

RENEWABLES JAPAN STATUS REPORT 2010

EXECUTIVE SUMMARY

Chapter 1 : Introduction

This report deserves commemoration as the first Renewable Energy White Paper to be published in Japan. Following roughly 4 years behind the establishment of the world renewable energy White Paper, the Global Status Report (REN21), which was first published in November 2005 at the Peking International Conference on Renewable Energy (BRIEC 2005), in some ways this report's delay reflects Japan's late start in renewable energy policy and market development.

Renewables have long occupied a branch within energy policies. However, greater technological dispersion has helped bring about a global trend in which exponential growth in renewables is emerging due to continuous innovation and decreasing costs. Within the next 10 years renewables are expected to be able to exceed a 100 trillion yen market becoming a key form of energy for the 21st Century in addition to fulfilling simultaneous roles as a base industry and providing the core component for time urgent climate change policy measures.

In this way, a renewable energy revolution has continued to advance and gain momentum in recent years. In Japan interest is also finally heightening regarding the role renewables play in energy, climate change, and industrial policies. Supported by effective policies measures such those from Green New Deal initiatives, which are occurring in several countries around the world, and Feed-in Tariff (FIT) schemes, which expanded from Europe to the rest of the world, renewables have achieved rapid growth. Such policies have created conditions in which renewables, such as wind and solar photovoltaic (solar PV), are emerging more and more as attractive new industries and markets.

With such goals as the EU's aim of 20% renewable energy by 2020 and the Obama administration's declaration of 25% electricity from renewables by 2025, a type of "target introduction competition" for renewables is fast expanding in numerous

countries, regions, and municipalities. Japan can also be said to have at long last joined in this competition.

However, Japan's renewable energy market has remained in a grounded state due to market policies for renewable not been sufficiently examined or implemented. At the 2008 G8 Summit (Toyako Summit), solar PV, only one form of renewable energy, was finally recognized as an important candidate for government backed support. A type of gift was left behind by the former administration in which a limited FIT scheme applicable for only surplus electricity generated from residential, non-business use solar PV was established in November 2009. However, the government remains behind in conducting policy-based examinations for other forms of renewable electric generation such as wind power, the use of natural heating, and bio-fuels.

The new administration, which won the general election in August 2009 and is led by the Democratic Party of Japan, set several high targets in its manifesto including a 25% reduction of greenhouse gases by 2020 based on 1990 levels, the introduction of a FIT for all quantities and types of renewables, and increasing the percentage of renewables as a primary energy source to 10%. It is hoped that the new administration will show initiative as a leader by shifting control of energy policy away from ministry bureaucrats and push for new measures to deal with renewable energy and global warming issues.

The publication of Japan's first ever renewable energy White Paper was made possible by the expertise and action accumulated though the cooperative efforts of various renewable energy business organizations. It is hoped that this first publication will help spur rapid development in Japan's renewable energy markets, the new industries supporting these markets, and the regional societies revitalized by them.

Chapter 2 : Renewable Policy Landscape

With the submission of its Provisional Basic Law for Measures against Global Warming in March 2010, the Japanese government is preparing to

declare a target of renewable energy comprising 10% of overall energy supply by 2020. In FY 2003, in a separate policy, Japan established a

renewable portfolio standard (RPS). However, due to problems such as carrying over surplus from the previous year's requirement, utility businesses have had little incentive to expand renewable energy. In addition, subsidies supporting solar PV installation were terminated by the government. This caused Japan to fall from first place in the world in solar PV installations in 2004 and suffer from a declining market share ever since.

The G8 Summit in 2008, however, triggered Japan to finally shift its posture, becoming more proactive in support of solar PV. This resulted in the introduction of a feed-in tariff (FIT) in November 2009, although the FIT is limited to the sale of surplus power generated by solar PV. The additional reintroduction of subsidies for solar PV January 2009 also helped stimulate an increase in solar panel shipments for 2009 of 2.1 times that of the previous year. The latter half of the year (July~December), which includes the introduction of the FIT in November, experienced particularly strong growth with shipments increasing as much as 3 times that of the previous year. Such results provide a good example of the degree in which policies can promote the introduction of renewables (in this case solar PV). The ruling Democratic Party of Japan's manifesto promises to expand the current FIT to include all amounts and types of renewables. In order to effectively spread the use of renewable energy, following through with such a promise is desirable.

