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Report Highlights:

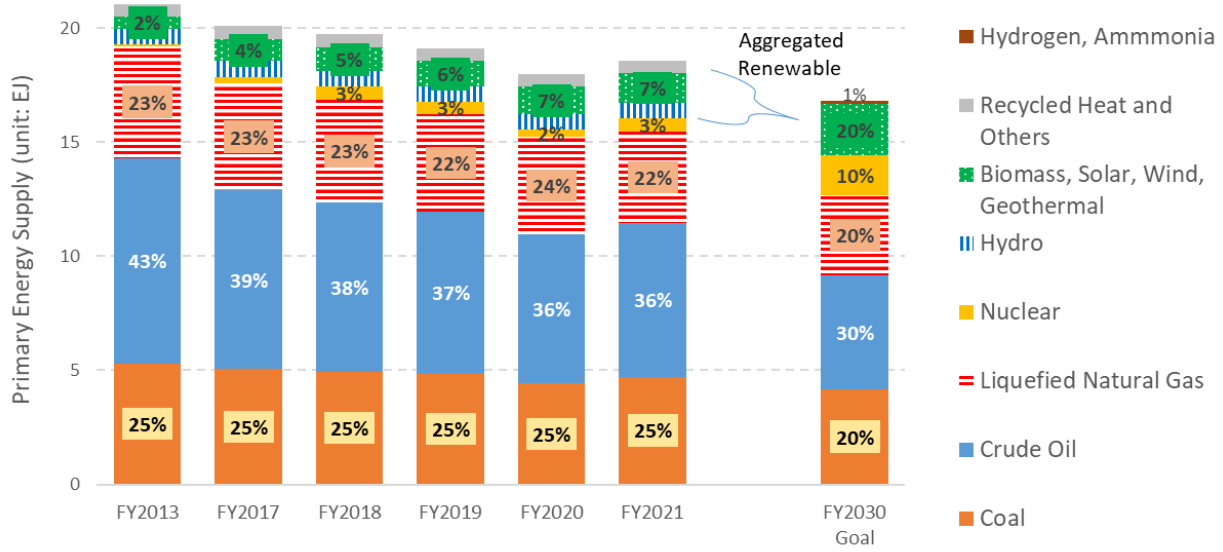
Japan has been dramatically increasing its wood pellet imports for its feed-in tariff (FIT) program, as more large-scale FIT-approved biomass power plants become operational. Palm kernel shell imports may slow down in the coming years, as Japan begins to enforce sustainability certification requirements from April 2024.

Overall Policy

Renewable Energy and Greenhouse Gas (GHG) Emissions

Japan has pledged to reduce its GHG emissions by 46 percent in Japanese fiscal year (FY: April-March) 2030 from FY 2013 levels and to become carbon neutral by 2050. In line with these goals, in February 2023, Prime Minister Kishida's Cabinet approved the "Green Transformation (GX) Basic Policy". GX Basic Policy advocates for the use of renewable energy as the main power source, yet adheres to the 2030 energy outlook (available in Japanese only) target of the 6th Strategic Energy Plan (SEP), which the Agency of Natural Resources and Energy (ANRE) of the Ministry of Economy, Trade and Industry (METI) released on October 2021 (JA2021-0113). In the outlook, ANRE proposed to reduce the total primary energy[1] supply to approximately 16.7 exajoule (EJ) by FY 2030, a 10 percent reduction from FY 2021 (Figure 1). ANRE expects this reduction to occur through decreased demand due to improved energy efficiency and energy conservation. Several other key changes in the new targets of primary energy supply include: (i) increase in the use of renewables (biomass, solar, wind, geothermal and hydro); (ii) reduction in the reliance on crude oil and coal; and (iii) addition of hydrogen and ammonia to the list of energy sources.

