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Argus White Paper:

Japan's growing demand for wood pellets: An outlook

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Japan's wood pellet demand is set to more than double from 4.4mn t in 2022 to 10mn t/yr by 2025. The country surpassed South Korea to became Asia's biggest wood pellet consumer in 2022. The two countries require different certifications to import wood pellets, but this has not quelled the competition to secure pellets in southeast Asia. Rapid growth in Japan's biomass sector and its wood pellet requirements will impact global supply-demand balance. But the country's biomass industry also has to contend with policy changes, as well as certification challenges.

Introduction

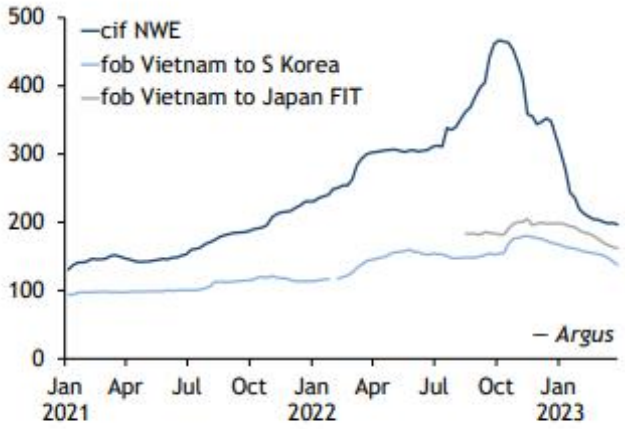
Japan has become the fastest growing market for industrial wood pellet burn for power generation in Asia and globally, and will continue to grow at a rapid pace in the coming years, in line with the growth in biomass-fired generation capacity supported by the country's feed-in-tariff (FiT) scheme.

The northeast Asian country's import demand is set to more than double to 10mn t/yr by 2025, from just 4.4mn t it imported in 2022. Nearly half of this demand is expected to be sourced from north American producers, with which Japanese companies have signed long-term offtake agreements. Such contractual volumes have been gradually increasing since 2021.

This has resulted in more integration at a global scale for the market in recent years, as Asian buyers compete with European buyers for north American supplies. Rivalry between the two regions was strong in 2022, after Europe lost a significant amount of biomass supply from now-sanctioned Russian and Belarus deliveries.

Spot prices for wood pellet deliveries to northwest Europe (NWE) rose to record highs in late 2022, attracting quicker US deliveries, which in turn resulted in fewer shipments to Japan than was previously expected. Japanese buyers sought to close the gap by sourcing more from southeast Asia, also lifting pellet prices in this region to record highs. High European prices also encouraged some cargoes to be shipped from Asia to Europe, further tightening Asian supply. Such shipments were limited, mostly because of differences in sustainability certification requirements between the two regions.

Spot pellet prices down from record highs in 2022 $/t



Industrial wood pellet markets may remain exposed to price volatility risks until a new balance is reached to accommodate the supply shock from sanctioned Russian supplies.

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There is uncertainty surrounding the European demand outlook, after the expiry of state-backed subsidy schemes for biomass-fired power generation in 2026-27, but growth in Japan and elsewhere in Asia will ensure power-sector demand for the commodity lasts beyond 2040.

Biomass capacity may exceed 2030 goals

Japan will likely achieve its biomass generation target of 8GW for the April 2030-March 2031 fiscal year before this deadline, given its already approved capacity under the country's FiT scheme. It may even exceed this goal, as the country's push for the phase-out of inefficient coal-fired plants could spur a fuel shift to biomass, with a large-scale non-FiT project already scheduled to start up by 2030-31.

Japan's overall biomass-fired installed capacity rose to 6.2GW by the end of September 2022, according to latest data available by the trade and industry ministry (Meti), including 879MW of non-FiT projects. This was nearly double of the 3.2GW in March 2017, just before Tokyo introduced a revised FiT law in April 2017.

Of these, installed capacity fed by general woody biomass and crop residue was 2.8GW, up by 42pc from end September 2021. Capacity fired with unused woody biomass rose by 8.4pc to 476MW, and that fed with methane gas fermentation or general waste also rose on the year (see table). Capacity using construction waste was steady from the previous year at 86MW.

Five biomass-fired dedicated plants, each with a capacity above 10MW, and three major units that co-fire biomass with coal —the Taketoyo, Misumi and Shunan plants — began operations in the second half of 2022. This, combined with cancelled projects over the same period, left 4.2GW of FiT-supported capacity under planning or construction as of November 2022, *Argus* estimates.

Biomass-fed installed capacity continued to grow rapidly into 2023, with at least a combined 346MW capacity having already come on line from 1 January to 2 April and an additional 75MW likely to start commercial operations by May (see table above).

