

WHAT POWERS AN FCEV?

A Fuel Cell Electric Vehicle (FCEV) is powered by electricity generated from the electrochemical reactions between hydrogen and oxygen. The only by-product is pure, distilled water.¹

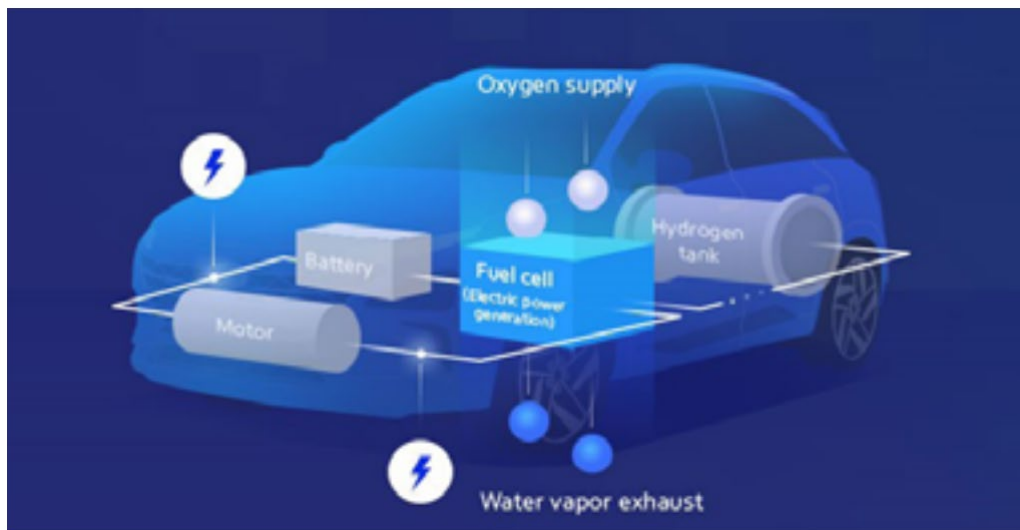


Figure 1 Schematic of FCEVs. Source: Hyundai Motor Company

The oxygen necessary to react with hydrogen is drawn from the atmosphere. Such air drawn into the FCEV passes through a 3-stage air purification system which cleans it of particulates, carbon-oxides, and other unwanted matter, leaving the air cleaner. In a way, it has an atmospheric “scrubbing” effect.

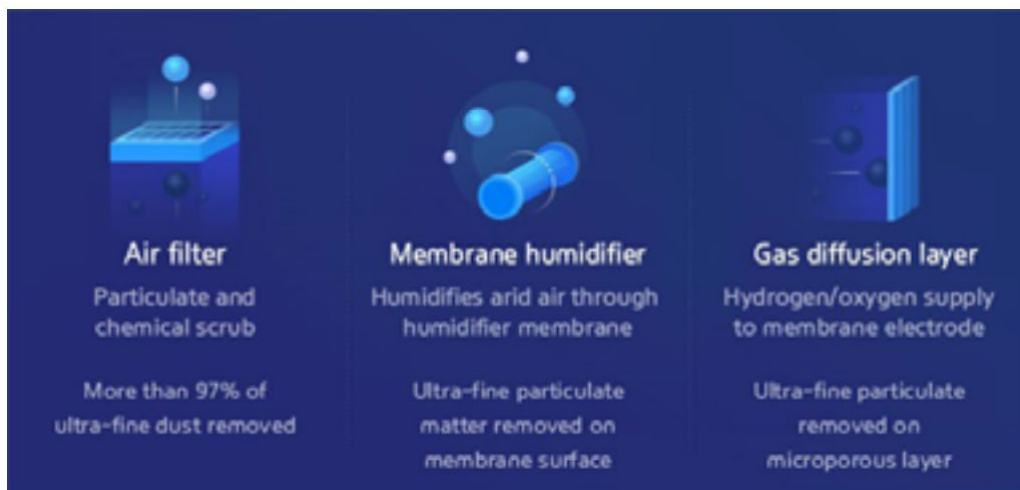


Figure 2 FCEVs Air Purification System. Source: Hyundai Motor Company

HOW IS AN FCEV DIFFERENT FROM OTHER GREEN VEHICLES?

