



IEEFA Japan Briefing: Japan's Energy Transformation

March 2016

Key points

- **As Japan's electricity sector evolves, coal dependency will decline**
- **Japanese overall energy demand is declining**
- **Proposed new coal power plants risk becoming stranded assets**
- **Japan was one of the three largest solar installation markets in 2014 and 2015**
- **2015 will mostly likely stand as a peak year for Japanese thermal coal imports and coal-fired power generation**

Japan's power sector is transforming

Latest figures show Japan's power-sector is transforming, with energy-efficiency advances and weak economic growth resulting in a 2.7% decline in electricity demand over 2015. Total electricity demand declined 8.7% year on year (yoy) for the month of January 2016. Even allowing for monthly variability and the negative economic growth in Japan in the fourth quarter of 2015, this is triple the rate of decline evident over 2015. On the back of this, January 2016 coal imports declined 13% yoy.

Japanese electricity demand for the 10 major utilities was 806 terawatt hours (TWh) in 2015, down from a peak of 906 TWh in FY2010/11 having declined at a compound rate of 2.3%—despite annual GDP growth of 0.6% annually over this period (translating to a 3% annual improvement in electricity productivity).

Coal to Decline as Solar and Nuclear Gain Market Share

The consequences of the transformation will be felt most strongly in the thermal power sector, which faces declining market share for coal power generation and an almost inevitable drop in thermal coal imports.

"This is the fifth consecutive annual decline as the country's electricity market evolves in the wake of the Fukushima nuclear disaster. Japan continues to invest almost US\$20 billion annually in new solar developments that are bringing 8 gigawatts (GW) of solar-powered electricity online per year. Meantime, a gradual nuclear facility restart is under way, and oil and liquid natural gas (LNG) have seen significant price declines, improving relative cost competitiveness. Fossil fuel imports look to be the key loser," said Tim Buckley, Director of Energy Finance Studies at the [Institute for Energy Economics and Financial Analysis \(IEEFA\)](http://www.ief.org).

A new government policy direction was signalled in February 2016 when the Japanese Environment Minister Tamayo Marukawa was reported to be looking to allow new thermal power plant approvals in return for voluntary thermal efficiency targets. Minister Marukawa is pushing for voluntary efficiency standards on existing power plants and BAT technology requirements for new plants.

The power industry set its own target in July 2015 to cut emissions per kilowatt of power sold from 2013 levels by 35% by 2030 to 0.37kg/kWh.ⁱⁱ If achieved in full, the associated thermal efficiency gains could also drive a 1% annual reduction in coal use.

New coal power plants potentially uncommercial

Japan today has a record 47 coal-fired power plants in the pipeline, aiming to bring 22.5 GW of new capacity online during the next decade.ⁱⁱⁱ However, given the likely increased market share of both solar and nuclear over the next five years, and the declining electricity-demand profile, IEEFA sees a significant number of closures of dated coal-fired plants and/or a decline in average thermal power plant utilization rates.

These fundamentals will undermine the commercial rate of return on both the 47 proposed new plants and the existing thermal power plants and they risk becoming stranded assets.

Furthermore, the Australian Government's Office of the Chief Economist estimates that Japanese thermal coal use declined marginally over 2015, despite a reported increase in coal imports to 145 million metric tons as utilities increased inventories while coal prices hit decade lows.^{iv} This is consistent with the Japanese government statistics reporting coal-fired electricity production in 2015 was 291TWh, up 1% yoy.

Barring a significant and sustained recovery in oil and LNG prices, IEEFA sees a decline in LNG and coal demand in Japan of 2-3% annually until 2020. This is likely even in the face of already record low U.S.-dollar thermal coal prices, which are forecast to decline a further 10-20% by 2022 to US\$42/metric ton.^v

While Japan was one of the few large energy markets reporting thermal coal import growth last year, it's a trend that is unlikely to last. Indeed, 2015 will mostly likely stand as a peak year for Japanese thermal coal imports and coal-fired power generation, with January 2016 coal imports down 13.2% yoy.^{vi}

Japan's rising sun

Japan was one of the three largest solar installation markets globally in 2014 and again in 2015. IEEFA estimates 2015 installs reached 8 gigawatts (China was No. 1 with 15 GW of installs last year, and the U.S. is estimated to have installed 7.5 GW). Total Japanese solar installations are estimated to have reached nearly 30 GW at the end 2015, on track to exceed 50 GW by 2020 (76GW of solar was approved as at the start of 2015).

