HRI Report

Direction of Japan's Energy Policy from the Perspective of COP21

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1. Japan's INDC and Energy Policy

On July 17, the Japanese Government decided on the Intended Nationally Determined Contributions (INDC) for the upcoming COP21 UN Climate Change Conference, and submitted it to the UN (Table 1). By FY2030, Japan aims to achieve a greenhouse gas (GHG) reduction of 26.0% from FY2013 (or 25.4% from FY2005). This is equivalent to 1.042 billion t-CO_2 (Table 1). This essay looks at those sources which make up about 90% of GHG emissions, and sheds light on the direction of Japan's energy policy through the INDC.

Table 1: Outline of Japan's INDC

Benchmark Year	Both FY2013 and FY2005 were registered as the benchmark years though explanations were made mainly with reference to FY2013.
Target Fiscal Year	FY2030
Period of Implementation	April 1, 2021 to March 31, 2031
Target Range	In all sectors, energy-originated emissions account for about 90% of the total (fuel combustion, fuel leakage, storage and transport of CO_2)
Target Gases	CO_2, CH_4, N_2O, HFCs, PFCs, SF, NF_3
Coverage	100% (with respect to GHG)

Source: "Japan's INDC", Government of Japan

In order to achieve the INDC, in particular the resolution of the energy-originated CO_2 emission reduction issue (henceforth global environment issue), a good understanding of the environment policy, energy policy, and their interrelations is necessary. Thus, it becomes possible to reconsider the future direction of Japan's current energy policy, specifically, the keys to resolving the global environment issue, including the importance of energy conservation and the priority and relative positioning of nuclear and renewable energies.

The INDC states that, in order to ensure consistency in its energy mix, Japan's contribution toward post-2020 GHG reduction is set at a feasible reduction target by bottom-up calculation based on concrete policies, measures and individual technologies with adequate consideration given to inter alia, technological and cost constraints.

The policies and measures set forth in the INDC are two-pronged, namely supply and demand. With regard to resolution of the global environment issue, past discussions have mostly focused on supply; i.e. the composition of power sources, centering on nuclear power. In the current INDC, however, energy conservation from a demand aspect takes a significant role (Table 2).

Table 2: Examples of Energy Conservation Policies and Measures by Sector

	Policies and Measures
Industrial	• Energy management at plants • Development and introduction of innovative technologies and high-efficiency production equipment • Promoting energy conservation among SMEs
Commercial	• Implementation of energy management utilizing BEMS, etc. • Promoting compliance with energy conservation standards in newly-constructed buildings • Introduction of energy conservation in buildings (remodeling) • Introduction of commercial-use water heaters, high-efficiency lighting, etc. • Promoting nationwide campaigns (Cool Biz, etc.)
Residential	• Implementation of energy management utilizing HEMS and smart meters • Promoting compliance with energy conservation standards in newly-built houses • Promoting thermal insulation use in the renovation of existing houses • Introduction of high-efficiency water heaters and lighting • Utilization of the top runner program • Promoting nationwide campaigns (Cool Biz, etc.)
Transport	• Enhancement of fuel efficiency • Promoting widespread use of next-generation automobiles • Promoting traffic flow measures
Others	• Utilization of technologies related to fuel cells and hydrogen

Source: "Japan's INDC", Government of Japan

In Japan, energy conservation has long been described as 'wringing a dry cloth', as it is deemed to have already reached an advanced level. The appearance of unconventional policies and measures in the current INDC has attracted much attention.

These include energy conservation approaches that are closely related to IT, such as Building Energy Management Systems (BEMS), Home Energy Management Systems (HEMS), smart meters, and novel energy technologies such as next-generation automobiles, fuel cells and hydrogen-related technologies. It is likely that these technologies will bring about major innovations followed by future reforms to systems in the electricity and gas sectors.

Specifically, changes are expected in energy conservation efforts. In the past, relatively simple methods were adopted, such as replacing low-efficiency products with ones of higher efficiency, encouraging reduced use of air-conditioning, and through campaigns such as 'Cool Biz'. In future, IT will be utilized to enhance the efficiency of the system instead of individual products as well as to transform each individual's lifestyle based on precise energy data rather than relying solely on nationwide campaigns.