EVs and HCEVs are environmentally sustainable vehicles with no exhaust emission. FCEVs take it a step further by scrubbing the air wherever they go, and are considered the most environmentally friendly vehicles. In 1 year, a medium-sized SUV will emit about 2.2 tons of CO₂. Offsetting that with

¹ Hyundai Motor Group, 'All About FCEVs: 1. What Powers an FCEV?', Hyundai Motor Group newsroom, 2020.02.28, <https://news.hyundaimotorgroup.com/Article/All-About-FCEVs-1-Whatpowers-an-FCEV?null>

an emission-free FCEV can be the equivalent of planting 600,000 trees (a single tree absorbs about 35kgs of CO₂ in a year).



Figure 3 CO₂ Absorption Effect of FCEVs Source: Hyundai Motor Company

Driving an FCEV for an hour can scrub enough air for about 42.6 adults. (calculations based on Hyundai NEXO).



Figure 4 Air purification effect of FCEVs Source: Hyundai Motor Company

HOW SAFE ARE FUEL CELL ELECTRIC VEHICLES?

Hydrogen is a relatively new and unfamiliar energy source to a majority of the public, but it has been a staple element used across industries for a long time. Safety as a source of fuel is one of its key features.²

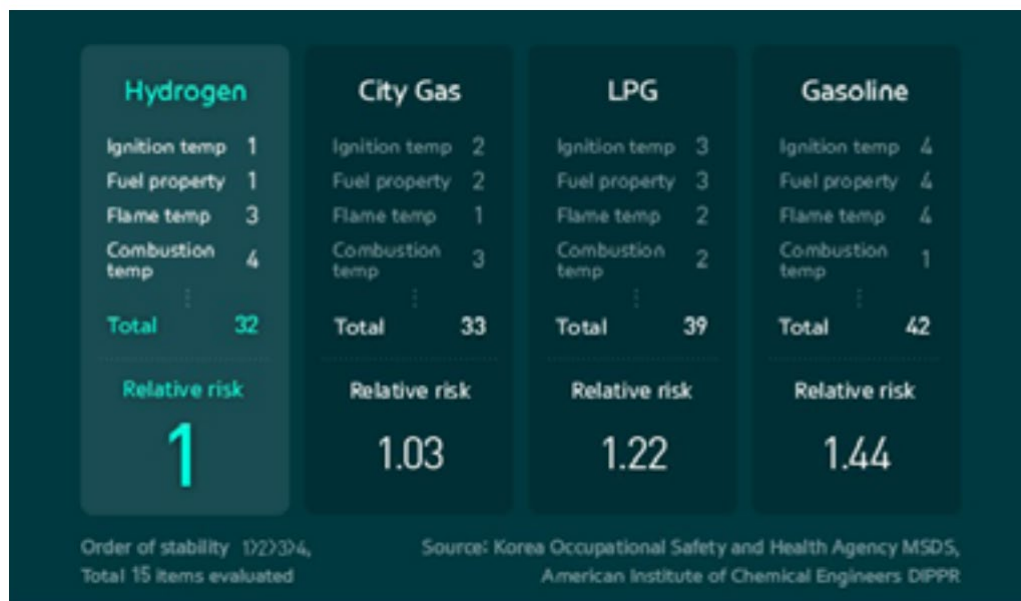


Figure 5 Relative risks by fuel type. Source: Hyundai Motor Company

A FCEV's hydrogen tank undergoes various tests to receive international safety certification, including drop impact tests, bullet penetration tests, and bonfire tests.



Figure 6 Key tests for hydrogen tank safety. Source: Hyundai Motor Company

FCEVS STATUS

² Hyundai Motor Group, 'All About FCEVs: 2. How Safe are Fuel Cell Electric Vehicles?', Hyundai Motor Group newsroom, 2020.02.28, <https://news.hyundaimotorgroup.com/Article/How-safe-are-FuelCell-Electric-Vehicles?null>

FCEV adoption has already gained impressive traction in countries that have implemented pro-hydrogen policies and infrastructure.³

