Institute for Sustainable Energy Policies
isep
認定NPO法人
環境エネルギー政策研究所

Renewables 2016 Japan Status Report , Summary

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

Toward the Age of Energy Democracy

Looking back on the past sixteen years, from the time the Institute for Sustainable Energy Policies (ISEP) was established until today, We are at a major turning point.

Sixteen years ago, there was just short of 20GW of wind power capacity worldwide, but in just the past year there was an increase of 60GW and the total capacity has finally come more than amount of capacity of nuclear power. Regarding photovoltaics, there was only 1 GW world-wide, but in just the past year alone, there was an increase of 50GW and the accumulated total has reached half the 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 286 billion USD. As the Paris Agreement[1] was decided at the Paris climate conference (COP21) last year in December, it's necessary to switch to 100% renewable energy worldwide in the long term. 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 sixteen 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 distributed, small-scale, open systems. With the lowering of renewable energy costs, which is essentially small-scale, distributed 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 Tokyo Electric's Fukushima I Nuclear Power Plant blew away the thick, opaque veil (what Wolferen called the "false

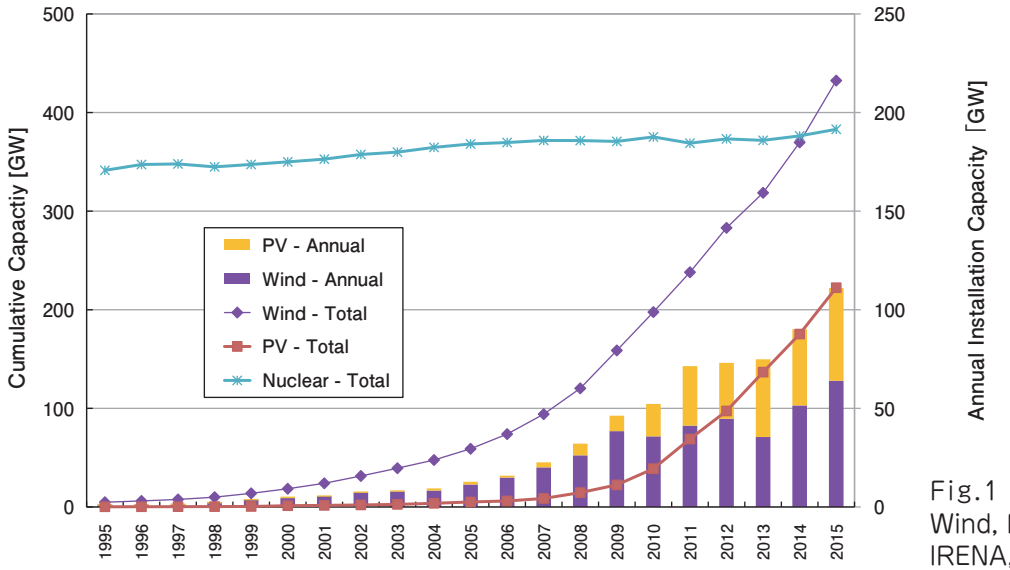


Fig.1 Worldwide trends of Wind, PV and Nuclear (Source: IRENA, IAEA, Graph:ISEP)

[1] ISEP, Renewable Energy has Become "Paris' Light of Hope" http://www.isep.or.jp/en/library/3093

reality") made by the government, utilities 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 of KEPCO. And last year, the 70th since the end of WWII, with the discussion about the National Security Act, which was 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. This is "The Age of Energy Democracy."

Status and Trends of renewable energy in Japan

After March 11, 2011, Fukushima nuclear power accident, power generation by nuclear rapidly decreased from 25% to almost zero as shown in Fig.2. Share of renewable energy power generation has increased to 14.5% including large hydro in FY2015, which remained at 10% of power generation unchanged for the past two decades before Fukushima as shown in Fig.3. Large hydro is largest share 7%, however, PV has second share of 3% in renewable energy power generation, however, small share 0.5% of wind power in Japan as shown in Fig.4.

As shown in Fig.5 of trends of Renewable Energy Capacity in Japan, excluding large hydro, total capacity of renewable energy reached 43GW including PV of 32GW by end of FY2015. In trends of Renewables electricity in Japan excluding large hydro, ratio of renewables electricity reached 7% in FY2015 as shown in Fig.6.

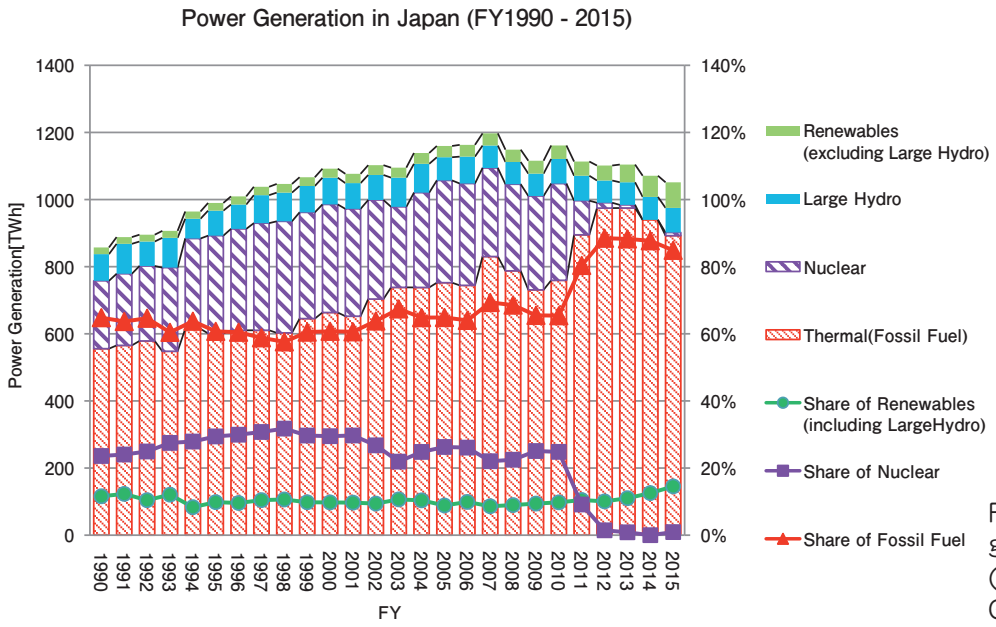


Fig.2 Trends of power generation in Japan (Source: EDMC, METI, etc. Graph: ISEP)

