

Woody biomass capacity grew more than sevenfold in the last decade in Japan and South Korea, despite doubts of profitability and sustainability

Woody biomass power stations are being used to meet renewable energy goals in Japan and South Korea despite their lack of financial viability and maintenance of the status quo for emissions.

The latest data in Global Energy Monitor's [Global Bioenergy Power Tracker](#) (GBPT) shows that Japan has 3.8 gigawatts (GW) of woody bioenergy capacity projected across 59 units by 2026 and South Korea has 1.46 GW projected across 32 units by the same year. Through the Renewable Energy Certificates (REC) in South Korea and the Feed-in-Tariff (FiT) program in Japan, dedicated woody biomass burning units receive renewable subsidies based on the false premise that they are carbon neutral. But [supply chain emissions](#) — including logging, transportation to a processing plant, processing into wood chips or pellets, and additional transportation to the power plant — remain a serious concern.

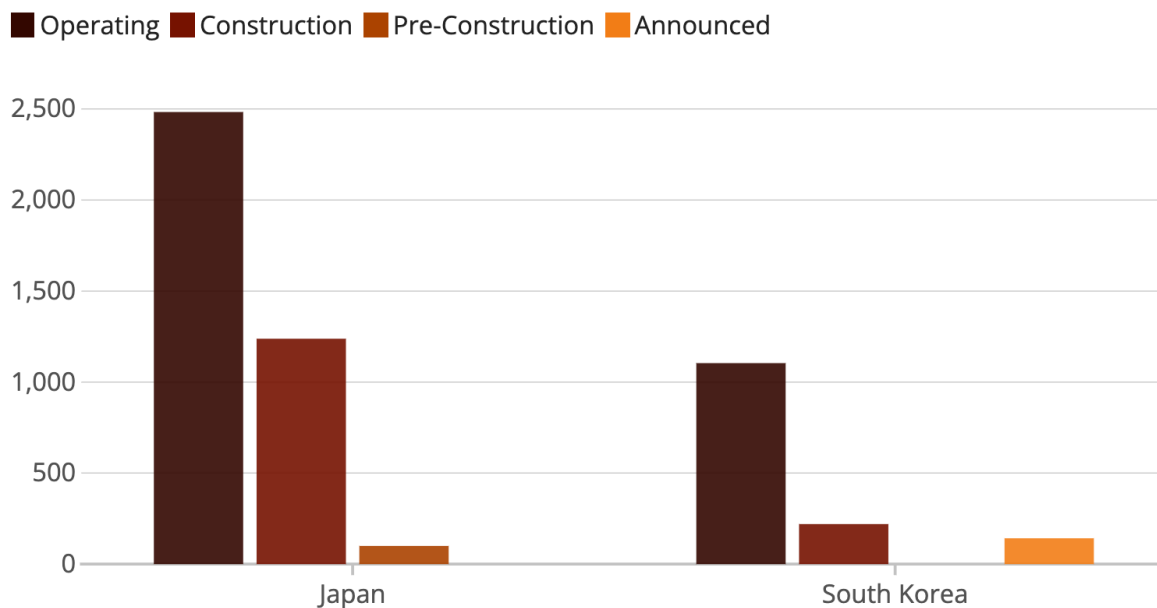
Those emissions are in addition to the carbon emissions from woody biomass itself, which can be [30% higher](#) than coal burning emissions. Woody biomass must be burned in higher volumes than fossil fuels because of its lower energy density, particularly if

the wood is [wet and dirty](#), and the [emissions increase](#) as the volume combusted grows. A study from the [Partnership for Policy Integrity \(PFPI\)](#) found burning woody biomass is worse than burning coal if a country is interested in reducing carbon dioxide emissions within the next 40 years. With a [carbon debt payback](#) period estimated between [44 and 104 years](#), both Japan and South Korea are continuing to invest in an energy which is [not carbon neutral](#) when burning woody biomass.

The combustion of woody biomass poses safety concerns for [local communities](#) with [increased air pollution](#) and the possibility of [explosions](#), with specific hazards for power plant employees including [exposure to fungi and bacteria](#) especially when [unloading wood chips](#) used for fuel.

Japan and South Korea continue to build environmentally problematic woody biomass power plants

Status of woody biomass combustion units, in megawatts (MW)



Source: Global Bioenergy Power Tracker, September 2024, Global Energy Monitor

Japan and South Korea also have 16.7 GW of capacity across 55 units that co-fire bioenergy with coal being the primary fuel, according to GEM's Global Coal Plant Tracker (GCPT). This is equivalent to 17.4% of the total operating capacity in those countries. In some cases, combustion units are retiring coal and converting entirely to woody biomass, such as [Mikawa power station](#) in Japan and [Yongdong power station](#) in South Korea, while other power stations are co-firing coal and woody biomass, such as [Iwanuma Mill power station](#) in Japan and [Samchonpo power station](#) in South Korea. With woody biomass burning power plants emitting [150% the CO₂](#) of coal, neither Japan nor South Korea are taking steps to actually reducing their emissions.