As a result, with the full deregulation of the power retail market starting from FY2016, power sales will be converted into power services, meaning consumers will have more diversity of choice.

Meanwhile, on the supply side, policies and measures adopted for the energy conversion sector (power generation) include promoting the introduction of renewable energy to the maximum extent possible, pursuit of high efficiency in thermal power generation (USC, A-USC, IGCC, etc.), and utilizing nuclear power generation that is identified as safe (Tables 3 and 4).

The "consistency in the energy mix" which appears in the INDC refers to the composition of power sources. The power source composition targeted for FY2030 was presented in the reference material (Forecast of Long-term Energy Demand and Supply) released concurrently to the INDC. Nuclear power generation will account for 20-22% of the total power generation capacity, with renewable energy accounting for 22-24%. It was stated clearly that coexistence of nuclear energy with renewable energy is necessary to achieve the environmental policy (Figure 1).

Table 3: Estimated Energy-Originated CO_2 Emissions by Sector

	FY2030	FY2013 (FY2005)
Energy-originated CO_2	927	1,235 (1,219)
Industrial	401	429 (457)
Commercial and Others	168	279 (239)
Residential	122	201 (180)
Transport	163	225 (240)
Energy Conversion	73	101 (104)

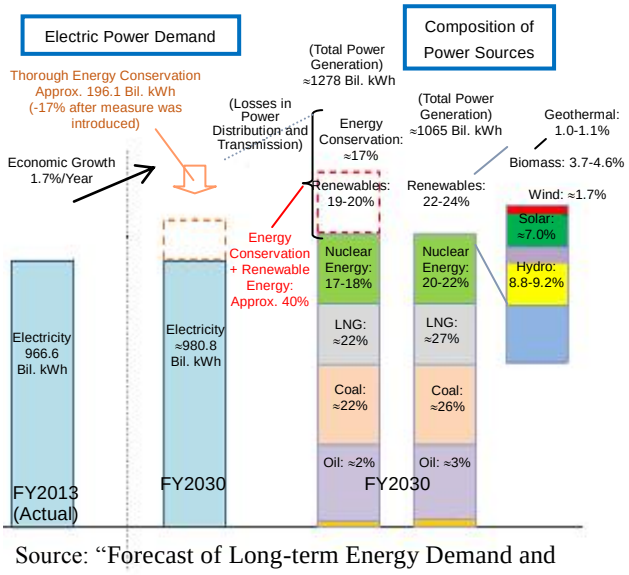
(Unit: Million t-CO_2)

Source: "Japan's INDC", Government of Japan

Table 4: Policies and Measures used in the Bottom-Up Calculation of the GHG Reduction Target

	Policies and Measures
Energy Conversion Sector	• Promoting the introduction of renewable energy to the maximum extent possible • Utilizing nuclear power generation that is identified as safe • Pursuit of high efficiency in thermal power generation (USC, A-USC, IGCC, etc.)

Source: "Japan's INDC", Government of Japan



Source: "Forecast of Long-term Energy Demand and Supply", METI

Figure 1: Japan's Energy Mix by 2030 (2015)

2. Confusion in the Debate on Japan's Energy Mix

Confusion is seen in the debate concerning the current environment and energy policies, particularly those related to energy mix.

An energy mix which is consistent with Japan's environment policy refers to the coexistence of nuclear energy with renewable energy. There is a need for more in-depth discussion on how to strike a balance between the stable output of nuclear energy and the variable output of renewable energy, both technically and socially. Another subject for discussion is how to construct a distribution and power supply system which makes effective use of the characteristics of both nuclear and renewable energies, with highly localized concentrations of power in the case of nuclear power and highly dispersed, low-intensity power in the case of renewable energy.

Today, debate in Japan tends to focus on concerns about the nuclear energy risk management system and the unstable output of renewable energy. In addition to addressing these issues, it is also important to deepen discussion on how best these power sources can coexist.

