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Renewables 2015 Japan Status Report (Summary)

Institute for Sustainable Energy Policies http://www.isep.or.jp/en/

Toward the Age of Energy Democracy

Tetsunari Iida, Executive Director, ISEP

Looking back on the past fifteen years, from the time the Institute for Sustainable Energy Policies (ISEP) was established until today, I truly feel that we are at a major turning point.

Fifteen years ago, there was just short of 20 GW of wind-generated electricity worldwide, but in just the past year there was an increase of 50 GW and the total has finally come shoulder-to-shoulder with the amount of generating capacity of nuclear power. Regarding photovoltaics, there was only 1.3 GW world-wide, but in just the past year alone, there was an increase of 40 GW and the accumulated total has reached half the generating capacity of nuclear power and is expected to be shoulder-to-shoulder with it in three more years.

Last year, more than 60% of the newly installed power sources world-wide were renewable energy and the level of investment worldwide set a new record, reaching approximately 36 trillion yen. As we approach the COP21 in Paris, to be held this year in December, the EU has set an ambitious goal of doubling renewable energy generation to 45% by the year 2030, with each country positioning renewable energy as an immovable central policy for dealing with global warming, of course, and also for providing energy, for the industrial economy, and for invigorating regional economies.

Circumstances like this were unthinkable fifteen years ago, but there are two major contributors to this growth. One is that renewable energy, which is small-scale distributed technology , follows Moore's Law like computers so, due to the effects of technological learning, performance increases and cost decreases are continually found so, in many countries, it has finally started to go below the costs of electricity and other types of energy. The idea that "renewable energy is expensive," is already becoming a thing of the past.

Another, even larger driving force, is the movement of energy from large, centralized monopolies to dispersed, small-scale, open systems. With the lowering of renewable energy costs, which is essentially small-scale, dispersed technology, there is a rising tide around the world of regional communities and individuals or groups producing energy and becoming self-reliant.

The Fukushima nuclear accident at TEPCO's Fukushima Daiichi Nuclear Power Plant blew away the thick, opaque veil (what Wolferen called the "false reality") made by the government, electric companies and mass media and that had been covering Japanese society and many citizens were presented with the reality of Japanese society and this led to the Ajisai Revolution, the movement against the restarting of the Ōi Nuclear Power Plant. And this year, the 70th since the end of WWII, with the discussion about the National Security Act, which is strongly suspected of being unconstitutional, SEALDs (Student's Emergency Action for Liberal Democracy – s) and other young people are rising up, displaying the aspects of a democratic movement.

Humans, all of them, have an intrinsic right to rule themselves. Producing energy by oneself or a group, or the regional community, is consistent with a democracy where conversation and participation determine how a region's resources (renewable resources, the environment, scenery, sounds, people, money, etc.) are used, what is produced and how they are managed. This is called Associative Democracy, as opposed to Representative Democracy.

The community power that has boiled up around the world, and in Japan, not only has the possibility to "democratize" energy policies and the energy industry, which have long been monopolized but, at the same time, has the potential to democratize society through associative democracy. I would like to call this "The Age of Energy Democracy."

After March 11, 2011, power generation by nuclear rapidly decreased from 25% to zero. Ratio of renewable energy is about 10% of power generation, which remained unchanged for the past two decades.

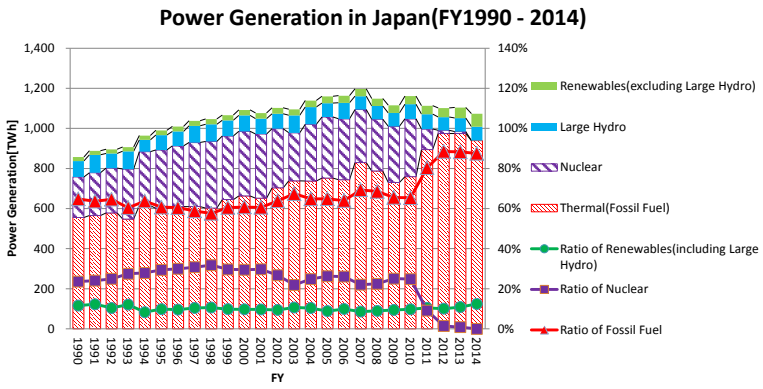


Fig.1. Trends of Power Generation in Japan
(Source data: EDMC, METI, etc. Graph: ISEP)

Renewable Energy is increasing contribution to the power generation in Japan, 12.5% in FY2014, including large hydro.