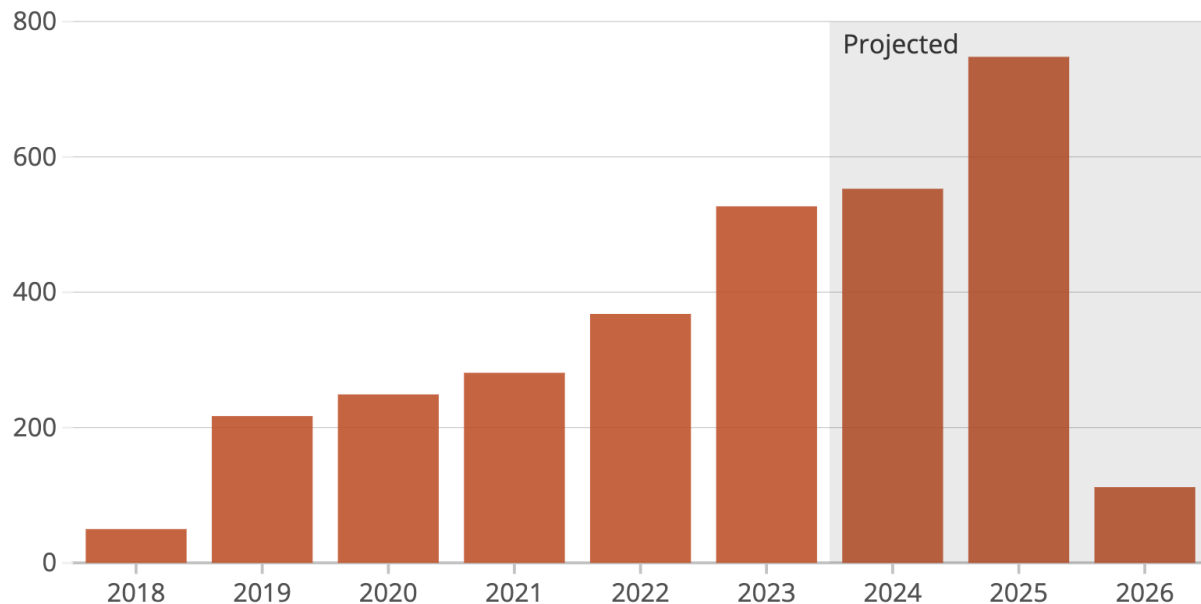
While South Korea has a 2050 [coal phaseout](#) date and Japan has yet to commit to a date, utilizing biomass co-firing could serve to lengthen the tail of coal burning in the countries. The continued subsidies also crowd out funding for truly renewable sources of energy like wind and solar and keep coal plants online.

Japan

The Institute for Sustainable Energy Policies (ISEP) reported that Japan was operating at [5.7% biomass generation](#) in its energy mix, surpassing its 5% goal for 2030. The [climate risks](#) caused by the combustion of woody biomass in Japan have not slowed the influx of [approved projects](#) in the pipeline. As of September 2024, the GBPT captures 1.34 GW across 20 prospective units primarily burning woody biomass that Japan will be adding to its energy mix. The [formula](#) used by Japan's Ministry of Economy, Trade, and Industry (METI) justifies the use of woody biomass for co-firing by falsely presenting coal units as more efficient and justifying the extension of their use.

Japan continues to add problematic woody biomass burning power projects

Annual additions of woody biomass in Japan, in megawatts (MW)



Source: Global Bioenergy Power Tracker, September 2024, Global Energy Monitor



Japan's METI established its Feed-in-Tariff program in 2015. Under the [FiT scheme](#), “power utility companies charge customers a fixed price for power from eligible renewable power generators for predetermined periods” once the plant is operational. Japan's FiT scheme initially covered new biomass co-firing plants, helping to incentivize more coal burning. [METI's formula](#) to determine coal plant efficiency deducts biomass inputs from those of coal, making co-firing coal plants appear more efficient than they are. Thirty-eight co-firing generators were certified to receive support for the 20 years of their FiT contracts. [In April 2019](#), Japan removed co-firing plants from being eligible for the FiT program, because data collected after the program began showed that co-firing plants would be [profitable without incentives](#). Still, the [38 new co-firing plants](#) already approved for the 20-year FiT program will continue to receive support over the duration of their contracts.