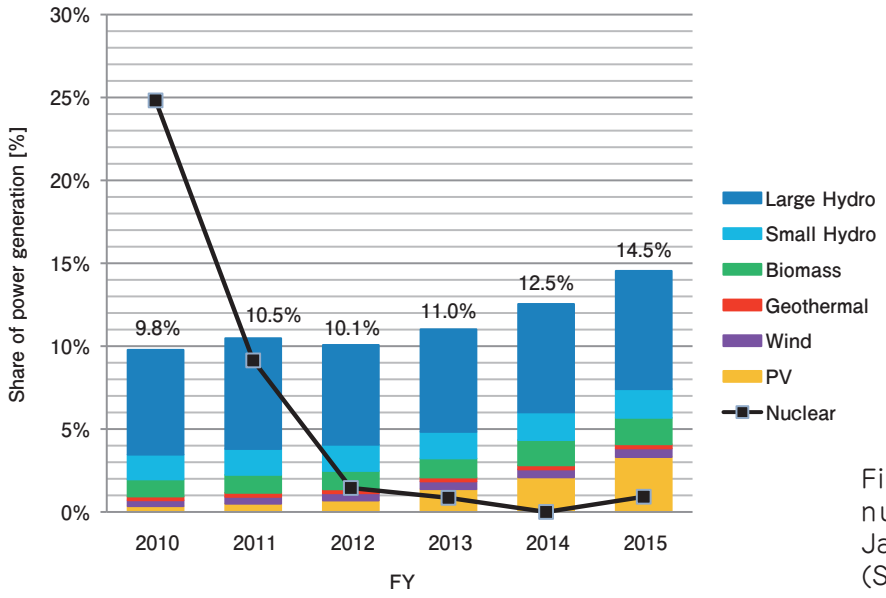


Fig.3 Trends of renewable and nuclear power generation in Japan
(Source: METI, Graph:ISEP)

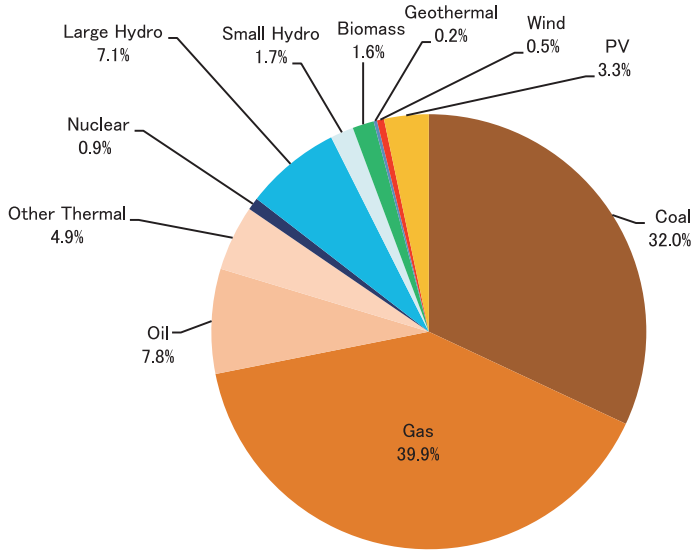


Fig.4 Power Generation in Japan (FY2015)
(Source: METI, Graph:ISEP)

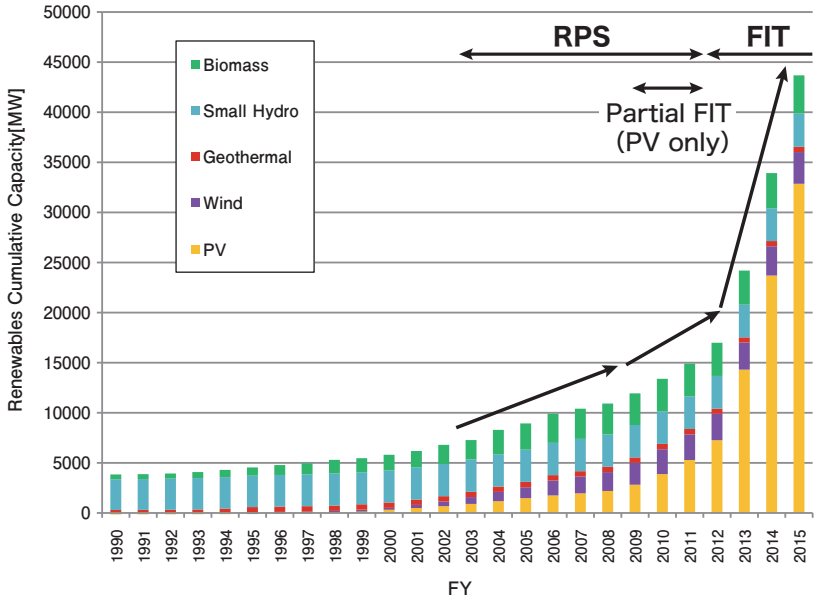


Fig.5 Trends of Renewable Energy Capacity in Japan
(Source: ISEP)