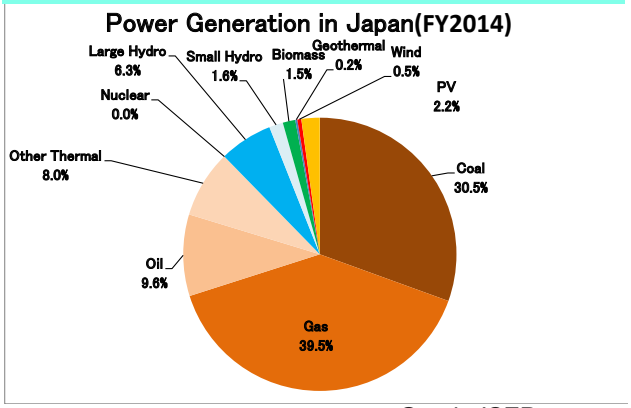


Fig.2: Power Generation in Japan(FY2014)Graph: ISEP

Trends of Renewable Energy Capacity in Japan(excluding large hydro): Total capacity is 34GW including PV of 24GW by end of FY2014.

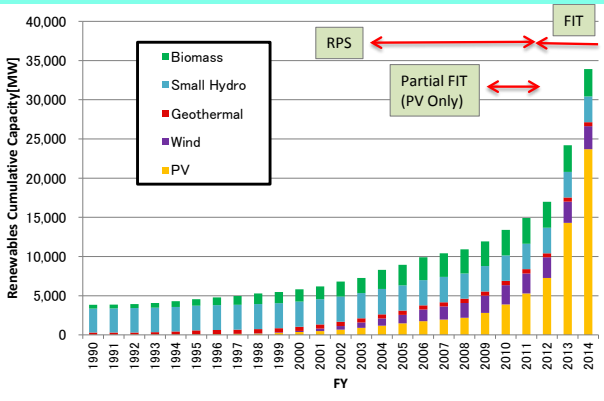


Fig3: Trends of Renewable Energy Capacity in Japan
(Source: ISEP)

In trends of Renewables electricity in Japan (excluding large hydro), ratio of renewables electricity was 5.9% in FY2014.

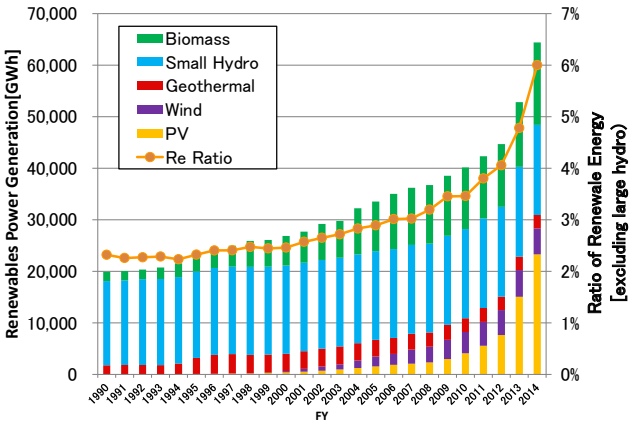


Fig 4: Trends of Renewable Energy power generation in Japan, excluding large hydro (Source: ISEP)

After 2013. trend of additional PV capacity is dramatically changed in Japan and Germany.

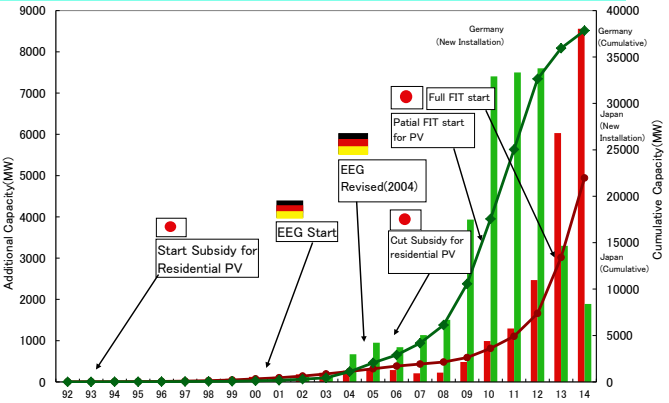


Fig 5: Trends of Solar PV in Japan and Germany
(Source Data: : IEA PVPS, EPIA, Graph: ISEP)

After FY2011, annual installed capacity of wind power keeps very low level because of several regulation. Pipeline of environmental assessment is around 6GW including certified wind capacity is over 2GW at the end of 2014.

