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Japan's Energy and Climate Policy :

Towards Dispelling the Uncertainties

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Executive Summary

Four years after the Great East Japan Earthquake and a few months before the opening of the Paris Climate Conference, Japan is about to clarify its energy and climate policy. Already in spring 2014, the Cabinet of Prime Minister Shinzo Abe released the 4th Strategic Energy Plan, drawing the first lessons for the post-Fukushima era. The zero-nuclear scenario was abandoned, although it was established that dependence on nuclear should be as low as possible. Later in 2014, two expert panels were requested to work on quantitative targets for 2030, both in terms of future split between sources for power generation and in terms of greenhouse gas (GHG) emission reduction.

The Cabinet's final decisions are expected for June 2015. The draft proposals are already known and suggest that Japan is determined to find a proper balance between system stability, energy security and cost control objectives on the one hand, and the need to reduce domestic GHG emissions on the other hand. Because this task is highly challenging, the government's proposals are unlikely to gain unanimous support, neither domestically nor from the international community.

Taking into account the March 2015 decision to decommission five reactors, Japan now has 43 operable nuclear power plants with a capacity of 40.47 GW. Should all of them come back online, their total capacity would be sufficient to meet the draft 2030 target (20-22% share of electricity production), provided that electricity consumption does not rise significantly and that the lifetime of the nuclear plants is extended to 60 years. Although the approved restart of some nuclear units is a milestone for Japan's nuclear industry and energy mix, there are still uncertainties around the scale and timing of the restart, in particular because of the local opposition.

Japan aims at increasing the share of renewable electricity production, which is set to reach 22-24% in 2030. Such target does not seem particularly ambitious, knowing that the country has ample hydropower capacity and that solar PV has already developed at a high speed since 2012. Concerns over the surplus on electricity bills and the challenges with grid expansion tend to argue in favour of a slower development rate for renewables. The need to control fuel costs is also pushing Japan to stick to coal as fall back option for base-load power production, in particular with the use of highly-efficient coal plants. The share of coal in the power mix should remain around 26%, almost on par with natural gas (27%). Determined to lower procurement costs, the government has also developed a new LNG policy, based on diversification of supply sources and modes of imports.

In this context, Japan's climate leadership is questioned. Its energy mix choices cannot lead to a drastic reduction of its domestic GHG emissions, although further improvements in the area of energy conservation are expected. The draft target indicates that GHG emissions would be reduced by 26% in 2030 compared to 2013 levels, which only amounts to a 17% reduction compared to 1990 levels. Once committed to building a super energy-efficient nation, Japan's climate strategy is now progressively shifting to external action, with the idea that overseas mitigation efforts will be more cost-effective. Japan has made great use of international credits and is now developing a new bilateral offset scheme with developing countries. Although its contribution to climate finance is significant, Japan is exposed to criticism on the international stage because of its support for coal power plant projects. While the clean coal technologies are presented as a major improvement - compared to the least-cost options, that developing countries would choose otherwise - Japan's strategy is viewed by some as running against the ultimate objective of remaining below the 2°C limit.

Sommaire

Introduction

The Japanese energy mix has undergone drastic changes since the March 2011 Great East Japan Earthquake and the accident at TEPCO's Fukushima Daiichi nuclear power plants. Whereas nuclear capacity accounted for almost 30% of total power generation, the country's 54 reactors had to be progressively shut down for safety inspections. The power system went under extreme stress. The gap in lost capacity was filled primarily by natural gas, which leaped from a 29% in FY2010 to a 43% share in FY2013[1], coal and oil, which jumped respectively to 30% (from 25%) and 15% (from 8%). Utilities had to reactivate mothballed units, even the oldest and least efficient ones. Despite exceptional energy conservation efforts, electricity supply had to be curtailed in period of peak demand to avoid risks of blackouts.

While the shift from nuclear to thermal power helped prevent a major electricity outage, it came at a very high price for Japan's economy. Overall, the cost of imported fossil fuels surged from JPY18.1 trillion[2] in FY2010 to 28.3 trillion in FY2013, accounting for a third of Japan's total imports. After a decade of surplus, Japan's trade balance fell into the red (JPY12.8 trillion trade deficit in 2014) and only returned positive in March 2015. Utilities faced major losses and real electricity prices increased by 25% for industrial users and by 16% for households between 2010 and 2013, ranking amongst the highest in the world. The price surge was further accentuated by the increase of the renewable power energy promotion surcharge, which was introduced in July 2012. The drop in oil and LNG prices is now easing the pressure on Japanese buyers. However, lowering fuel costs remains a top priority while the country is still struggling to resume healthy economic growth.

Despite the energy efficiency efforts and the push for renewables, CO_2 emissions from the energy system also saw a marked increase in the post-Fukushima era, going up by 9% between FY2010 and FY2013 to 1,232 Mt. In FY2013, Japan's total greenhouse gas (GHG) emissions

[1] The Japanese fiscal year Y starts on April 1, calendar year Y and ends on March 31, calendar year Y +1.

[2] On 1 April 2010, exchange rates were: 1JPY = 0.0107USD = 0.0079EUR
On 1 April 2011: 1JPY = 0.0119USD = 0.0084EUR
On 1 April 2012: 1JPY = 0.0121USD = 0.0090EUR
On 1 April 2013: 1JPY = 0.0107USD = 0.0084EUR
On 1 April 2014: 1JPY = 0.0096USD = 0.0070EUR
On 1 April 2015: 1JPY = 0.0084USD = 0.0077EUR

have reached their second highest on record, up 16% from 1990, the base year used to define commitments under the 1997 Kyoto Protocol.

Four years after the Earthquake and just a few months before the Paris climate conference, the need for Japan to take a fresh look at its energy and climate policy is evident. The review process has already achieved a key milestone with the adoption of a new Strategic Energy Plan in April 2014. In line with these new orientations, Japan is closer to putting some of its nuclear capacity back online. While the debate around the use of nuclear power remains highly sensitive, Japan is now about to clarify its energy future. By June 2015, the government will specify what will be the country's quantified energy mix and climate change mitigation commitments for 2030. As the ministerial committees start to unveil their proposals, key trends are emerging. However, the country is facing such constraints and challenges that there is no easy choice for the Cabinet of Prime Minister Shinzo Abe.

Key orientations for Japan's future energy system

Under this challenging context, on 11 April 2014, Japan's Cabinet approved a new **Strategic Energy Plan**[3], the first one after the Fukushima accident. The plan defines the lines of a "long-term, comprehensive and systematic" energy policy which pursues two main objectives:

Solving the numerous challenges that Japan has to face since the TEPCO's Fukushima Daiichi accident and making the energy system more competitive, resilient and diverse.

Developing an industrial policy oriented toward the exports of energy technologies and services given that the growth of energy consumption in Japan will be limited.

The four main principles of the energy policy

The Strategic Energy Plan confirms the "3Es" (energy security, environment protection and economic efficiency) as the basis of Japan's energy policy, to which the Japanese government has added Safety as a basic premise **("3E + S").**

The second principle is the **global approach** of the policy, with the development of energy policies consistent with changes in international energy supply and the internationalization of domestic energy industries by facilitating their business overseas.

The third principle is the **contribution to economic growth** of energy policy measures. In particular, Japan will carry out **energy sector reforms in order to enhance its competitiveness as a business location**. The government expects that the new competitive environment will encourage existing energy companies to extend their operations (from gas to power for instance) and improve the efficiency of the whole sector, thereby contributing to Japan's economic growth.

[3] METI (Ministry of Economy, Trade and Industry), Strategic Energy Plan, April 2014, provisional translation, April 2014.

The fourth principle is "building a **diversified, flexible, multi-layered supply-and-demand structure"**. To achieve this structure, Japan will implement policy measures based on the following objectives:

Establish resilient, realistic and multi-layered energy supply structure, where each energy source can exert its advantage and complement drawbacks of others.

Create a flexible and efficient energy supply-demand structure, led by the demand-side by providing various options to end users, and energy system reforms, encouraging the participation of diverse players.

Improve self-sufficiency by developing and introducing indigenous energy sources to minimize the impact of external events.

Contribute to global warming counter-measures by reducing global GHG emissions.