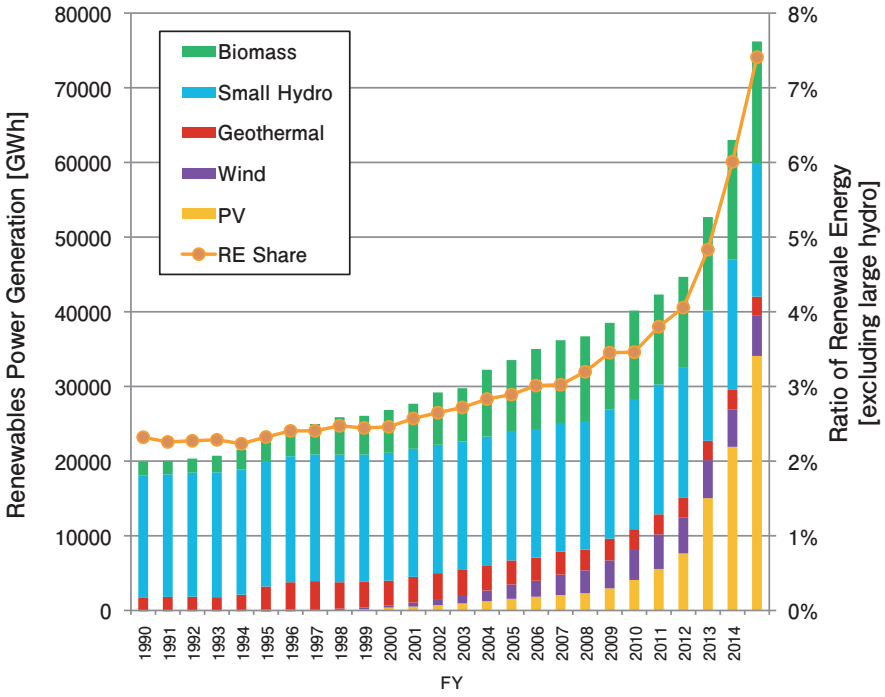


Fig.6 Trends of Renewable Energy power generation in Japan, excluding large hydro (Source: ISEP)

As shown in Fig.7, after 2013, trend of additional PV capacity is dramatically changed in Japan and Germany. In Japan, annual installation of PV rapidly increased after new FIT program started in 2012. In Germany, change of FIT program caused decreasing annual installation of PV after 2013. In 2015, China became top country of PV installation in total and annual, meanwhile, Japan is second county of PV annual installation as shown in Fig.8.

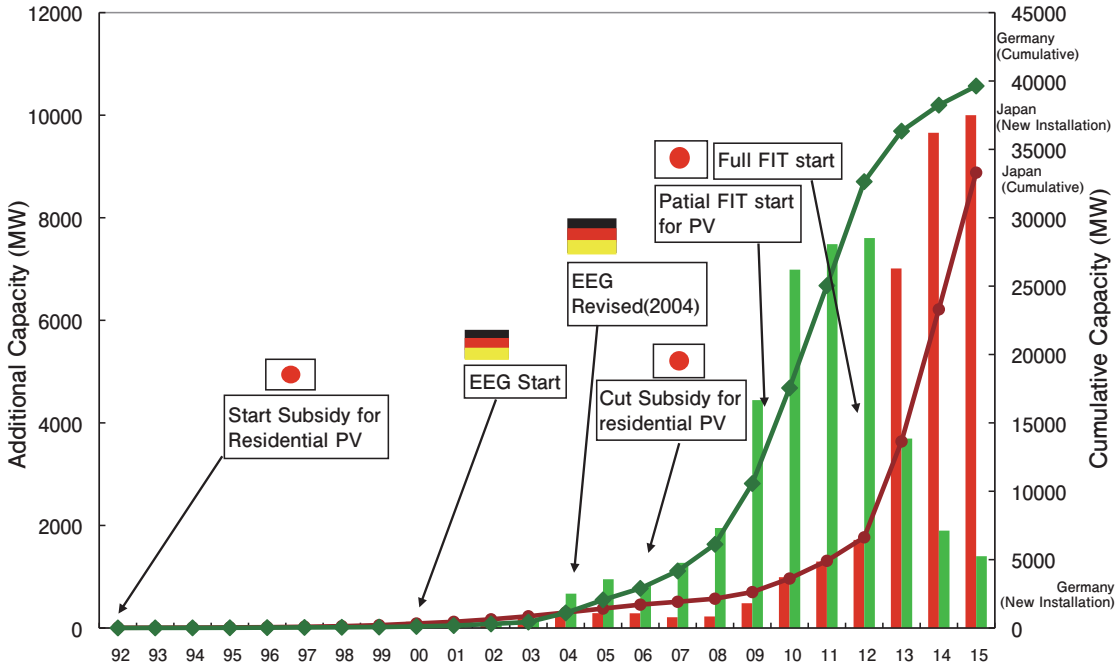


Fig.7 Trends of Solar PV in Japan and Germany (Source: IEA PVPS, EPIA, Graph: ISEP)

After FY2011, annual installed capacity of wind power keeps very low level because of several regulations. As a result, cumulative capacity of wind power is 3.2GW by end of FY 2015. Pipeline of environmental assessment is over 7GW including certified wind capacity is over 2GW at the end of FY2015 as shown in Fig.9. Wind power has stagnated compared to overseas but recently it has started to grow. For it to become truly widespread, the current problems must be solved for more than 7GW must be solved, namely the ongoing environmental assessments, land-use zoning, obtaining social agreement and preparing connections to the electrical system.

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. 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 combined heat and power(CHP) are issues. For geothermal and mid-to small hydro power, getting consent from the locality, nature parks and water rights are issues. Fig.10 shows trends of geothermal power capacity and generation which grow stagnant recent more than ten years.

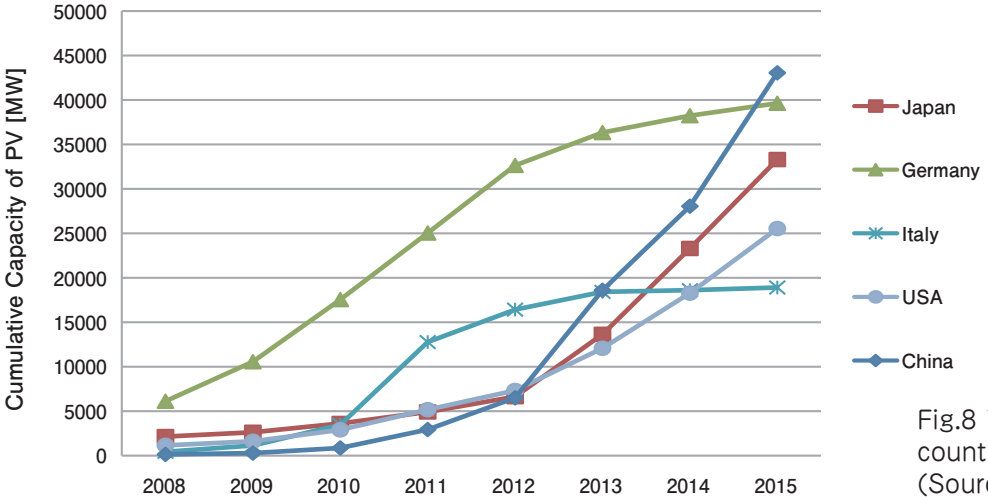


Fig.8 Trends of Solar PV of top 5 countries
(Source: IRENA, Graph:ISEP)