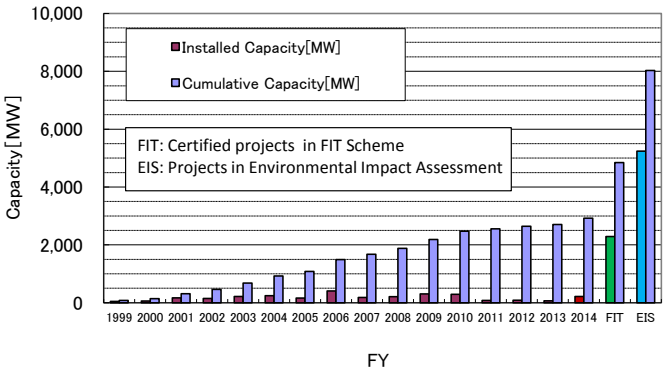


Fig 6: Trends of Wind power capacity in Japan
(Source Data: : JWPA, Graph: ISEP)

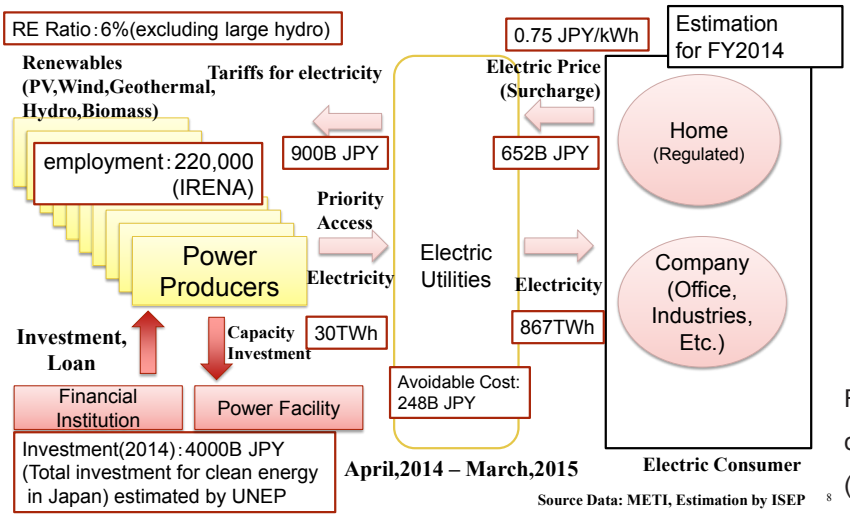
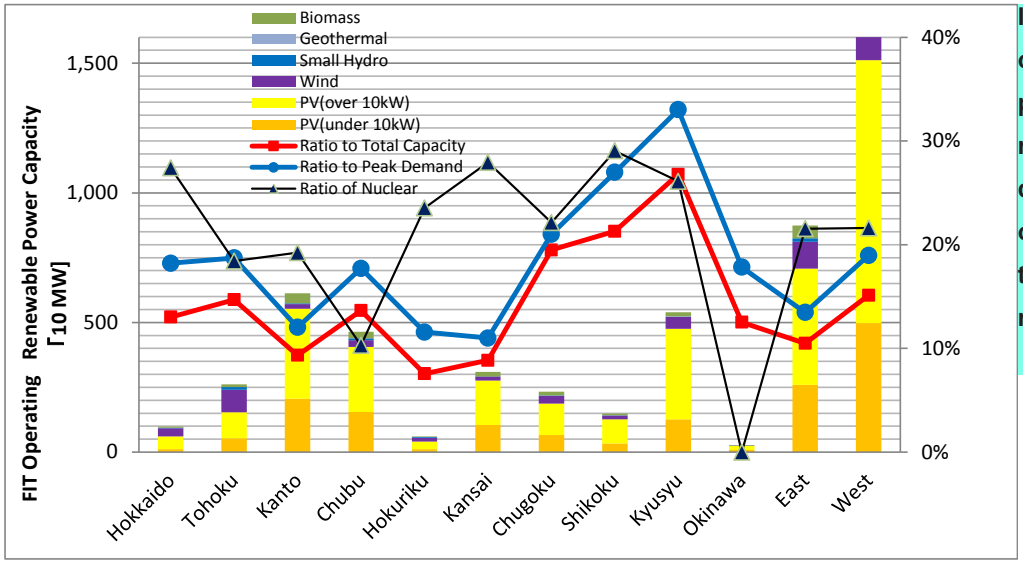


Fig 9: Operating Renewable power capacity in each utility
(Source data: METI, Graph: ISEP)