The plan highlights that the **priority challenge is to lower energy costs.** This includes restarting nuclear power plants and other measures to diversify electricity sources, limiting electricity price hikes through fuel cost cuts, and utilizing a variety of fuels to avoid overdependence on one source. **Demand-side response** is also actively pursued along with **energy conservation,** which was implemented based on the Energy Conservation Act amended in 2013 (see section 3.1).

The role and direction of each energy source

The Strategic Energy Plan did not include a specific quantitative contribution for each energy source, citing the difficulty to foresee how many nuclear reactors would restart, how fast renewable energy sources could develop based on the feed-in-tariff (FiT) program, and how international discussions on global climate change would evolve. However, it did indicate **clear roles for each energy source and the future directions of their development**. In addition, the expert committee for the long-term energy supply-demand outlook, set up by METI in 2014, is now finalizing its proposals. In **late April 2015, METI unveiled what would be its recommendations for 2030, detailing the shares of each energy source in the future electricity mix**. The committee's proposals foresee that nuclear power will account for 20-22% of Japan's electricity supply by FY2030, while the share of renewables, including hydro, will be raised to 22-24%. Coal would still account for 26% of the electricity production in FY2030 (compared to 30% in FY2013 and 25% before the Fukushima accident). The draft plan aims to increase the ratio of base-load power sources to 56%, compared to 40% today, as a way to reduce the price burden on electricity consumers. Because all the other base-load power sources (nuclear, renewable hydro and geothermal) have a limited expansion potential, coal is the fallback option. Conversely, the share of gas (43% in FY2013) is set to return to 27%, close to the pre-Fukushima levels (29%). Although it could reduce emissions from the power sector, coal-to-gas substitution is not promoted

because reducing the dependency on costly LNG imports is still the key priority.

Table 1: METI's recommended shares for each energy source in the 2030 electricity mix

Energy source	FY2030	FY2013	FY2010 (pre-Fukushima)
Nuclear	20-22%	1.0%	28.6%
Natural gas	27%	43.2%	29.3%
Coal	26%	30.3%	25.0%
Oil	3%	14.9%	7.5%
Renewables	22-24%	10.7%	9.6%
of which Hydro	8.8-9.2%	8.5%	8.5%
of which Solar	7%		
of which Biomass	3.7-4.6%	2.2%	1.1%
of which Wind	1.7%		
of which Geothermal	1-1.1%		

Source: Reuters, 28 April 2015 (2030), METI

Should these figures be confirmed by the Cabinet, they would be roughly in line with the outcome of an analysis carried out by the Institute of Energy Economics of Japan (IEEJ) in January 2015[4]. In its quantitative assessment of four energy scenarios to 2030, IEEJ favoured an energy mix with a slightly higher share for nuclear (25%) and renewables (25%), while limiting thermal generation to 50%, against 56% in the METI draft scenario. This 25-25-50 scenario was selected by IEEJ on the ground that it would be cheaper than a non-nuclear scenario and would help the country increase its self-sufficiency to 28%, while allowing a 26% decrease in CO2 emissions compared with FY2005. The country would save JPY2.1 trillion in fossil fuel spending compared to a non-nuclear scenario, by importing 19.1 Mt less LNG in 2030. This also means Japan could return to a positive trade balance of JPY1.3 trillion instead of a deficit of JPY2.3 trillion under a non-nuclear scenario. For IEEJ, the only area of concern was the cumulative nuclear fuel consumption which would amount to 37 kilotons uranium (ktU), whereas it would only be 26 ktU in a non-nuclear scenario. In a recent government report[5], **nuclear power has been confirmed as the cheapest power source**, despite the rising costs of safety measures. It would cost JPY10.3/kWh in 2030, compared with 12.9/kWh for coal, 13.4/kWh for gas, up to 34.7/kWh for wind power and 16.4/kWh for solar power.

[4] IEEJ (2015a), Toward choosing energy mix, 16 January 2015, <http://eneken.ieej.or.jp/data/5886.pdf>.

[5] The Japan News, Nuclear remains cheapest power source despite Fukushima meltdowns: government, 11 May 2015, <www.japantimes.co.jp/news/2015/05/11/business/nuclear-remains-cheapest-power-source-despite-fukushima-meltdowns-government/#.VVMysvntmkr>.

Restart of nuclear power under strict safety regulation, but the pace and scale is still uncertain

In a stark departure from the zero-nuclear future proposed by the previous administration, the Strategic Energy Plan endorses restarting the country's idled nuclear reactors provided their safety is guaranteed. It positions **nuclear power generation as an *"important base-load power source*** *as a low carbon and quasi-domestic energy, contributing to stability of energy supply-demand structures, on the major premise that safety assurance should be prioritized above all else"*. While the Strategic Energy Plan provides an official government approval to restart safe reactors, it also pledges to *"**lower dependency on nuclear power** as much as possible through energy saving, introducing renewable energy and improving the efficiency of thermal power generation"*.

In September 2012, Japan established the **Nuclear Regulation Authority (NRA), an independent regulatory commission,** to review nuclear power plant restart and ensure the safe operation of the plants. In July 2013, the **Nuclear Reactor Regulation Act** was revised to introduce **new strict safety standards** based on lessons learnt from the Fukushima accident, latest technical knowledge, overseas regulation trends, etc. In December 2013, a regulation on Fuel Cycle Facilities and Research Reactors was promulgated.

Before the accident at Fukushima Japan had 54 nuclear reactors with a total capacity of 46.7 GW[6]. Following the accident, the four units at Fukushima Daiichi were written off and the decision was made to decommission Fukushima Daiichi units 5&6. The total operable capacity of the 48 remaining reactors amounts to 42.6 GW. In addition, two nuclear power plants, under construction in 2011, are now almost completed (Shimane 3 and Ohma 1, with a capacity of 1,373 MW each).

So far 20 reactors have applied for permission to restart. Their combined power capacity amounts to 19 GW, i.e. a potential power generation of around 130 TWh at 80% utilization rate. In addition, Japan's Electric Power Development Co. (EPDC) has filed an application with the NRA to confirm that its Ohma plant, currently under development, meets the new safety requirements. EPDC plans to complete the construction of the plant by 2020 and begin commercial operation in 2021 or 2022. Finally, Kansai Electric Power applied for license renewals in order to extend the service life of units 1&2 of the Takama power plant beyond the 40-year mark.

[6] World Nuclear Association, Nuclear Power in Japan, 27 January 2015, <www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Japan>

Table 2: Nuclear power plants – Applications for permission to restart (as of January 2015)

Application	Licensee	NPP Type	Submission	Net capacity (MWe)	First commercial operation
Tomari 1, 2	Hokkaido	2 loop PWR	Jul-13	1100	Jun-89 and Apr-91
Tomari 3	Hokkaido	3 loop PWR	Jul-13	866	Dec-09
Takahama 3, 4	Kansai	3 loop PWR	Jul-13	1660	Jan-85 and Jun-85
Ohi 3, 4	Kansai	4 loop PWR	Jul-13	2254	Dec-91 and Feb-93
Ikata 3	Shikoku	3 loop PWR	Jul-13	846	Dec-94
Sendai 1, 2	Kyushu	3 loop PWR	Jul-13	1692	Jul-84 and Nov-85
Genkai 3, 4	Kyushu	4 loop PWR	Jul-13	2254	Mar-94 and Jul-97
Kashiwazaki Kariwa 6, 7	Tokyo	ABWR	Sep-13	2630	Nov-96 and Jul-97
Shimane 2	Chugoku	BWR	Dec-13	439	Mar-74
Onagawa 2	Tohoku	BWR	Dec-13	796	Jul-95
Hamaoka 4	Chubu	BWR	Feb-14	1092	Sep-93
Tokai 2	Japco	BWR	May-14	1060	Nov-78
Higashidori	Tohoku	BWR	Jun-14	1067	Dec-05
Shika 2	Hokuriku	ABWR	Aug-14	1304	Mar-06
			TOTAL	**19060**	

Source: World Nuclear Association, press announcements

As of end of May 2015, three nuclear power plants have been approved by the NRA for restart. In September 2014, the NRA confirmed that Sendai 1&2 reactors conform to the new regulation standards, and in November, local authorities approved the restart of the two units. Sendai's reactors are now expected to restart in July 2015[7], after the reviews of the construction plans and operational manuals are completed. The NRA also approved Kansai Electric's Takahama Units 3 and 4 in February 2015. Kansai's reactors were expected to restart by November 2015. However, this date is uncertain since a local court issued an injection against the restart in April 2015. Finally, in May 2015, the NRA approved Shikoku Electric's Ikata Unit 3[8], which will also require operational checks and the consent of local authority to restart. Safety assessment applications for the other reactors are still being reviewed by the NRA.

