

# IEA-Advanced Motor Fuels ANNUAL REPORT 2023

## REPUBLIC OF KOREA



## Republic of Korea

### Drivers and Policies

#### Renewable Fuel Standards

Korea introduced and distributed transportation biofuels in 2022 to improve the atmosphere quality and began 0.5% mixing for the first time in 2007. As of 2023, biofuels that have been commercialized and distributed in Korea include biodiesel for transportation (diesel fuel replacement) and bio-heavy oil (B-C) for power generation. Bioethanol for transportation, which is used in major overseas countries, has not yet been commercialized in Korea.

The Korean government is implementing the Renewable Fuel Standards (RFS), a system that requires transportation fuel suppliers to mix biofuels with existing fossil fuels at a certain ratio. The RFS is based on Article 23(2) of the Renewable Energy Act, revised in 2013, and has been in effect since July 31, 2015, following a 2-year grace period after the revision of the law.

Currently, transportation fossil fuels and renewable energy fuels subject to mandatory mixing are limited to ‘automobile diesel’ and ‘biodiesel,’ respectively. The mandatory mixing amount is determined by multiplying the domestic sales of transportation fuel by the annual mixing obligation ratio.

The mandatory mixing ratio was 2.5% from the beginning of the RFS in 2015 until 2017 and was revised to 3.0% in January 1, 2018, and 3.5% in 2023; it will be raised to 5.0% by 2030. In addition, the Korean government plans to expand the mandatory mixing ratio from 5% to 8% through the introduction of next-generation biodiesel<sup>1</sup> in order to revitalize biofuels, as described in the ‘‘Eco-Friendly Biofuel Expansion Plan’’ dated October 2022 (Table 1).

Table 1. Ratio of New and Renewable Energy Fuel Blending to Transportation Fuel<sup>a</sup>

Year	Blending Ratio
2015	0.025
2016	0.025
2017	0.025
2018	0.03
2019	0.03
2020	0.03
January 2021–June 2021	0.03
July 2021–December 2021	0.035
2022	0.035
2023	0.035
2024	0.04
2025	0.04
2026	0.04
2027	0.045
2028	0.045
2029	0.045
After 2030	0.05

<sup>a</sup> To determine the compulsory blending amount by year, multiply the compulsory blending ratio by year by the domestic sales volume of transportation fuel, including mixed renewable energy fuels.

<sup>1</sup> Next-generation biodiesel = a biodiesel with the same chemical properties as ordinary diesel that will be introduced in 2026.

### Advanced Motor Fuels Statistics

Table 2 lists the number and ratio of vehicles registered in Korea by year and fuel type from 2016 to 2023.

Table 2. Vehicles Registered in Korea, 2016–2023

Fuel	2016	2017	2018	2019	2020	2021	2022	2023
Total	21,803,351	22,528,295	23,202,555	23,677,366	24,365,979	24,911,101	25,657,123	25,949,201
Gasoline	10,092,399	10,369,752	10,629,296	10,960,779	11,410,484	11,759,565	12,069,043	12,314,186
	(46.29%)	(46.03%)	(45.81%)	(46.29%)	(46.83%)	(47.21%)	(47.04%)	(47.45%)
Diesel	9,170,456	9,576,395	9,929,537	9,957,543	9,992,124	9,871,951	9,758,173	9,500,164
	(42.06%)	(42.52%)	(42.80%)	(42.06%)	(41.01%)	(39.63%)	(38.03%)	(36.61%)
LPG	2,167,094	2,104,675	2,035,403	2,004,730	1,979,407	1,945,674	1,904,860	1,832,535
	(9.94%)	(9.34%)	(8.77%)	(8.77%)	(8.12%)	(7.81%)	(7.42%)	(7.06%)
HEV	233,216	313,856	405,084	506,047	674,461	908,240	1,170,507	30,352
	(1.07%)	(1.39%)	(1.75%)	(2.14%)	(2.77%)	(3.65%)	(4.56%)	(0.12%)
CNG	38,880	38,918	38,934	38,147	36,940	35,208	32,780	1,542,132
	(0.18%)	(0.17%)	(0.17%)	(0.16%)	(0.15%)	(0.14%)	(0.13%)	(5.94%)
EV	10,855	25,108	55,756	89,918	134,962	231,443	389,855	543,900
	(0.05%)	(0.11%)	(0.24%)	(0.38%)	(0.55%)	(0.93%)	(1.53%)	(2.10%)
H <sub>2</sub>	87	170	893	5,083	10,906	19,404	29,623	34,258
	(0.00%)	(0.00%)	(0.00%)	(0.02%)	(0.04%)	(0.08%)	(0.12%)	(0.13%)
Other <sup>a</sup>	90,364	99,421	107,652	115,119	126,695	139,616	148,237	151,674
	(0.41%)	(0.44%)	(0.46%)	(0.49%)	(0.52%)	(0.56%)	(0.58%)	(0.58%)

