

Country Reports

IEA Bioenergy: 09 2018

This report was prepared from the 2018 OECD/IEA World Energy Balances, combined with data and information provided by the IEA Bioenergy Executive Committee and Task members. All individual country reports were reviewed by the national delegates to the IEA Bioenergy Executive Committee, who have approved the content. General background on the approach and definitions can be found in the central introductory report¹ for all country reports.

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NATIONAL POLICY FRAMEWORK IN JAPAN

Japan has national targets in FY2030 as follows. The overall target is that renewable energy should account for 13 to 14% of primary energy supply. The target for electricity is that the power source mix should include 22 to 24% of total power generation coming from renewable energy, and 3.7 to 4.6% of total power generation coming from biomass.

Table 1: Japan's renewable energy targets for 2030

Sector	Share per sector
Overall target	13-14% of primary energy supply by 2030
Heating and cooling	-
Electricity	22-24% of total power generation by 2030
Transport	-

The main instrument to promote bioenergy in Japan is the Feed-in tariff for electricity from renewable energy sources, which has been in force since 2012.

The "Strategic Energy Plan" by the Cabinet of the Japanese government is the basis for the orientation of Japan's new energy policy and it has been reviewed about every 3 years. The latest version was formulated in April 2014, which was the first after the Great East Japan Earthquake and the accident at

¹ Available at <https://www.ieabioenergy.com/iea-publications/country-reports/2018-country-reports/>

Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi Nuclear Power Plants in 2011.

Following that Plan, Ministry of Economy, Trade and Industry (METI) released the "Long-term Energy Supply and Demand Outlook" in July 2015². Utilization of biomass energy is one of the major approaches to expand positively as well as geothermal and hydroelectric. They can operate stably independent of the natural conditions, thereby securing base load power sources and reducing dependence on the nuclear power plants.

The Long-term Energy Supply and Demand Outlook drew up the outlook of the energy supply-demand structure in FY2030 from a mid- to long-term viewpoint in light of the Strategic Energy Plan. For primary energy supply, renewable energy accounts for 13 to 14%, which is greater than nuclear power 10 to 11%. For power sources mix, biomass power accounts for 3.7 to 4.6%, which surpasses wind power 1.7%.

In August 2017, METI has started discussion on latest energy situation toward the revision of the Plan.

A detailed description of all fiscal and non-fiscal supports for bioenergy development is available at: http://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/021/pdf/021_005.pdf (in Japanese).

TOTAL PRIMARY ENERGY SUPPLY (TPES) AND THE CONTRIBUTION OF BIOENERGY

The total primary energy supply of Japan in 2016 amounted to 17,833 petajoule (PJ) and is overwhelmingly dominated by fossil fuels (94%). Oil products account for 42% (7,400 PJ), coal for another 27% (4,789 PJ) and natural gas for around 24% (4,258 PJ). Nuclear energy represents a small fraction of 1.1% (197 PJ). There is also a small share of energy from non-renewable waste (1.4% or 243 PJ). Renewable energy sources have a share of 5.3% or 946 PJ – 1.9% bioenergy and 3.4% other renewable energy sources.