Although the approved restart of nuclear units is a milestone for Japan's nuclear industry and energy mix, there are still uncertainties around the scale and timing of the restart. While the Government is committed to restarting safe reactors, **public confidence in the safety of nuclear energy and in nuclear policy has been lost after the Fukushima Daiichi accident**. Despite the election of a pro-nuclear government in 2012, there is no consensus at national level on the future of nuclear energy. To help reassure the public, the Government has asked operators to consider permanently decommissioning reactors that are too old or expensive to upgrade[9]. In March 2015, power utilities

[7] Nuclear Energy Institute (NEI), Sendai 1 Restart Slated for July, 30 April 2015, <http://www.nei.org/News-Media/News/Japan-Nuclear-Update>.
[8] Reuters, Japan approves third reactor for restart, 20 May 2015, <http://www.reuters.com/article/2015/05/20/japan-nuclear-restarts-idUSL3N0YA38220150520>.
[9] Reuters, Japan approves nuclear restart amid push to close old reactors, 10 September 2014.

announced their decision to decommission five reactors (Kyushu's Mihama 1&2, Japan Atomic Power's Tsuruga 1, Chugoku's Shimane 1, and Kyushu's Genkai 1). All are relatively small (320 to 529 MW each and a combined capacity of 4 GW) and above 40 years of age, implying that major expenditure on upgrades was hard to justify. As a result, Japan **now has 43 operable nuclear power plants with a capacity of 40.47 GW**. Should all of them come back online, their total capacity would be sufficient to meet the METI draft target, provided that electricity consumption does not rise significantly and that the lifetime of the nuclear plants is extended to 60 years. However, before the decision to decommission the five old reactors, analysts and industry watchers expected that of the remaining 48 reactors, 14 would probably restart at some point, 17 were uncertain and another 17 were unlikely to come back online due to their age, location or proximity to suspected active fault lines[10]. **Depending on the scale of the nuclear restart, fossil fuels used by the power sector may weaken, decreasing Japan's dependency on external supplies.**

LNG: toward better pricing

The Strategic Energy Plan recognizes the many positive attributes of natural gas: its high efficiency, its lower CO_2 emissions than other fossil fuels and its low geopolitical risk compared to oil. Therefore, the Strategic Energy Plan considers "***natural gas as an important energy source whose role is expected to expand***".

Natural gas will continue to play **a key role in mid-load power generation**. The Government promotes the advanced use of natural gas, such as combined cycle thermal power generation. Historically, Japan has procured LNG at a high price compared to international standards. In response, the Government recommends promoting cost reduction by diversifying supply sources, while avoiding over dependence on gas as a power source.

The Government encourages a **steady shift to natural gas in the industrial sector**, by diversifying the way natural gas is used, including its use for distributed energy through cogeneration systems, as well as a hydrogen source and as a fuel in the transportation sector.

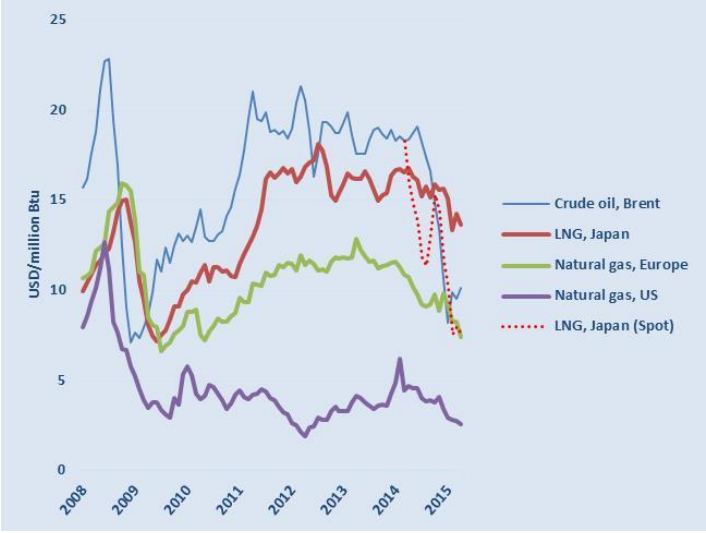
Japan has limited gas reserves and relies on LNG imports for almost all its gas supplies. The country is the world's largest importer of LNG, and its demand for LNG sharply increased after the Great East Japan Earthquake from 93 billion cubic meters (bcm) in 2010 to 104 bcm in 2011 and 116 bcm in 2012. In just two years, the increase represented the equivalent of more than four LNG trains. This sudden and steep rise dried up the international liquefaction capacity reserve and tightened the international LNG market. Combined with the rise in oil prices, to which Japan LNG prices are tied, the price of LNG imported in Japan

[10] Reuters, Japan may only be able to restart one-third of its nuclear reactors, 2 April 2014.

skyrocketed. Japan's average CIF LNG price increased from USD10.9/million Btu (MBtu) in 2010 to USD16.6 in 2012, up 52% in two years. It remained at elevated levels (USD16/MBtu) in 2013 and 2014. LNG procurement cost has therefore become a key issue for LNG importers and Japan's economy. In 2013 and 2014, imports levelled off at around 119 bcm.

The rising cost of LNG has led to a wide spread between gas prices in Asia-Pacific and other regions. The price of LNG imported in Japan was about four times higher than gas prices in the United States and 60% higher than those in Europe on average in 2014. This situation has led Japanese companies to seek for ways to decrease their procurement costs and eliminate the "Asian premium". As LNG prices are tied to oil prices with a time lag, their level is falling dramatically and is expected to average at USD10/MBtu in 2015. Already, **spot LNG prices have collapsed to USD7/MBtu** in the first quarter of 2015, a level lower than spot prices in Europe. Despite this fall, Japan remains committed to its policy which focuses on LNG procurement cost reduction and diversification of supply sources and modes of imports, including possible imports by pipeline from Russia. To achieve this goal, the Government has developed a wide strategy, which encompasses the full LNG value chain, from upstream overseas investment to a move away from oil indexation for LNG pricing, elimination of destination clauses, diversification of supplies and strategic comprehensive alliances. Recent key alliances include the alliance between TEPCO and Chubu Electric, which will create one of the world's biggest importers and consumers of LNG.

Figure 1: Evolution of regional gas prices



Source: World Bank, EIA, METI

In the future, **the Government expects that the price of LNG will be determined by market forces thanks to the shale gas revolution.** The active participation of Japanese companies in the development and financing of shale gas and LNG projects in the United States is the key strategy to achieve this objective, through diversification of supplies and indexation on gas benchmark (initially, on US Henry Hub spot prices). In addition, Japan is seeking to create an Asian gas benchmark, which

reflects the Asian market fundamentals, and since April 2014, the Government has published monthly spot LNG prices of cargoes received in Japan. Japan also launched its first LNG derivatives trading platform in September 2014, a first step in the direction of a futures market, to help increase LNG price transparency and allow hedging strategies.

An enhanced role for clean coal technologies

The energy situation in Japan and Asia has pushed the Government to re-evaluate the role of coal in the power mix. The Strategic Energy Plan assigns an **enhanced role for coal on two fronts**:

As an important base-load power source based on its lower geopolitical risk and low-cost per unit energy. Coal-fired power plants will continue to be used to supply base-load electricity, but because of GHG emissions, such plants must improve their environmental impact through further application of high-efficiency technologies.

As a source of export earnings through the sale of Japan's technology, engineering and consulting services for high-efficient technologies, coal-fired power plants and projects (see Section 3.5).