In April 2022, the Japanese government introduced a mandatory greenhouse Life Cycle Assessment (LCA) for all new biomass plants — still not counting smokestack emissions — seeking a government subsidy through the FiT program. These plants are required to have a 50% life cycle emission reduction compared to average fossil fuel emissions up to 2030, then a 70% reduction after 2030. Those plants already under the government subsidy scheme, including those under construction, are [exempt from making reductions](#) but will still have to disclose their lifecycle emissions for their biomass power generation — such as manufacturing and transportation. If [megabanks](#) shift their sustainability policies to address the high carbon emissions and harm to forest ecosystems caused by woody biomass, there may be a slowdown in new combustion projects.

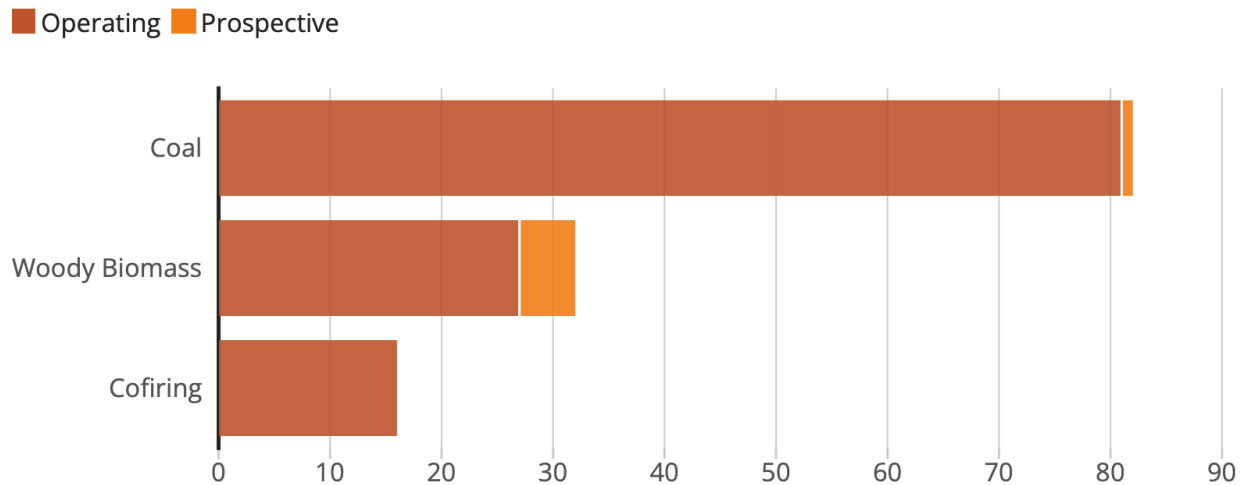
South Korea

Despite [legal challenges](#) in South Korea disputing the use of biomass as a “green” replacement for coal, South Korean biomass units continue to receive higher Renewable Energy Certificates weightings than either solar or onshore wind, contributing to the 385% increase in woody biomass burning power stations between 2015 (272.8 MW) and 2024 (1,324 MW) captured in the GBPT.

South Korea’s Ministry of Trade, Industry, and Energy (MOTIE) manages the country’s Renewable Portfolio Standard (RPS) and Renewable Energy Credits (RECs). Power utilities over 500 MW are required to meet the renewable mandate (13.5% in 2024 and 25% by 2030) through self-procurement or purchasing RECs. Renewable energy producers earn RECs which are weighted by energy source and facility. These [weightings](#) determine the profitability of renewable energy and, indirectly, grant subsidies to dedicated biomass facilities. Since 2015, South Korean biomass has received [\\$3.7 billion USD](#) worth of RECs. [As of 2023](#), MOTIE grants biomass facilities at a higher rate than solar or onshore wind.

South Korea utilizes the cofiring of woody biomass to keep coal plants online

Operating and prospective capacity by coal alone, woody biomass alone, and cofiring, by number of power plant units



Source: Global Bioenergy Power Tracker, Global Coal Plant Tracker, September 2024, Global Energy Monitor

The national goal of increasing woody biomass burning for energy sixfold by [2050](#) is supported by [low construction and operational costs](#) for woody biomass plants, even though there are high financial and environmental fuel costs when compared to a truly renewable form of energy. As of September 2024, the GBPT captures 362 MW across five prospective units slated to primarily burn woody biomass in South Korea. The country's future support for the use of wood pellets for biomass combustion between 2022–2036 through the [10th power plan](#), coupled with existing policy incentives, means it is unlikely that developer interest will shift from large-scale woody biomass operations.