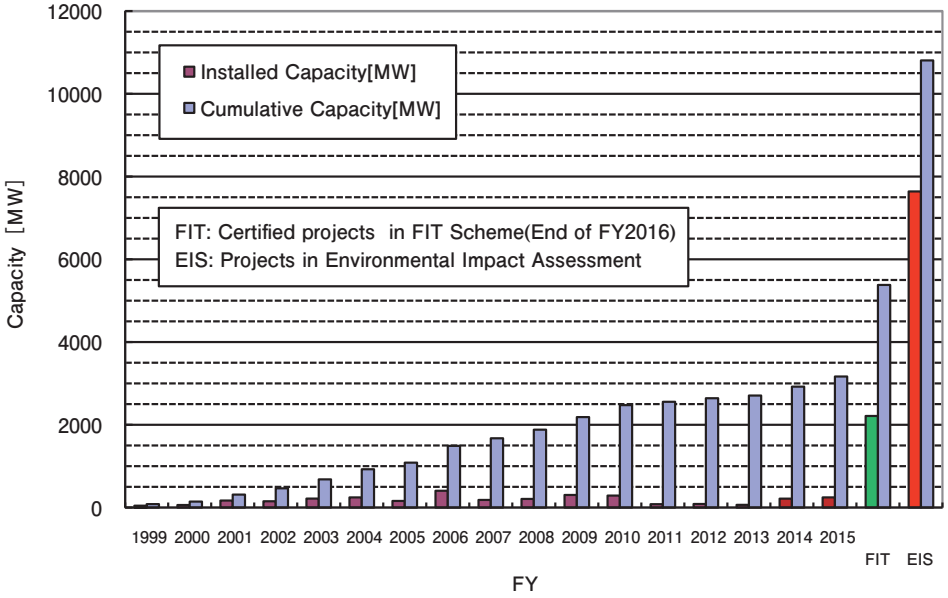


Fig.9 Trends of Wind power capacity in Japan
(Source: JWPA, Graph: ISEP)

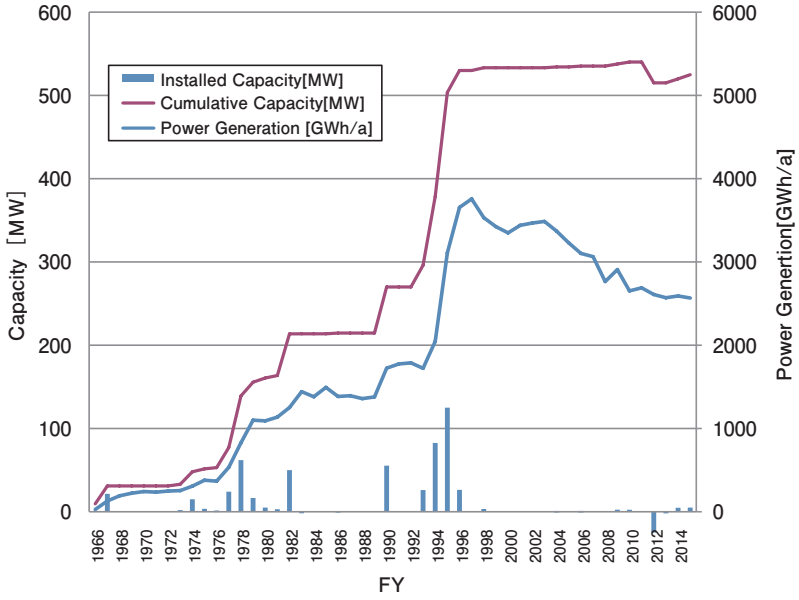


Fig.10 Trends of Geothermal power capacity and power generation
(Source: METI, Graph:ISEP)

Renewable Energy Policies in Japan

Japan's renewable energy policies changed greatly after 3.11, Fukushima nuclear accident 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 almost zero(less than 1%), the energy mix in FY2015 covered with reduced energy usage (8% reduction compared to 2010), renewable energy (increase to about 15% from 10% in FY2010) and fossil fuels (increase to 85% from 65% in FY2010).

While keeping nuclear power at almost zero, reducing reliance on fossil fuels is important for ensuring energy safety and as a measure against climate change but, under the 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 357 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 Status and Issues

Over Four years has passed since the FIT program went into effect and the large results of this even appear in statistics. As shown in Fig.11, by the end of FY2015, the FIT program facility approvals had surpassed 96 GW with PV power 85GW accounting for 88% of that including transfer from pre-FIT (80GW newly certified after FIT program). Since the start of the FIT program, facilities accounting for over 28 GW of capacity have newly started operation, with 96% being PV. Including transfer from pre-FIT, over 37GW of capacity have started operation by end of FY2015.

