiency) / Minimum Installation Area

*Product image and size may vary from the actual products.

MODEL	200kW Hydrogen Power System		
Product Name	ECOGENER HG 200K	Efficiency(LHV)	Electrical Efficiency 50%, Overall Efficiency over 85%
Power Output (Electricity/Heat)	200kW/144kW	Power Supply	220V(Single Phase), 380V(Three Phase)
Size(W×D×H)	4.5 × 1.7 × 1.8 m	Startup Time	Within 3 minutes
Hot Water Temperature	Max 50°C (May vary based on hot water usage)	Application Area	Hydrogen Power Generation, Hydrogen Stations, Auxiliary Power Supply And Emergency Power Generation for Commercial Buildings
Fuel and Consumption	Pure Hydrogen(H ₂), 0.75m ³ /hr/kW	Installation area (minimum)	200kW(1 unit) : approx. 24 square meters 1MW(5 units) : approx. 91 square meters 2MW(10 units): approx. 157 square meters
Features	Quick Startup(within 3 minutes), Low Noise(58dB or less), Zero emissions of SOx, NOx, CO		

Hydrogen Generation Demonstration Cases

Ulsan Technopark(300kW)

- Completed the demonstration of PEMFC generation system using by-product hydrogen
Cumulative power generation of 85MWh per unit
- Fuel cell system with verified stack durability
Voltage drop rate of 0.979μV/h
- Stack durability verified even with DSS (Daily Start & Stop) operation
- Durability verified during quick startups and ON/OFF operations



[Ulsan Technopark HGSOK Demonstration - Using By-product Hydrogen]

Taeon Thermal Power Complex Division, Korea Western Power Co. Ltd.(100kW)

- Korea Electric Power Corporation Research Institute in collaboration with Korea Western Power Co., Ltd. and Technology Development Service
- Enhanced system durability and accomplished 95% in-country production
- World's first successful demonstration operation of coal gasification fuel cell (IGFC)
Continuous operation for more than 400 hours



[Taeon Thermal Power Complex Division, Korea Western Power Co. Ltd. - IGFC System]

06

Fuel Cell Power Packs

ECOHYNER

ECOHYNER



MPD 2.5K



MPF 2.5K ~ 5K



MPF 10 ~ 15K

Customized fuel cell power packs from design to system

Suitable for electric power sources requiring a lot of energy, supplied as a modular package system

MODEL	MPD 2.5kW Fuel Cell Power Pack	MPF 2.5/5kW Fuel Cell Power Pack	MPF 10/15kW Fuel Cell Power Pack
Product Name	ECOHYNER 2.5K	ECOHYNER 2.5 ~ 5K	ECOHYNER 10 ~ 15K
Application	Drones, Small Generators	Forklifts, Small Generators	Forklifts, Small Generators
Size(W×D×H)	350 × 300 × 150 mm	2.5K : 600 × 380 × 410 mm	10K : 600 × 600 × 520 mm
		5K : 600 × 600 × 520 mm	15K : 1,000 × 650 × 600 mm
Fuel	Pure Hydrogen(H ₂)		
Fuel Consumption	0.78m ³ /hr/kW		
Efficiency(LHV)	Electric Efficiency of over 45%		
Features	Quick Startup(within 10 seconds), Zero emissions of SO _x , NO _x , CO		

*Product image and size may vary from the actual products.



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We Make
Free Energy Planet

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