In July 2024, Seoul High Court [ruled against](#) a solar cooperative calling for MOTIE to remove the REC weightings for biomass power generation, closing the case without considering woody biomass-led climate impacts. As reported by Solutions for Our Climate (SFOC), the [subsidies](#) that the South Korean government has given to the biomass industry via the RECs slow down coal plant closures and divert funding from

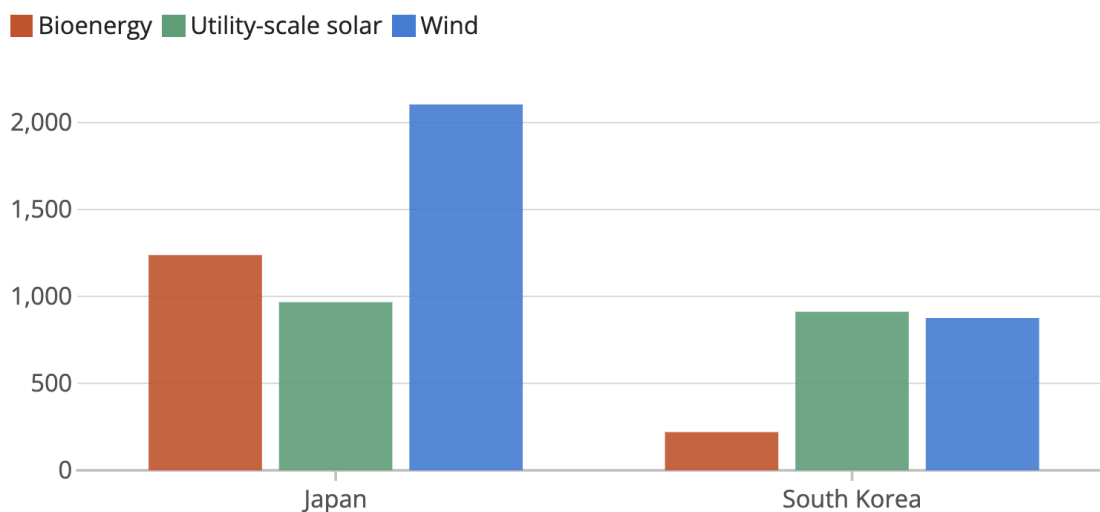
potential solar and wind installations. Such installations could move South Korea closer to its 39.9 GW required for reaching 21.6% renewables [by 2030](#) without having to use an accounting loophole to appear carbon neutral. The [September 2024 ruling](#) from South Korea's constitutional court to set legally binding targets for greenhouse gas reductions between 2031–2049 is an opportunity to move away from both coal and woody biomass combustion.

The future of woody biomass combustion

According to data in GEM's [Global Integrated Power Tracker \(GIPT\)](#), wind and utility-scale solar continue to grow within Japan and South Korea, but the misrepresentation of woody biomass combustion as renewable will continue to impact emissions and detract resources from increasing implementation of prospective wind and solar projects.

Japan and South Korea continue to misrepresent woody biomass as renewable

In-construction woody biomass capacity in Japan and South Korea, compared to utility-scale solar and wind, in megawatts (MW)



Source: Global Bioenergy Power Tracker, Global Integrated Power Tracker, Global Energy Monitor
 Note: Data includes only solar project phases with a capacity of 20 megawatts (MW) or more and wind power phases with a capacity of 10 MW or more.



Not only is the combustion of woody biomass [more expensive](#) than utility-scale solar and wind, it's more dangerous. At least twelve biomass plants in Japan have caught fire over the past five years putting employees and local communities at risk, with speculation that [poor quality fuel](#) is a cause of the explosions. As biomass burning increases, so will the demand for fuel, leading to [further decreases in quality](#).

Deforestation [within South Korea](#) and the countries that export wood pellets to both [Japan](#) and South Korea — including Canada, the [United States](#), and [Vietnam](#) — should be factored into calculations on the true impact of large-scale woody biomass combustion. With utility-scale wind and solar as true renewable energy options that are also more affordable, government subsidies should not be spent on a technology with low financial and technical viability.

About the Global Bioenergy Power Tracker

The Global Bioenergy Power Tracker (GBPT) is a worldwide dataset of utility-scale bioenergy power facilities. It includes bioenergy units with capacities of 30 megawatts (MW) or more. The tracker provides separate data on each of the multiple facilities that typically exist at a particular location. The tracker includes every bioenergy unit at the 30 MW capacity threshold for operating, announced, pre-construction and in-construction power station units. In some cases, units may combust multiple fuel sources in addition to bioenergy.

Background on Global Energy Monitor

Global Energy Monitor (GEM) develops and shares information in support of the worldwide movement for clean energy. By studying the evolving international energy landscape and creating databases, reports, and interactive tools that enhance understanding, GEM seeks to build an open guide to the world's energy system. Follow us at www.globalenergymonitor.org and on Twitter/X [@GlobalEnergyMo](https://twitter.com/GlobalEnergyMo)

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