Figure 1. Japan's Primary Energy Sources



Sources: Summary of Draft SEP; Long-term Energy Supply and Demand Outlook; ANRE
Notes:
- 1 EJ (exajoule) = 1,000 petajoule (PJ) = 10^{18} joules = 25.8 x 10^{9} crude oil equivalent liter
- FY 2021 energy data is the most current data as of August 2023.
- Aggregated renewable includes solar, biomass, wind, geothermal, hydro and recycled heat.

Electricity Generation

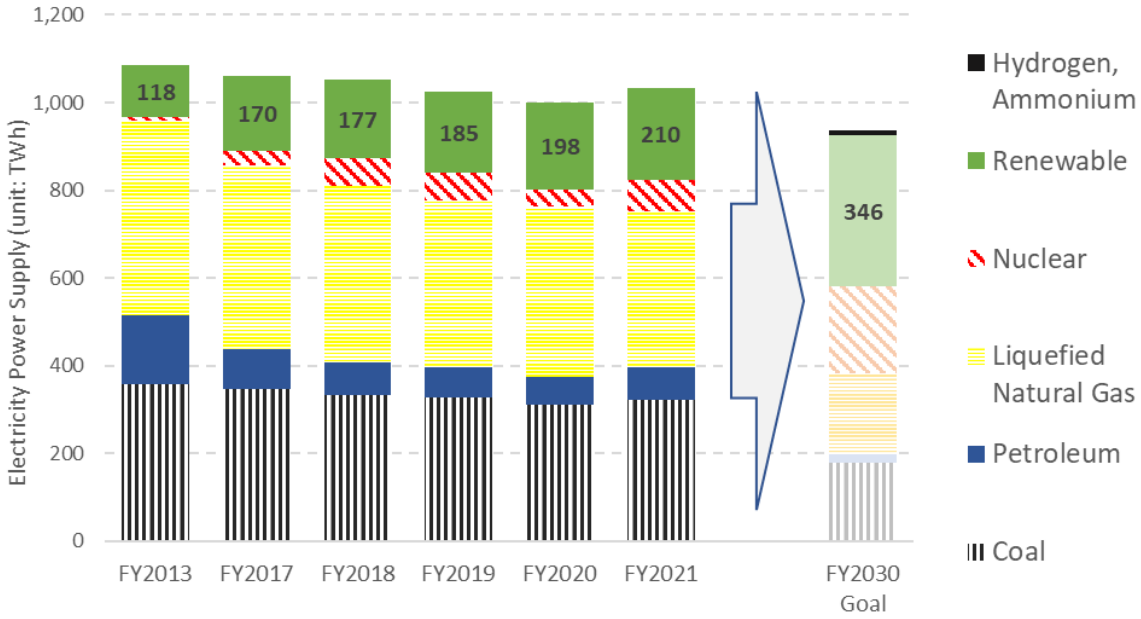
Electricity generation sector is the primary target of the Government of Japan's (GOJ) greenhouse gas (GHG) emission reduction policy. In FY 2021, 48 percent of Japan's primary energy supply went toward power generation. The gradual restart of nuclear power generation after the Fukushima nuclear disaster, the expansion of

[1] Primary energy refers to energy in its raw state prior to human-engineered transformation (e.g., electricity or heat).

renewable energy utilization and energy efficiency gains have reduced the need for imported fossil fuels and contributed to a continuous decline in Japan's GHG emissions.