In response to the new policy and a rising prospect that several nuclear units may not come back online, several power utilities are considering building new coal-fired power plants. Currently, there are 43 coal-fired power plants with a combined capacity of around 21 GW at various stages of development in Japan. In addition to promoting the replacement of aging thermal power plants and introducing state-of-art technologies to new power plants and the expansion of existing ones, Japan further promotes the development of new technologies (e.g., Integrated Gasified Combined Cycle, IGCC, and Integrated Gasified Fuel Cell, IGFC) to drastically reduce GHG emissions per unit of generated power. The first IGCC power plant, Nakoso Power Station No. 10 unit (250 MW), started commercial operation in April 2013. In addition, TEPCO, in a joint venture with Mitsubishi, has announced the construction of two coal-fired 500-MW IGCC plants in Fukushima to demonstrate the technology at a larger-scale. The IGFC technology is being tested by the Osaki CoolGen project, developed by J-Power and Chugoku Electric. A 166-MW power plant is under construction at Osaki, Hiroshima Prefecture. It will integrate IGCC with a fuel cell system[11].

Challenges of an accelerated introduction of renewable energy sources

The Strategic Energy Plan foresees a level of renewable energy at least above the target set in the previous energy plan elaborated in 2010, which

[11] An IGFC plant uses the hydrogen produced during the gasification of coal in fuel cells to generate electricity. The plant station would emit 30% less CO_2 than standard plants and operate with an energy efficiency of 55%. The cost of the project is estimated at JPY100 billion. The project also includes plans to test methods for separating and recovering CO_2.

targeted a share of about 20% by FY2030. In July 2012, Japan introduced a very attractive FiT for a period of 20 years. Since then, solar development has exploded: **Japan added nearly 10 GW of renewable energy capacity between July 2012 and the end of March 2014, most of it is solar PV**[12]. Just in calendar year 2014, Japan added around 9 GW of solar PV capacity. By the end of August 2014, 93 GW (of which 75 GW is solar PV and 4 GW is wind) had been authorized[13]. With an average solar capacity utilization of 15%, the 93 GW would translate into 122 TWh, the equivalent of 12.7% of FY2013 power generation. In addition, large-scale hydro represents about 8% of the power mix. These figures suggest that Japan could largely exceed the target for renewables set in the previous energy plan and in the METI draft scenario (22-24% in FY2030).

However, **the rapid expansion of solar PV encounters two main challenges**. The first one is the high cost that this development may add on the economy and consumers' bill. If all the authorized capacity became operational, the IEEJ calculated that consumers' cumulative burdens for the 20 years would reach JPY46 trillion, amounting to JPY2,600/MWh, equivalent to 11% of electricity rates for households and 21% of those for large industrial users[14].

The second challenge is the integration of renewables into the grid and grid stability. The pace of growth of solar PV has been very rapid and has placed a severe strain on the transmission and distribution systems, especially in regions where new solar capacity exceeds customer demand. The lack of cross-regional power interconnections (as well as the absence of international interconnections) amplifies this issue. The power market reform will help reinforce the grid infrastructure as well as improve the market environment for the integration of renewable energy.

Box 1: The electricity market reform

Following the March 2011 earthquake and nuclear accident, the vertically segmented structure of the energy industry was identified as an important cause of inefficient resource distribution. It cannot adequately respond to new demand for flexible, diverse and efficient supply of power (including distributed power sources) and to new services required on the demand side. It cannot either respond to the need for cross-regional operation of the transmission system. Except for Okinawa, the power systems of the major companies are interconnected. However, the country's electricity grid is effectively severed between east and west because utilities in the two regions move power using distinct frequencies—50 hertz in the east and 60 hertz in the west—with limited conversion between the two parts of the country.

[12] IEEJ (2014f).
[13] IEEJ (2014a).
[14] IEEJ (2014a).

To thoroughly resolve these challenges, the Cabinet decided in April 2013 to initiate change under the 'Policy on Electricity System Reform'. **The Government now expects to fully liberalize the electricity market by 2020 and is planning to advance the reform in three phases.** The first one, implemented by 1 April 2015, establishes the "Organization for Cross-regional Nationwide Coordination of Transmission Operators (OCCTO)". The organization is charged with operating a national-level network, balancing supply and demand, planning enhancement of the cross-regional grid transmission and assessing power generation capacity. Phase 2 (to be implemented by around 2016) includes the full market opening of the retail sector (one-third of total demand) and the abolishment of wholesale regulations. Phase 3 (to be implemented from 2018 to 2020) will implement the legal unbundling of the electricity transmission and distribution sectors and fully abolish the retail price regulations.

In response to the announced reform, competition has already intensified. An increasing number of local governments are inviting companies to bid for the right to provide electricity and power utilities have established new energy providers to sell electricity throughout the country. The structure of the power market is about to change dramatically, as a result of a higher participation from gas companies, oil companies, businesses with a private power generation capability, and renewable energy suppliers. **The Government is also working on the gas market reform**, although the project is still in the early stages.

The Japanese power sector will also require massive investments in smart grid and energy storage. In the meantime, five electricity utilities suspended new grid applications for large PV projects in October 2014 stating that rising solar power capacity threatened the stability of their grids[15]. In response, METI undertook a wide-ranging review of the FiT[16] and decided to implement a shift from the current system to a system with a new output-control scheme. The new rules include limits to how much renewable energy major utilities must accept under the FiT. Under the new rules, developers are also given limited time-frames to start building and to connect projects or risk losing their right to grid access. In addition, METI announced in January 2015 that tariffs for nonresidential solar PV could potentially be reduced by 16% to reflect lower operating and maintenance costs. The tariff would be cut twice in 2015, first to JPY29/kWh in April 2015 compared with the current rate of JPY32 – and then to JPY27 in July 2015. Many analysts view the new rules and tariffs as a game-changer, which would slowdown solar development in

[15] Climatewire, Power Companies in Japan Move to Restrict Solar, 2 October 2014.
[16] METI, Promulgation of the Ministerial Ordinance and the Related Public Notices for Partially Revising the Ordinance for Enforcement of the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities, ANRE, 22 January 2015, <http://www.meti.go.jp/english/press/2015/0122_02.html>.

Japan[17]. **The 22-24% share announced in the METI draft scenario is a clear indication that renewables will be introduced progressively, taking into account their characteristics (variable vs. stable output) and the various constraints (grid and tariffs).**

Oil remains an important energy source, but is structurally on a long-term downward trend

Oil remains the most significant energy source in Japan, accounting for some 44% of the country's total primary energy supplies in FY2013. Japan's oil demand steadily decreased from 5.7 million barrels per day (Mb/d) in 1997 to 4.5 MB/d in FY2013. Almost all supplies are imported, and Japan is dependent on the Middle East for approximately 80% of its oil supplies. According to the Strategic Energy Plan, **oil will continue to be used as an important energy source.** Its advantage lies in its wide applicability as a fuel in the transportation, consumer and power sectors and also as raw material for chemical and other products. Although the amount of oil used as a power source is not high, oil plays a role as a peaking and adjustable power source. It can also serve as **an energy source of "last resort"** in the event of a disaster, given its high portability, well-developed nationwide supply network, and abundant stockpiles.

Japan will continue to promote diversification of supply sources, cooperation with oil producing countries, enhancement of crisis management, including stockpiling and resilience of oil supply networks, effective utilization of crude oil, diversification of fuels for transportation, utilization of oil in thermal power as load following power source.

Domestic oil demand is, however, on a structural downward trend, driven by higher efficiency, such as vehicle fuel efficiency improvements and fuel-switching policies. The latter include switching from kerosene to electricity and city gas, switching heavy fuel oil used by power utilities to other electricity sources, and diversification of fuels in the transportation sector (electricity, natural gas and fuel cells). Already in 2014, despite no nuclear restart, fuel oil consumption fell significantly thanks to fuel switching.

Methane hydrates and hydrogen: long term solutions

Considerable amounts of methane hydrate are estimated to exist off the coast of Japan. To better assess this potential, METI launched the "Japan's Methane Hydrate R&D Program" in FY 2001[18]. This is an 18-

[17] Cleantechnica, 17.3 GW Of Approved FiT Solar PV Projects In Japan Being Canceled Due To "Insufficient Grid Capacity", 3 December 2014, <http://cleantechnica.com/2014/12/31/17-3-gw-approved-fit-solar-pv-projects-japan-canceled-due-insufficient-grid-capacity/>.

