

Nukes vs Renewables

Japan's energy situation five years after Fukushima

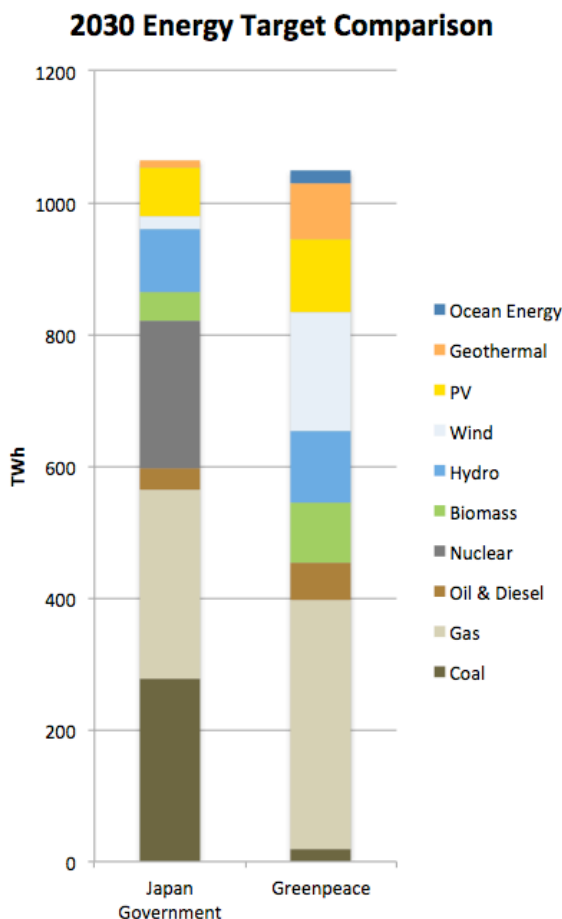
February 2016

On 11 March 2016, the people of Japan will mark a tragic and sombre anniversary. It will be the 5th year since the Great East Japan Earthquake and tsunami triggered the beginning of the worst nuclear disaster in a generation. Greenpeace Japan takes this moment to assess Japan's progress on the path to the clean and secure energy supply that its people so keenly desire. To get there, Japan must urgently formulate more ambitious targets, keep nuclear reactors off the grid and permanently shut them down, remove the obstacles to renewable energy, and stop all planned investments in new coal power plants.

It is difficult to describe all the devastating environmental and human costs of the triple reactor core meltdowns and destroyed containment buildings at Tokyo Electric Company's (TEPCO) Fukushima Daiichi nuclear power plant in March 2011. Vast regions have become uninhabitable, about a hundred thousand people are still displaced, and the billions of US dollars poured into decontamination activities have so far merely resulted in eerie piles of plastic bags filled with radioactive material.

On the (in)adequacy of energy targets

The disaster and its consequences have reminded the world of the tremendous risk that nuclear power represents. In addition, 196 states at the 21st UN climate change conference in Paris late last year also recognized that we cannot afford the risk of global temperatures rising by more than 1.5°C. And yet, different actors have come up with different conclusions as to what energy targets should be pursued as a result. In 2011, Greenpeace Japan presented a pathway for Japan to replace all nuclear power with savings and renewable power generation by 2020 and to increase the share of renewables to 57% of overall generation by 2030.¹ In June 2015, the Japanese government then declared a 2030 target of only 22-24% renewables, with 20-22% allocated to nuclear energy and 26% to coal.² As these targets provide insufficient protection from both nuclear and climate risks, progress must be measured against the Greenpeace Japan targets instead.