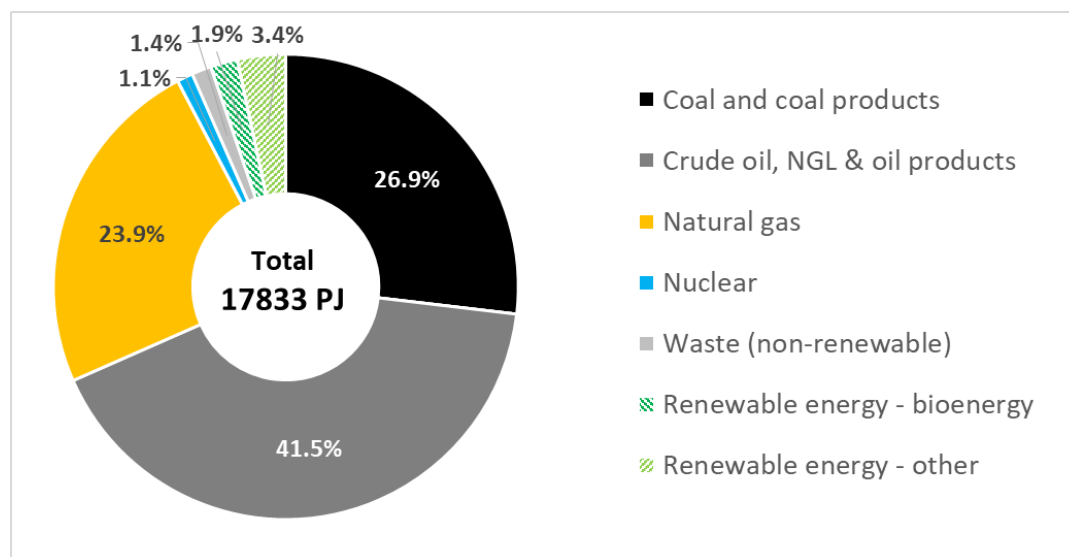


Figure 1: Total primary energy supply in Japan in 2016 (Source: World Energy Balances © OECD/IEA 2018)

Compared to 6 years earlier (2010) the primary supply levels of nuclear energy has dramatically reduced from 15% to around 1%, which is related to the 2011 earthquake/tsunami and related

² Available at: http://www.meti.go.jp/english/press/2015/pdf/0716_01a.pdf

problems with a nuclear reactor. Meanwhile, the shares of all fossil energy sources have increased: oil products increased from 40.6% to 41.5%, but particularly natural gas (17.3% to 23.9%) and coal (23.2% to 26.9%) have seen major increases. In the same period there was a moderate increase of renewable energy from 4.0% to 5.3%, with the main increase in other (non-bioenergy) renewable energies.

The total primary energy supply of renewable energy sources is split between one third bioenergy (336 PJ), 30% hydropower (284 PJ), 20% solar energy (193 PJ), 10% geothermal energy (98 PJ) and a small fraction of wind energy (21 PJ).

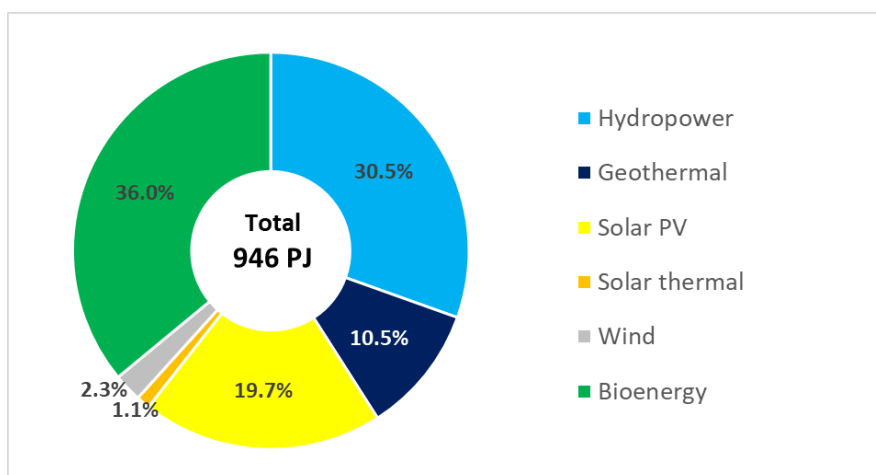


Figure 2: Total primary energy supply of Renewable Energy Sources in Japan in 2016 (Source: World Energy Balances © OECD/IEA 2018)

Most of the bioenergy consumed in Japan comes from solid biomass (298 PJ), of which only 0.5 PJ in residential applications. Biogasoline (16 PJ) and renewable municipal waste (15 PJ) each represent around 5% of total bioenergy. Biogas (6 PJ) represents less than 2% and biodiesel only 0.5 PJ.

