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Evaluation and recommendations on the Japan's Fifth Basic Energy Plan (draft)

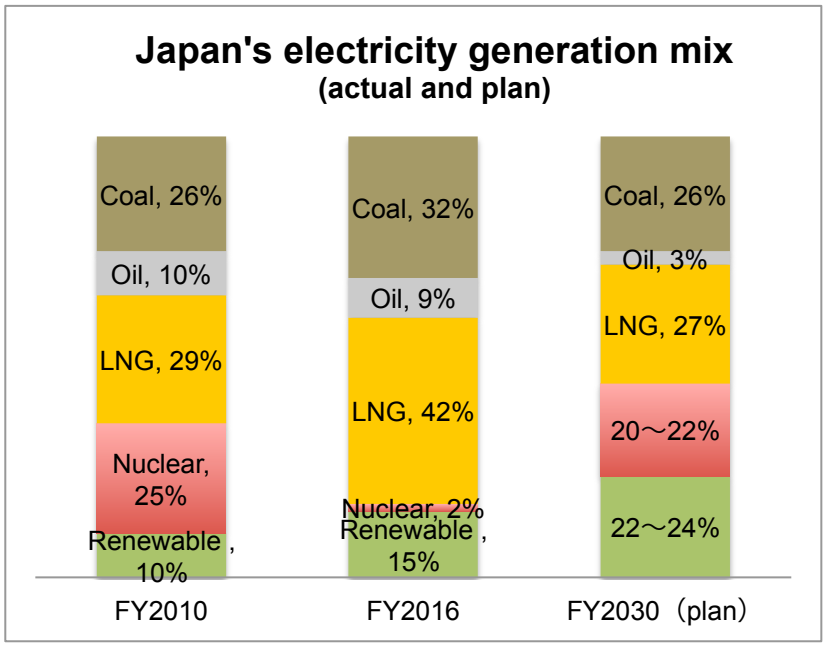
Overview

In May this year, the Ministry of Economy, Trade and Industry (METI) announced the "Fifth Basic Energy Plan (draft)" that will guide the national energy policy going forward. The government solicited public comments until June 17, with a final plan due to be approved by the Cabinet decision this summer. This briefing paper by Greenpeace Japan is to evaluate the draft plan and to summarize our recommendations to the government.

The draft plan clearly states that renewable energy is the "main power supply" for the first time, while calling nuclear power "an important base load power supply" and "dependence will be reduced as much as possible", which maintains the existing policy. The current electricity mix for 2030 is 20 to 22% of nuclear power plants, 22 to 24% of renewable energy, etc. (see chart[1]).

The world is now at a "tipping point" in climate change. We must promote rapid decarbonization to keep the temperature rise below 1.5 degrees.

Under such circumstances, it can be said the draft METI plan's renewable energy target lacks ambition and urgency, its coal ratio is far too high, and the ratio for nuclear power is wholly unrealistic. Seven years after TEPCO's Fukushima nuclear power plant accident, 70% of Japanese people are still seeking a non-nuclear society[2], and this wish is not reflected in the proposed energy mix. As we face an



[1] Based on METI data. http://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/022/pdf/022_006.pdf, http://www.enecho.meti.go.jp/en/category/brochures/pdf/japan_energy_2017.pdf

[2] https://www.47news.jp/673397.html

unprecedented climate crisis, it is clear that nuclear and coal generation cannot deliver a secure and sustainable energy future for Japan. The proposed new Basic Energy plan is a missed opportunity for Japan to change direction and to seek to catch up with worldwide trends. On the other hand, Japan will not be able to avoid a renewable energy revolution in the coming years no matter how unambitious the government remains about renewable energy.

Japan's unsustainable coal expansion plan

Currently, Japan's electricity production is over-dependent (70%) on fossil fuels: coal, LNG and oil. While coal accounted for 30% of Japan's electricity production[3], it was responsible for more than half of the GHG emissions from electricity production, and 20% of Japan's total GHG emissions.[4]

While the rest of the economically advanced world is aiming to reduce its coal usage rapidly, Japan is going backwards by planning to build 35 new coal power plants domestically (situation as of 1st June 2018)[5]. The Basic Energy Plan endorses this development despite it conflicting with the recommendations of climate experts and global financial trends. To avoid catastrophic climate change, leading scientists have found that there is no room for new or expanding coal power[6], and all existing coal-fired power plants must be phased out as soon as possible[7]. According to the IPCC, sufficient emission reductions will not be achieved by efficiency improvements nor by shifting from coal to gas[8].