While policies regarding solar PV have been examined and implemented in Japan, measures to expand the use of other renewables have been left behind. For wind power, problems such as grid restrictions, coexistence issues of birds and wind turbines, and social consensus problems exist. In addition, policies, much less frameworks, needed to support renewable energy heating and transportation fuels are also lacking. In the private sector, there are high expectations for the smart grid system being introduced by the Obama Administration. However, solutions regarding issues such as deregulation and reduction of grid restrictions remain to be seen. With Japan entering the first commitment period established by the Kyoto Protocol, various carbon credits such as carbon offset, domestic credits, J-VER, and Tokyo metropolitan credits have been introduced, crowding the market. While the environmental value of the utilization of renewable energy in these markets is promising,

many issues such as harmonization of credits and establishment of national legislation remain to be solved.

Among local governments, the Tokyo metropolitan government is leading Japan's environmental energy policies. Tokyo plays a key role in creating policy models through such actions as the introduction of an emission trading scheme and expansion of solar energy. In addition, Tokyo is initiating policy cooperation in the metropolitan area as well as creating practical partnerships with private sectors and environmental NGOs.

Energy companies such as electric power, gas, and oil companies are also pursuing renewable energy. Power utilities are planning mega solar power generation as well as integrating solar heating technologies in the development of hot-water heat pump mechanisms. In addition, gas companies are developing solar heating for apartments that can be installed on balconies, and oil companies are entering full-scale into the solar PV market.

The solar PV industry is most the advanced among Japanese renewable energy industries. The former administration targeted an increase of 20 times as many solar PV installations by 2020 and 40 times by 2030. Although other renewable were given low standing by the previous administration, it is expected that more proactive renewable policies will be introduced by the new government.

Green Power Certificate trading in the private sector reached 160 GWh in FY 2008 (100% increase from the previous fiscal year) with trading expected to be increase further due to the Tokyo Metropolitan Government's new cap & trade market. Green Heat Certificates for solar hot water systems were also introduced in April 2009 and a similar certifying system for other heat renewables is being created.

In order to expand the renewable energy market, it is necessary to provide financial support, develop infrastructure to encourage participation by citizens and communities, and establish a new social system based around social consensus regarding issues involving windmills such as birds and scenery, or those between hot springs and geothermal power

Chapter 3 : Trends of Renewable Energy

(1)Electric Power

Changes in trends regarding the electric power energy market in Japan are described as follows. As shown in Figure 1, the existing capacity of renewable power generation reached over 10,000MW at the end of fiscal year 2008, 60% of which consisted of small hydro under 10,000kW and biomass (including waste power generation). Solar PV and wind power accounted for an estimated 37% at the end of FY 2008. These grew more than 30% annually from 2000 until 2004, however, growth has since slowed due to a discontinuation of subsidies. Although added power capacity from geothermal and small hydro has been small since 1990, it accounted for estimated 35% of the cumulative capacity at the end of FY 2008.

Increases in waste-power generation, especially those using general wastes, had led to an overall increase in biomass power capacity resulting in biomass providing just under 30% of total capacity at the end of FY 2008.

The projected amount of power generation in each fiscal year is shown in Figure 2. This was calculated by a ratio of facility utilization (i.e. how much energy is actually produced from facilities) based on each technology. Although the growth rate of geothermal power and small hydropower was low, its utilization rate exceeded 60% on the average and annual power generation accounted for more than half of the energy supplied by renewable energy.

Solar PV and wind power generation had a high growth rate and accounted for 15% of renewable energy power generation in FY 2008. Renewable energy supplied only 3% of the total power generation in Japan (1,200,000GWh in FY 2007, including households) which is only 1% increase since 1990.