The prevalence of FCEVs is growing rapidly around the world.⁴

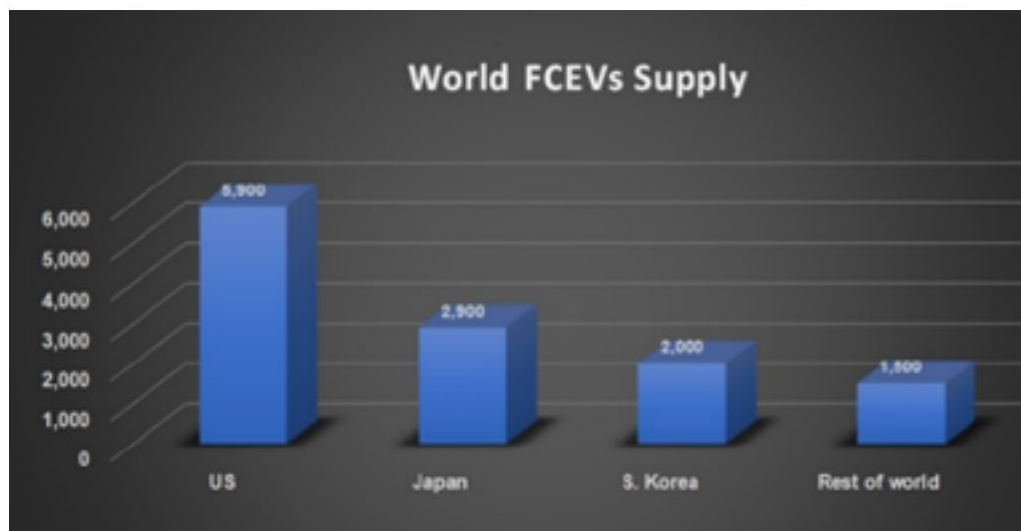


Figure 7 World FCEVs Supply Source: Hyundai Motor Company

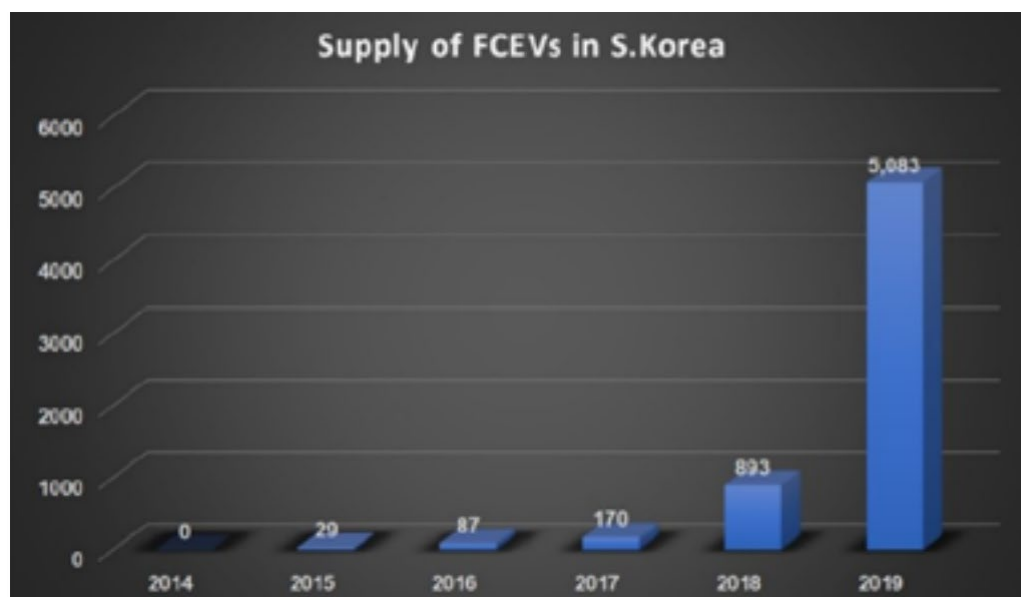


Figure 8 Supply of FCEVs in S. Korea Source: Ministry of Land, Infrastructure and Transport

SUPPLY OF HYDROGEN STATIONS

Currently, there is 1 ICE fuel station for every 1,814 vehicles and 1 LPG gas station at 1,037 vehicles. To build a hydrogen station at a similar level, 2,000 hydrogen stations will be needed by 2040, when the cumulative distribution of hydrogen-electric vehicles is estimated to be 2.9 million.