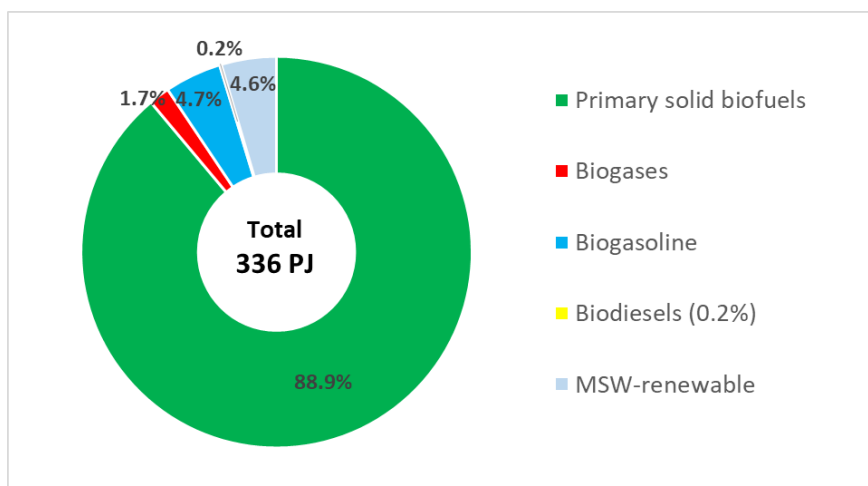


Figure 3: Total primary energy supply from bioenergy in Japan in 2016 (Source: World Energy Balances © OECD/IEA 2018)

The share of bioenergy in TPES is around 2%. From 2005 to 2010 bioenergy consumption in Japan grew by around 60%. This was particularly related to a growth in solid biomass use for energy. After 2010 solid biomass stabilized between 280 and 300 PJ. Energy from renewable MSW was introduced between 2005 and 2010; from 2010, levels of renewable MSW were stable at around 26 PJ per year. The figure of 2016 indicates a drop in energy from MSW (to 15 PJ) – new figures for 2017 will show if this is a consistent trend. Liquid biofuels (in particular biogasoline) were introduced between 2005 and 2010.

Since 2012 biogasoline is experiencing a consistent growth, doubling from 8 PJ in 2012 to 16 PJ in 2016. The role of biogas was relatively modest up to 2015, with a step increase of 6 PJ in 2016.

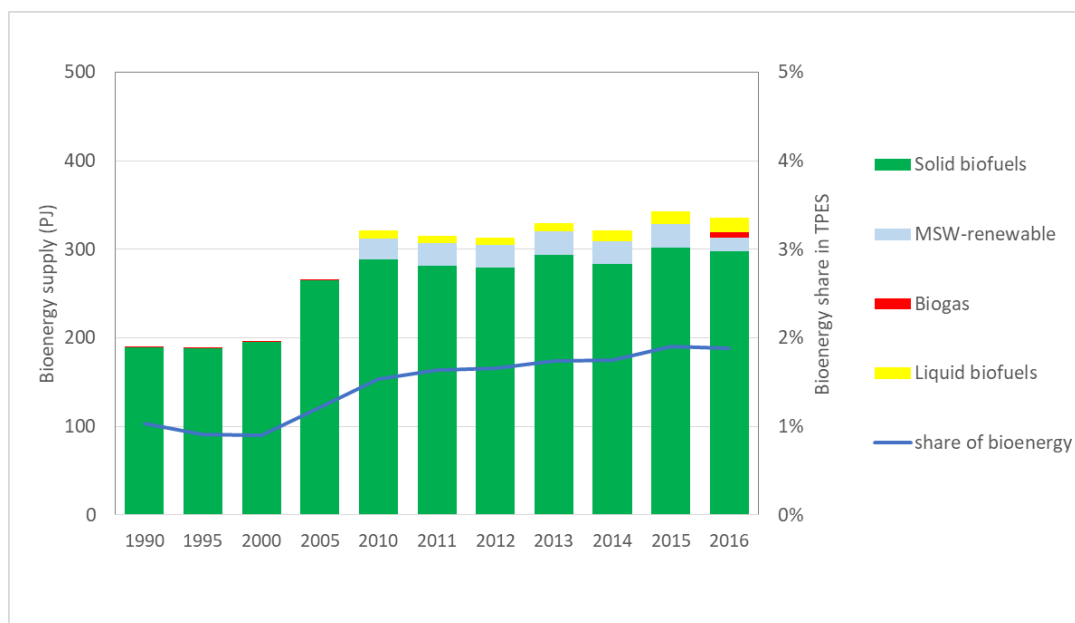


Figure 4: Development of total primary energy supply from bioenergy in Japan 1990 – 2016 (Source: World Energy Balances © OECD/IEA 2018)

Table 2 expresses the 2016 TPES figures per capita, considering Japan’s population of 127.0 million people. Compared to the other 22 member countries of IEA Bioenergy (expressed per capita), Japan ranks in the low end for all bioenergy carriers.

