RENEWABLES JAPAN STATUS REPORT 2009
EXECUTIVE SUMMARY

Chapter 1 : Overview

In Japan, renewable energy is finally beginning to gain attention as a key element in energy, climate change and industrial policy with renewable energy such as wind power and solar photovoltaic (PV) emerging as an attractive new industry and market. This is attributed to the "Green New Deal" policy which has been undertaken in countries around the world, as well as other effective policies such as Feed-in Tariff which was initiated in Europe and expanded to the rest of the world.

Many national, regional and local governments have been setting targets as if they are competing with each other. For example, Europe established a target for 20% share of energy consumption from renewables by 2020, while the Obama administration pledged that 25% of electricity should come from renewable sources by 2025. These policies placed pressure on the former Aso administration in Japan resulting in the establishment of a target of"20% renewable energy by 2020" (the share of energy consumption provided by renewables).

However, renewable energy policies have not been fully examined nor implemented at the "policy market" level and the Japanese renewable energy market has yet to grow. While the G8 Toyako Summit in 2008 triggered the Japanese government to prioritize political support for solar PV, other renewable energy such as wind power, heating and transport fuels have yet to receive through political analysis.

The new administration led by the Democratic Party, which took over as the result of the general election in August 2009, has called for a "25% reduction from 1990 levels" and "Feed-in Tariffs applicable for all technologies as well as the entire amount of energy produced" in its manifesto. It also established the high goal of introducing renewable energy. However, whether the new administration can change energy policies drafted by Ministry officials (Kasumigaseki) and whether it can introduce renewable energy and global warming policies with political initiative remains to be seen.

Chapter 2 : Renewable Policy Landscape

Both national and local governments have improved renewable energy polices drastically in Japan.

Since last year when the financial crisis caused a worldwide recession, a "Green New Deal" which focuses on renewable energy in order to tackle economic, climate and energy crisis, has been examined. The Japanese government decided to allocate 1 trillion yen in the supplementary budget of "Economic Crisis Measures" to spur a low carbon revolution. Nevertheless, aspects needed to help transform the "social framework" and structure of society into a low carbon society are not included in this budget.

Since 2004, solar PV market has been growing rapidly all over the world, especially in Germany. Japan slipped from first place in solar PV installations in the world, resulting in a shrinking of its market in contrast to the global trend. The G8 summit in 2008 triggered the government to change its position to support solar PV more positively. In addition, the ruling and opposition parties as well as Ministry of the Environment proposed a Feed-in Tariff ("FIT"), causing the Ministry of Economy, Trade and Industry, which had formerly opposed an FIT, to finally change its position and disclose the introduction of FIT. Although the fast implementation of the FIT signaled a positive change in renewable energy policy, it needs to be further reviewed since it does not correspond with the new administration's manifesto.

Other than solar PV, the renewable energy market has not matured yet. Wind power has some issues such as grid restriction or social consensus on "how windmills can coexist with birds". In addition, there is no policy, or framework to support the renewable heating market and renewable transportation fuels. Although the expectations by private sectors concerning the smart grid proposed by the Obama administration are quite high, development to solve the issues such as the regarding reduction of grid restrictions remains to be seen.

With the first commitment period set by the Kyoto protocol approaching, various carbon

Copyright 2009, JREPP

credits such as carbon offset, domestic credits, J-VER, and Tokyo metropolitan credits have been introduced. While the environmental value of in these renewable markets is promising, issues such as harmonization of credits and establishment of legal systems remain to be solved.

Among local governments, the Tokyo metropolitan government is leading Japan's environmental energy polices. It plays a key role and is creating policy models in important environmental energy fields by introducing emissions trading and promoting solar energy. In addition, Tokyo is initiating policy cooperation in the metropolitan area as well as practical partnerships with private sectors and environmental NGOs.

Energy companies such as electric power, gas or oil companies are also pursing 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 apartment balconies, and oil companies are entering full-scale into the solar PV market.

The solar PV industry is most advanced among Japanese renewable energy industries, since the previous administration did not encourage renewable energy other than solar PV. The former administration targeted an increase of 20 times as many solar PV installations by 2020 and 40 times by 2030. Now that the new administration has been established, it is expected that more active renewable policies will be introduced.

Green Power Certificate trading by private sectors reached 160 GWh in FY 2008 (twice that of the previous fiscal year) and will be further promoted by the new market which the Tokyo Metropolitan Government plans to introduce. 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 prepared.