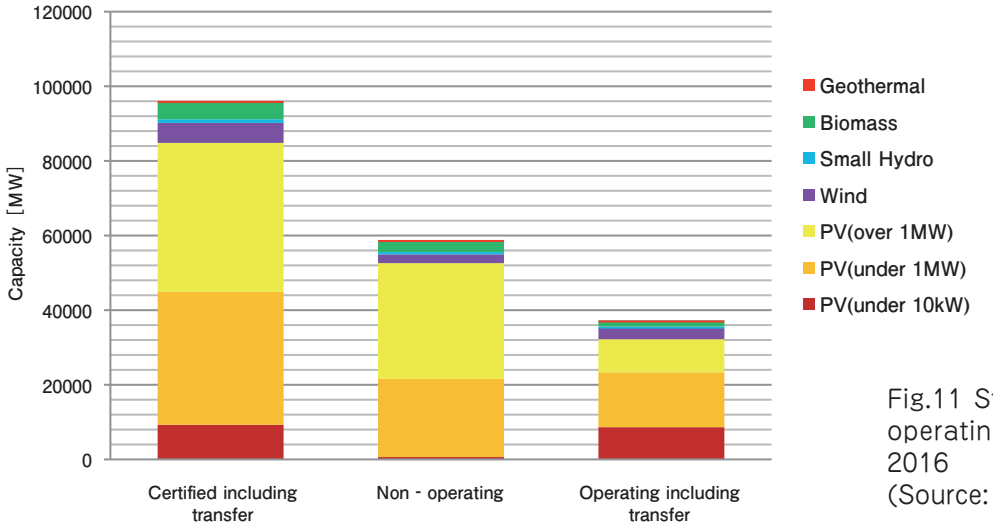


Fig.11 Status of FIT certified and operating capacity as of March, 2016
(Source: METI, Graph: ISEP)

Because capacity of about 60GW, 59% of certified facilities were non-operating by March 2016, legislation of revised FIT was passed in May, 2015 and will become effective since April 2017. About 5.4 GW of wind power and about 4.8 GW of biomass power have been approved including transfer from pre-FIT (newly certified capacity are 2.8GW and 3.7GW, respectively). But certifications of medium-to-small hydro and geothermal have stopped at about 1GW and 0.1GW, respectively by end of FY2015.

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.

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 by March 2016 as shown in Fig.12. 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 demand 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 (50Hz) and Mid-to-Western Japan (60Hz) 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 as shown in Fig.13. Looking at the broader area of Mid-to-Western Japan (60Hz), and it stops at the even lower level of 20% capacity.

With a string of connection responses being withheld, the Connection Working Group (hereinafter Connection WG) was established under the auspices of the METI General Resource Energy Inquiry Committee, Energy Conservation/New Energy Sub-Committee, New Energy Sub-Committee, and through the deliberations of this Connection WG each of the electric companies made

suggestions for acceptable upper limits of renewable energy, or "allowable connection amounts" of PV and Wind as shown in Fig.14 and Fig.15. If FIT Law is read in a straightforward manner, it states that if suppression of output were to go over 30 days in a year, the electricity provider would be compensated for damages (Germany has a system for compensation of lost profits due to suppression of output) but we can also read this "allowable connection amount" to be a way of avoiding that compensation. This phrasing is not something that was specified in the Special Measure Act but it has since been used in official government documents, such as that of inquiry commissions, etc. and, in actual fact, it is now such that the concept has been allowed and confirmed by METI.

In Japan, there are many statements that if this allowable connection amount isn't established, the stable supply of electricity will be threatened, often times taking it as if it was a technical limit. But in actuality, it is no more than a single guideline from restrictions of the Law, as written above. However, from an international viewpoint, there are almost no countries other than Japan setting upper limits to connections like the "allowed connection amount" and, from more than 10 years of precedents, connecting large amounts of renewable energy is considered to be fully solvable, technically. In this sort of international trend, using a supposedly technical reason for setting an upper limit to connections of renewable energy is just like sending out a message to the world that Japan doesn't have the technological ability. More than anything else, although we have a FIT program, setting a low limit can be said to be going against the spirit of the FIT law.

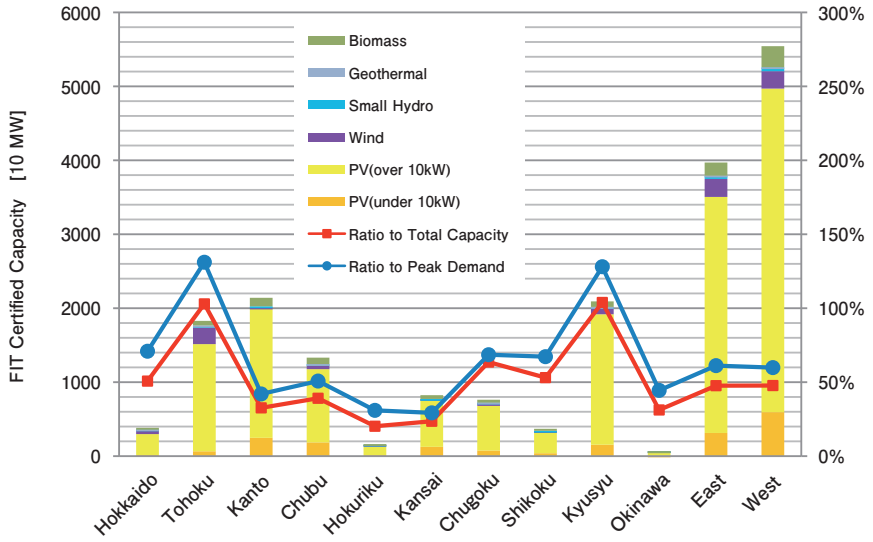


Fig.12 FIT certified capacity in each utility as of March, 2016 (Source: METI, Graph: ISEP)

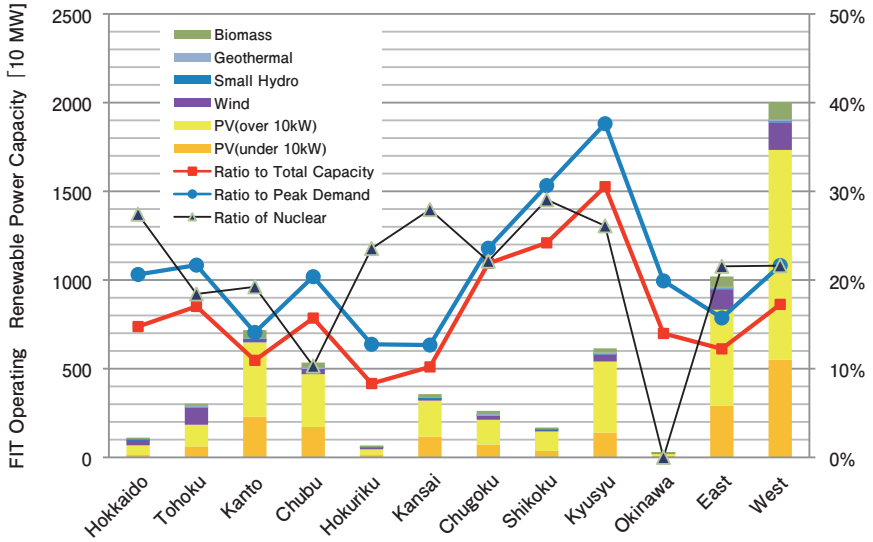


Fig.13 FIT operating capacity in each utility as of March, 2016 (Source: METI, Graph: ISEP)