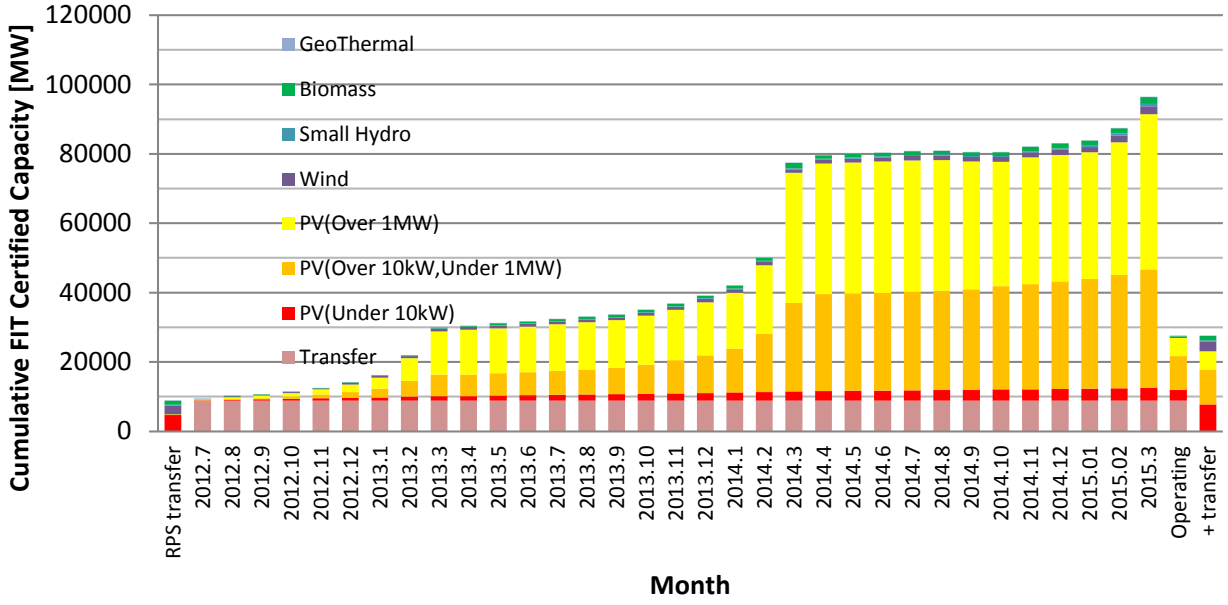


In Kyusyu region, operating renewable power capacity reaches 30 % of peak demand. And ratio of certified capacity to peak demand reaches over 100%.

Fig 7: Economical effects of FIT scheme in Japan (FY2014) Source data: METI, IRENA, UNEP

Cumulative capacity of certified facilities is nearly 88GW until March, 2015 since July 2012. PV capacity is 94%(83GW) of certified facilities. And certified large PV over 1MW is 45GW(51%). Operating facilities are 21%(19GW) of certified facilities by March 2015.

Fig 8: Status of FIT in Japan (as of March 2015)
Source data: METI, Graph: ISEP



Renewable Energy Policies and the Energy Mix

Japan's renewable energy policies changed greatly after 3.11 but the renewable energy target for 2030 is only 24%, which is quite low compared to the targets of the European countries.

In the Basic Energy Plan decided upon in the April, 2014 Cabinet meeting, renewable energy was positioned as "a promising and diverse domestic energy source," and it was indicated that for three years after 2013, introductions would be accelerated to the largest extent possible and even after that, actively promoted. However, no mid-to long-term vision or targets were given and it stopped at simply summing up a basic policy. With nuclear power at zero, the energy mix in FY2014 covered with reduced energy usage (8% reduction compared to 2010), renewable energy (2% increase compared to 2010) and fossil fuels (15% increase compared to 2010).

While keeping nuclear power at zero, reducing reliance on fossil fuels is important for ensuring energy safety and as a measure against climate change but, under the Abe government, nuclear power is "an important baseload power source" which has "a superb ability to supply stably and efficiently," and "the operating costs are low and have little variability," a policy which seems to go back to pre-3.11 without reflecting on the Fukushima nuclear power plant accident. We shouldn't have a basic energy policy which relies on the hugely risky and no-longer economical nuclear power, instead, what's called for is a change to a sustainable energy policy with a renewable energy policy at the core which rapidly reduces dependence on fossil fuels and has practical and ambitious goals for increasing energy efficiency and reducing energy usage.