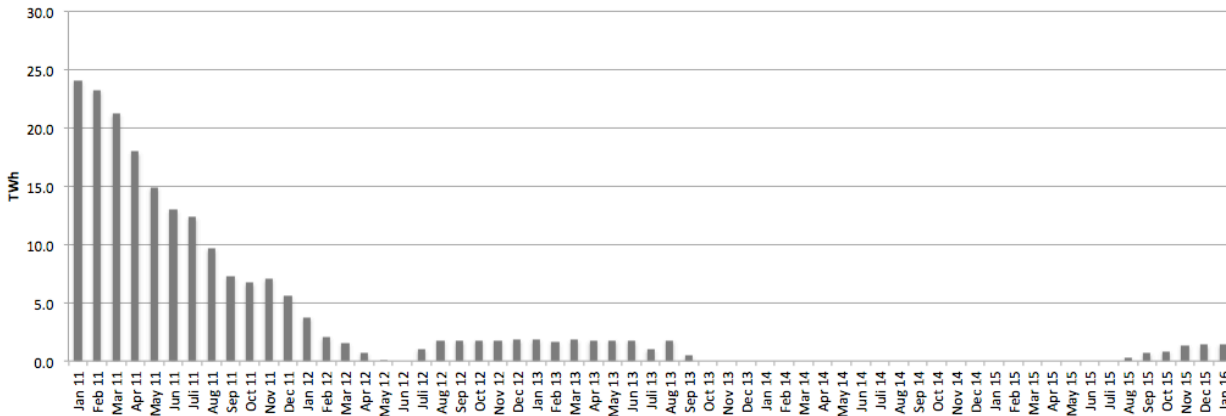


Source: Ministry of Economy, Trade and Industry "Long Term Supply and Demand Outlook" and Greenpeace Japan "Energy [R]Evolution: a sustainable energy outlook for Japan"

The progress of Japan's energy transition

Before the Fukushima disaster, Japan had 54 commercial nuclear reactors with an annual production of 288 TWh, i.e. a share of around 25% of the national generation mix. By the end of September 2013, 4 of these reactors had been destroyed at Fukushima Daiichi, a further 4 at Fukushima Daini will never operate again, and the remaining 46 were shut down pending review and so called upgrades. Of these, 7 have since been declared ready for decommissioning by the utilities. For nearly two years, until August 2015, no nuclear reactors operated in Japan.ⁱⁱⁱ No blackouts were caused as a result.

Monthly generation of nuclear power in Japan

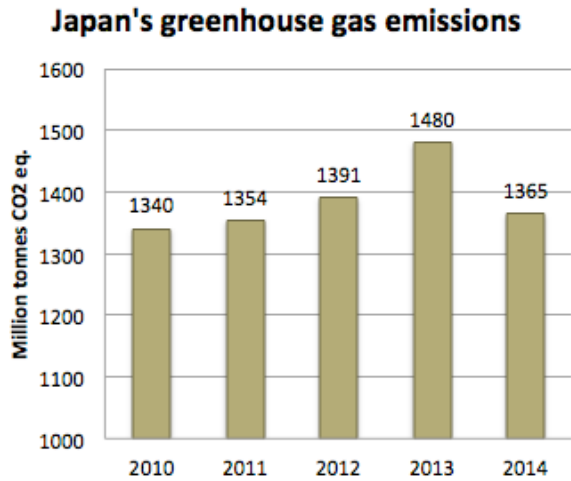


Source: the Federation of Electric Power Companies of Japan "Electricity Generated and Purchased"