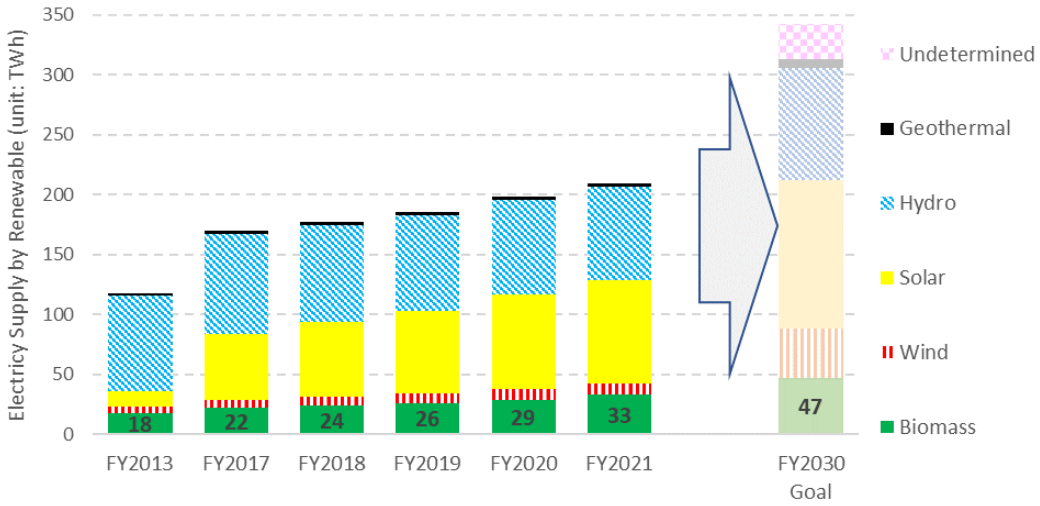
According to the energy outlook and the 6th SEP, GOJ plans to make renewables the main energy source for electricity generation. In FY 2021, Japan derived 20.3 percent (210 terawatt-hours (TWh)) of its electricity from renewables. By 2030, GOJ expects that share to increase to about 36-38 percent (approximately 346 TWh) by FY 2030 (Figure 2).

Figure 2. Japan's Historical and Target Electric Energy Consumption by Source



Sources: Summary of Draft SEP; Long-term Energy Supply and Demand Outlook; ANRE Total Energy Statistics

Figure 3. Comparison of FY 2030 Targets for Renewables for Energy Generation



Sources: Summary of Draft SEP; Long-term Energy Supply and Demand Outlook; ANRE Total Energy Statistics

ANRE expects to sharply increase energy generation by solar panels and onshore and offshore windmills (Figure 3). The 6th SEP calls for increased biomass power electricity generation to approximately 47.1 TWh from the projected capacity of 8 gigawatts (GW) by FY 2030. In addition to specifying targets for different renewable types, the provisional target also aims to add 20-40 TWh from renewables of a yet undetermined source (Figure 3).

FIT Market

Following the Fukushima Dai'ichi nuclear power plant accident caused by the 2011 Tohoku earthquake and tsunami, then ruling Democratic Party of Japan expanded the Feed-in Tariff (FIT) scheme, which had at that point only included solar power, to other renewable energy sources. The FIT scheme adopted in July 2012 covers most renewable energy sources, including biomass, wind, geothermal and small-scale hydro, in addition to solar. Under Japan's FIT scheme, power utility companies charge customers a fixed price (i.e., tariff) for power from eligible renewable power generators for predetermined periods after the power plants start operation. The FIT program applies only to electric power generation, not to biomass use for industrial boilers.

Table 1. Biomass Feed-in Tariff by Fuel Category (unit: yen/kWh)

Fiscal Year	Domestic Unutilized Wood & Thinning		General Wood and Ag. Residues (e.g., imported pellets, sawmill residue, PKS)			Palm Oil	C&D Wood
	< 2MW	2MW≤	< 10MW	10-20MW	20MW ≤		
2012	32		24			General Wood	13
2013	32		24				13
2014	32		24				13
2015	40	32	24				13
2016	40	32	24				13
2017	40	32	24		21		13
2018	40	32	24	Auction (20.6*)		Auction (20.6*)	13
2019	40	32	24	Auction (19.6*)		Auction (19.6*)	13
2020	40	32	24	Auction (19.6*)		Auction (19.6*)	13
2021	40	32	24	Auction (18.5*)		Auction (18.5*)	13
2022	40	32	24	FIP Auction		FIP Auction	13
2023	40	32	24	FIP Auction		FIP Auction	13

Source: ANRE

Note: * represents maximum acceptable prices, disclosed after the auctions. Between FY 2018 and 2021, METI set the FIT premium through auctions for the general wood category. From FY 2022, the auctions (indicated as "FIP Auction" above) for the general wood category and palm oil are for the feed in premium (FIP).

