

# IEA-Advanced Motor Fuels ANNUAL REPORT 2016

An aerial photograph of a city, likely Tokyo, Japan, showing a dense urban area with many skyscrapers and buildings. In the foreground, there is a large, lush green forest. A highway with several lanes of traffic is visible in the lower part of the image. A bridge spans across a body of water in the middle ground.

Japan

# Japan

## Drivers and Policies

Fossil fuel plays a central role as a source of energy in Japan. The country’s domestic sources of fossil fuel are limited, however, making it dependent on imports. The “Basic Act of Energy Policy” was enacted in June 2002 for the purpose of ensuring the steady implementation of energy policy.

The point of the energy policy is to first and foremost ensure stable supply (“Energy Security”) and to realize low-cost energy supply by enhancing its efficiency (“Economic Efficiency”) on the premise of “Safety.” It is also important to make maximum efforts to pursue environment suitability (“Environment”).

In terms of primary energy, Japan’s new Strategic Energy Plan, approved in April 2014, discusses the use of nuclear power and ensuring safety, improving the efficiency of electricity generation, expanding the use of liquefied natural gas (LNG) and liquefied petroleum gas (LPG), and places an emphasis on reducing the cost of renewable energy.

On April 30, 2015, the Ministry of the Environment (MOE) and the Ministry of Economy, Trade and Industry (METI) presented a Government proposal that sets a target for the level of greenhouse gases in 2030 “to be reduced by 26% compared to the level in 2013.”

In the transportation sector, in order to improve the energy efficiency of automobile transportation, Japan will take measures such as increasing the ratio of next-generation vehicles (e.g., hybrid vehicles, electric vehicles [EVs], plug-in hybrid vehicles [PHEVs], fuel cell vehicles [FCVs], clean diesel vehicles, and compressed natural gas [CNG] vehicles) to all new vehicles to 50% to 70% by 2030.

Now that biofuels, electricity, natural gas, LPG, and hydrogen are available as energy sources, an environment is being created in which consumers’ vehicle choice promotes competition not only for fossil fuels, but for a wider variety of energy sources.

In spreading and expanding the introduction of next-generation vehicles, research and development (R&D) and infrastructure building are indispensable. Thus, the Government of Japan and the private sector will collaborate to disseminate infrastructure for next-generation vehicles.

## Advanced Motor Fuels Statistics

Figure 1 shows the energy sources used in the transportation sector [1] in Japan. Oil-related energy accounts for 97.8% of total usage. The market for alternative fuels is very small in Japan, as is the number of alternative fuel vehicles (Table 1). Methanol, CNG, hybrid, EVs, and FCVs currently constitute the low-emission vehicles. The number of hybrid vehicles is rather large, owing to the number of passenger hybrid vehicles. CNG vehicles currently account for the largest number of vehicles in the low-emission truck category. The penetration of FCVs in the market has already launched; Japan has 630 FCVs.

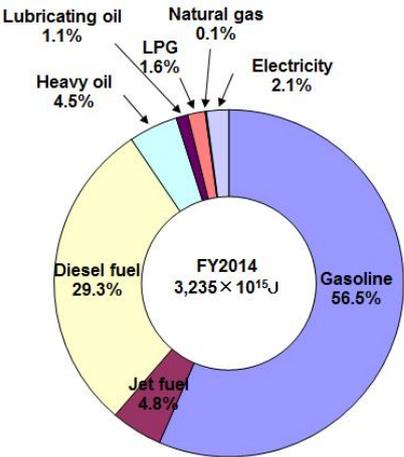


Fig. 1 Energy Sources Used in the Transportation Sector in Japan in 2014

Table 1 Current Penetration of Low-Emission Vehicles in Japan

Vehicle Type	Methanol [2]	CNG [3]	Hybrid [4]	EV [4]	FCV [4]	Vehicle Registration [5]
Passenger vehicles	0	1,591	5,558,725	62,134	630	39,506,932
Light, mid-, and heavy-duty trucks	576	5,928 19,723	14,026	1,270	0	5,868,283
Buses	0	1,577	1089	39	0	232,169
Special vehicles	0	3,988	7,729	37	0	1,712,158
Small vehicles	0	10,416	239,962	17,031	0	Not available
<b>Total</b>	576	43,223	5,821,531	80,511	630	Not available

## Research and Demonstration Focus

### Hydrogen

The Revised Version of the Strategic Roadmap for Hydrogen and Fuel Cells [6], which includes new goals and specific explanations of the new efforts to be undertaken, was released on March 22, 2016. In concrete terms, the revised version of the roadmap stipulated the following.

1. Future price targets for household fuel cells.
2. Targets for the dissemination of FCVs: in total, about 40,000 vehicles by 2020, about 200,000 vehicles by 2025, and about 800,000 vehicles by 2030.
3. Targets for the construction of hydrogen stations: about 160 stations by 2020 and about 320 stations by 2025.
4. Clarification of descriptions concerning hydrogen power generation.
5. The technical and economic challenges concerning the utilization of hydrogen generated using renewable energy.

### Natural Gas

Approximately half of the natural gas vehicles (NGVs) in Japan are commercial vehicles such as trucks, buses, or garbage trucks. Of the trucks, the majority are light- to medium-duty vehicles designed for short- or medium-distance transportation.