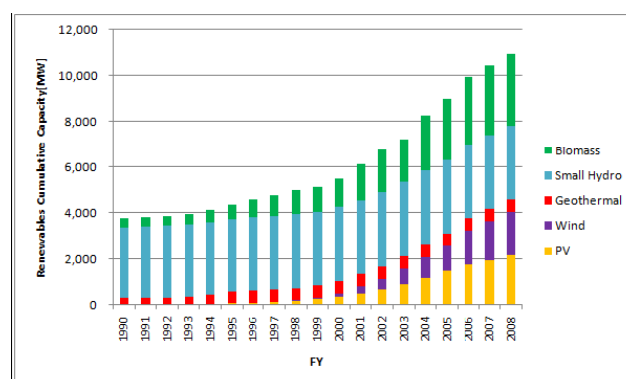


Figure 1 Cumulative Renewable Power Capacity in Japan (ISEP)

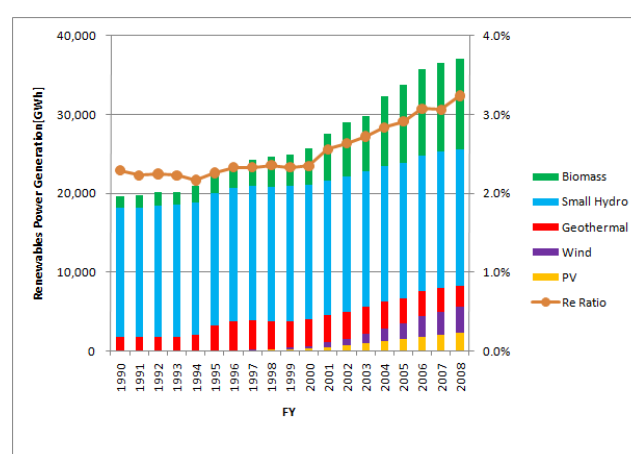


Figure 2 Estimated Renewable Power Generation in Japan (Survey by ISEP)

In FY 2008, the total renewable energy supply was 7,918GWh while the amount required by the Renewable Portfolio Standard (RPS), which was introduced in FY 2003, was 7,465GWh. A surplus of 6,759GWh was carried over from the previous fiscal year. Thus, while electrical power suppliers can meet the RPS requirement, they can also carry over 7,043GWh for FY 2010. Therefore, it can be concluded that the current PRS framework does not create incentives for electric power suppliers to promote renewable energy.

On the other hand, since the green power certification system started in FY 2001, the amount of certified electric power has continued to expand, with cumulative capacity of certified facilities reaching 400MW in FY 2008. Annual certified power exceeded 200GWh in FY 2008 and green power certificates of more than 160GWh were also issued in FY 2008.

(a) Solar Photovoltaic (PV) Power Generation

Cumulative installations of solar PV reached

2,198MW, exceeding 2,000MW mark at the end of FY 2008 in Japan, although the growth rate has slowed down since FY 2005 when subsidies for households expired. On the other hand, overseas shipments of solar PV panels grew steadily and exceeded domestic shipments in FY 2004. An estimated 900 MW was shipped abroad in single FY 2008 (four times as much as the total amount shipped domestically).

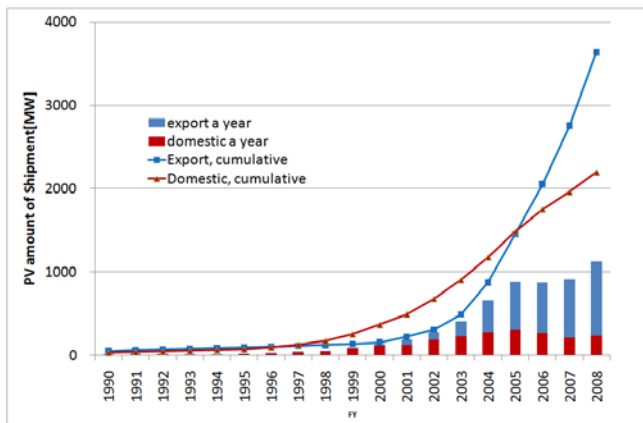


Figure 3 Shipment Volume of Solar PV (from JPEA data)

(b) Wind Power Generation

Japanese wind power generation started in 1980, but began in full-force with the introduction of 1,000kW generating systems in 1999. Since then, the construction of new large-scale wind farms have allowed for total generation capacity to reach more than 10,000kW.