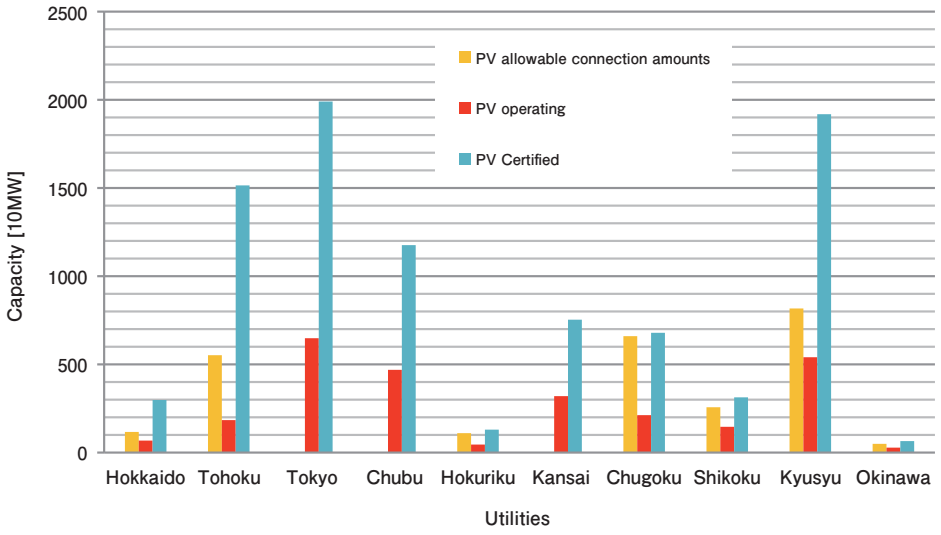


Fig.14 PV "allowable connection amounts", certified and operating capacity as of March 2016 (Source: METI, Graph; ISEP)

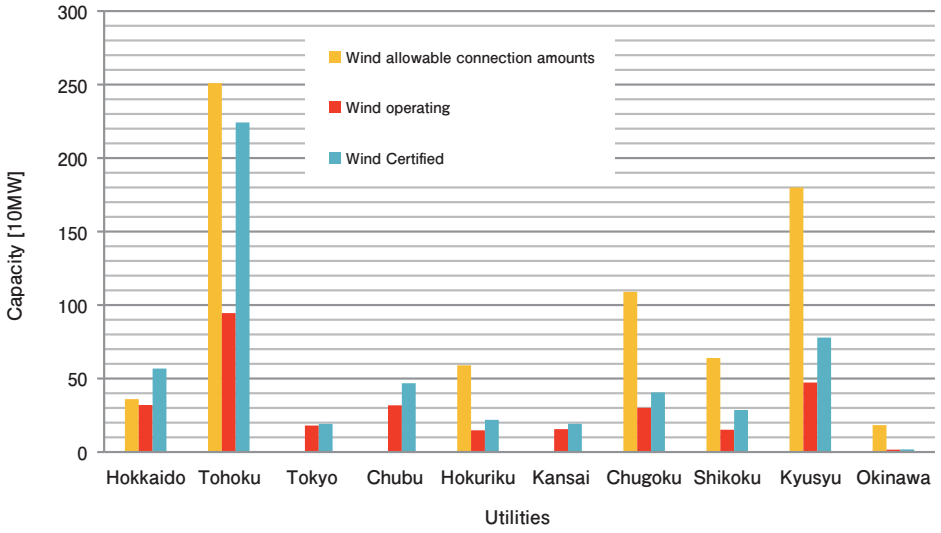


Fig.15 Wind "allowable connection amounts", certified and operating capacity as of March 2016 (Source: METI, Graph; ISEP)

Topic1: The trend to aim for 100% renewable regions

In Japan, Fukushima Prefecture has a vision of promoting renewable energy with a goal of 100% by 2040 as shown in Fig.16. 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%.

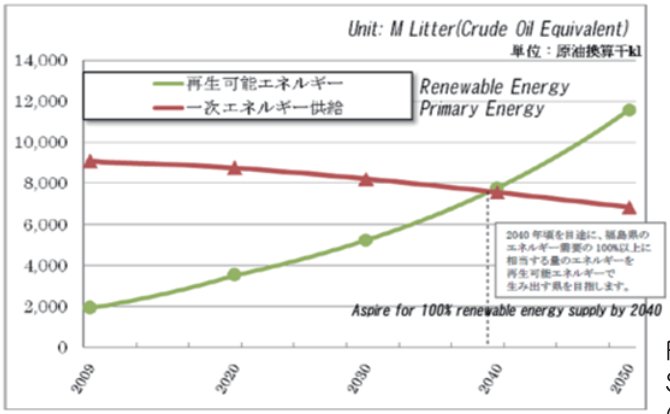
It is important that more regions supply sustainable energy to a larger degree in the future in each Prefecture, city, town and village. The Sustainable Zone research group[2] (collaborative research by the Kurasaka Laboratory, Chiba University and ISEP) has been making the current state and progress 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, 2016, "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,

[2] http://www.sustainable-zone.org/

for the estimated FY2014 amount of renewable energy supplied, at the end of March, 2015, the four prefectures Oita, Akita, Toyama and Kagoshima, the share of renewable energy power supplied compared to demand by the residential/business and agricultural/forestry/fisheries sections is over 25% as shown in Fig.17. 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 61 municipalities where it was estimated that the ratio of renewable energy supply was over 100%. In addition, there were 100 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.