From fiscal year 2012 to 2014, FIT program paid equally 32 yen per kilowatt-hour (kWh) for all plants using domestic "unutilized wood" derived from thinning operations (see JA9098 for details on Japanese forest operation). To expand FIT utilization to smaller plants, particularly in rural communities, ANRE increased the FIT rate to 40 yen per kWh for micro power plants (i.e., generating less than 2 megawatts (MW)), provided they use domestic unutilized wood.

"General wood (and agricultural residues)" category includes imported woody biomass, palm kernel shell (PKS), and palm trunk. General wood can earn 24 yen per each kWh of electricity generated over the 20 years. From FY 2017, the FIT program reduced the general wood payment to 21 yen/kW for power plants with output greater than 20 MW. From FY 2023, METI expanded the FIT general wood category to include nut shells and hulls (i.e., walnut, almond, pistachio, peanut, sunflowerseed, cashew, chesnut), corn straw pellets, empty fruit brunches, coconut shells, bengkuang seeds, and sugarcane stems and leaves. As of August 2023, METI is examining whether to add wheat straw, rice straw and rice husk to the FIT category.

Additionally, woody biomass from construction and demolition (C&D) materials can earn 13 yen per each kWh of electricity generated. Typically, C&D-derived biomass is chipped and burned. Palm oil stearin was initially in the general wood category, but in 2018 METI established a separated "liquid biomass" category. For more information about palm oil, please see Japan's Oilseeds Annual.

The FIT program maintained a set price regardless of the wholesale electricity price. Since From FY 2022, Japan introduced a feed-in premium (FIP) program for renewable power sources. Under FIP, METI sets a fixed premium that is added for the average price of wholesale electricity over the previous 12 months. METI has not approved any new FIT or FIP biomass projects since 2017.

Environmental Certification

In 2012, Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF)'s Forestry Agency published guidelines (in Japanese only) for the sustainability/legality verification of wood pellets (JA2019-0124). Forestry Agency generally requires third-party chain-of-custody (CoC) forestry certification, but there are also other verifications that Forestry Agency may accept. Following Russia's invasion of Ukraine in 2022, major third-party forestry certification schemes have designated Russian wood pellets/chips as conflict wood. Consequently, Japanese trading houses have stopped importing Russian woody biomass for the FIT program.

Since 2019, METI's expert panel (in Japanese only) has reviewed biomass sustainability requirements for the FIT program, such as the eligible chain-of-custody certification programs and life-cycle GHG emissions. According to industry experts, the sustainability certifications available to U.S. biomass suppliers should satisfy Japan's requirements for wood pellets.

From April 2023, METI has required biomass power generators to calculate lifecycle GHG emissions. METI also published the default GHG emission values associated with biomass feedstock eligible for the FIT/FIP programs for power generation (JA2023-0007). METI also indicated plans to require power plants to provide information to verify their GHG emission calculations.