By the end of FY 2008, 1,517 wind turbines were installed with capacity of 1,853.6MW. However, reaching the national target of 3,000MW added by 2010 appears unlikely without any support from the government.

Many wind turbines have been installed in Hokkaido, Tohoku, and Kyushu where the wind conditions are desirable. However, recruitment for new installation is limited because grid connection capacity is constrained. Applicants need to draw lots or take bids. Furthermore, various restrictions on location, the amendment to the building code in 2008, and global increasing demand on wind power plants have added burden on wind power industries. As a result, in terms of single year basis, additional installations were stagnating.

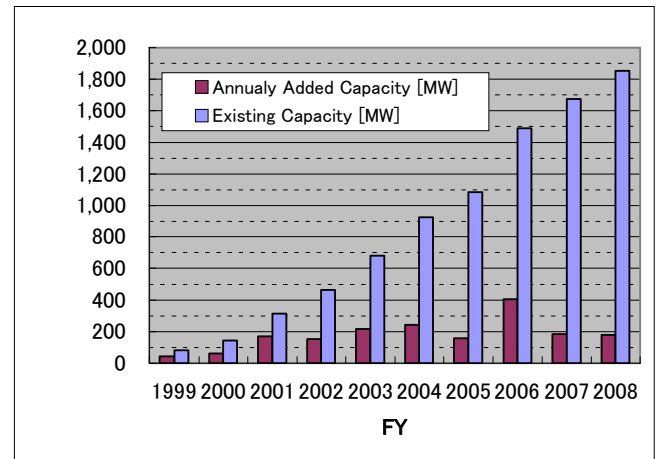


Figure 4 Wind Power Capacity, Added and Existing (JWPA)

(c) Small Hydropower Generation

Small hydropower capacity with 10,000kW or less was 3,225MW (1198 plants) at the end of FY 2008, accounting for 6.6% of the total hydropower capacity in Japan. Most domestic small hydropower plants were built before 1990, and only 127 plants accounting for a total capacity of 166MW were constructed after 1990. Individually, most of these facilities produce less than 1000kW so they are subject to the Renewable Portfolio Standard.

(d) Geothermal Power Generation

Since the first operation of geothermal power generation started in 1966, geothermal power capacity has remained around 550MW. When geothermal development gained momentum after the oil crisis in the 1970's, geothermal power equipment was installed by private initiatives. Since 1990, installations had been promoted by various subsidies provided by the government. However, since 1999 when the last facility was introduced in Hachijo Island, geothermal has not been developed further, leading the current decade to be called the "lost decade". Most geothermal power is not regarded as renewable energy, nor applicable to Renewable Portfolio Standards. In recent years, reviews on the geothermal power generation have once again started with geothermal beginning to drawing attention due to the huge resource potential and growth of domestic industry.

(e) Biomass Power Generation

There are various sources used for fuel in biomass power generation including wood originated from forests, food and livestock, industrial waste such as

architectural scraps and general waste such as food waste. Biomass power is generated from direct combustion, gasification or methane fermentation of biomass. Cumulative domestic capacity increased 750% (from 1990 level) to 3,138MW by the end of FY 2008. Power generation from general waste accounted for 55% with industrial waste supplying 40%, making up 95% of biomass power generation in Japan. In addition, most of the biomass facilities have been certified by Japan's RPS. Power generation from woody biomass of forest remained about 4% making cascade utilization of forestry biomass through the promotion of forest industry and active use of domestic lumber highly expected. Evaluation of both the sustainability and reduction effects of CO₂ according to different types of biomass sources has proven difficult, making the development of a fair evaluation method greatly needed in order to support the implementation of other systems such as emissions trading.

(2) Heat

Generally, there are three types of renewable heating markets. Solar heating is the most popular. The second type is geothermal heating which includes heat from ground sources. This type is familiar to the public as a source for hot springs. The third is biomass heat which uses forestry resources. However, other than solar heating, there is very little domestic statistical information and data in order to determine how many heating systems have been installed.