<sup>a</sup> Other fuels (kerosene, alcohol, solar, liquefied natural gas [LNG]) and towed vehicles (trailers, etc.)

As of the end of 2023, the cumulative number of registered automobiles in Korea was 25,949,000 — up 1.7% (446,000 vehicles) from the end of the previous year. At the end of December 2023, the number of new registrations was 1,759,000: 831,000 gasoline cars, 294,000 diesel cars, 67,000 liquefied petroleum gas (LPG) cars, 391,000 hybrid vehicles, 163,000 electric vehicles (EVs), and 5,000 hydrogen (H<sub>2</sub>) cars.

The cumulative number of registered vehicles using fossil fuels decreased for the first time compared to the previous year, and eco-friendly (electric, hydrogen, hybrid) vehicles are steadily increasing. In 2023, the cumulative number of EVs increased by 39.5% compared to the previous year (to 543,900). Korea aims to increase the proportion of eco-friendly, domestically produced vehicles to 33% by 2030. H<sub>2</sub>-fueled vehicles increased by 15.6% compared to the previous year (to 34,258). Through the next-generation H<sub>2</sub> fuel system development project, the government is pushing to increase the fuel efficiency of H<sub>2</sub> vehicles by more than 30% by investing USD 24 million by 2024.

### Research and Demonstration Focus

#### Biodiesel

Biodiesel is mainly made using waste cooking oil, animal oil, palm oil, and by-products (palm fat acid distillate [PFAD]) of refined palm oil. Biodiesel, which has been in use since 2006, is distributed by mixing 3.5% (2023) in diesel for automobiles. Based on the total domestic sales and fuel mixing of the mixed obligators by year, the mixing performance ratios from 2015 to 2018 were 2.58%, 2.52%, 2.53%, and 3.03%, respectively, indicating that the target obligation ratio stipulated in the law has been achieved each year (Table 2).

Table 3. Year-over-year performance of RFS obligations

Business year	Domestic sales volume (A, kℓ)	New/Renewable energy fuel mixing volume (B, kℓ)	Mixing ratio (C=B÷A×100, %)
2015	8,693,516	224,145	2.58
2016	23,032,087	580,953	2.52
2017	24,727,402	624,534	2.52
2018	25,083,294	759,475	3.03

Source: Ministry of Trade, Industry and Energy/Korea Energy Agency (2019.04.11)

Looking at the supply status of biodiesel in Korea by year, the actual production of biodiesel increased every year until 2019. On the other hand, in the case of ‘Supply capacity,’ which means the maximum production capacity of biodiesel each year, the degree of increase was not significant compared to the trend of increase in production (Table 4).

Table 4. Domestic biodiesel supply performance by year

Year	Production (kℓ)	Supply capacity (kℓ/year)
2006	58,945	333,000
2007	105,705	507,700
2008	196,289	743,204
2009	280,872	1,142,900
2010	394,278	1,104,400
2011	372,979	1,204,400
2012	399,463	1,204,400
2013	409,635	1,177,468
2014	430,298	887,087
2015	489,839	854,687
2016	491,519	854,687
2017	475,087	1,008,630
2018	697,177	2,283,370
2019	713,992	1,441,330
2020	704,037	1,237,630
2021	609,253	1,259,230
2022	696,958	1,325,880

Source: Ministry of Trade, Industry and Energy/Korea Energy Agency, "2022 New/Renewable Energy Supply Statistics."