No space for any new coal in carbon budget

The Government's plan indicates it will prohibit the construction of inefficient coal plants, promoting more efficient coal technology instead. This policy is totally inadequate in the face of the massive emission cuts required. Coal-fired power plants with higher thermal efficiency might reduce CO2 emissions from around 880g/kWh for a new subcritical power plant to around 740-800g/kWh for an ultra-supercritical plant[9], but assessments of emission scenarios shows that to limit global average temperatures below 1.5 degrees, the electricity sector needs to be fully decarbonised globally by 2050, and by 2030 in countries like Japan[10]. The global carbon budget and remaining time to reduce greenhouse gas emissions simply do not allow for the replacement of retired coal plants with new ones.

Assuming that the planned coal projects start operation as scheduled and retire at the current average retirement age, Japan would be still burning coal in around 2070. That means there is a gap of close to 40 years between the government's plan and the latest climate science.

Exporting coal-fired power generation technology overseas

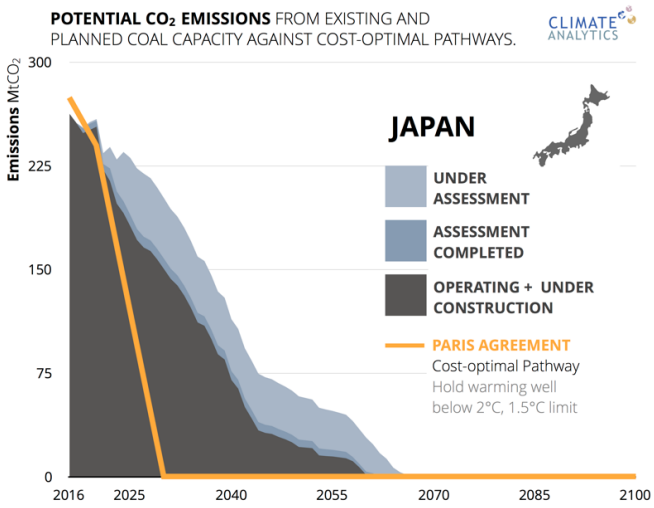
Another issue of Japan's coal policies is its export of coal technology. Currently Japan is subsidizing the export of coal-fired power plants to other countries where average emissions are

3 https://www.renewable-ei.org/en/statistics/electricity/
4 http://climateanalytics.org/publications/2018/science-based-coal-phase-out-timeline-for-japan.html
5 http://sekitan.jp/plant-map/en/v2
6 https://europeanclimate.org/documents/nocoal2c.pdf
7 http://climateanalytics.org/briefings/coal-phase-out.html
8 https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter7.pdf
9 https://www.ecofys.com/files/files/ecofys-2016-incompatibility-of-hele-coal-w-2c-scenarios.pdf
10 http://climateanalytics.org/publications/2018/science-based-coal-phase-out-timeline-for-japan.html

well below 500g/kWh (e.g. Vietnam)[11], dramatically increasing their CO2 intensity at a time when CO2 emissions urgently need to decrease.

Coal divestment accelerating in the world - Japan is left behind

By basing its energy mix on large coal electricity generation, the government is deceiving Japanese companies into following a shortsighted and potentially ruinous business strategy that risks them becoming sidelined from global megatrends. Investors are already starting to identify dependency on coal in the energy mix as a potential risk for companies. Lack of plan for decarbonising the energy system will make Japanese companies less attractive for foreign investments.



If the Basic Energy Plan is realized and currently planned plants are built, there are two possible results:

- Japan will exceed its carbon budget in line with the Paris Agreement by about three times
- In order to comply with the Paris agreement, both existing and new coal plants will eventually need to be closed before their expected lifetime, resulting in vast financial losses

What is the solution?