(a) Solar heating

Solar hot water capacity increased in the 1980's after the oil crisis, however, declines in product reliability stemming from quality issues of these generation systems caused a decline in sales. Recently however, development of new technologies allowing for the combination of solar heating with other heating sources has led to resurgence in expectations for its use as these systems can be employed not only for households, but also for businesses.

The solar heating market emerged in the 1970's after the oil crisis. Sales reached a peak in 1980, with more than 800,000 solar hot water systems ($\approx$ 1680MWth) and about 26,000 ($\approx$ 17.5MWth) solar heating systems installed. However, the

market shrank to less than one tenth of the peak, with 60,000 solar hot water and 4,700 solar heating systems installations in 2008. As a result the total capacity of solar heating, which is determined by deducting the depreciation of the systems from the cumulative installations, has continued to decline since 1994.

(b) Geothermal

The traditional use of hot springs for bathing is regarded as a usage of geothermal heat. Hot springs can reduce the usage of fossil fuels as substitutes for heating bath water. The use of geothermal heat, which tends to have stable temperatures, can help improve the energy efficiency of air conditioning, heating, and supply of hot water.

(c) Biomass

Traditionally, firewood has been included as a biomass resource. However, in its consideration of biomass, this report assumes the use of sources such as wood pellets and wood chips in special burning appliances. Large scale boilers which use biomass resources in paper manufacturing companies, as well as CHP (combined heat and power) systems are also considered in this research. Nevertheless, it is difficult to estimate the amount of energy generated from these means as the most of the heat generated is consumed in the manufacturing process.

(3) Fuels

The bio-fuel target of 500,000kl to be used for transportation by 2010 was included in the Kyoto Protocol Target Achievement Plan, which was determined by the cabinet ministry in 2005. Nevertheless, domestic ethanol production was only 30kl in 2006, 90kl in 2007 and 200kl in 2008. While biodiesel production was 10,000kl in 2007, its main component waste vegetable oil is also used in feedstock, industrial manufacturing, and boiler fuels leading to an estimated demand of 100,000kl.

However, sales of electric vehicles (EV) expected to use renewable energy started in 2009, leading to a potential increase in attention surrounding bio-fuels.

Chapter 4 : Long-term Scenario

“Renewable energy vision in 2050” which adopts Japan’s long term energy vision was published by “Japan Renewable Energy Policy Platform” (JREPP), an organization established in July, 2008 among renewable energy related organizations. This vision examines the potential of renewable energy, particularly as a center of “innovation” in regard to the possibility of Japan establishing its own targets as well as contributing toward climate change measures.

For the study, a goal of 75% reduction in CO₂ emissions originating from energy use (based on 2000 levels) and the domestic development of 50% of Japan’s energy needs by 2050 was assumed. The results of the study showed the potential for renewable energy to be responsible for 67% of domestic electric demand and more than 50% of primary energy supply. In order to achieve this long-term vision, it is essential to establish a long-term high numerical target and political commitment as well as the inclusion of external costs such as those caused by climate change.

In order to achieve this vision, JREPP is creating policy recommendations, to help establish a transparent and stable “renewable energy market” which can reduce the financial risk of renewable energy business for the long term by introducing feed in tariffs.

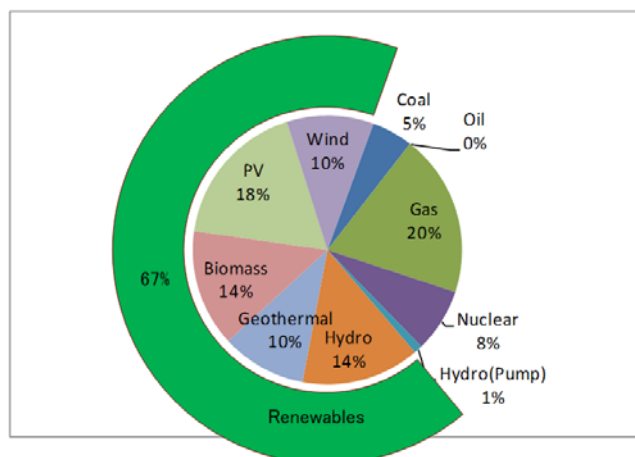


Figure 5 Share of Power Generation by Technologies in 2050

Chapter 5 : Regional Potential & Implementation

Although only 4% of energy is domestically supplied in Japan, certain regions have the potential to supply abundant amounts of renewable energy.