### Bioethanol

In 2016, Korea began an empirical study of bioethanol supply, with the results for manufacturing, supply, infrastructure, and applicability of fuel verified in 2019.

One gas station was selected, and equipment and storage problems were checked for 365 days by season. The study examined the exhaust gas and vehicle conditions of four demonstration vehicles after endurance driving up to about 45,000 km.

In addition, from 2019 to 2020, Korea conducted a 9-month feasibility review study aimed at expanding the introduction of biofuels in the domestic transportation field. The study determined that more careful review is necessary for the future introduction of bioethanol.

### Hydrogen and Electricity

Since 2021, hydrogen engines (vehicle and power generation) have been reflected in policies aimed at carbon neutrality, fostering the hydrogen industry, and developing the automotive industry.

#### **Government**

- The 1<sup>st</sup> Basic Plan for the Implementation of the Hydrogen Economy (2021.11, Ministry of Trade, Industry and Energy): The plan presents development of hydrogen engines for vehicles, LPG convergence charging stations, and smart power supply and demand plans using pipelines and hydrogen engines.
- The 5<sup>th</sup> Hydrogen Economy Committee (2022.11, joint session of relevant ministries presided over by the Prime Minister): The committee's goal is to diversify distributed power sources by creating large-scale demand for hydrogen and developing hydrogen engines. The government intends to establish standards and operation plans for clean hydrogen and introduce the "Korean clean hydrogen certification system" that can be used internationally by 2024. The committee also proposed a vision of Korea as a hydrogen-leading country.

#### **Industry**

- HD Hyundai Infracore announced the commercialization of hydrogen engines during 2025. The company is mass-producing HD Hyundai Infracore hydrogen engines (11 liters, 200–300 kW class) by 2024, and is pursuing additional technology development and lineup expansion. In early 2024, the hydrogen engine will be installed on a low-floor bus, and after that, it will gradually expand to equipment such as trucks and excavators.
- In 2024, Korea East-West Power will start developing a hydrogen power plant engine for power generation. HD Hyundai Heavy Industries Group announced the success of the LNG-hydrogen mixed combustion engine development in December 2022 and is pushing for it to be used as a ship engine and a land power generation engine.

#### **Outlook**

The Korean government announced a plan to expand eco-friendly biofuels in October 2022, including expanding the supply of existing biofuels and promoting the introduction of new biofuels.

#### **Biodiesel**

The Korean government is pushing to raise the current mandatory mixing ratio for diesel cars to 8% in 2030 by expanding the introduction of renewable diesel. The plan addresses the composition of renewable diesel task force, quality and performance evaluation criteria after empirical analysis, and establishment of a plan to increase the mandatory mixing ratio of RFS by year (2024~2025)

#### **Bioethanol**

Safety, eco-friendliness, and economic feasibility will be reviewed through private-led pilot projects beginning in 2024 that address vehicles of public institutions, test gas stations.

#### **Sustainable Aviation Fuel**

The sustainable aviation fuel (SAF) production-demand industry is participating in a demonstration project (2023–2024) to promote the introduction of SAFs in Korea by 2026. The project includes the following elements:

- Establishment of quality standards in time for domestic production (currently under investment plan for refiners) and inclusion of new targets for RFS application.
- Public-private consultative body<sup>2</sup> to prepare and promote supply plans, such as applying RFS to bio-airline oil, establishing infrastructure, and preparing incentives (around November 2022).

In January 2024, the Oil Business Act was revised by the National Assembly plenary session, securing a legal basis for SAF production.

#### **Additional Information Sources**

- [K-Petro](#)
- [Korea Register](#)
- [Ministry of Trade, Industry and Energy](#)
- [Korea Automobile Manufacturers Association](#)

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<sup>2</sup> Participation of the Ministry of Trade, Industry and Energy (MOTIE), the Ministry of Land, Infrastructure and Transport (MOLIT), the Petroleum Association, the Aviation Association, and oil refiners and airlines.