Japan's biomass-fired generation capacity by Sep '22 *MW*

	Installed	Approved (inc. installed)
Methane fermentation gas	86	136
Unused woody biomass (<2,000kW)	47	148
Unused woody biomass (>2,000kW)	429	549
General woody biomass, crop residue	2,828	6,780
Construction waste	86	112
General waste, others	442	571
Total FIT new	3,918	8,296
Total FIT transferred	1,381	
non-FIT	879	
Total biomass installed	**6,178**	

— Meti

Installed biomass-fired generation capacity so far in 2023

Company	Plant name	Unit	Capacity (MW)	Commissioning date	Location
Okumura, Iwahori, Shikoku Electric Power	Fukushima Hiratamura	Unit 2	2.0	2-Apr-23	Fukushima
Marubeni, Chubu Electric Power	Godo		7.5	2-Apr-23	Gifu
Kansai Electric Power	Aioi		200.0	24-Mar-23	Hyogo
Ishikari Bio Energy	Ishikari Bio Energy		51.5	2-Mar-23	Hokkaido Island
Japex and partners	Abashiri	Unit 3	9.9	8-Mar-23	Hokkaido
Nippon Paper, Sojitz	Yufutsu		75.0	2-Feb-23	Hokkaido
Renova	Tokushima-Tsuda		74.8	May-23	Tokushima

– Argus research

Around 90pc of projects or 3.8GW that are under construction or planning are for units with a capacity of 10MW or more, most of which are expected to consume wood pellets or palm kernel shells (PKS). Some 2.3GW of this capacity is scheduled to start up before 2027 (see table), while the timeline for the remaining capacity is unclear, although all projects should commence operations by 2030-31 to meet deadlines set under the new FiT law.

Japan would achieve its 2030-31 biomass power installation goal of 8GW, even when just adding the 2.3GW of capacity scheduled to come on line by 2027, as official data showed total operational capacity was at 6.2GW by the end of September 2022. It may even exceed this goal, if including the capacity that started up in the second half of 2022, planned commencement of non-FiT projects and a possible coal-to-biomass fuel switch outside of the subsidy scheme.

Scheduled additional biomass-fired FIT capacity (>10MW)

Commissioning year	Biomass	Wood pellet*
2023	936	675
2024	425	425
2025	913	800
2026	75	-
NA	1,484	40
Total	**3,834**	**1,940**

**Dedicated or partly fired by wood pellets.*

– Argus research

Phasing out unabated coal-fired units

The Japanese government plans to phase out inefficient coal-fired capacity by 2030 through a requirement for utilities' power generation arms to have an efficiency of over 43pc on an entity basis. This objective is in line with the government's

target of cutting greenhouse gas emissions by 46pc against 2013-14 levels by then.

Companies may opt to reach their efficiency targets through different routes, such as by utilising latest clean coal technologies — such as integrated coal gasification combined cycle (IGCC) technology and ultra super-critical (USC) technology. They could also opt to cut utilisation rates of older inefficient units, decommission them, or increase the co-firing ratio of cleaner fuels such as biomass and ammonia.

Japan currently has around 55GW of coal-fired capacity, 50pc of which are inefficient units and likely to be scrapped. But achieving 43pc efficiency may prove challenging — even for higher-efficiency coal-fired units equipped with USC technologies — without additional efforts such as co-firing with biomass and utilising waste heat, given that most of such operating capacity do not have a 43-45pc efficiency, Meti data show. Only two coal-fired units had over 43pc efficiency as of 2019-2020.

Under Japan's 2030-31 power mix goal, coal-fired generation would account for 19pc of the total power output, from 32pc in the 2019-2020 fiscal year. This is because the country would need to depend on stable thermal generation as back-up capacity in its pursuit to expand renewables such as wind and solar power that have intermittent supply that is dependent on weather conditions. The back-up capacity will also mitigate uncertainty surrounding how many nuclear reactors will restart, especially as it remains too early to introduce large-scale hydrogen and ammonia output.

This implies a potential further increase in biomass demand to supplement and replace the use of coal to ensure stable supplies and lower emissions, as biomass-fired generation is little affected by weather conditions. Some companies said such potential 'post-FiT' capacity could be a game changer for the biomass market.