In this context, Isuzu Motors Limited announced the Giga CNG in December 2015 [7]. The introduction of this heavy-duty CNG truck to the market is expected to increase the use of NGVs for long-distance transportation. In addition, events such as the opening of the first combined gasoline and L-CNG filling station in Japan at the Keihin Truck Terminal in March 2016, hints at future, more widespread use of NGVs in the commercial vehicles sector.

Many papers concerning natural gas engines presented at the 26th Internal Combustion Engine Symposium held in Japan from December 8 to 10, 2015, included research on the impact of hydrogen and carbon dioxide on knock resistance, research investigating the effects on combustion and fuel efficiency with a compression ignition (CI) engine, and research investigating the effects on exhaust emission and fuel efficiency with a dual fuel engine using diesel fuel and CNG.

A Ministry of Land, Infrastructure Transport and Tourism project is pursuing research on boil-off gas countermeasures as part of an effort to commercialize heavy-duty LNG vehicles with a long-distance cruising range.

### Bioethanol

A project underway in Okinawa Prefecture to promote the use of biofuels supplied roughly 72,000 kiloliters (kL) of E3 and E10 fuel in FY 2015, and had established 34 service stations supplying E3 fuel and 32 service stations supplying E10 fuel as of March 2016. [8]. In Miyakojima City, the Japanese Government is continuing to support a verification project for the high-efficiency production

of bioethanol from molasses and the promotion and dissemination of E3 biofuel based on previous successes [9]. In contrast, the number of service stations in Japan selling bio-gasoline blended with ethyl tertiary-butyl ether (ETBE) decreased by approximately 2% from April 2015 to 3,230 stations as of April 10, 2016 [10].

### **Methanol/Dimethyl ether (DME)**

DME is attracting attention as an alternative fuel to diesel because it can be easily produced from methanol. Two Japanese companies — Mitsubishi Gas Chemical Company Inc. and Mitsubishi Corporation — have plans to produce DME for vehicles in Trinidad and Tobago, and Isuzu Motors, Ltd. is supplying low-pollution vehicles with DME engines [11].

Field tests on public roads in Japan have been conducted after obtaining ministerial authorization, and a technical standard proposal for DME vehicles has been drafted based on the resulting data. The Ministry of Land, Infrastructure Transport and Tourism officially announced the applicable standards in January 2015, thus opening the door for the approval and registration of the remodeling of DME vehicles in Japan. In June 2016, a DME truck compliant with the safety regulations became the first such registered vehicle [12].

### **Outlook**

In April 2014, the Japanese Government approved the new Strategic Energy Plan (the fourth plan) [13], which forms the basis for Japan's energy policies for the immediate future. The basic concepts behind this plan are ensuring stable energy supplies, economic efficiency, and environmental suitability. With the addition of safety to these concepts, the plan is now summed up as "3E+S."

### **References**

- [1] Government's white paper on energy, 2016 (in Japanese).
- [2] LEVO, the Organization for the Promotion of Low Emission Vehicles (cumulative total number: out of production).
- [3] Japan Gas Association (JGA), as of March 2016.
- [4] Next Generation Vehicle Promotion Center (NeV), as of March 2016 (estimated number).
- [5] Automobile Inspection and Registration Information Association, as of October 2016.
- [6] Agency for Natural Resources and Energy, 2016, the Revised Version of the Strategic Roadmap for Hydrogen and Fuel Cells, March 22.
- [7] Isuzu Motors Limited, website; <http://www.isuzu.co.jp/product/giga/cng/> (in Japanese).
- [8] Miyakojima City website; <http://www.city.miyakojima.lg.jp/gyosei/ecoisland/index.html> (in Japanese).
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- [10] Petroleum Association of Japan website; <http://www.paj.gr.jp/eco/biogasoline/> (in Japanese).
- [11] 6th International DME Conference, 2014, San Diego, California, October 7–9.
- [12] IEA-AMF Newsletter, "First DME Truck Registered in Japan," October 2015, issue no. 3/2015, [http://www.iea-amf.org/app/webroot/files/file/Newsletters/AMFnewsletter\\_3-2015.pdf](http://www.iea-amf.org/app/webroot/files/file/Newsletters/AMFnewsletter_3-2015.pdf).
- [13] Ministry of Economy, Trade and Industry (METI), Agency for Natural Resources and Energy, as of April 11, 2014, Cabinet Decision on the New Strategic Energy Plan, [http://www.meti.go.jp/english/press/2014/0411\\_02.html](http://www.meti.go.jp/english/press/2014/0411_02.html).

### **Additional Information Sources**

- Japan's Energy White Paper, 2016, [http://www.enecho.meti.go.jp/en/category/whitepaper/pdf/whitepaper\\_2016.pdf](http://www.enecho.meti.go.jp/en/category/whitepaper/pdf/whitepaper_2016.pdf)
- Agency for Natural Resources and Energy, Long-term Energy Supply and Demand Outlook, [http://www.meti.go.jp/english/press/2015/pdf/0716\\_01a.pdf](http://www.meti.go.jp/english/press/2015/pdf/0716_01a.pdf)

**Benefits of Participation in the AMF TCP**

Participation in the AMF TCP makes it possible to obtain the latest information on advanced motor fuels for stakeholders, policy makers, and industry in the world. AMF TCP activities facilitate an international network on advanced motor fuels.