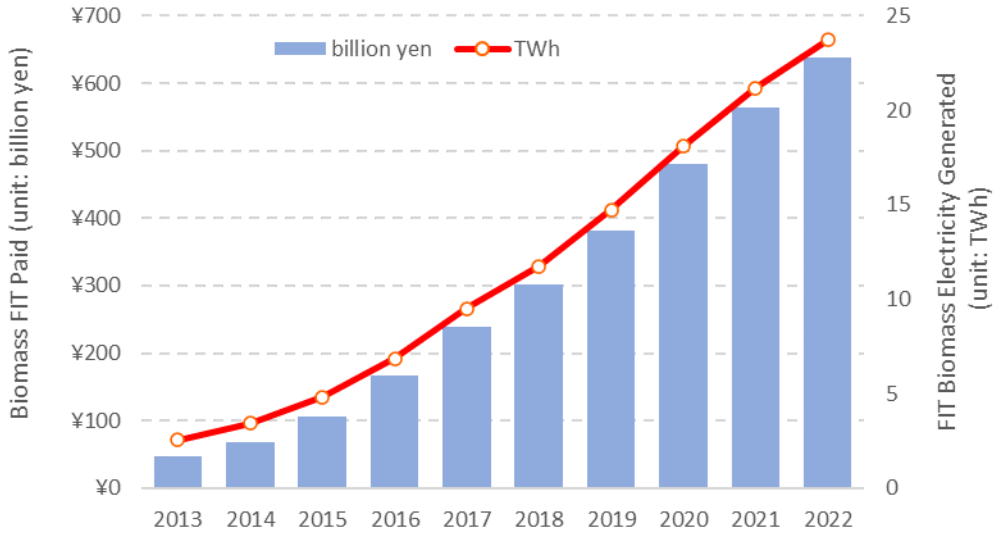
From April 2024, METI plans to introduce mandatory sustainability requirements for PKS for use under the FIT program. Japan accepts the Roundtable on Sustainable Biomaterials, Green Gold Label and International Sustainability, Carbon Certification (ISCC), and Malaysian Sustainable Palm Oil programs for PKS.

Consumption

Biomass Consumption

Japan's biomass consumption for electricity generation, as reflected in FIT payments (Figure 4), has greatly expanded. In 2022, total biomass FIT payments reached 638 billion yen ($4.85 billion[2]). These 2022 payments represent 23.7 TWh of biomass-generated electricity. According to ANRE, by the end of December 2022, METI approved 900 biomass power plants with total 8.3 GW capacity for FIT. As of December 2022 (latest information available), only 586 biomass plants with a total capacity of 4.1 GW capacity were in operation.

Figure 4. Annual FIT Paid to Biomass Energy Producers and Electricity Generated



Source: ANRE

Forestry Agency collects biomass consumption for business use data from Japanese businesses. Based on this data, as well as trade and energy statistics, FAS/Tokyo estimates the total consumption of biomass for business use in Japan (Table 2).

[2] $1 = 131.50 yen.

Table 2. Japanese Annual Biomass Consumption by Power Plants and Industrial Heat Boilers (in thousand of bone-dry ton (BDkt))

		2015	2016	2017	2018	2019	2020	2021	2022e[3]	2023f[3]
Consumption by Types of Biomass										
Total domestic wood chip	**BDkt**	**6,903**	**7,725**	**8,592**	**8,975**	**9,116**	**10,112**	**10,288**	**10,400**	**10,600**
- from thinnings	**BDkt**	***1,168***	***1,918***	***2,635***	***2,745***	***3,029***	***3,910***	***4,114***		
- from C&D materials	**BDkt**	***4,197***	***3,980***	***4,126***	***4,110***	***4,064***	***4,198***	***4,010***		
- from sawmill residues	**BDkt**	***1,428***	***1,649***	***1,501***	***1,808***	***1,712***	***1,674***	***1,777***		
- from imported logs	**BDkt**	***0***	***6***	***5***	***5***	***0***	***0***	***1***		
- from others (e.g., pruning)	**BDkt**	***110***	***172***	***326***	***307***	***311***	***330***	***387***		
Imported wood chip	**BDkt**	**0**	**9**	**134**	**329**	**307**	**304**	**405**	**300**	**300**
Domestic firewood	**BDkt**	**41**	**40**	**51**	**44**	**43**	**35**	**38**	**40**	**40**
Domestic sawdust	**BDkt**	**147**	**129**	**162**	**147**	**171**	**181**	**236**	**200**	**200**
Domestic other biomass (e.g., hogfuel)	**BDkt**	**200**	**280**	**478**	**239**	**204**	**366**	**289**	**280**	**280**
Domestically produced wood pellets	**BDkt**	**70**	**70**	**71**	**73**	**89**	**96**	**90**	**90**	**90**
Imported wood pellets	**BDkt**	**198**	**295**	**430**	**901**	**1,372**	**1,724**	**2,649**	**3,746**	**4,250**
Imported PKS	**BDkt**	**428**	**691**	**1,199**	**1,418**	**2,011**	**2,785**	**3,560**	**4,142**	**4,800**
Biomass Consumption by Users										
By electricity plants	**%**	**47%**	**55%**	**57%**	**64%**	**67%**	**71%**	**77%**	**79%**	**80%**
By cogeneration plants	**%**	**34%**	**29%**	**30%**	**24%**	**21%**	**20%**	**14%**	**13%**	**12%**
By heat boilers	**%**	**18%**	**16%**	**13%**	**13%**	**11%**	**9%**	**9%**	**8%**	**8%**
Reference										
Black liquor	**BDkt**	**12,246**	**12,179**	**12,230**	**12,350**	**12,023**	**10,723**	**11,188**	**11,114**	**11,100**