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)

Fig.16 Renewable Energy Vision and Scenario of Fukushima prefecture
(Source: Fukushima prefecture)

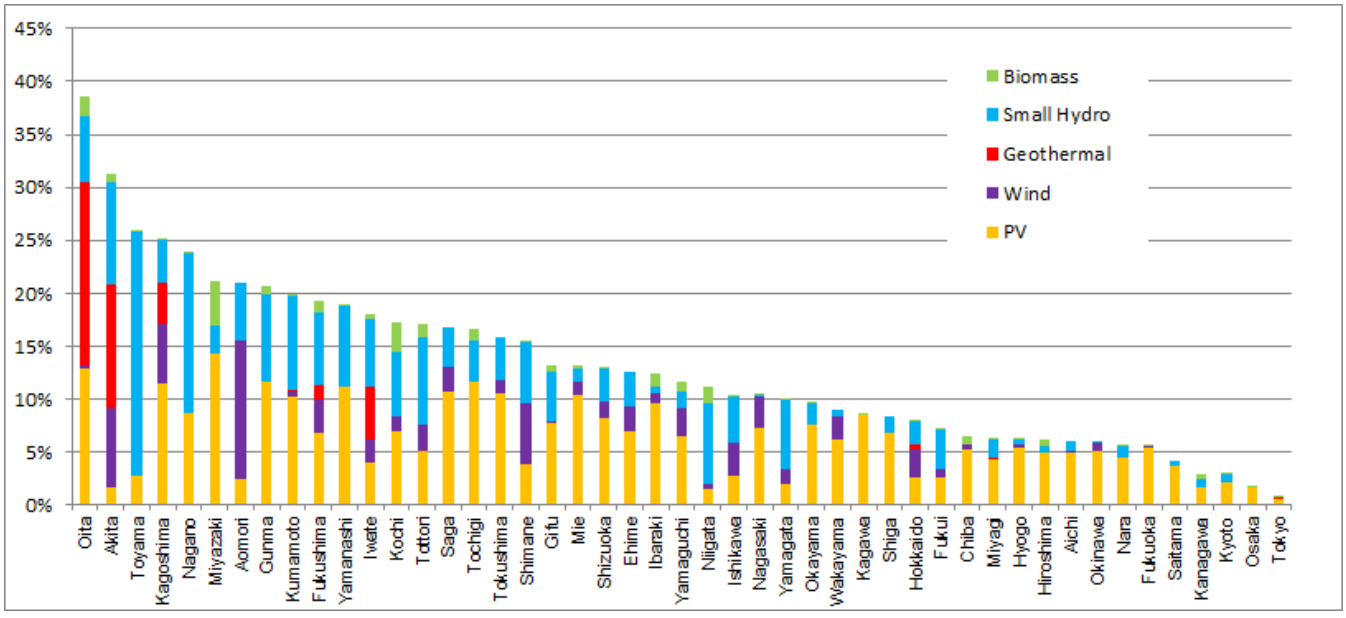


Fig.17 Share of renewable energy power generation in each prefecture of Japan as of FY2014
(Source: Sustainable Zone research group)

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.

Topic 2: Renewable energy and getting social greement

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 Renewable Energy Institute (REI) 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 3: Coming to grips with community power

The "Japan Community Power Association"[3] 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 Power 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 Japan Community Power 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

[3] Japan Community Power Association http://www.communitypower.jp/

sponsoring and supporting the holding of symposia, both domestic and overseas networking is also encouraged.

WWEA Community Power, Institute for Sustainable Energy Policies and Japan Community Power Association invite the world of community power cordially to attend "the 1st World Community Power Conference 2016" (WCPC2016)[4] taking place in Fukushima City in November, 2016. WCPC2016 aims at bring leading community power proponents from Japan and the world together in order to discuss the role community power has to play in the global shift towards renewable energy. WCPC2016 will also discuss a global community power strategy and its national and local implications.

WCPC2016 will take place on the occasion of the first anniversary of the Paris climate change agreement in which all governments of the world have agreed to switch the global energy supply to greenhouse gas neutrality by 2050, meaning in fact 100% renewable energy. WCPC2016 happens on the occasion of the fifth anniversary of the Fukushima nuclear accident and of the 30th anniversary of the Chernobyl nuclear accident.

With the original contribution from Elektrizitätswerke Schönau (Germany) in commemoration of Stromrebellen Award 2014 to Yauemon Sato (CEO of Aizu Power, Japan Community Power Association), Fukushima Renewable Future Fund was established in February, 2016, aims to support Fukushima's renewable energy projects and recovery projects for the future. The Fukushima Renewable Future Fund realizes and disseminate sustainable social models harmonized with nature and independent from nuclear energy.

Photo: People of "Community Energy Association", established in May, 2014

Topic 4: Production of food and renewable energy in agriculture

Agricultural/mountain/fishing villages are treasure chests of renewable energy. Businesses that turn primary industries into AFFrinnovation[5] and set up energy production using the FIT program as a sideline have a chance at winning.

Foodstuffs are considered essential to the existence of humans so, in that sense, they are positioned as "necessities" but, as the level of income rises, the increase in demand slows down. This is known as Engel's Law. But, while energy isn't necessary for the existence of humans, it is considered necessary to increase the level of lifestyle through economic growth. Looking at history, humans have gone from the use of wood-type biomass energy, such as bonfires, to the use of coal (steam) and from coal, to oil (internal combustion engine) and, in the process, have greatly grown the economy. But, at the same

[4] the 1st World Community Power Conference 2016 http://www.wcpc2016.jp/en/
[5] Adding value to agricultural products, forest products and fishery products in an innovative way, making new combinations, or creating a value chain(Source: MAFF "FY2014 Annual Report on Food, Agriculture and Rural Areas in Japan Summary")

time, we have brought about various impacts on the environment such as the release of greenhouse gasses.

Japan's economy and rapid industrialization were planned for in the post-World War II rebuilding and economic miracle, and resources, starting with energy, and foodstuffs were imported. These were processed and, with the foreign exchange obtained through the exporting of manufactured products, the necessary food and energy resources were imported, choosing the so-called "processing trade country" model and rising to be a major world economy.