[18] See Research Consortium for Methane Hydrate Resources in Japan (also known as MH21), <http://www.mh21japan.gr.jp/english/> and Research Consortium for Methane Hydrate Resources in Japan, Implementation Plan for Phase 2, 8 July 2009. <http://www.mh21japan.gr.jp/english/wp/wp-content/uploads/c78678339b1ca272c59cb2b006dd244a1.pdf>.

year program, which aims at impelling technological developments into drilling, production and recovery of methane hydrate on an economical basis for future utilization. The step-by-step program completed its first phase in 2008, which included an assessment of hydrate methane offshore Japan. The second step, started in 2009, implements production tests in selected methane hydrate resource fields. The first test took place in March 2013 offshore the Atsumi Peninsula. The third and final step, to be finalized by 2018, aims at improving technologies for the commercial production of methane hydrate and establishing a development system complying with environment.

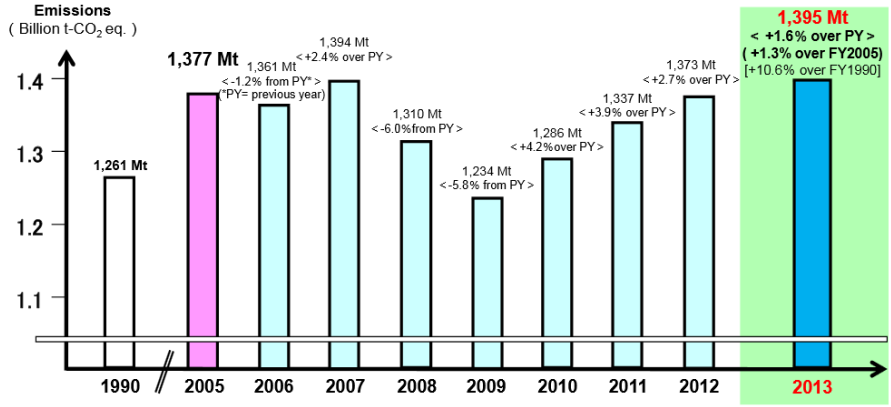
According to the Strategic Energy Plan, the Government will develop technology to realize commercial methane hydrate production by FY2018 and promote technology development so as to allow private sector-led projects for commercial methane hydrate production to start between 2023 and 2027. Commercial methane hydrate production in full scale is expected to come in the 2030s.

Hydrogen is also seen as a key option for the future. Already in 2011, Japan launched stationary fuel cells for households for the first time in the world. In 2014, fuel cell vehicles were put on the market. In 2015, Japan will start large-scale hydrogen-fired power generation (Osaki CoolGen project). In the short term, the use of hydrogen will be limited by infrastructure, technological and cost challenges. In the long term, Japan expects that hydrogen will become one of the key energy sources.

What to expect from Japan in terms of climate ambition?

Japan has been a **front-runner in the fight against climate change**, improving its performance domestically thanks to innovative technologies and encouraging global action. In 1997, Japan dedicated significant diplomatic efforts to facilitate the negotiation of the Kyoto Protocol, which became the first international binding agreement on climate change mitigation. **Almost twenty years after COP3, Japan seems much more hesitant to demonstrate leadership**. The country is undeniably facing particular circumstances since the Great East Japan Earthquake, but the recent rise in total GHG emissions is concerning for future trends.

Figure 2: Japan's total GHG emissions*

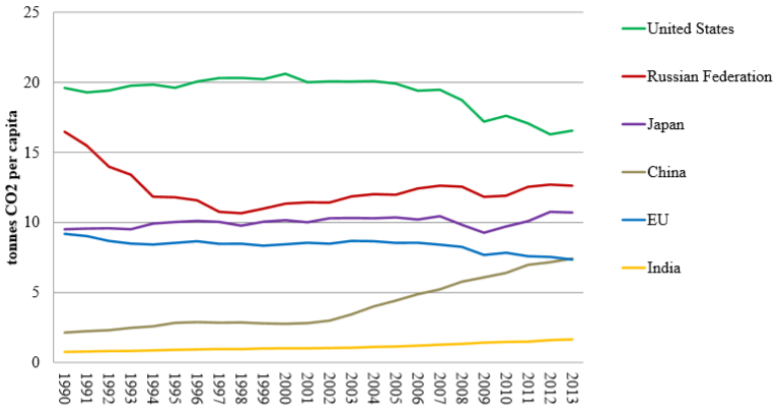


Source: MOE, 2015
* Excluding removals by forests and other carbon sinks, temporary figures for FY 2013

As the sixth largest GHG emitter in 2013 (EDGAR, 2014)[19], Japan holds a strong responsibility in the fight against global warming. Many countries, now including the US and China, have already announced strong mitigation measures. These recent commitments have strengthened the global momentum towards COP21. In this context, Japan is under strong international pressure to cope with its domestic challenges and to align its climate action with its responsibilities and capabilities.

[19] Japan is the sixth largest GHG emitter if the EU 28 members are considered as a single entity. Japan is the fifth largest emitter if EU Member States are ranked separately.

Figure 3: CO_2 emissions per capita



Source: European Commission, EDGAR, 2015

In today's discussions, emphasis has been placed first on determining the electricity mix and mitigation targets are to be somehow derived from this 2030 mix. The key question is whether the two processes can be smoothly articulated or whether energy policy issues, and in particular fuel costs and security of supply concerns, will ultimately prevail over climate ambitions.

Early efforts to build a super energy-efficient nation with innovative technologies

Since the **oil price shocks** of the 1970s, Japan has placed a **high priority on energy efficiency**, both as a way to foster its energy security and to protect the environment. Already in 1979, the Act on the Rational Use of Energy put an obligation on all industrial players to report every year to the government on their energy consumption and their medium/long term plans for improvement. This same law introduced the first energy efficiency standards for appliances and equipments, applicable to refrigerators, air-conditioners and automobiles at the time. The government also launched a 15-year investment plan of JPY130 billion to promote research and development for energy efficiency. As a direct result of this impulse, energy consumption per unit of real GDP decreased by 40% between 1973 and 2011 (METI, 2014). While the improvement has levelled off since the mid-eighties, Japan was still holding the **world's 7th lowest energy intensity of GDP** - at constant purchasing power parities – in 2013 (Enerdata, 2014). Continuing in this direction, **the government is positioning energy conservation as a major pillar of its new energy policy**; if future electricity consumption is

reduced as a result of thorough energy conservation, the need to build new power stations can be limited[20].

In 1998, a mandatory scheme called "**Top Runner Programme**" was implemented. This central scheme establishes energy consumption standards for a wide range of machinery and equipment based on the highest performance observed for each segment. Manufacturers and importers selling their products on the Japanese market are required to meet these standards by a certain date and customers are informed of the efficiency requirements for each product. If the targets are not reached, METI can disclose the names of the unsuccessful companies and issue recommendations, orders and fines. Since its introduction in 1998, the energy conservation regulatory framework has been revised several times to enlarge the scope of application of the standards. Originally applied to devices that consume energy, the programme has been covering building materials since the revision of the Act on Rational Use of Energy in 2013. In March 2015, the Cabinet approved a new bill on the energy consumption performance of buildings, paving the way to the introduction of mandatory standards for newly-constructed medium and large-size nonresidential buildings. The bill aims for enactment in 2017 at the earliest and would be implemented step by step by 2020.