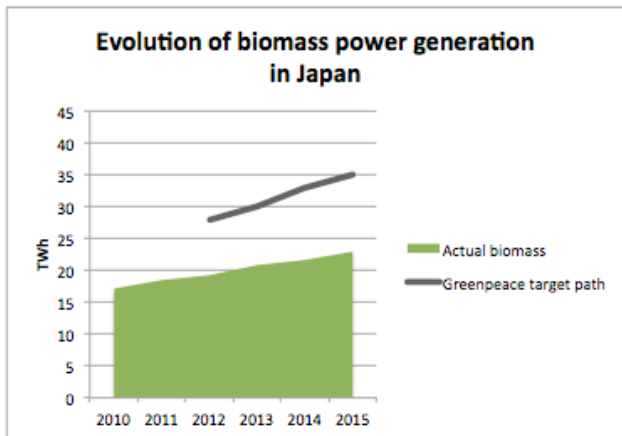
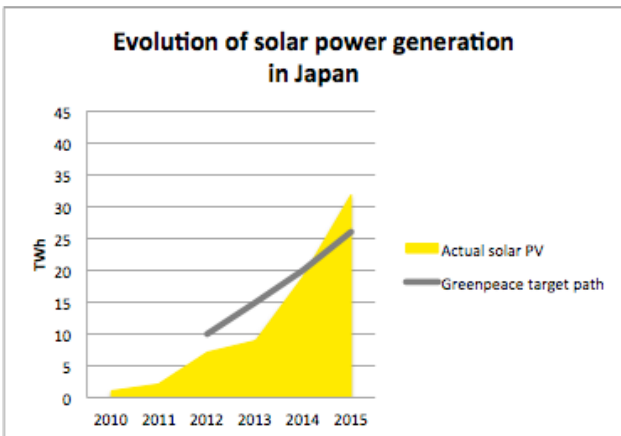
Nuclear Reactors in Japan	Change	permanently shut down	theoretically operable	operating
Pre-disaster			54	
Destroyed in Fukushima	-4	4	50	
Non-recoverable (proximity to Fukushima)	-4	8	46	
Declared for decommissioning in 2014	-2	10	44	
Declared for decommissioning in 2015	-5	15	39	
Restarts of Sendai I and II and Takahama III			36	3
Situation on February 1, 2016		15	36	3
Older than 40 years in 2030	-21		18	

Seemingly unable to learn their lesson, and in complete disregard of the views of the Japanese people,^{iv} nuclear plant operators began requesting approval to restart their reactors in July 2013; as of today 23 requests are pending. 2 reactors at the Sendai nuclear plant in Kyushu, southern Japan, resumed operation in August and October 2015. Takahama 3 in Fukui prefecture came back on the grid at the end of January 2016 and Takahama 4 followed one month later. With full operation of these 4 reactors by April 2016, the electricity they will supply to the grid during fiscal year 2016 will be around 22 TWh – much less than Japan's output of solar power, which reached that number in fiscal year 2015 already (see below).

Japan initially compensated for the missing nuclear power mostly with energy savings and increased usage of thermal power plants. Efficiency and other energy saving measures led to a reduction in demand from 1,045 TWh in FY 2010 to 961 TWh in FY 2014.^v These 84 TWh correspond to the output of almost 16 average sized nuclear reactors.^{vi} While increased thermal generation initially mostly came from gas, the Japanese power sector soon made the terrible mistake of planning dozens of new coal power plants. Japanese NGO Kiko-net currently counts 47 planned coal power plants with a combined capacity almost equalling the existing capacity.^{vii} This is particularly unfortunate as the 2014 preliminary figures of Japan’s Ministry of Environment show that the country’s greenhouse gas emissions almost returned to “pre-Fukushima” levels in FY 2014.^{viii} For this reason among others, the think tank E3G in 2015 assessed Japan to be “the worst performer among the G7 across every category” of its coal phase out scorecard.^{ix}