Note: 2023f imported wood pellets and PKS are based on first five months of trade.

FAS/Tokyo estimated thousand bone-dry ton (BDkt) values from trade and other statistics under the assumption of 15 percent moisture in imported biomass, 20 percent moisture in PKS and firewood, 60 percent moisture in sawdust, and 50 percent moisture in "other biomass."

Woody biomass not used by power plants and industrial heat boilers (e.g., residential heating such as fireplace and wood stoves, campfire, charcoal production etc.) are not included in the volumes.

Percentage values per year may not add up to 100 percent due to rounding error in the source data.

Source: Forest Agency, ANRE, Japan Customs

[3] Trade volumes in 2023 are estimated based on the first five months. FAS/Tokyo forecasted values (in gray) for 2022 and 2023.

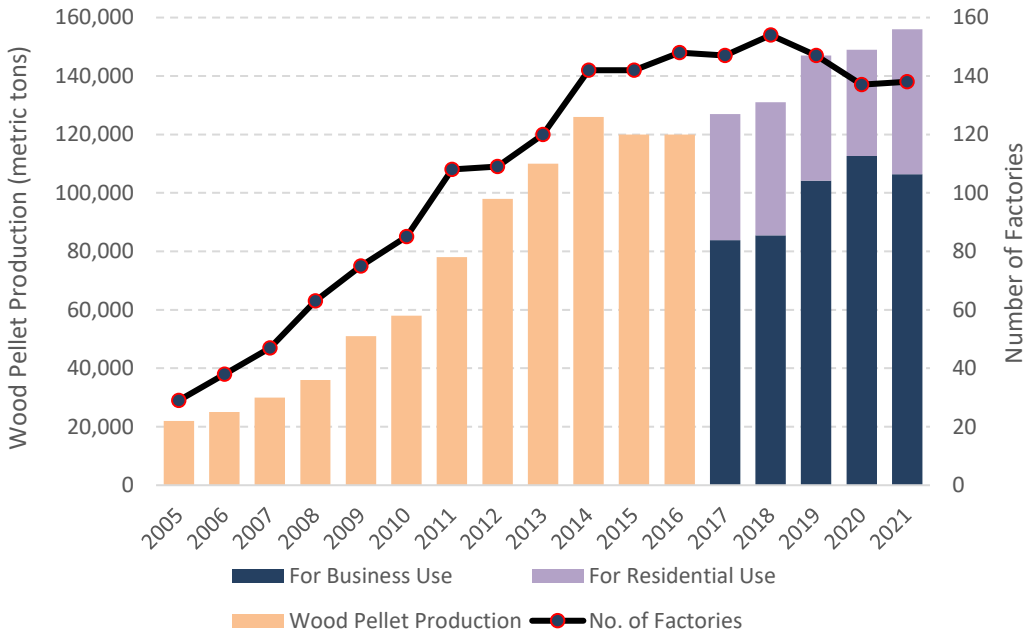
Biomass Production

Since there is no reason to densify woody biomass destined for boilers and local small to medium scale biomass power plants, wood chips are the predominant domestic woody feedstock for energy generation (or biomass are brought directly to boilers and power plants, they chip by themselves). In 2021 (the most recent official data), Japan produced 9.9 million bone-dry ton (BDt) of wood chip for energy production, a substantial jump from 6.9 million BDt in 2015. In 2021, 40 percent of wood chips were derived from forest thinning, 39 percent from C&D materials, 17 percent from sawmill residues, and 4 percent was from others, such as pruning and garden trees.

Wood chip production from thinning has been on the rise. GOJ's GHG emission target largely relies on carbon sink by land use, land use change, and forestry (LULUCF) through domestic forest thinning operations. Japan set aside 120 billion yen per year for thinning and selective logging on about 520,000 hectares of private and