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 on the basis of the social consensus regarding issues surrounding 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 in 2005. 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, have 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 is 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 is low, its utilization rate exceeds 60% on the average and annual power generation accounts 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 2000.

Copyright 2009, JREPP

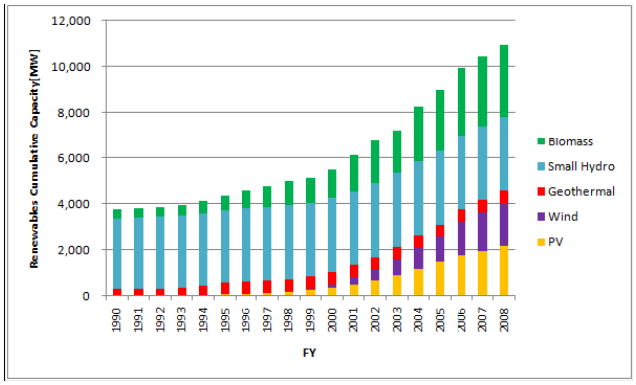

Figure 1 Cumulative Renewable Power Capacity in Japan (ISEP)

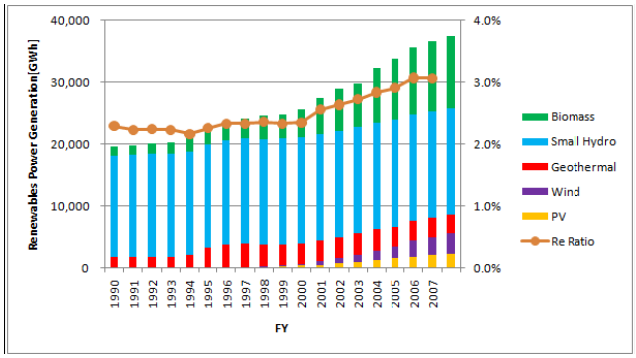

Figure 2 Estimated Renewable Power Generation in Japan (Survey by ISEP)

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 2,198MV, exceeding 2,000MV 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 MV was shipped abroad in single FY 2008 (four times as much as the total amount shipped domestically).

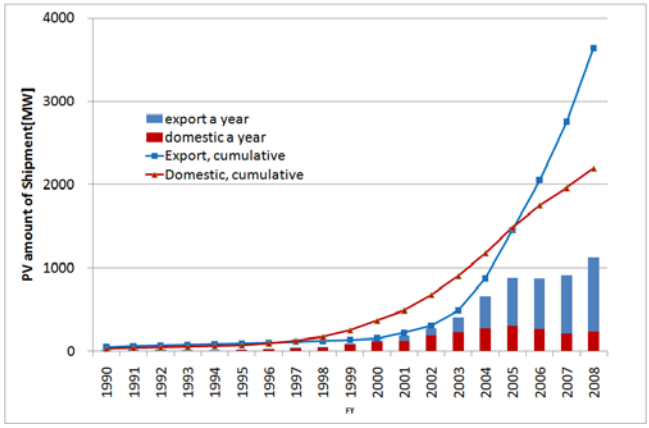

Figure 3 Shipment Volume of Solar PV (from JPEA data)

(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 3,000MV added by 2010 seems unlikely without further initiatives.

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 are now stagnating.

Copyright 2009, JREPP

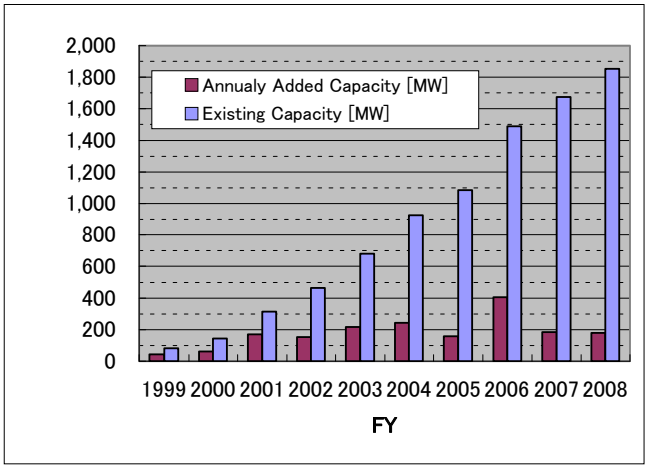

Figure 4 Wind Power Capacity, Added and Existing (JWPA)

(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 not 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 a 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 (≒1680MWth) and about 26,000 (≒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

Copyright 2009, JREPP

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 the attention in bio-fuels.