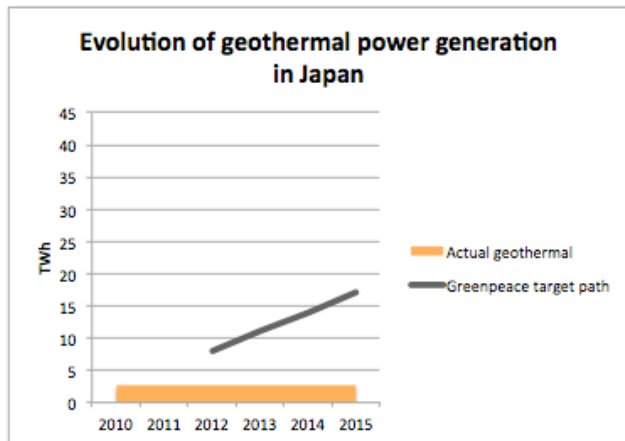
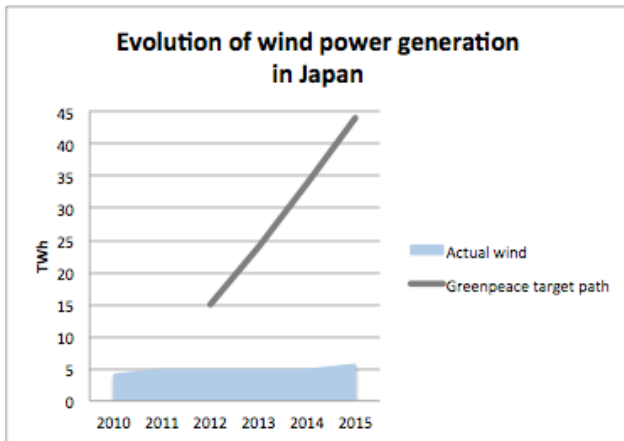


Increasingly, however, renewables are also contributing their share to replace nuclear power. Since the introduction of the Feed in Tariff (FIT) by the Democratic Party of Japan (DPJ) government in 2012, solar power in particular has boomed. In FY 2015 alone, solar power capable of generating an estimated 13 TWh was newly installed.^x This is more than the 2 Sendai reactors that were restarted that year can produce - a speed of expansion that not even Greenpeace Japan had anticipated.



Source: the Ministry of Economy, Trade and Industry(METI) / the Agency for Natural Resources and Energy(ANRE) "Total Energy Statistics" and Greenpeace Japan "Energy [R]Evolution: a sustainable energy outlook for Japan"

Unfortunately, the boom of solar power was not matched by the other renewable sources of energy envisioned by Greenpeace Japan in our 2030 scenario.^{xi} In the last few years, the expansion of wind and geothermal power has more or less stalled. Biomass also remains under target, although less dramatically. This unequal development represents a failure of policy that must be remedied as soon as possible. A 100% renewable energy scenario with an optimized minimum of required infrastructure and storage can only be achieved with a diversified mix of energy sources that complement each other.



Source: METI/ANRE "Total Energy Statistics" and Greenpeace Japan "Energy [R]Evolution: a sustainable energy outlook for Japan"

Japan's conflicting energy policies

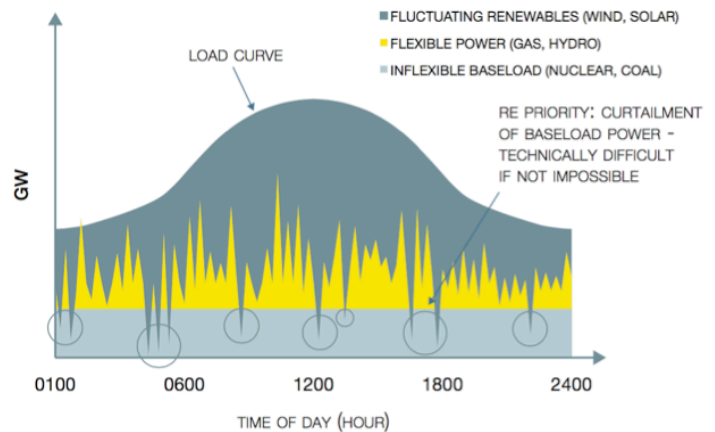
Japan is on the verge of an energy revolution. 5 years after the start of the Fukushima nuclear disaster, the battle between dirty old and clean new energy is in full swing. Frightened to the core by the boom of solar power, the nuclear and fossil industries are desperately trying to survive by holding on to their old business models, irrespective of the damage they are causing to nature and people. Unfortunately, the Japanese government is acting to protect the interests of the dirty utilities rather than supporting the people of Japan in their ambitions for a safe and clean energy system.