Data from the “Energy Sustainable Zone” report (2008) shows that 11 prefectures including Oita, Akita and Toyama supplied more than 10% of their energy demand in consumer (household & business, excluding industry and transportation) and agricultural sectors from renewables. 6 prefectures supplied more than 10% of their demand in electricity and heat of consumer and agricultural sectors. Furthermore, an estimated 50 municipals supply their municipal energy demand (both power and heat) in consumer and agricultural sectors with renewable energy only, with 100% or more of the energy self-supplied (Figure 6).

In comparison, the energy self-sufficiency ratio for big cities such as Tokyo and Osaka is very low at less than 1%. It is therefore necessary for these cities to deepen cooperation with regions where renewable energy is available or abundant in order to increase their development and use of renewable energy.

As for the potentiality of regional installations, examination of the feasibility and estimated generation capacities of solar PV, wind power, and geothermal power have been conducted. In addition, the suitability of these locations as well as their social and economic limitations is also becoming clearer from studies conducted by the Ministry of Environment and other organizations. For renewables other than solar PV, policies supporting introduction which match the particularities of each region and focus on factors such as reinforcing the regional power operation systems are needed. The results of each the studies carried out are currently being used base material for regional renewable energy introduction plans.

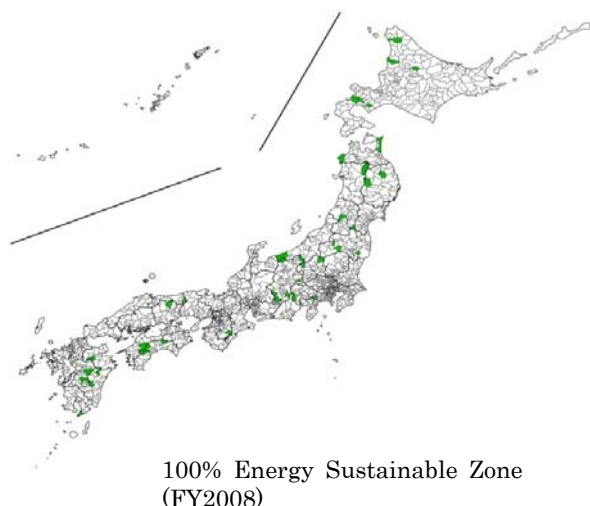


Figure 6 Municipals with 100% Self Supplied Energy

“Renewables Japan Status Report 2010, Executive Summary”

Producers : “Japan Renewable Energy Policy Platform” (JREPP) <http://www.re-policy.jp/>

Editing : Independent, Non-Profit Research Organization,

Institute for Sustainable Energy Policies (ISEP) <http://www.isep.or.jp/>

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Published : March 12th, 2010 (revised on March 26) English version: April 27th, 2010

Cooperation : “Biomass Industrial Society Network”

※This report is made possible with the financial support of Mitsui & Co., Ltd. Environment Fund, UK Foreign and Commonwealth Office Strategic Programme Fund and Japan Fund for Global Environment.

What is Japan Renewable Energy Policy Platform (JREPP) ?

JREPP is a voluntary association established on July 1st, 2008 by several renewable energy related organizations and aims to implement sustainable renewable energy policies for the development of a low carbon society. In order to accomplish this goal, JREPP provides policy analysis and advice on renewable energy.

Participating organizations (as of March, 2009) : Japanese Association for Water Energy Recovery, Japanese Wind Power Association(JWPA), Wind Power Developer Association(WPDA), Solar System Development Association, Japan Geothermal Developers' Council, The Geothermal Research Society of Japan, Research Committee on Climate Change Measures in Architectural Institute of Japan, Japan Wood Pellet Association, Institute for Sustainable Policies

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