However, this path halved the self-sufficiency in foodstuffs on a calorie base from about 80% to around 40% and, since Japan isn't blessed with fossil fuels such as oil and coal, energy self-sufficiency is an extremely low 4% (19% if nuclear power is considered a domestic energy).

This "processing trade country" path, which plans on economic growth while keeping low self-sufficiency in foodstuffs and energy, is based on the prerequisites that foodstuffs and oil are inexpensive, Japan's population continues to grow, the cost of living rises slowly and, even if the domestic market becomes saturated, international competitiveness is maintained so exports are possible.

However, the above prerequisites are changing dramatically. With the Plaza Accords of 1985 as the turning point, the yen appreciated rapidly and domestic industries, not sufficiently planning to change to a high value added industry model as seen in Germany and other advanced countries, lost international competitiveness. In addition to this, foodstuffs and energy, which were thought to remain inexpensive forever, started to have unstable international prices and demand due to increasing population in developing countries and economic growth of newly emerging countries. On top of that, measures against global warming to counter the use of fossil fuels are needed and, because of the Tokyo Electric Fukushima Daiichi Nuclear Power Plant accident as the initiator, there's been a rise in citizens' desire to be free of nuclear power. Also, while Japanese society has suffered with a deflationary economy from the end of the 20th Century, the population is declining and aging is proceeding. As a result, demand for agricultural products and foodstuffs is decreasing, agricultural sales are continuing to decline while the prices for materials necessary for manufacturing continue to rise due to the effect of the skyrocketing price of oil, and profits are shrinking. These circumstances make agriculture itself an unattractive industry causing the entry of young people to decline. On top of this, it is causing people running agriculture business to lose the desire to run them and crop lands left to fallow are increasing. The above agricultural circumstances point to the potential decline of the productive capability of agriculture.

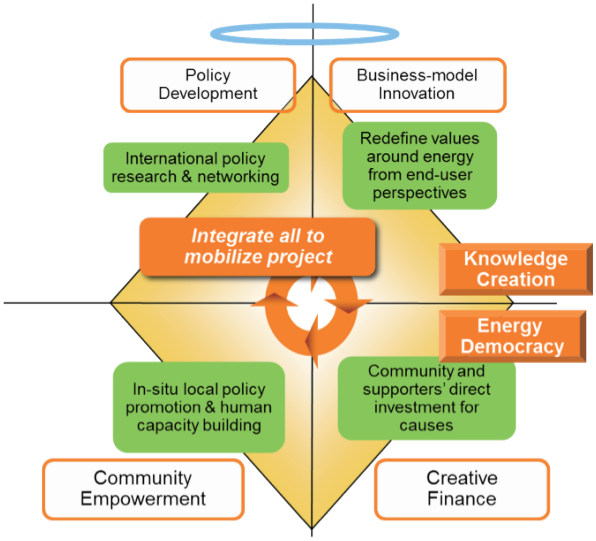
Concerning the above foodstuff and energy problems, we should pay attention to the fact that the production of renewable energy while producing foodstuffs can be one solution. In other words, renewable energy sources such as solar, both PV and thermal, wind power, geothermal power, hydro power and biomass are broadly dispersed in the agricultural/fishing villages, which take up a large portion of national land so if they produce renewable energy while they produce foodstuffs that meet the needs of the actual consumers, we can expect increases in both food self-sufficiency and energy self-sufficiency. The opportunity for this is turning agriculture into AFFriinovation (the combination of agriculture (primary industry), processing/manufacture (secondary industry), and distribution/service (tertiary industry)) along with the production of energy using the FIT program. Through this, it's possible that it will become a profitable industry.

Acknowledgement

This "Renewables 2016 Japan Status Report, Summary" aims for the full-scale diffusion of renewable energy in Japan and is edited and published by the Institute for Sustainable Energy Policies (ISEP), a non-profit organization. With regards to editing, external writers have been in charge of writing for us. We would like to use this space to express our heartfelt thanks. Also, ISEP staff have been in charge of writing and research and we've had the cooperation of interns and volunteers. We are very grateful.

Institute of Sustainable Energy Policies (ISEP)

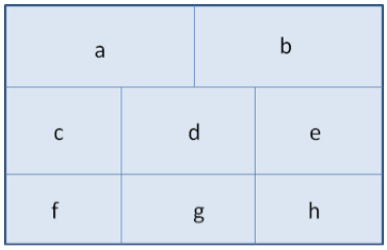
The Institute of Sustainable Energy Policies is an organization independent of the government and industry which has as its goal the realization of sustainable energy policies. It was established in 2000 by environmental activists and specialists dealing with energy problems and measures to counteract 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.



Renewables 2016 Japan Status Report, Summary
Producer: Institute for Sustainable Energy Policies (ISEP)
URL: http://www.isep.or.jp/en/
Tel: +81-3-5942-8937 Fax: +81-3-5942-8938
Address: 4-7-3, Nakano, Nakano-ku, Tokyo, 164-0001, Japan
Editorial Supervisor: Tetsunari Iida (ISEP)
Editor in chief: Hironao Matsubara (ISEP)
Design: Rmoon
Published: October, 2016

Photos of front page:

a.Solar sharing of Aizu power (Kitakata, Fukushima)
b.Wind power of Shonai town(Shonai, Yamagata)
c.Biomass Laboratory of Tokushima Regional Energy (Sanagochi, Tokusima)
d.timber from forest thinning (Mogami, Yamagata)
e.Binary geothermal power plant of Tuchiyu Onsen(Fukushima city)
f.Sand-trap dam of river(Fukushima city)
g.Small hydro power generation of Tuchiyu Onsen(Fukushima city)
h.Hacchobaru geothermal power plant by Kyuden (Kokonoe, Oita)



Published: October, 2016

Renewables 2016 Japan Status Report, Summary

Institute for Sustainable Energy Policies (ISEP)
Address: 4-7-3, Nakano, Nakano-ku, Tokyo, 164-0001, Japan
TEL: +81-3-5942-8937
FAX: +81-3-5942-8938
http://www.isep.or.jp/en/

Institute for Sustainable Energy Policies
isep
認定NPO法人
環境エネルギー政策研究所