In addition to these mandatory performance standards, Japan relies strongly on **voluntary approaches to promote energy efficiency and GHG emission reduction in the industrial sector**. In the Kyoto Protocol Target Achievement Plan, issued in 2005 and describing the country's strategy for reaching its emissions reduction target by 2012, the government emphasized the **cost-effectiveness of voluntary action**, referring to the ease of selection of the most appropriate measures and the low transaction costs. The plan indicates that *"business operators, as members of society, will individually or collectively formulate voluntary plans and inspect the implementation of those plans"* (MOE, 2005). Already in 1997, **Keidanren**, the largest Japanese business federation, released its first **Action Plan on the Environment** and annual follow-ups have been issued thereafter. From that time onward, business groups from the industrial, energy conversion sectors, as well as from the business operations and transport sectors have defined individual GHG emissions reduction plans and set targets in terms of energy consumption intensity, energy consumption, CO_2 emissions intensity or CO_2 emissions. Covering 44.3% of Japan's GHG emissions and 82.8% of those from the industrial and energy conversion sectors in 1990, 103 business groups have established quantitative targets and have had their plans assessed by governmental councils (Keidanren, 2014). **As the monitoring and verification process takes place at the industry level, evaluating the performance of the Keidanren's plans remains challenging** (IEA, 2008). Keidanren's figures indicate that efforts made between 2008 and 2012 led to a five-year average of GHG emissions from the industrial and

[20] IEEJ (2015), Japan: Government estimates the effects of energy conservation, various energy-saving measures to be implemented, April 2015.

energy conversion sectors which is 12.1% lower than 1990 levels. In 2013, Keidanren updated its strategy and launched a new action plan called **Commitment to Low Carbon Society**, including sector-based carbon intensity or CO_2 emissions reduction targets for 2020. Keidanren's commitments now extend to strengthening the cooperation with stakeholders (consumers, employees and consumers), fostering technology transfers to developing countries and driving low-carbon technology developments through collaboration with academia and research institutes.

Although Japan has introduced environmental regulation, such as a **tax on all fossil fuels based on their CO_2 content**[21], the role of the State is more to **encourage action** rather than to prescribe general targets. For instance, the establishment of a nation-wide mandatory emissions trading scheme is not supported, for fears that it would hinder the competitiveness of the industry. However, the central government plays an enabling role by managing the **J-Credit Scheme**, which certifies the amount of GHG emissions reduced and removed by sinks. The J-credits can then be used for various purposes, such as achieving the targets of Keidanren's Commitment to a Low Carbon Society or implementing voluntary carbon offsets. Likewise, the 2013 revision of the Act on Rational Use of Energy has also led to introducing a new evaluation system to facilitate new demand side measures, such as the utilization of storage batteries or Building Energy Management Systems (BEMS), with the specific goal of addressing electricity peak demand. In addition to providing a framework for action, **Japan aims to support technology developments by facilitating investments in R&D**. The new **"Low Carbon Technology Plan"**, decided by the Council for Science and Technology Policy in September 2013, refers precisely to R&D tax systems for the private sector as well as to the development of high-risk/high-return technologies under the leadership of the government. The objective is to **build on the country's historical expertise and continue developing advanced environmental and energy technologies**.

Watered-down mitigation commitments after the Fukushima accident

Energy conservation and the promotion of these voluntary commitments have been the key pillars of the country's strategy for achieving its emissions reduction targets. Hosting the Third Conference of the Parties to the UNFCCC (COP3) in December 1997, Japan contributed to the adoption of the Kyoto Protocol, which stipulated binding and quantified

[21] The tax rate was of JPY 289/t-CO_2 in October 2012. It is set to increase gradually until April 2016 (METI, 2015).

targets to all "Annex I countries" (OECD countries, countries undergoing the process of transition to a market economy, etc.). **Japan committed to achieve an average emissions reduction of 6% below 1990 levels over the first commitment period (2008-2012)**. The already existing "Act on Promotion of Global Warming Counter-measure" was amended to enable the ratification of the Kyoto Protocol in June 2002. Despite the increased fossil fuel consumption after the 2011 Great East Japan Earthquake**, Japan managed to fulfill its commitment over 2008-2012**. Although the five-year average actual emissions were 1.4% above 1990, removals from forest and other carbon sinks as well the acquisition of Kyoto mechanisms credits[22] enabled the five-year average "total emissions" to decrease by -8.4% against 1990 levels (MOE, 2013). Compared to what was foreseen in the "Kyoto Protocol Achievement Plan", emissions reduction in the residential and commercial sectors fell short of the target levels and needed to be compensated by a **stronger reliance on offset credits** (Kuramochi, 2014).

Advocating for ambitious commitments for the post-2012 period, Japan's government (led by the Democratic Party of Japan, DPJ) pledged in Copenhagen (2009) to pursue a -25% target relative to 1990 levels, with a premise that all major economies would join in with similar goals. While the previous government (led by the Liberal Democratic Party, LDP) was only calling for a moderate objective of -8% relative to 1990 levels, the mitigation target put forward by DPJ was particularly ambitious, even more than the one of the EU (-20%). It was primarily based on plans to progressively expand the nuclear capacity up to 40% of total power generation. However, commentators questioned at the time whether the DPJ's target was realistic without a strong shift in domestic policies.

As a logical consequence of the Fukushima accident and the suspension of nuclear power generation, Japan decided to revise downward its mitigation commitment for 2020. **During COP19 in November 2013, the new LDP-led government announced that emissions would now be reduced by only 3.8% in 2020 compared to 2005 levels (+3.1% compared to 1990 levels).** This pledge includes the potential use of carbon sinks and credits from projects implemented overseas and it assumes a **zero contribution from nuclear power capacity**. The announcement of this new "Warsaw target" was met with criticism, from China, the EU and environmental NGOs in particular, because the downgrading seemed to go beyond Fukushima-related adjustments. For instance, Climate Action Tracker's analysis (2013) suggested that, even in a scenario where all projected nuclear capacity would be replaced by coal, the expected increase in emissions would represent only 55% of the increase from the Copenhagen pledge to the revised 2020 pledge. The ambition was in fact watered down to the target which had been considered before the DPJ came to power (pre-

[22] "Kyoto mechanisms" or "flexibility mechanisms" aimed at lowering the overall cost of mitigation, by enabling Parties to the Protocol to gain "credits" from mitigation actions taken in another country and count these credits towards their own emissions target.

Copenhagen target), factoring out all nuclear capacity (Kuramochi, 2014). Although Japan clarified that its target would be reconsidered after the review of the country's energy policy, the majority of observers interpreted the Warsaw target as a **shift in terms of political will to tackle the climate challenge**.

While the level of ambition for the medium term has become rather unclear, Japan is still tied to its commitment to moving to a low carbon economy over the long term. In line with the IPCC's 2007 recommendations for industrialized countries, the fourth revision of the "Basic Environment Plan" of 2012 enacted a **-80% emissions reduction by 2050 from 1990 levels**. Although this long-term target is not enshrined in law, future pieces of legislation are expected to be consistent with the Cabinet decision of April 2012. The question is whether Japan will take the necessary steps in time in order not to compromise its 2050 goal.

The relatively modest ambition of the Warsaw target has legitimately raised concerns that climate would now be assigned lower priority in Japan. In a context where the country is still struggling to recover from the economic crisis, the industry argues that the energy policy should enable the achievement of Japan's growth strategy and not put a burden on competitiveness (Keidanren, 2014). Linked to the major concerns over fuel costs, Keidanren's reminder could be viewed as a call for the LDP government to take very cautious mitigation targets.

COP21: an opportunity for Japan to restore its climate ambition?

Despite its weakening credibility in international climate talks, Japan has remained fully supportive of the negotiation process aimed at a new global framework for post-2020 climate action. The key difference is that **Japan is no longer in favour of internationally legally-binding climate commitments, such as the ones of the Kyoto Protocol**. Japan argues that the "Paris agreement" should only put an obligation on all Parties to submit a national contribution to the fight against climate change (the so-called Nationally Determined Contributions or NDCs). The NDCs themselves should be supported by domestic policies and measures but would not be part of the international agreement. The primary justification put forward by Japan is that the **legal constraint would prevent the participation of all the major emitters**, in particular the US and China. Already in 2010, Japan refused to commit to the second phase of the Kyoto protocol arguing that the framework was *"neither fair nor effective because the total emissions from the Parties under the Kyoto protocol account for only 27%"* (MOFA, 2010). Another justification raised by Japan (MOFA, 2014) is that **removing the legal burden would *"facilitate ambition"***. Given the importance of the voluntary approaches in Japan, it is not surprising that the government is not a strong supporter of a mandatory compliance system. **The national policy is primarily derived from the aggregation of individual efforts to reduce emissions** and

not from binding rates inducing a top-down transformation of the economy. In that sense, the first commitment phase of the Kyoto protocol could be seen as an exception in terms of public policy approach. Performance standards are probably even less favoured today, knowing that the country remains hesitant about its energy future.