This is creating a dangerous situation of mutually destructive policies that will lead to negative outcomes for everyone involved. The biggest lobbying success of Japan's nuclear utilities so far is the right to block access to the grid for renewable power plants whenever they deem it necessary to preserve grid stability. One company, Shikoku Electric, has actually started applying the curtailment rules in January 2016.^{xii} These curtailment rules make no sense from a macroeconomic viewpoint. They reduce the security of investments in renewable energy and increase the price of new power plants by forcing investors to apply a risk premium. In that way, they annihilate the biggest benefit of the FIT - investment security - and thus make the energy transition unnecessarily more costly.

Utilities are blocking renewables because the latter's fluctuating output is incompatible with the inflexible output of the old nuclear reactors they are trying to restart, and the coal power plants they intend to replace or build. The infographic shows why baseload power is an obstacle to renewables and must be abandoned.^{xiii}

A Greenpeace analysis in 2015 showed, however, that it will be practically impossible for utilities to bring back enough nuclear power plants to reach the government's target nuclear share of 20-22%.^{xiv} Of the 54 reactors in 2011, perhaps 10 will succeed in surmounting the tremendous legal, political, economic and safety-related (ageing) obstacles before them by 2030, for a share of perhaps 6-8% of total production. In 2015, the power sector "voluntarily" promised to reduce its CO₂-emissions factor to 370 grams of CO₂ per kWh produced by 2030. This is a deceitful strategy to get approvals for the

THE INCOMPATIBILITY OF NUCLEAR/COAL BASELOAD AND RENEWABLES



Source: Greenpeace International, "Energy [R]Evolution: a sustainable world energy outlook 2015"

construction of coal power plants. The latter have an emissions factor of more than 900g/kWh. If they are built, the emissions factor can only be reduced to 370 grams if the nuclear reactors come back online. Since this will not be the case (see above), Japan will find itself in an extremely uncomfortable situation - i.e. putting itself into a corner to achieve CO2 reduction targets - in the coming years.

If the current stalemate continues, utilities will bring up the spectre of possible energy shortages. Plant operators will pressure the government to increase the lifetime of nuclear reactors beyond the current maximum of 40 years, and try to avoid environmental assessments for new coal power plants. To prevent this very dangerous situation, and to contribute meaningfully to global efforts to save the climate, the Japanese government will need to free itself from the stranglehold of the dirty energy industry. This is best achieved by mobilizing the collective power of many actors, including millions of citizens and communities eager to produce clean, domestic electricity. Like Mr and Mrs Okawara, organic farmers from Fukushima prefecture who have just inaugurated their crowd-funded solar roof with the help of Greenpeace Japan, and are now inspiring others to do the same.

Immediate measures needed

In order to remain on track to a sustainable, reliable and affordable electricity system, the Japanese government urgently needs to change course and streamline its policies. It needs to put the interests of the Japanese people before those of the utilities and carry out the following measures as a matter of priority:

- **Stop the efforts wasted on attempts to restart nuclear plants**

Nuclear power plant owners are currently wasting an incredible amount of financial and human resources in an effort to restart their reactors, the end result of which will be to again jeopardize the safety of the Japanese people. These resources should instead be invested in the development of clean and safe alternatives, energy savings and smart solutions to grid expansion and demand-side management, as well as safe decommissioning of the nuclear reactors and radioactive waste treatment. Planning for the energy transition would be greatly facilitated – and the costs for Japanese society as a whole as a result much smaller – if nuclear energy was abandoned once and for all.