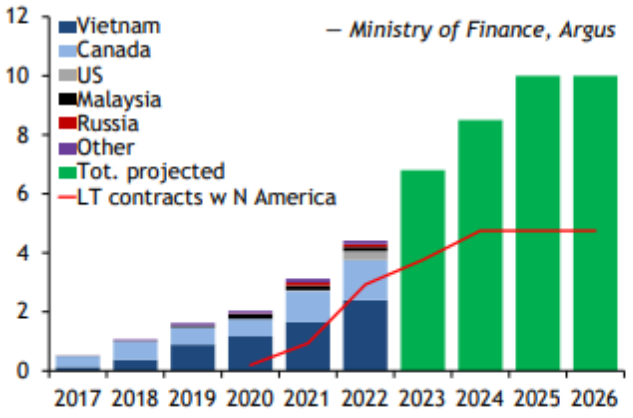
Japan's import demand rises

Japan's industrial wood pellet imports have increased significantly since 2017, when the country revised the FiT support scheme for renewable energy generation. It imported 4.4mn t of pellets in 2022, up by 41pc on the year and significantly higher than 510,000t in 2017. The trend is broadly in line with biomass-fired power generation capacity, which has doubled since 2017.

Wood pellet imports are expected to jump to 5.5mn-6.5mn t in 2023 and plateau at around 10mn t/yr by 2025.

Vietnam was Japan's largest supplier for pellets during 2019-2022, and even though Vietnamese imports are likely to increase in the coming few years as Japanese demand grows, it may lose some market share to other Asian or north American supplies.

Past vs projected imports, LT volumes w N America *mn t*



Vietnamese receipts jumped by 45pc on the year to 2.4mn t in 2022. Indonesian imports also rose slightly to 55,000t while receipts from other southeast Asian countries all dropped on the year (see chart).

Canadian and US imports rose on the year to a combined 1.7mn t in 2022, with the highest ever year-on-year jump for Canadian shipments to Japan.

Competition for north American supplies

Japan's rapid increase in demand for wood pellets, with projected consumption exceeding Asian production capacity, meant that buyers secured part of their long-term needs out of north America, the region with the largest export capacity globally.

Long-term contractual volumes between Japanese off-takers and north American producers were expected to reach 2.93mn t/yr by the end of 2022 and gradually increase in the following years to plateau at 4.75mn t/yr by 2026 (see chart), *Argus* estimates.

As more capacity becomes operational in Japan, the country's spot demand for north American pellets will grow, and so will competition for the commodity with Europe. This was already seen last year when global supply tightened.

As the *Argus* cif NWE spot price reached record highs in 2022, more than doubling long-term contractual prices for north American deliveries to Japan that are estimated around $200-210/t cfr Japan, significant US volumes were re-directed to the European market. US deliveries to Japan held at below previously expected levels (see chart), as at least some long-term contractual volumes were met by supply out of southeast Asia.

While Canadian deliveries to Japan kept up with the new long-term contractual volumes throughout 2022 and are likely to increase by another 100,000t in 2023 to 1.2mn t/yr before plateauing.

North American deliveries to Japan in 2022 were delayed by several months. This resulted in stronger Japanese demand for Asian pellets or alternative fuels such as PKS, supporting spot prices for both commodities.

The pressure on supplies also grew stronger as European buyers also sought alternative supplies out of Asia to meet the deficit in Russian pellets, which were sanctioned from 11 July 2022. A total of 180,000t of Malaysian wood pellets were shipped to Europe in 2022 — primarily to the Netherlands, the UK, Denmark and France — the first time the Asian country shipped to Europe since at least 2012. Thailand also exported 15,000t of wood pellets to the Netherlands in January-November 2022, Thai customs data show. And Eurostat trade data suggest some 33,000t of Vietnamese wood pellets were delivered to Belgium in November.

But weakening European demand for industrial pellets since the start of the winter 2022-23 season offered some relief on north American deliveries to Japan into 2023.

Pellet consumption in NWE fell sharply for most of winter, mostly because of lower generation at UK's Contracts-for-Difference (CfD)-supported units and unusually warmer weather. This resulted in a sharp drop in cif NWE spot prices, rendering deliveries to Europe less attractive in 2023 compared with most of 2022.

The US became Japan's largest supplier in February, Japanese import data show. And the weak outlook for European demand during summer 2023 suggests north American deliveries may be quicker over this period compared with a year earlier. Japan may continue to see tight supply availability later in 2023, depending on price signals from other regions or sectors that compete for the same raw materials, freight rates and other drivers. The suspension of third-party certifications for a large Vietnamese producer in October 2022 for 3½ years also exacerbated the supply strain, with around 400,000-500,000 t/yr of contracts with Japanese buyers estimated to have been cut owing to the suspension. A significant portion of this supply likely found a home in the South Korean market.

Forest Stewardship Council (FSC) endorsement is the most commonly used form of sustainability certification in Japan, according to the scheme's website. But at least a portion of these volumes could gain certification from other schemes and regain eligibility to be delivered to Japan going forward.

Challenges for biomass sector in Japan

Stricter FIT rules

Japan has tightened the FiT regulations starting from 1 April 2022, mandating biomass power projects to start supplying electricity within four years after they obtained FiT or feed-in-premium (FiP) approval, with the new rules to also be applied retrospectively. Support under FiT and FiP could expire if power generators fail to start plant operations by the deadlines.