In order to avoid these outcomes, as well as to stay relevant in the global energy markets, the Japanese government needs to set a phase-out date in line with comparable countries, and prepare a roadmap for scaling down the current coal fleet. Possible policy options to reach this goal should include measures such as carbon pricing and higher air pollution standards.

Not credible nuclear policy 2030

The prospects for nuclear power in Japan remain highly uncertain, but what is clear is that Japan will not reach the current Government 2030 energy target for nuclear power. To attain the current 22 percent target, Japanese utilities will need to be operating in the range of 30 reactors (equal to 30 GW of capacity) over the next two decades. There are currently nine reactors that have resumed operation, as of 23 June 2018 six are operating[12]. By the end of fiscal year 2018, it is expected that all nine reactors will be in operation, barring further successful legal challenges or accidents.

A future of multiple shutdowns

The reactors so far connected to the grid are Pressurized Water Reactors (PWR); there have been no restart of Boiling Water Reactors (BWR), which are of the same principal design as

11 Estimate based on Vietnam's electricity profile and typical emission factors. https://www.evn.com.vn/userfile/files/2017/3/AnnualReport2016.pdf"

12 Takahama 3&4; Ohi 3&4 and Genkai 3&4; Sendai 1&2 in maintenance; Ikata 3 shutdown by court injunction at least until September 2018.

those at Fukushima Daiichi. There are ten BWRs under review by the Nuclear Regulation Authority (NRA), two of which, Kashiwazaki Kariwa 6&7, have passed the first stage of the review process. The prospects for restart of most of these BWRs in the coming few years are close to zero.

In the case of Kashiwazaki Kariwa 6&7, there are no prospects for restart before 2021/2, however, it's also possible that the plant will have to be decommissioned. All of the BWRs are subject to technical, safety, and/or political obstacles that will be very difficult to overcome, including legal challenges. In the case of the Chubu Electric Hamaoka plant, there is the prospect of a referendum that could lead to the decommissioning of the plant.

In the case of further PWR restarts, there remain major unresolved seismic and other safety issues, including for three reactors owned by Hokkaido Electric at Tomari. Restart of additional PWRs in the next two years looks unlikely. Two reactors are under construction at Shimane 3 and Ohma, though TEPCO also list the Higashi-dori plant as under construction. Start up date for the former is likely to be within 5 years, with major uncertainty as to whether Ohma will ever operate. Any additional new reactors being proposed to be built in Japan would generate large scale public opposition, as well as requiring investment of trillions of yen, so look near impossible.

Of the 39 Japanese reactors that remain listed as operable[13],14 have not yet applied for NRA review, and the majority are not likely to ever restart. Of the twenty-six reactors in total that have applied for NRA review, there are credible scenarios that between 6-14 reactors will not restart. By 2030, 10 reactors that are in theory capable of operation will be required to complete the life extension review process to operate beyond 40 years. There are of course enormous uncertainties, but its possible that between 16-34 reactors out of a total of 39 will be announced for decommissioning by 2030, leaving five in operation. This would be in addition to 15 reactors declared for permanent closure as of 1 June 2018.

Conclusion

By 2030, in theory, our analysis concludes that reactor operation could range between 9 and 23 units, which would generate in the range of 7.3-17.5 percent of Japan's electricity[14]. However, the higher percentage is almost certainly unattainable. Clearly, this is a wide range of potential reactor operations underscoring the enormous uncertainties. To reach anywhere approaching a medium percentage of 8-10 percent will require utilities and the NRA to grant 60 year life extension to multiple additional reactors, and resolve major seismic, volcano and other technical safety issues and complete existing construction of new nuclear plants. In addition, public acceptance and political obstacles, in particular in Niigata and Shizuoka, will have to be overcome. Securing all of this is not likely.

With no life extension and many other units not able to overcome the major obstacles to operation then it is possible that the nuclear generation percentage could be as few as five reactors and 3.5 percent generation share by 2030.