Even with relatively low solar irradiation, Japan is estimated to have generated 30TWh of solar power over 2015, or 3.7% of Japan's total electricity generation. And even with a

slowing solar installation rate, IEEFA sees Japanese solar generating 40TWh of Japan's electricity in 2016, a 4.8% market share and a gain of over 4.2% market share points in the five years since Fukushima.

Further growth is likely: the Japan Photovoltaic Energy Association last April published a strategy document outlining how the country can reach 100 GW of installed photovoltaic generation capacity by 2030.^{vii} This would imply generation of over 110TWh annually of solar production, equating to 15% of Japan's total electricity demand. However, the Japanese utilities are lobbying strongly against solar and may limit additional deployment rates in the face of declining thermal power plant utilisation rates.

In addition to solar, the Japanese renewables industry has continued to invest in potential for floating offshore wind, which is likely to add diversification and improve energy security through greater domestic sourcing of electricity generation post 2020. Hitachi Zosen Corporation installed the first demonstration 5MW offshore floating turbine in mid-2015,^{viii} closely followed by a 7MW turbine installed by Mitsubishi Heavy Industries.^{ix}

Japan's gradual nuclear restart

Kansai Electric Power Co. this month fired up the third Japanese nuclear reactor to clear post-Fukushima safety rules and overcome court challenges. The country's 40 other operable reactors remain shut, however, so Japanese nuclear power operated at an average capacity utilization rate of only 4.5% of potential.

Nuclear power generated 1.4TWh in December 2015, or 2.2% of Japan's total generation. Under the unlikely and extreme scenario that all of the country's nuclear reactors restarted, nuclear could return to supplying 30% of Japan's total electricity.

Declining coal: an international trend

IEEFA notes that if Japan builds excessive new coal-fired power plants, the outcome will be underutilisation of whole. This pattern has already occurred in China where the average coal-fired power plant utilization rate has declined from just over 60% in 2011 to a record low 49.4% in 2015. Similarly, in India, the prolonged annual addition of 15GW of new coal-fired power plants has been met with significantly weaker than forecast electricity demand growth. The result: India's coal-fired power sector utilization rate has fallen from 75% in 2011 to an estimated 61% average rate in 2015 (with IEEFA forecasting a further drop to a record low of 57-58% in 2016).

The decoupling of economic growth from electricity demand also mirrors trends established in Australia, Germany and the U.S. over the past five years.

These factors together mean less market share for thermal power generation and signal an almost inevitable decline in thermal coal imports and coal-fired power generation over the balance of this decade.

The transformation towards a lower emissions intensive, more efficient Japanese electricity system less dependent on fossil fuel imports would improve Japan's energy security needs and is not only consistent with Japan's COP21 commitment, but would also serve to avoid significant stranded fossil fuel asset risks.

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ABOUT IEEFA

IEEFA conducts research and analyses on financial and economic issues related to energy and the environment. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy and to reduce dependence on coal and other non-renewable energy resources.

More here on IEEFA research: <http://ieefa.org/category/subject/reports/>

ⁱ Federation of Electric Power Companies of Japan;

http://www.fepc.or.jp/english/news/generated_purchased/index.html

ⁱⁱ <http://asia.nikkei.com/Politics-Economy/Policy-Politics/In-about-face-environment-ministry-to-OK-coal-plants>

ⁱⁱⁱ <http://sekitan.jp/plant-map/en>

^{iv} [http://www.industry.gov.au/Office-of-the-Chief-](http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/req/REQ-December-2015.pdf)

[Economist/Publications/Documents/req/REQ-December-2015.pdf](http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/req/REQ-December-2015.pdf)

^v <http://quotes.esignal.com/esignalprod/quote.action?symbol=NCFQ-ICE>

^{vi} <http://af.reuters.com/article/metalsNews/idAFL3N1652GT>

^{vii} [\[tech.org/news/with_100gw_of_solar_by_2030_japan_could_meet_11_of_demand_says_in_dustry_gro\]\(http://www.pv-tech.org/news/with_100gw_of_solar_by_2030_japan_could_meet_11_of_demand_says_in_dustry_gro\)](http://www.pv-</p></div><div data-bbox=)

^{viii} <http://www.windpoweroffshore.com/article/1362869/hitachi-add-5mw-production-line>

^{ix} <http://www.windpoweroffshore.com/article/1358221/worlds-largest-floating-turbine-installed-fukushima>