Table 2: Total primary energy supply per capita in 2016

	GJ/capita
Total energy	140.4
Bioenergy	2.6
Solid biofuels	2.3
Renewable MSW	0.12
Biogas	0.05
Liquid biofuels	0.13

Source: World Energy Balances © OECD/IEA 2018

Role of bioenergy in different sectors

Japan has a moderate share of around 15% renewable electricity in 2016, half of it from hydropower, one third from solar energy and about 10% from biomass.

The share of biofuels for transport is around 0.3% of transport energy consumption.

Overall, the direct share of biomass for heating in the different sectors is around 3.5%. In the residential

sector biomass use for heat is very low. Heat output generated and sold by CHP plants and heat plants is at very low level, for which no biomass use is reported.

Table 3: Role of bioenergy and renewable energy in electricity production, transport energy consumption and fuel/heat consumption in 2016

Sector	Share of bioenergy	Share of renewable energy	Overall production/ consumption
Electricity production	1.6%	14.8% (7.5% hydro)	1,052 TWh (3,786 PJ)
Transport energy (final consumption)	0.3%	0.5%	2,996 PJ
Overall fuel and heat consumption³	3.5%	3.9%	4,236 PJ

Source: World Energy Balances © OECD/IEA 2018

RESEARCH FOCUS RELATED TO BIOENERGY

In 2017 New Energy and Industrial Technology Development Organization (NEDO) launched a project aiming at the development of a full-scale manufacturing process technology for producing biomass-derived jet (biojet) fuels from microalgae and wood chips. This technology development project will verify the feasibility of stable and continuous system operation over a long term, and reduction of production costs, by conducting pilot-scale verification tests, including the construction of a 10,000 m²-scale microalgae culture facility.

Through the project, NEDO aims to place biojet fuel into commercial use around 2030 toward CO₂ emissions reduction originating from jet fuels in the aerospace sector.

RECENT MAJOR BIOENERGY DEVELOPMENTS

Concerning biomass power generation, under the feed-in tariff (FIT) scheme, the amount of certified woody biomass rapidly increases, resulting in a certification volume which is three times higher than the 2030 target level. Moreover biomass power generation cost is higher than foreign countries in general and the FIT tariff remains high. Under this situation, an auction scheme (for woody biomass and liquid biofuels) has been introduced in 2018.

As for biofuels, conventional domestic bioethanol projects (1st generation) in Japan have not led to business and all the bioethanol has been imported from Brazil so far. Simple increase of biofuel introduction could result in the expansion of twin deficits and be inefficient compared to other measures. The bioethanol introduction target of 500,000 kL/year (crude oil equivalent) will be maintained for 5 years (2018-2022) considering international supply-demand perspective and R&D trends for the next-

³ This includes final consumption of fuels and heat in industry, the residential sector, commercial and public services and agriculture/forestry. Transport fuels are excluded. Energy used for transformation and for own use of energy producing industries is also excluded.

generation bioethanol commercial production.

Different from gasoline, of which the demand seems to decrease due to EV shift and structural reasons such as population reduction, large vehicles and airplanes which need high energy density fuel are expected to have steady fuel demand. From the medium- and long-term perspective, introduction of biojet and biodiesel fuels will be continuously investigated considering the possibility of policy resource input.

LINKS TO SOURCES OF INFORMATION

Feed-in Tariff system: http://www.meti.go.jp/report/whitepaper/data/pdf/20180207001_1.pdf

Biojet Fuels project: http://www.nedo.go.jp/english/news/AA5en_100229.html

Present state of biofuel policies (in Japanese):

http://www.meti.go.jp/committee/kenkyukai/energy_environment/bio_nenryo/pdf/002_03_00.pdf