Even in the new Basic Energy Plan, goals for introducing renewable energy are not specified, but it states that we should aim for higher levels than had been set in previous Basic Energy Plans. After that, in the Outlook for Long Term Energy Demand (Energy Mix) decided on by the Ministry of Economy, Trade and Industry (METI) in July, 2015, the targets for introducing renewable energy are 22-24% by 2030 (approximately 250 TWh).

However, in January, 2015, a de factor "upper limit" for the "amount connectable" to the electric system was introduced for renewable energy and for variable renewable energy such as wind and PV, in particular. Because of this, the targets for introducing PV and wind power can only be increased by about 9% by 2030 and this is very low even compared to the actual amounts introduced in the countries of Europe. It cannot be said that this sufficiently reflects the circumstances overseas, such as in the European countries which are leading nor the circumstances of introductions in Japan after 3/11 that were starting to increase rapidly. In Japan, which gave rise to the Fukushima nuclear power plant accident, a disaster of historic proportions, luckily a Feed-in Tariff(FIT) was started almost at the same time in the midst of that misfortune and, if the rapid expansion of the PV market this brought is followed up on, Japan, too, can look for ambitious introduction targets that exceed 30% by 2030.

To determine introduction targets for renewable energy, it's important to have a long-term vision of the future, a so-called energy concept. The nation's Basic Energy Plan is not showing such a new energy concept; it stops at bringing up the old standards of "stable supply, economical, and environmentally sound" without change. However, if we think of the serious risk of a nuclear power accident, the organization of an energy supply completely reliant on overseas fossil fuels and the climate change problem, it's absolutely necessary to put up an energy concept that aims for 100% renewable energy by 2050 and has drastic reductions in energy usage as the only sustainable energy.

To get to that future, the renewable energy targets must be determined by backcasting from the climate change targets and the new energy concept. CAN-Japan, an environmental NGO network, is calling

for 40-50% reductions of greenhouse gases by 2030 (compared to 1990) and 45% of electricity produced by renewable energy. These targets are in line with the scenarios put forth by domestic environmental NGOs, such as WWF Japan, Kiko Network, CASA, etc.).

The Ministry of the Environment (MoE) has published a renewable energy introduction scenario. In this, even the low scenario has the same levels as the METI Basic Energy Plan and in the high scenario, the annual production of electricity in 2030 is at 356.6 TWh, so even if the total electrical capacity is the same as today, renewables will have a share over 30%.

Renewable energy industry groups have also put forth their own long-term introduction scenarios.

The Japan Photovoltaic Energy Association (JPEA) has published an introduction scenario to 2030, "JPEA PV Outlook 2030," (revised March, 2015). This is a revised version which takes into account the latest market trends and changes to the environment in which industries work since the start of the FIT program. This outlook has the domestic PV capacity in 2030 at 100 GW, but this is a realistic amount that doesn't exceed the 2014 actual additions in 2014 of about 8 GW.

The Japan Wind Power Association has published a roadmap for introducing wind power out to 2050. This roadmap envisions 20% or more of electrical production in 2050 coming from wind power and the cumulative estimate for wind power by 2030 is more than 36.2 GW (onshore: 26.6 GW, offshore: 9.6 GW).

The FIT Program: Current State and Issues

By the end of FY2014, the FIT program facility approvals had surpassed 87 GW with PV power accounting for 94% of that. Since the start of the FIT program, facilities accounting for over 20 GW of capacity have started operation, with 97% being PV.

Over three years has passed since the FIT program went into effect and the large results of this even appear in statistics.

PV power was introduced rapidly and, in FY2013, almost doubled over the previous year. The cumulative amount installed came to approximately 14 GW and in FY2014 increased by another 9 GW for a total of approximately 24 GW. The amount of PV power introduced in one year was second in the world, behind China, and the amount of investment in renewable energy overall was 4 trillion yen. Renewable energy accounts for 12.6% of Japan's total electrical production (Figure 3, including large hydro, FY2014).

Renewable energy other than PV, such as wind, geothermal, small hydro, and biomass, are not increasing very much. This is because these other types of renewable energy require more time to prepare a business and there's more risk.

Since April, 2014, data from electric power facilities approved by the FIT program is published with a 3 month delay by city, town and village on the Agency for Renewable Resources and Energy (ANRE) website for disclosing information. Numbers for the amount of electricity produced nationwide has started to be published in the Electricity Statistics (ANRE) but there is room for improvement in the statistical preparation and disclosing of information for renewable energy.