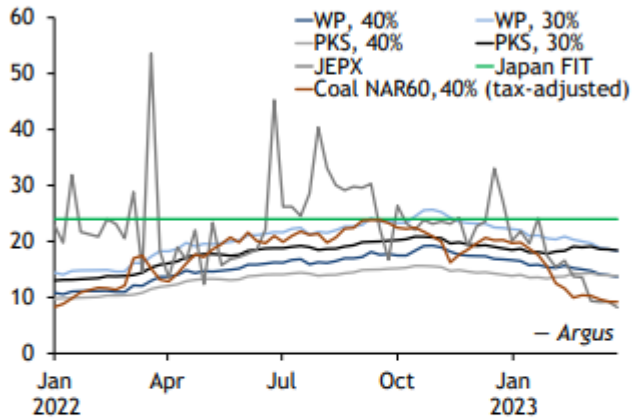
But power developers can extend the deadline of a project by another four years if they present an application to build facilities connecting with power grids within a year after the deadline passes. This means that firms facing deadlines before April 2022 needed to show the contract by 31 March 2023.

The revision was in response to a rising number of non-operating projects, especially solar power, after securing a connecting right to the country's power grid. This could limit transmission capacity open to new applications despite an availability of capacity.

The government aims to spur development and ensure the start-up of renewable projects to increase clean power sources. But as renewable capacity under the FiT system increases, the FiT surcharges that power consumers have to pay in their monthly electricity bill are also rising. This prompted Meti to lower FiT prices in 2017-18 for projects of more than 20MW using general woody biomass and palm oil, and then to launch a tender system from 2018-19 to decide FiT prices for projects with more than 10MW consuming general woody biomass and palm oil, without a capacity limit.

Even the economic viability of the ¥24/kWh FIT that was awarded to most post-2017 projects was put to test in 2022 as wood pellet and PKS prices rose to record highs, and the bark spread for less efficient units narrowed sharply to near-zero or turned negative for most of the second half of the year.

Break-even power prices vs JEPX vs FIT *'000 ¥/t*



Assumptions: Landed costs to Japan. Wood pellet (wp) price used is Argus fob Vietnam to Japan FIT assessment; PKS price is Argus fob east coast Sumatra assessment. Vietnam-Japan freight rate for wood pellets: Argus shadow assessment; Indonesia-Japan rate: $45/t. Foreign exchange rate floating for both pellets and PKS. Energy content pellets 4,063kcal/kg (17GJ/t); PKS 3,600 kcal/kg (15.06GJ/t). Efficiency pellets 30-40%; PKS 30-40%. Coal landed costs to Japan based on Argus-assessed NAR 6,000 kcal/kg coal fob Newcastle price and Argus-assessed 75kt freight from east coast Australia to Japan.

Meti also introduced a FiP scheme from 2022-23, partly replacing a FiT scheme, to align utilities' revenues with spot power prices. This was aimed at reducing the financial burden on power consumers in the long term, and encouraging projects to continue operating even after the government's support period ends. But the first FiP tender failed to attract any bids for biomass.

Tepid start of the FiP mechanism

Japan issued the first biomass power tender under the FiP system in October 2022 for a total capacity of 120MW, targeting for more than 10MW of general woody biomass, PKS and palm trunk, as well as a palm oil plant with more than 50kW. But no bids were submitted.

The tender result implies the new system still has not been widely accepted by the industry. This is partly because of uncertainty over the cost recovery in the long term, especially as the country's wholesale electricity market has seen high volatility in recent years, which may also be an obstacle to securing project financing.

Under the FiP scheme, premiums change in response to market values, unlike the FiT mechanism which offers fixed premiums for 20 years in the case of biomass. Income under the FiP scheme is the total of the premium and market selling prices, while the FiT scheme ensures a fixed revenue for utilities regardless of the spot power market prices.

The FiP is calculated by deducting the variable market reference prices from the fixed standard prices. Market reference prices are mostly linked to the wholesale power prices on the Japan Electric Power Exchange (Jepx), while standard prices are decided through a tender or by the government.

Power generators also need to find their own buyers under the FiP scheme, such as through direct contracts with retailers or selling onto Jepx, similar to independent power trading. But all electricity generated under the FiT scheme is purchased by the country's independent private regional grid firms.

An obligation to pay imbalance charges under the FiP scheme is another deterrent for investors. Power generators need to absorb their own imbalance costs under the FiP scheme, if their generation plans fail to match actual demand, while companies operating under the FiT scheme are exempt from imbalance fees, which are in turn absorbed by the government via retailers.

But the government plans to provide a subsidy to suppliers for a few years, partly amid a lack of aggregation services that can help secure power sales at best prices and hedge imbalance risks in Japan.