public land. Wood yielded from these operations is used in construction and power generation (see JA9098 for details on forestry policy). Japan more than tripled its consumption of wood chips from thinnings, from 1.2 million BDt in 2015 to 4.1 million BDt in 2021. FAS/Tokyo forecasts Japan's wood chip production will continuously increase as Japan reliably sets aside public funds to support forest management projects.

Domestic wood pellet production relies on small producers targeting boilers, small-scale biomass power plants and residential wood stoves. Japan produced 156,000 metric tons (MT) of wood pellets by 138 factories in 2021, a 30 percent volume increase since 2015 (Figure 5). According to the Forestry Agency, about 70 percent was consumed by businesses (e.g., boiler, cogeneration), and 30 percent went toward residential heating. On June 15, 2023, MAFF published a new voluntary Japanese Agricultural Standard (JAS) for wood pellet fuel for residential stoves (see JA2021-0148).

Figure 5. Domestic Wood Pellet Production



Note: After 2017, the Forestry Agency's annual survey categorizes wood pellet production based on intended use.
Source: Forestry Agency

In addition to wood chips, in 2021, Japanese industries produced and used 589,000 MT of sawdust (about 236,000 BDt), 47,000 MT of firewood (about 38,000 BDt), and 577,000 MT (about 289,000 BDt) of other biomass, such as hog fuel and shavings, for energy production. These woody biomasses have been used for in-house boilers of

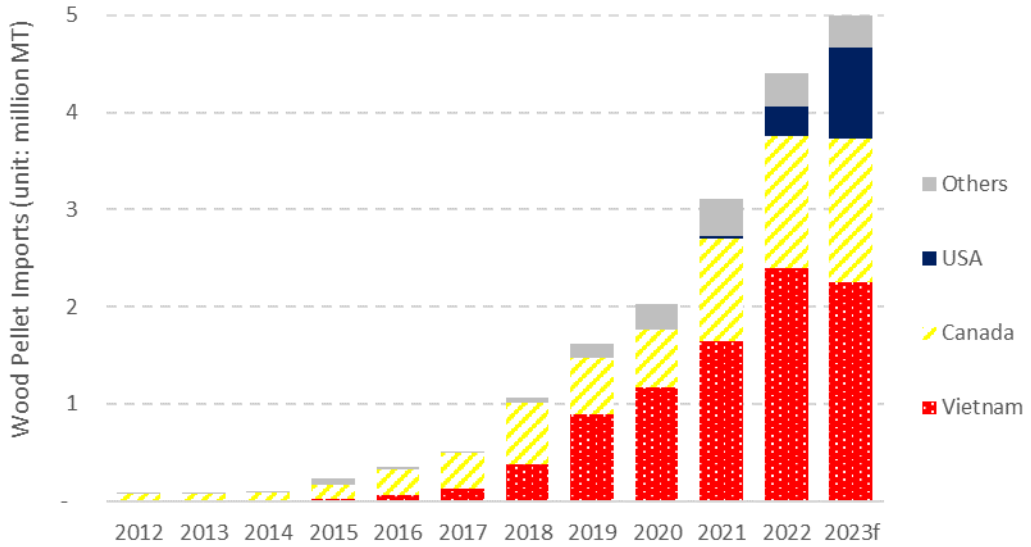
wood processors, but more and more businesses have utilized them for electricity generation to take advantage of the FIT program. In addition, Japanese pulp mills produced and used 11 million BDt of black liquor (i.e., residues containing lignin and hemicelluloses from pulp production) as an in-house energy source in 2021.