From the start of the FIT program until the end of March, 2015, new approvals of renewable energy facilities exceeded 87 GW of capacity (not including approvals of pre-FIT facilities), as shown in Figure 34 but approximately 94% of this is PV (half is mega solar with output of 1MW or more). About 2.3 GW of wind power and about 2 GW of biomass power have been approved, but medium-to-small hydro and geothermal have stopped at about 660 MW and 70 MW, respectively.

Wind power has stagnated compared to overseas but recently it has started to grow. For it to become truly widespread, the current problems for more than 5.2 GW must be solved, namely the ongoing environmental assessments, land-use zoning, obtaining social agreement, preparing connections to the electrical system, etc.

For biomass power, a stable supply of raw materials that have sustainability taken into consideration and a plan to introduce a suitably sized facility and increasing energy efficiency such as with heat-using co-generation are issues. For geothermal and mid-to small hydro power, getting consent from the locality, nature parks and water rights are issues.

Looking at the status of facility approval for each electric company, for Kyushu Electric, when pre-FIT approvals are included, approximately 20 GW of facilities are already approved. This is equivalent to the capacity of all of Kyushu Electric's facilities as of the end of FY2012 and is about 120% of the maximum power output in a year (2013 results). For Tohoku Electric, also, approvals are about equal to 80% of their entire capacity and 100% of their maximum output.

For Kanto, Chubu, and Kansai, where there is a large demand for electricity, approvals have stopped at 20-40% of capacity. Looking at the broad regions of Eastern Japan and Mid-to-Western Japan which have hitherto been trading electric power via interconnection lines between companies, the ratio of approved renewable energy facilities is equivalent to about 50% of maximum output.

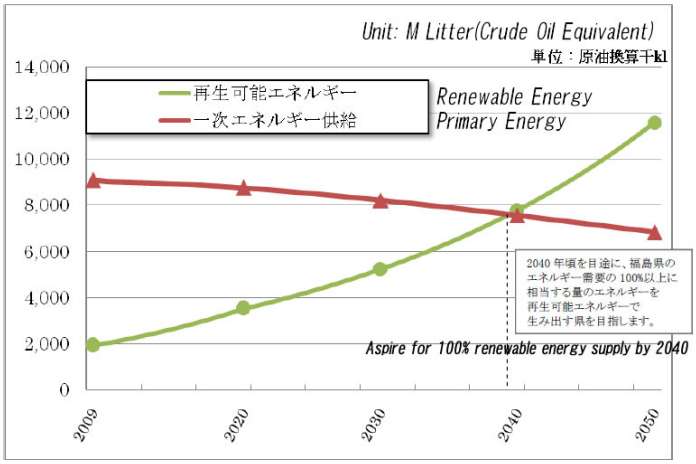
Looking at power generating facilities implemented under the FIT program (the total of pre-FIT approved and newly introduced facilities) by electric company, we can see that even for Kyushu Electric, which has the highest ratio of implementation, they have stopped at about 30% of maximum output. Looking at the broader area of Western Japan, and it stops at the even lower level of 20% or less.

Under the FIT program, the fixed price that is paid is made up of the fee paid by consumers and the escapable cost paid by the electric companies. Because of this, the method for calculating the escapable cost is important. A method of linking to the wholesale electric exchange is being considered as a replacement for the average calculating method that has been used up to now. However, the amount traded on the current wholesale electric exchange is only a few percent of the total and there is the possibility of the market being greatly influenced at the discretion of the electric companies. As we head toward the free retail electric market that is to come, in order for the retail electricity companies to handle as much renewable energy as possible, a more equitable and more transparent calculation method is needed.

Topic1: The trend to aim for 100% renewable energy, domestically

In Japan, Fukushima Prefecture has a vision of promoting renewable energy with a goal of 100% by 2040. In the "Takarazuka Energy 2050 Vision," the city of Takarazuka, in Hyogo Prefecture, is aiming to supply 50% of both electric power and heat demand by itself by 2050 and, combined with procurements from outside the city, get a usage rate of 100%.