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[13] Japan Atomic Industrial Forum, "Operable NPPs", see http://www.jaif.or.jp/en/npps-in-japan/

[14] For the estimates on nuclear reactor generation in percentage terms we took a very conservative approach to the benefit of the industry, based on their historical maximum TWh production - in reality the output would not attain this output year on year, with average capacity factor providing a more realistic generation. The total TWH is then calculated as a percentage of METI's lower projection for total generation in 2030, which is 970 TWh. In terms of selecting which reactors are likely to be operating, the Greenpeace scenarios are based on the conditions of the plants post Fukushima accident, the local and prefectural conditions in each location; the technical challenges at the site (active seismic fault or not, for example); as well as legal status. For earlier GP analysis see, "Reality Check: Energy Mix 2030 and Japan's Collapse in Nuclear Power Generation", April 2015, https://www.greenpeace.org/japan/Global/japan/%5BFINAL%5DEN_2030Energy%20Mix_G7_2016.pdf

Given the financial pressure on utilities, including from rapidly lower global renewable costs and the impact of electricity deregulation, combined with entrenched public opposition to nuclear power, there is no end in sight for the crisis in the Japanese nuclear sector. The Japanese government must implement a nuclear phase out.

Japan's nuclear power plant overview (June, 2018)

	PWR	BWR	Status
Total number of "operable" reactors (39) (3 are over 40 years)	17	22	
Reactors in operational status (9)	Takahama 3,4, Ohi 3&4, Ikata 3, Genkai 3&4, Sendai 1&2 (in total of 9)	None	All of them are under legal challenge by citizens
Under NRA review (17)	Takahama 1&2* Mihama 3* Genkai4 Tsuruga2 Tomari1,2,3 (in total of 8)	Tokai-Daini Onagawa, 2, Kashiwazaki Kariwa 6&,7, Hamaoka 3&4, Shika 2, Shimane 2, Tohoku Electric Higashidori 1, Ohma (in total of 9)	*undergoing retrofitting Most reactors are under legal challenge by citizens
Not applied for review (14)	Genkai 2 (in total of 1)	Onagawa 1&3, Fukushima-Daini 1~4, Kashiwazaki Kariwa1 ~5, Hamaoka 5, Shika 1 (in total of 13)	TEPCO as of 14th June has confirmed it is considering decommissioning Fukushima Daini
Under construction (3)		Oma, TEPCO Higashidori 1, Shimane 3 (in total of 3)	Other than Higashidori1, they are under legal challenge by citizens

The need for ambitious RE targets and RE centred policies

Policy driven energy shift in the world

The threat posed by climate change requires a rapid transition of the global energy system, including Japan. As a result of policy measures introduced by countries in Europe, led by Germany, as well as China, the investment in renewable technology over the years has grown rapidly. Within the European Union, in the period 2000 and 2017, 291 gigawatts (GW)

Renewable Energy (RE) power capacity, out of which, 92% was from wind and solar[15]. The developing world invested US$170 billion in renewable energy in 2017[16], and India is planning to increase renewable capacity to 227GW by 2022[17].This has contributed to the dramatic decline in the cost of renewable energy technologies, in particular solar PV and wind power. Globally, the cost of solar power has decreased by 73% in the past seven years, at 10 cents/kWh[18], and wind power is 4 cents/kWh - lower cost than fossil fuels (Roughly 5 to 17 cents/ kWh)[19].

These dramatic cost reductions are due to RE centred policies, and its resultant rapid growth leading to economy of scale. This highlights the importance of ambitious policy measures, which is wholly lacking in the current METI energy plan. Real efforts to stop accelerating climate change lead inevitably to policies that bring about rapid expansion of RE. Ignoring the reality that RE is globally expanding rapidly, the Japanese government, together with the coal and nuclear utilities, continues to seek to block the growth of RE which they see as a major threat to their outdated baseload generation model.

Situation in Japan

A global revolution in energy is underway, but not fully yet in Japan. The urgency of climate change, including the implementation of the 2015 Paris Agreement, makes clear that the pace of the energy transition to renewables needs to increase dramatically.