However, Japan's overall support to the negotiation process implies that **the country will make its best effort to define transparent and quantifiable post-2020 mitigation commitments**. With the US and China having detailed their climate ambitions in November 2014 already, Japan is facing mounting pressure. In October 2014, a joint expert's committee was established by MOE and METI to discuss Japan's INDC (Intended Nationally Determined Contribution). The work of this "INDC committee" was of course highly dependent on the energy system modeling that the committee on long-term supply and demand for energy (led by METI) was conducting in parallel and made public late April 2015. **The domestic political challenge had to be balanced with the risk for Japan to be marginalized in the international climate talks**. Although the initial March 31 deadline for INDC submissions is missed, Japan has referred to the G7 meeting of June 2015 for the official submission of its INDC. After a final round of discussions and public consultations, **the Cabinet will take the final decisions on the energy mix as well as on the mitigation commitments**. While schedules are tight, the June deadline is still within reach.

As reported by local media and NGOs, the latest proposal of the INDC committee would be **to cut GHG emissions by 26% in 2030 compared to 2013 levels**, with -21.9% coming from reduced energy-related CO_2 emissions, -1.5% coming from reduced HCFC/HFC gases emissions and -2.6% coming from removals of GHG resulting from the land use, land-use change and forestry sector. The reference to 2013 as a baseline is strategic, knowing that Japan's GHG emissions have reached their second-highest on record in the fiscal year ending in March 2014. **Compared to 1990 levels, the proposed target would only amount to a 17% reduction (or 25.4% compared with 2005)**. Environmental NGOs have already expressed concerns that such commitment would fail to meet Japan's international responsibility[23] and compromise the country's long-term commitment of a -80% emissions reduction by 2050 from 1990 levels[24]. It remains to be seen whether the consultation and the Cabinet decision process can lead to upgrading the ambition before the official INDC submission.

[23] As a comparison, the EU committed to cut GHG emissions by 40% in 2030 compared to 1990 levels. The US committed to cut GHG emissions by 26-28% below 2005 levels by 2025 (equivalent to a -16% reduction compared with 1990).

[24] See in particular CAN International, "Letter to Prime Minister Shinzo Abe - CAN responds to Japan's draft Intended Nationally Determined Contribution", 30 April 2015 <www.climatenetwork.org/press-release/letter-prime-minister-shinzo-abe-can-responds-japans-draft-indc> and Friends of the Earth Japan, "Japan's new climate goal far short of what science and global equity requires", Press release, 30 April 2015 <www.foejapan.org/en/energy/pdf/150430.pdf>.

Conciliating climate action with coal expansion: a risky strategy

As the government is about to finalise its 2030 energy mix and mitigation efforts plans, it becomes clear that **the coal option will not be discarded**. On the contrary, it will remain an integral part of Japan's power generation fuel mix in the long term. While others, such as the EU and the US, are considering new rules which could curb the use of coal-fired power plants[25], in the METI draft scenario, the share of coal in the electricity mix is planned to be one percentage point above its level before Fukushima. **The expansion of coal-fired power plants will depend on the evolution of electricity demand. According to the government's estimate, the new energy conservation measures could lead to limiting the rise in electricity demand to 1.5% per year** from FY2013 to FY2030. Without such measures, electricity demand is projected to increase by 1.7% per annum[26]. In addition, the scales of the challenges that the nuclear industry is facing are such that the 20-22% target for nuclear capacity cannot be easily achieved, which might also result in a stronger reliance on coal as a fall back option for base-load generation. Japanese environmental NGOs are concerned about the **"lock-in" effect**, as new coal-fired power plants would necessarily emit large volumes of CO_2 over the course of several decades. In a statement of early April 2015, Kiko Network alerted on the fact that the 43 coal power projects under construction or planned (21.2 GW) could emit the equivalent of 10% of Japan's total GHG emissions in 1990[27].

In an attempt to accelerate investments and reduce fuel costs, the government has amended existing environmental impact assessments requirements. Those requirements were preventing the construction of new coal units before the Fukushima accident. Since 2013, the Japanese utilities have opened up many bids to replace old thermal power stations, and coal was chosen in several cases, raising **concerns over a possible "coal rush" for power generation**. Acknowledging the environmental risk, MOE and METI announced in April 2013 **new requirements for the environmental assessments of new coal plants** with a generating capacity of 112.5 kW or more. In the first place, the new plants are required to **use "best available technologies"**, in compliance with the official list of technologies per size and fuel type. In the second place, the construction of new coal plants has to be **consistent with the mid- and long-term national mitigation goals**. It implies that the business operator has to buy offsets from abroad to compensate the net increase of

[25] Ongoing discussions on the reform of the EU Emissions Trading Scheme and development of new Clean Power Rules by the US EPA.
[26] Reuters, Japan's recommended energy mix, electricity demand forecast for 2030, 28 April 2015, <http://af.reuters.com/article/energyOilNews/idAFL4N0XP45S20150428>.
[27] Bloomberg Energy Finance, Japan's New Coal Plants Threaten Emission Cuts, Group Says, April 9 2015 <http://about.bnef.com/bnef-news/japan-s-new-coal-plants-threaten-emission-cuts-group-says/>.

emissions due to the new coal plant, in comparison with a gas plant. To ensure consistency with the country's 2050 target, business operators are also required to increase efforts in the development of CCS technologies. In February 2015, the Nikkei Newspaper suggested that the government could introduce mandatory generating efficiency standards for all new fossil-fuel plants by the end of the year[28]. Should this information be confirmed, this would be a shift away from the voluntary approach which has been prevailing for the utilities sector so far.

Reducing GHG emissions overseas, including with controversial highly-efficient coal plants

Rightly or wrongly, Japan considers that its **domestic potential for emissions reduction is limited**, in particular because of its already high performance in terms of energy efficiency, the need to reduce nuclear use and the grid limitations for a massive shift to renewables. For this reason, supplementing domestic measures with **support to the mitigation efforts of other countries** is considered the most cost-effective climate strategy for Japan. In addition, the government's intention to *"establish proactive diplomatic strategy against global warming in order to contribute to the world with Japan's technologies"*[29] is strongly supported by the private sector as it can **boost exports** and help improve the balance of trade.

As mentioned above, Japan relied heavily on offset credits to meet its mitigation target for the first commitment phase of the Kyoto Protocol. The Clean Development Mechanism (CDM) has precisely been developed under the UNFCCC framework to enable one country to finance the dissemination of low-carbon technologies, products and services in a developing country and to be awarded credits based on the measurement of the emissions reduction achieved. In reaction to the perceived failings of the CDM, including the complexity of the UNFCCC's project registration process, Japan has pushed forward improvements of the CDM rules and also developed a **new bilateral scheme, called the Joint Crediting Mechanism (JCM)**. First presented in 2012, the JCM is managed by a joint committee comprised of representatives from Japan and the host country, outside the supervision of the UNFCCC CDM Executive Board. Such **decentralized approach** is aimed to facilitate and accelerate the implementation of mitigation projects. Up to now, Japan has signed bilateral documents for the introduction of the JCM with twelve countries[30]. Still, only three projects in Indonesia and one in Palau have been

[28] Nikkei, Japan to require better efficiency at fossil-fuel power plants, 23 February 2015.
[29] Instruction issued by Prime Minister Shinzo Abe in January 2013. This was followed by the adoption of the "New Low Carbon Technology Plan" by the Council for Science and Technology Policy in September 2013
[30] Mongolia, Bengladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Combodia and Mexico

successfully registered so far, with a combined capacity to reduce annual emissions of CO_2 equivalent by 482 tons. While Japan has to foster the development of JCM projects to meet its voluntary pledge for 2020, it also needs to obtain some kind of **acknowledgement from the UNFCCC.** This way, the offset credits generated by this bilateral scheme could count for the post 2020 international commitments. Promoting the JCM is a key element of the Japanese delegation's negotiation mandate for the Paris conference.