Fukushima Prefecture:
Vision and Scenario of 100% Renewable Energy.
Primary Energy Ratio:
Current Status： 20% (2009)
Policy Target1： 40% (2020)
Policy Target2： 64% (2030)
Vision： 100% (2040)



Topic 2: Japan's 100% renewable energy regions (Sustainable Zone)

It is important that more and more regions supply sustainable energy to a larger degree in the future in each Prefecture, city, town and village. The Sustainable Zone Research Committee (collaborative research by the Kurasaka Environmental Research Laboratory, Chiba University and ISEP) has been making the current state and progress of renewable energy supply by region here in Japan visible since 2007. Using the share of renewable energy supply as that region's sustainability index, and from the actual use of solar PV and wind, small hydro, geothermal, biomass, etc. in a region, the sustainability of a region is evaluated, which heretofore couldn't be obtained from economic indicators. In the research published in March, 2015, "Energy Sustainable Zone," each region's characteristics are derived from the renewable energy supply ratio for each region and introduced.

Looking at the data by Prefecture, we can see that, for the estimated FY2013 amount of renewable energy supplied, at the end of March, 2014, the four prefectures Oita, Akita, Toyama and Aomori, the share of renewable energy supplied compared to demand by the residential/business and agricultural/forestry/fisheries sections is over 20%. As for the characteristics of each Prefecture, geothermal power generation has a large share in Oita, in Akita, in addition to geothermal and small hydro, wind power also has a large share and, in water resource-rich Toyama, small hydro has a large share.

In the entire country, there are 57 municipalities where it was estimated that the ratio of renewable energy supply was over 100% (Figure 8). In addition, there were 89 municipalities where renewable energy was supplied that was over 100% of the electricity demand. However, a majority of these regions were generating electricity with geothermal, small hydro and wind power facilities set up in the past by electric utilities and were supplying renewable energy electricity outside the region.

In large cities such as Tokyo and Osaka, there's a large demand for energy and the supply of renewable energy is small, at 1% or less. The trend for municipal governments in large cities is to supply a lot of renewable energy per unit of area and Kanagawa Prefecture has the highest in the country.

Although evaluating "100% renewable energy" from the amount of electricity and heat supplied from renewable energy is the first handle on evaluating a "sustainable region," in general, there are two issues remaining. These are: the latent potential of the renewable energy that a region has and the form that energy should take. In many of the current "100% renewable energy regions," a large share of this energy is produced by power plants previously developed in those regions by existing electric utilities. But, since the latent potential of the renewable energy in those regions is expected to be even larger, even though the usage of this pre-existing electricity and heat is low, it doesn't mean that the region's potential for sustainability is low. Also, just because a renewable energy power plant owned by the out-of-region large capital electric utility "happens" to be in a region, it doesn't mean that that region can use that power plant, nor does it mean that the profit for the region from that power plant is sufficient. Here on out, a 100% renewable energy index that accounts for these things need to be considered.

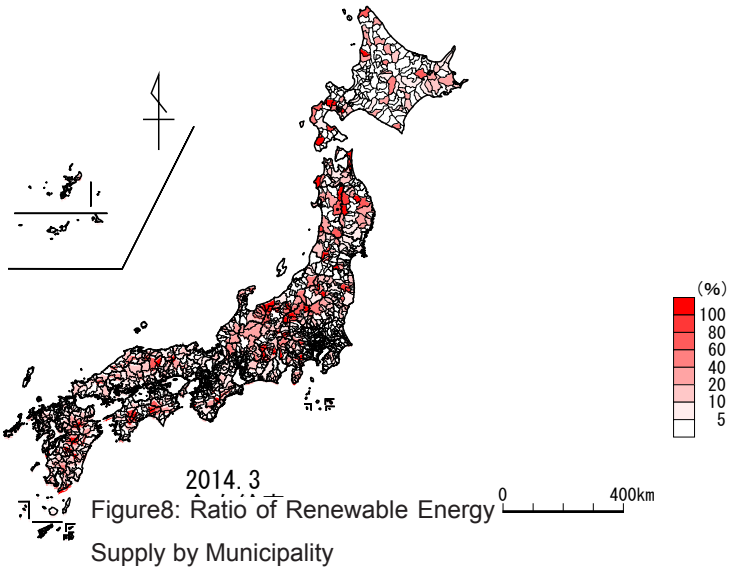


Figure8: Ratio of Renewable Energy Supply by Municipality

Topic 3: Renewable energy and getting social agreement

The Sustainable Society and Renewable Energy Research Committee, made up of businesses, interested people, and researchers have, upon having had conversation upon conversation, published the first domestic report which has agreement between multiple stakeholders with regards to renewable energy.

While renewable energy has various merits, it also has the possibility of having negative impacts on a regional society depending on how it is implemented. Here in Japan, the FIT program started in July, 2012, and development of renewable energy businesses is proceeding rapidly, but various interested parties have shown concern.