Japan is not currently embracing this essential reality, despite its enormous potential for expanding RE generation. Since the introduction of the Feed In Tariff in 2012, following the Fukushima Daiichi accident, there has been positive growth in solar PV in Japan, rising from 1.4GW and 2 TWh generation in 2011, to 43GW and 47TWh in 2016. Although the total electricity generated by RE energy in Japan has increased each year since 2012, the preliminary figure for 2017 was only 15.6%[20].

In the draft "Fifth Energy Basic Plan", RE energy for the first time was described as a "main energy source". That is indeed progress given the past record of dismissing the potential for RE by METI. However, the Japanese government target for the RE remains unchanged with the comparably low figure of 22% to 24% as of 2030. By comparison, the RE target in Germany is currently 65%, while many other EU nations countries exceeds 50% by 2030. California will reach its 50% target in 2020, ten years ahead of schedule[21].

Demands to the Japanese government

In countries where RE has advanced most significantly, they have moved beyond the concept of 'base load power supply' which cannot adjust to flexible power generation. Thus, they are and have developed infrastructures and systems that allow the large scale deployment of RE. For

[15] Wind in power 2017 - Annual combined onshore and offshore wind energy statistics, February 2018, see https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Statistics-2017.pdf

[16] Developing world investment in RE, 2017, see http://fs-unep-centre.org/sites/default/files/publications/gtr2018v2.pdf

[17] RE investment in India, see https://economictimes.indiatimes.com/industry/energy/power/india-will-add-225-gw-renewable-energy-project-capacity-by-2022-r-k-singh/articleshow/64461995.cms

[18] Tokyo Shimbun, "Reduced solar energy cost by 73% 7 years, World average wind power also decreased 23%", 23 February 2018, see http://www.tokyo-np.co.jp/article/economics/list/201802/CK2018021302000125.html

[19] GT, "IRENA: Global Renewable Energy Prices Will Be Competitive With Fossil Fuels by 2020 - The International Renewable Energy Agency calls it "a significant shift in the energy paradigm.", 16 January 2018, see https://www.greentechmedia.com/articles/read/irena-renewable-energy-competitive-fossil-fuels-2020#gs.u9O9Ano

[20] ISEP, "Ratio of renewable energy in total domestic power generation in calendar year of 2017 (preliminary report)" see https://www.isep.or.jp/archives/library/10930

[21] CleantTech "California To Meet 2030 Renewable Energy Targets By 2020", see https://cleantechnica.com/2017/11/21/california-meet-2030-renewable-energy-targets-2020/

example, by using weather forecast data and predicting the amount of power generation every few minutes, priority access can be given to RE. Without a change in policy that sets much higher RE targets, while also lifting the obstacles to its growth, particularly in the development of offshore wind power, Japan will fail in meeting necessary carbon reductions, while continuing to rely on fossil fuels and maintaining an unattainable nuclear share.

However, there are signs of change in Japan. Since the beginning of April 2017 through to June 2018, eight Japanese corporations (including a bank and administrative organization) have joined RE100 initiatives, which commit to meeting their electricity needs through 100 percent RE. This means corporate initiatives have started to catch up with wider Japanese society, where there is majority support for RE.

Conclusion

We are approaching the "tipping point" in climate change, where without rapid decarbonisation Japan and the world will fail to prevent temperature rise above 1.5 degrees. The Government must shift the energy sector so that it rapidly reduces emissions of greenhouse gases - only RE has the potential to deliver such reductions in the necessary timeframe. The government should have specific and ambitious RE targets towards 2030 through 2050. RE must have priority access to the grid as it is cheaper and environmentally-friendly (low marginal cost and no fuel costs). In order to do so, it is important to disclose the actual grid capacity, and for new energy suppliers not to be penalized through excessive grid costs. RE is the energy of today and the future. The current energy plan of the government fails to provide the vision and guidance that the Japanese people and business sector so desperately need.

However, the RE transition will continue, and Japan cannot for much longer avoid the inevitable RE revolution.

*The Renewable energy mentioned here does NOT refer to

- Biomass power generation that uses imported palm oil or palm kernel shells (PKS)
- Renewable power plants that destroys ecosystems during construction or does not have the consensus of local residents
- Hydrogen produced from fossil fuels and nuclear power generation

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