However, such international recognition may not be easy to obtain. As explained by METI[31], *"the JCM is expected to encourage more Japanese companies, including small and medium-size enterprises, to expand their technologies abroad"*. In line with this objective, MOE can fund up to 50% of the installation costs in return for at least half of the offset credits generated with the project. This financial incentive **might be considered in breach of WTO Agreement on Subsidies and Countervailing Measures**, although representatives from the MOE argue that the subsidies are not conditional on use of domestic goods over imported goods[32]. In addition to potentially representing a barrier to trade, the **sector/project coverage of the JCM** might not be approved by the UNFCCC because it is broader than the one of the CDM. In particular, ultra-supercritical coal-fired power plants can be used without any restriction under the JCM. **Promoting highly-efficient coal-fired power generation in emerging countries is indeed a major focus of Japan's climate strategy**. For Japan, it is inevitable that cheap and abundant coal will be burnt in greater proportion to support economic development and expand access to electricity. In this context, the use of the most efficient technologies should be encouraged. According to METI, *"replacing all coal power capacity in China, India and the U.S with the Japanese up-to-date technologies would bring about a cut of 1.5 billion tons a year of CO_2 emissions, more than Japan's total"*. While Japan refers to realism and pragmatism, others argue that it will not be possible to trigger a paradigm shift and prevent the rise of temperatures above the 2°C limit, with a mere improvement of the coal technologies. For instance, Christina Figueres, the Executive Director of the UNFCCC, restated on 4 May 2015 that *"science is clear that there is no space for new coal or unmitigated coal [power plants]"*[33]. International support for the JCM may be difficult to obtain under these conditions.

In addition to bilateral offset mechanisms, the controversy over the promotion of coal projects in developing countries extends to the **use of**

[31] METI, The Joint Credit Mechanism, Special Report, October – November 2013 <http://www.meti.go.jp/english/publications/pdf/journal2013_10b.pdf>.
[32] Statements from Yuji Mizuno, Director for International Negotiations at the MoE's Office of Market Mechanisms, as reported by Carbon Pulse on 28 April 2015, <http://carbon-pulse.com/japans-jcm-sees-slow-progress-facing-scrutiny-at-home-and-abroad/>.
[33] Statements from Christina Figueres, as reported by the Guardian on 4 May 2015 <www.theguardian.com/environment/2015/may/04/un-climate-chief-says-the-science-is-clear-there-is-no-space-for-new-coal>.

public finance. Many developed countries[34] and multilateral banks[35] have recently announced that they would stop or at least restrict public funding to new coal projects overseas, in an attempt to stem the growth of coal consumption. Discussions are also ongoing within the OECD about potential modifications of the export credits regulations. Current arrangements[36] allow export credit agencies to finance the export of all coal plants with extended repayment terms without any differentiation based on their emissions levels. Some Participants to the OECD agreement would like to change these arrangements and promote a ban on coal plants via the implementation of a stringent Emission Performance Standard. Such outcome remains unlikely for the near future because the amendment would need to be approved by all Participants. However, the pressure is increasing, in particular on Japan, which is currently in the top five OECD countries responsible for most export credits supporting coal plants expansion[37]. **In July 2014, the Japanese government declared that it would step up support for coal-fired power plants in developing countries**. The Japanese view is that without public loans and insurance from developed countries, emerging countries will choose the less costly, inefficient technologies (subcritical coal power plants), thus aggravating the global CO_2 issue. The controversy over Japan's funding for coal plants reached a new high in December 2014, when reports revealed that **funds set aside to combat climate change were channeled to coal generation projects**. After the allocation of $1 billion in loans to a coal project in Indonesia, Japanese officials confirmed in March 2015 that they were also counting as climate finance another $630 million in loans for coal plants in India and Bangladesh[38]. Despite diverging views on climate finance at the UN level, the board of the UN's Green Climate Fund (GCF) refused an explicit ban on fossil fuel projects referring to the same arguments as Japan[39].

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[34] In 2013, the US President committed to cutting public finance for overseas coal plants, unless the plants use CCS, or in extreme cases in least developed countries (no alternative available to meet energy needs). Similar commitments have been formulated since then by the UK, France, the Netherlands, Denmark, Finland, Iceland, Norway and Sweden.

[35] In July 2013, the World Bank announced that it would limit its funding for coal plants to only rare circumstances, in which there is no feasible alternative energy source. The European Bank for Reconstruction and Development and the European Investment banks have made similar announcement shortly after, referring to the need to move to low-carbon energy sources.

[36] These OECD arrangements apply to Australia, Canada, the European Union, Japan, Korea, New Zealand, Norway, Switzerland and the United States.

[37] From 2009 to 2013, France, Germany, Japan, South Korea and the US have been responsible for 92% of coal power plant export credits according to a March 2015 report from the Oil Change International Foundation.

[38] <http://www.japantimes.co.jp/news/2015/03/29/business/japan-accused-of-financing-coal-fired-power-plants/>.

[38] <http://www.japantimes.co.jp/news/2015/03/29/business/japan-accused-of-financing-coal-fired-power-plants/>.

[39] <http://www.powerengineeringint.com/articles/2015/03/un-agrees-to-keep-funding-clean-coal.html>.

Japan is a **major contributor to climate finance**, with its plans to commit $13 billion between 2013 and 2015, a pledge of up to $1.5 billion to the GCF and an additional commitment to provide around $450 million in aid to Pacific island nations in order to improve their resilience to climate change. Despite these significant financial efforts, the country is in an **increasingly isolated position**, at least within the OECD, because of its advocacy for coal projects. This is clearly a strong hurdle in the quest for climate leadership, as Japan can be viewed as opposing a more profound transformation of the world's energy system. However, it should be noted the coal debate is much less controversial in many non-OECD countries. In response to the funding restrictions by developed countries and multilateral financial institutions, the leaders of Brazil, Russia, India, China, and South Africa launched the "New Development Bank" in July 2014. With an authorized capital of $100 billion, this bank will finance *'infrastructure and sustainable development projects'* in emerging economies and developing countries, including energy (and coal) projects. This initiative will first reduce the scope of the funding restrictions decided by developed countries, but it will also add competitive pressure on Japan for the exports of clean coal technologies.

Conclusion

After the Fukushima accident, Japan's primary challenge was to avoid the collapse of its energy system with all consequences on the economy and the society at large. This challenge has been overcome, although at a very high cost. Equally demanding, the second challenge is to go beyond short-term measures and engage in long-term strategic planning. Defining a sustainable energy and climate policy has become urgent because current trends run contrary to the "3E" objectives of energy security, environment protection and economic efficiency. Not only is this planning exercise arduous, but it is also taking place in a rapidly changing landscape in both Japan and abroad, including the Russia-Ukraine situation, the destabilization of the Middle East, and the recent drastic drop in crude oil prices. Moving forward, the key to Japan's energy and climate future lies in the details plans to be approved by the Cabinet in June 2015.

At this stage, it is already obvious that the energy mix will strike a delicate balance between addressing various energy policy and economic issues on the one hand, and the need to reduce GHG emissions on the other hand. While Japan acknowledges the climate challenge, it does not seem ready to take bold actions to radically change its domestic energy mix, for fears that it would affect its economic performance and energy security. The Government supports the restart of nuclear power and the development of highly-efficient coal plants because these options can lead to lower fuel costs, lower emissions (in the case of nuclear power) and higher energy security. Conversely, subsidies for a massive shift to renewables, incentives for gas-to-coal switching or the introduction a mandatory emissions trading scheme are not on the agenda; such choices are not considered economically reasonable. This means that most Japanese mitigation efforts will be made abroad as it is considered as the most effective way to tackle climate change. While climate action is seen as an opportunity when it relates to reducing emissions overseas, it is still considered a too strong burden on the domestic stage. Defending the use of coal at the 21st Conference on the Future of Asia in May 2015, Prime Minister Abe emphasized again that spreading the Japanese highly-efficient coal technologies to US, China and India would have an *"even greater impact than if Japan were to return to the time before the Industrial Revolution, to have zero emissions"*[40].

[40] Speech by Prime Minister Shinzo Abeat the Banquet of the 21st International Conference on the Future of Asia, Thursday, May 21, 2015 <http://japan.kantei.go.jp/97_abe/statement/201505/0521foaspeech.html>.

The key question now is whether Japan's "pragmatic" approach to climate mitigation can prove effective and sufficiently ambitious over the long term, as well as acceptable by the other Parties to the future "Paris agreement".

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