- **Keep the FIT system and give renewables priority access to the grid**

The boom of solar has shown what is possible if the conditions are made right. The same now needs to happen with, geothermal and in particular wind power by setting an appropriate FIT system. Utilities should focus on – and be rewarded for – the necessary measures to integrate the renewable energy from producers who are ready to contribute their part to a sustainable system. They, together with the newly established Organization for Cross-Regional Coordination of Transmission Operators (OCCTO), are best positioned to find the most cost effective combination of grid expansion, grid modernization (smart-grids), demand-side management including efficiency measures, and storage capacity increases.

- **Improve the electricity market: ensure true costs**

On 1 April 2016, households and businesses with a connection of less than 50kW will be the last consumer segment to be able to freely choose their electricity supplier. Preliminary results of a Greenpeace Japan survey show, however, that

people will still remain without a truly green choice. For this to change, the government of Japan will need to fully unbundle the utilities' grid- and power supply operations, a development that is under way. More importantly, however, it will have to create a level playing field between the different sources of energy by ensuring that their prices reflect the true costs they cause for society and environment.

- **Stop investments in coal power plants that lock in climate destruction**

The plans to build new coal power plants are in total contradiction with the agreement concluded at the COP21 in Paris last year and even Japan's unambitious targets. Building coal power plants – the worst emitters of CO2 in power generation – means locking in CO2 emissions for decades to come. If Japan wants to prevent embarrassment in front of the international community in the coming years, it should not build a single additional coal power plant and start replacing the old ones with (bio-)gas turbines and renewables.

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¹ See „Energy [R]Evolution. A Sustainable Energy Outlook for Japan“: Greenpeace Japan, September 2011, available at http://www.greenpeace.org/japan/Global/japan/pdf/er_summary_eng.pdf

² See „Long Term Supply and Demand Outlook“: Ministry of Economy, Trade and Industry, July 2015, available at http://www.meti.go.jp/english/press/2015/pdf/0716_01a.pdf (accessed 20.02.2016)

ⁱⁱⁱ For further details, please refer to “Reality Check: Energy Mix 2030 and Japan's Collapse in Nuclear Power Generation”: Greenpeace Germany, August 2015, available at http://www.greenpeace.org/japan/Global/japan/pdf/Sendai%20Restart%20Brief_FINAL_20150804.pdf

^{iv} See <http://www.aljazeera.com/indepth/features/2015/01/japan-nuclear-restart-meets-public-fears-150129105332893.html> (accessed 20.02.2016)

^v Statistics provided by the Ministry of Economy, Trade and Industry (METI) at http://www.enecho.meti.go.jp/statistics/electric_power/ep002/results.html (accessed 20.02.2016)

^{vi} Calculation based on the 288 TWh of electricity generated by Japan's 54 reactors in the year before the Fukushima disaster.

^{vii} See http://sekitan.jp/plant-map/en/v2/table_en (accessed 20.02.2016)

^{viii} See the report published by Japan's Ministry of Environment (Japanese only) at <https://www.env.go.jp/press/files/jp/28580.pdf> (accessed 20.02.2016)

^{ix} See <http://www.e3g.org/library/snapshot-of-japan-coal-phase-out-progress> (accessed 20.02.2016)

^x Extrapolation based on the first eight months of data available provided by METI at http://www.enecho.meti.go.jp/statistics/electric_power/ep002/results.html (accessed 20.02.2016)

^{xi} See note 1

^{xii} See <http://www.pv-tech.org/news/japan-set-to-ok-auctions-as-power-company-applies-curtailment-rules> (accessed 20.02.2016)

^{xiii} See more detailed explanations in Greenpeace International's 2015 report „Energy [R]Evolution: a sustainable world energy outlook 2015“, available at: <http://www.greenpeace.org/international/en/campaigns/climate-change/energyrevolution/>

^{xiv} “Reality Check: Energy Mix 2030 and Japan's Collapse in Nuclear Power Generation”: Greenpeace Germany, June 2015, available at: <http://www.greenpeace.org/japan/Global/japan/pdf/20150428-briefing-energy-mix.pdf>