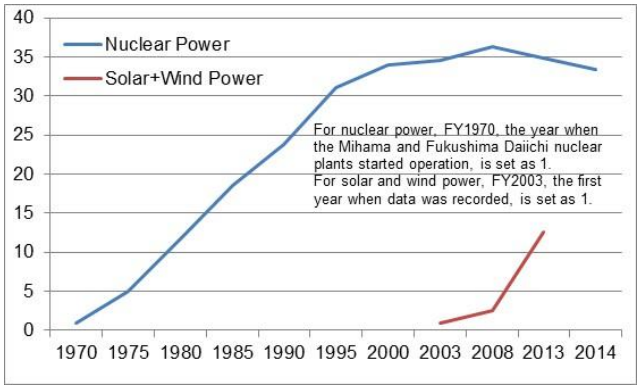
Widespread utilization of nuclear energy started in the 1970s, while renewable energy saw rapid growth from the late 2000s (Figure 2). While their technical attributes may differ, neither emit CO_2 and both originate in Japan. With this understanding, a debate is necessary on the 'social mechanism' and 'business model', which forms the basis of the innovation which will lead to the coexistence of nuclear and renewable energies.

With regard to the social mechanism, the Organization for Cross-Regional Coordination of Transmission Operators (OCCTO), which was established based on the Revised Electricity Business Act in April 2015, has attracted much attention. All electric power companies are required to join this organization. OCCTO's purview includes striving for power sources diversity, coordinating nationwide plans for power supply, reinforcing the power transmission network, nationwide system operation beyond simply supply, accepting connections for new power sources and release of system information, and establishing rules for coordination between power generation and power distribution and transmission.

As for the business model, debate is needed on how power system innovation should be carried out. For example, expectations have been placed on smart grids as an innovation utilizing electricity storage technologies and

IT to achieve the coexistence of established power sources (such as nuclear energy) and the more distributed renewable energy sources. However, the business model for smart grids remains unclear. Smart grids contribute to energy conservation and low carbon emission, so more in-depth discussion on them will be required following COP21.

Japan's INDC indicates that both the use of nuclear energy and renewable energy should be directed toward resolving the global environment issue. In the current INDC, renewable energy has almost gained parity with nuclear energy. As such, discussions on energy mix can be made more productive by debating the best form of business models and innovations to achieve Japan's target energy mix, this utilizing common ground between nuclear and renewable energies.



Source: HRI

Figure 2: Changes in Installed Capacity for Nuclear Energy and Renewable Energy

3. Toward Achieving the Optimal Energy Mix

Upon entering the latter half of the 2000s, the global environment issue has once again come to the fore. Following the inauguration of President Obama in 2009, he announced the Green New Deal, a policy which attracted worldwide attention. Meanwhile, the major countries including Japan successively presented environment policy proposals, such as the "Cool Earth Promotion Program" announced by thn Japanese Prime Minister Fukuda in 2008. These have led to heightened awareness of the global environment issue.

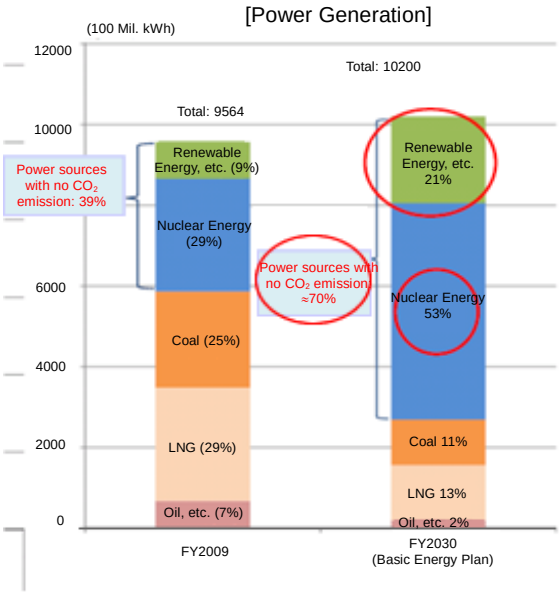
Looking at the changes in Japan's energy policies, 'the environment' was first included as a policy target after 1997, the year when the Kyoto Protocol was adopted at COP3 (Table 5). The widespread and growing use of nuclear energy in the 1970s has been attributed to its stable supply against a backdrop where there was an urgent need to reduce dependence on oil, in turn due to the oil crisis. However, the Hatoyama Administration in 2009 made an international commitment to reduce GHG emissions by 25% by 2020 compared to 1990 levels. Upon drawing up a basic energy plan, the target proportion of nuclear power generation was raised beyond 50%. Based on this commitment (Figure 3), the environment became the primary reason for promoting nuclear power generation. To achieve the 50% goal, construction of at least 14 additional stations by 2030 was targeted. This resulted in the overemphasis of nuclear energy over renewable energy as a power source for resolving the global environment issue (Figure 4).