Because of circumstances such as the above, we understood that there was a need for interested parties to create a common understanding about a more socially acceptable implementation of renewable energy and that this could be done via repeated discussions so, from the end of 2012, ISEP and the Japan Renewable Energy Foundation (JREF) got together with renewable energy business-related people, environmental protection-related people and researchers and started the “Sustainable Society and Renewable Energy Research Committee.” At the meetings, topics related to the social acceptance of renewable energy were discussed by type of energy and interested parties sat at the same table to engage in frank discussions. Among the discussions, there was a common understanding that crossed all the fields and a consensus was formed on a sustainable society and renewable energy so a report was published in June of 2015 with the basic thought of sustainable renewable energy and details of the individual topics.

There was consensus on several topics, starting with the most important agreement on sustainable development, the use of renewable energy was absolutely necessary, energy conservation should be further increased and, with regards to the development of renewable energy, a precautionary approach was taken. Also, with regional social acceptance as a precondition, there would be a re-evaluation of land zoning and strategic assessments, and through the independent participation of the regional community form of development that is more preferable for both the environment and society would be aimed at. In addition, consideration would be paid to the fact that scientific opinion is both uncertain and insufficient and that changes to social agreement occur so the method of development and use would be improved and revised. A common understanding of all of this among the participants was the result.

However, agreement wasn’t necessarily reached on topics such as the outlook for implementing renewable energy, how agreement would be reached, what sort of environmental impact assessment there should be, how to think about national and quasi-national parks and what they should be and development of geothermal power in national and quasi-national parks so these topics remain for future discussions.

In order to realize a more socially acceptable implementation of renewable energy, it’s important to provide a feedback process that includes a forum for a wider variety of participants to exchange ideas, the application in the field of the thoughts and ideas agreed-upon in that forum and further discussions between the participants on those results. The “Sustainable Society and Renewable Energy” consensus and report are the first step towards that and it is expected that there will be a more concrete search for implementation of sustainable, renewable energy.

Consensus on a Sustainable Society and Renewable Energy

►The use of renewable energy is necessary for sustainable development
►Energy conservation
►Renewable energy is necessary but just that is insufficient
►A preventive approach
►Regional society agreement is a prerequisite
►A plan to increase the sustainability of renewable energy use
►Provisional agreement and continual improvement and review

Topic 4: Coming to grips with community energy

The “Japan Community Energy Association” was established in May, 2014. This is the first nation-wide network made up of organizations and key people that deal with region-led renewable energy businesses in Japan.

The first nation-wide network made up of organizations and key people that deal with region-led renewable energy businesses was established in May, 2014. This was the “Japan Community Energy Association” and ISEP was made the secretariat. This Association is the embodiment of the accumulated actions taken by ISEP up to that time to spread community power. This is a developmental re-organization of the Community Power Initiative, formed on June 19th, 2013, and the establishment was announced by the promoter on March 11th, 2014, three years after 3.11. Then, the founding general meeting was held on May 23th 2014 and on July 1st, it became a general incorporated association.

The Community Energy Association is operated mainly by the directors and/or managers of the nation’s nine regions that deal with region-led renewable energy projects and consumer managers that deal with the popularization of renewable energy from the standpoint of consumers. There are approximately 30 member groups and companies as of July, 2015. Under the principle of working together and promoting the region-led development of renewable energy with the purpose of realizing sustainable and self-reliant regional societies, social business models are developed, information and experiences are shared, and networking, research and advice on policies, the nurturing of human resources, aiding projects, etc. are being carried out.Efforts are made to introduce the association to all parts of Japan and promote the understanding that community power has the possibility of opening up a region’s future. The association aims toward expanding the range of participation and, in addition to vigorously sponsoring and supporting the holding of symposia, both domestic and overseas networking is also encouraged.

Photo: Community Power Conference in Fukushima

Institute of Sustainable Energy Policies (ISEP)

The Institute of Sustainable Energy Policies is an organization independent of the government and industry which has as its goal the realization of sustainable energy policies. It was established by environmental activists and specialists dealing with energy problems and measures to counteract global warming. ISEP is active in a broad range of activities such as making suggestions on national policies for promoting renewable energy and counteracting climate change, giving advice to regional governing bodies, opening international conferences and symposia, etc. It also acts as Japan’s window for networking with the countries of the EU, North America and Asia to introduce overseas information and exchanges of people, etc. As for assistance to community energy projects, it makes proposals and assists projects such as community wind and solar power projects using community funds, etc.

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