Biomass Trade

Japan's growing wood pellet imports reflect more large-scale biomass power plants coming online. In 2022, Japan imported 4.4 million MT of wood pellets (3.75 million BDt) (Table 2), of which 54 percent came from Vietnam, 31 percent came from Canada and 7 percent came from the United States. Imports of cheaper wood pellets from fast-growing species (e.g., acacia, eucalyptus) from plantation forests in Asian countries, especially Vietnam and Malaysia, have been on the rise. However, some forest certification programs suspended certain Vietnamese wood pellets suppliers for failing to correctly report their supply chain. As the wood pellet price in Europe recently exceeded the price in Japan (due to fixed contracts for the FIT-approved powerplants), U.S. wood pellet manufacturers have prioritized exports to Europe.

FAS/Tokyo forecasts a continued growth in wood pellet imports as more large biomass power plants begin operations in Japan.

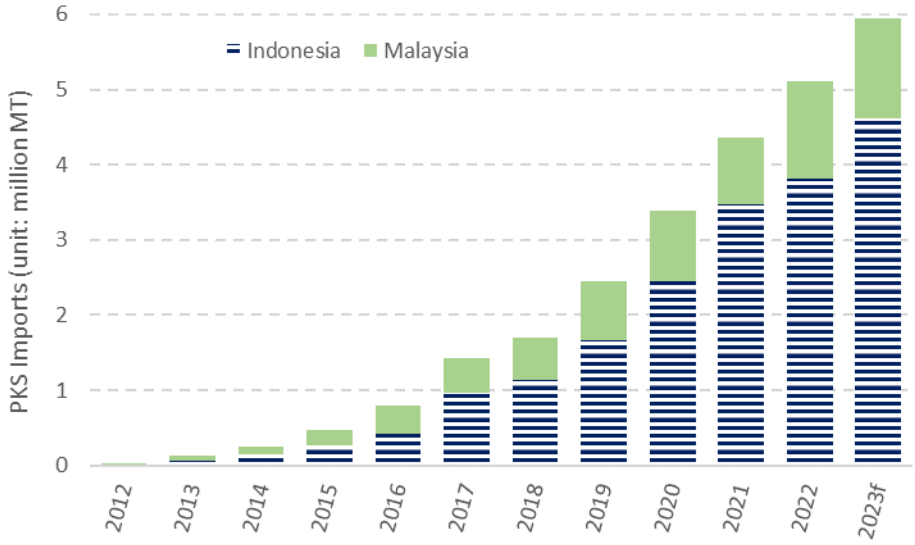
Figure 6. Growth of Wood Pellet Imports to Japan



Note: 2023f is based on first five months of trade.
Source: Japan Customs

Since the introduction of the FIT program, PKS imports have increased exponentially (see JA2020-0110). Medium-sized biomass power plants use PKS as a stable and inexpensive biomass fuel to qualify for the FIT program. Japan's 2022 PKS and palm shell imports increased 17 percent from 2021 to reach 5.1 million MT (approximately 4.1 million BDt). However, it is expected that the import volume may drop after METI begins to enforce sustainability certification requirements for PKS from April 2024.

Figure 7. Japan's PKS Imports



Note: The volume is the total of palm kernel meal and nut shells (JA2020-0110).
2023f is based on first five months of trade.
Source: Japan Customs

Attachments:

No Attachments.