Japan's current INDC for COP21 is a revision to the 2010 energy mix, which centered on nuclear energy. In order to contribute to the resolution of the global environment issue, the option chosen was the coexistence of nuclear with renewable energies, and this has directed Japan's energy policy toward innovation in the energy industry and electric power business.

Table 5: Changes in Japan's Energy Policy

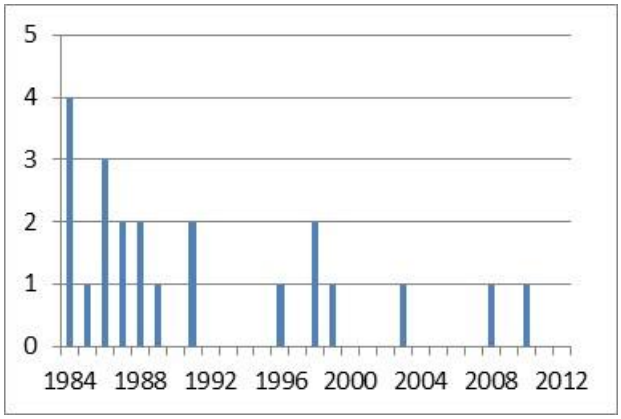
	Target	Backdrop
1970s	Stable supply	Oil crisis
1980s	Stable supply	Promotion of energy conservation
1990s	Stable supply + economic efficiency	Introduction of market forces
2000s	Stable supply + economic efficiency + environment	Adoption of the Kyoto Protocol
2010s	Stable supply + economic efficiency + environment	Implementation of the Kyoto Protocol
2015	Safety + stable supply + economic efficiency + environment	Nuclear disaster at Fukushima Daiichi Nuclear Power Plant

Source: HRI



Source: "Forecast of Energy Supply by 2030", METI

Figure 3: Japan's Energy Mix by 2030 (2010)



Source: "Nuclear Power Pocket Book", the Denki Shimbun

Figure 4: No. of Power Station Construction Works Started

4. Ideal Opportunity for Innovation

Driven by COP21, Japan's energy policy requires that innovation be pursued to the fullest to address the global environment issue.

It is the first time that high hopes have been placed on the COP21 to determine an international legal framework to succeed the Kyoto Protocol agreed at COP3. As there are no mandatory provisions under international law, there is effectively no legally binding force. Thus, the key to the success of COP21 lies in individual countries pursuing and sharing innovations in environmental technology, based on a strong desire to resolve the global environment issue. For example, during the 1973 oil crisis, a common sense of crisis toward energy security drove Japanese corporations to develop of energy-saving technologies, a beginning which has made Japan a superpower in environmental technology. Innovation resulting from such a common awareness among people provides a link between the global environment issue and Japan's energy policy.

The Japanese share a common understanding of the importance of renewable energies such as wind power and solar power. Expectations therefore exist for further innovations enabling nuclear and renewable energies to coexist within the same power system; put simply, innovations in the power distribution sector through cooperation between the demand side (energy conservation) and supply side (energy mix).

After COP21, further discussion related to the global environment issue will be needed. As part of this, deeper discussion will be necessary on how to achieve smart grids which maximize the effects of energy conservation, nuclear energy and renewable energy, based on concrete facts and verified data.

Source: "Nuclear Power Pocket Book", the Denki Shimbun

Figure 4: No. of Power Station Construction Works Started