³ Hyundai, 'H2 Economy Today', Bloomberg, 2020.02.28, https://sponsored.bloomberg.com/news/sponsors/features/hyundai/h2-economytoday/?adv=16713&prx_t=aXwFAAAAAAZ6MQA&prx_ro=s

⁴ 2019년 12월 자동차 등록자료 통계, 국토교통부 통계누리, 2019

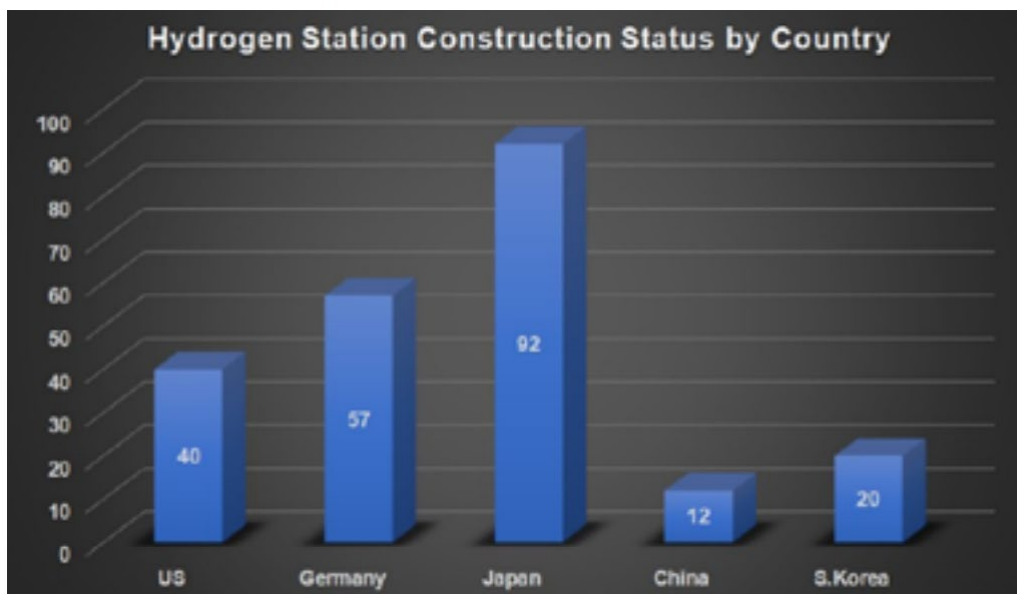


Figure 9 Hydrogen Station Construction Status by Country Source: Hyundai Motor Company

FCEVS SEMINARS SUPPLY OF HYDROGEN STATIONS

In 2019, four Task 35 seminars were held.

The first Task 35 seminar was held at University of Ulsan, Ulsan, Republic of Korea on 26th April, 2019. The topics presented and discussed at the seminar were:

- Research Trends of Advanced Fuel Cell Technology and Applied Technology.
- Research Trends on the Materials of Fuel Cell Electrolytes.

The second Task 35 seminar was held on 30th April, 2019 in Ulsan Science and Technology Promotion Centre, Ulsan, Republic of Korea. The topics presented and discussed at the seminar were:

- Current Status of Electric Bus Technology in Thailand.
- Republic of Korea's fuel cell electric vehicle technology exchange.

The third Task 35 seminar was held at University of Ulsan, Ulsan, Republic of Korea on 3rd July, 2019. Seminars were held for relevant companies and students. The topics presented and discussed at the seminar were:

- Research Trends of vehicle component performance about FCVs.
- FCVs Thermal Management System Analysis and Optimisation.
- Performance Improvement of FCVs Technology and Vehicle Parts.

The fourth Task 35 seminar was held on the 24th September, 2019 at the Hyundai Hotel, Ulsan, Republic of Korea. The seminar was attended by fuel cell companies, researchers, professors and students from Republic of Korea and Vietnam. The topics presented and discussed at the seminar were:

- Improvement of Environmental Problems of FCVs.
- Performance and convenience of FCVs

Date	Content	Place
26.04.2019	<ul style="list-style-type: none"> • Research Trends of Advanced Fuel Cell Technology and Applied Technology • Research Trends on the Materials of Fuel Cell Electrolytes 	University of Ulsan, Ulsan, Republic of Korea
30.04.2019	<ul style="list-style-type: none"> • Current Status of Electric Bus Technology in Thailand • Republic of Korea's fuel cell electric vehicle technology exchange 	Ulsan Science and Technology Promotion Centre, Ulsan, Republic of Korea
03.07.2019	<ul style="list-style-type: none"> • Research Trends of vehicle component performance about FCVs • FCVs Thermal Management System Analysis and Optimization • Performance Improvement of FCVs Technology and Vehicle Parts 	University of Ulsan, Ulsan, Republic of Korea
24.09.2019	<ul style="list-style-type: none"> • Improvement of Environmental Problems of FCVs • Performance and convenience of FCVs 	Hyundai Hotel, Ulsan, Republic of Korea

Table 1 Seminar schedule for 2019