Chapter 4 : Long-term Scenario

"Renewable energy vision in 2050" which adopts Japan's long term energy vision was published, among other renewable energy related organizations, by "Japan Renewable Energy Policy Platform" (JREPP), an organization established in July, 2008. 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.

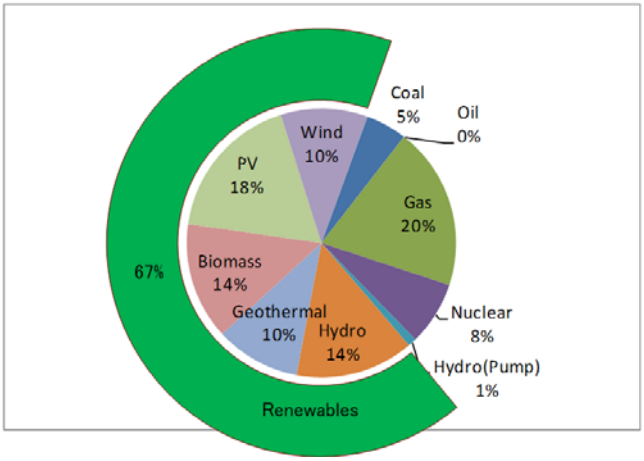

Figure 5 Share of Power Generation by Technologies in 2050

Chapter 5 : Regional Implementation and Its Potential

Although only 4% of energy is domestically supplied in Japan, according to a study entitled "Energy Sustainable Zone" abundant energy is being supplied in prefectures, cities and municipalities.

Each regional renewable energy supply which data was collected in 2008 shows that 11 prefectures

Copyright 2009, JREPP

including Ohita, Akita and Toyama supplied more than 10% of the energy demand in consumer and agricultural sectors. 6 prefectures supplied more than 10% of demand of electricity and heat from renewables. Furthermore, an estimated 50 municipals supply their municipal energy demand (both power and heat) 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 energy self-sufficient regions in order to increase their development and use of renewable energy.

As for the potentiality of regional installations, the feasibility and estimated amount of renewable energy which could be supplied by installations of solar PV, wind power, hydro or geothermal power are also examined.
The findings of these studies are published as evidence for recommendations to promote renewable energy.

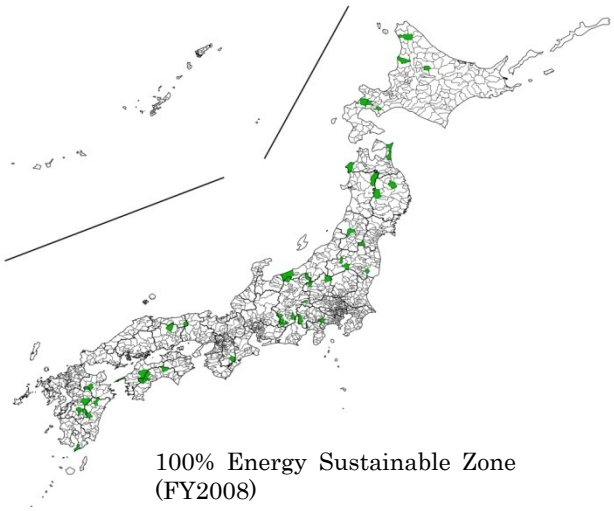

Figure 6 Municipals with 100% Self Supplied Energy

"Renewables Japan Status Report 2009, Executive Summary"

Producers : "Japan Renewable Energy Policy Platform" http://www.re-policy.jp/
Editing : Independent, Non-Profit Research Organization, Institute for Sustainable Policies (ISEP)
http://www.isep.or.jp/
Editors : Hironao Matsubara, Akira Urai and Noriaki Yamashita
Published : October 1st, 2009 (English version: February 1st, 2010)
Cooperation : "Biomass Industrial Society Network"

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

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

※Disclaimer : The views expressed in this report do not necessarily reflect the position of the organizations participating in JREPP. Although information given in this report is the best available to the authors at the time, JREPP cannot be held liable for its accuracy and correctness. The report is subject to revision in the future.

Copyright 2009, JREPP