(Essence)

Eight-point regional growth strategy centering on renewable energy

— Eight proposals and an eight-point regional vision for its realization —

Japan Economic Research Institute

Committee members

Table of contents

Preface

Prompted by the launch of the renewable energy feed-in tariff (FIT) system in July 2012, the Committee has been conducting research into growth strategies for regional industry and employment creation centering on sustainable, renewable energy systems. This research was also designed to present consistent and specific proposals for the various issues confronting the Japanese economy including regional revitalization, financial reform of local governments, and provision of high-yield domestic investments for savings.

Over this period, the Government has been moving ahead with environmental development policies aiming at the creation of regional growth industries centering on renewable energy, such as the Biomass Industrial Cities Concept Policy by seven ministries, the Regional Capacity-building Policy by the Ministry of Internal Affairs and Communications focusing on wood biomass and other green energy-related projects, and the Ministry of Environment's program to establish a government fund for promoting investment in regional low-carbon projects, which was requested in the fiscal 2013 budget.

In looking at renewable energy, the Committee specifically examined biomass gasification and power generation projects as a pillar of regional growth policies. The reason for this is that as long as people carry out their normal daily life activities and agriculture, livestock and fishery industries exist, while the volume may vary there will always be a stable supply of the raw material of aqueous organic waste in all regions through the action of local anaerobic microorganisms that have been present since time immemorial. These projects will therefore be able to operate non-stop, and can be expected to be highly profitable and provide an assured return to the local region, an important priority of these policies.

Similar to other forms of renewable energy, this will reduce the drain of local wealth, and contribute to regional growth through an increase of net product outflow to other regions. Signs can now also be seen of a tangible ripple effect to primary, secondary and tertiary industries.

Moreover, with the capability to shift their waste disposal services—along with welfare, one of the two key services provided by local governments—from disposal to energy resources (waste to energy), local governments facing financial pressure will be able to look forward to an improvement in their balance of payments.

We are currently witnessing the fourth biomass gasification boom, and so that the current boom translates into the creation of new industries, the Committee examined technical and policy issues behind the various causes that sustainable industries did not take root during the previous booms. During this, we came to realize that this industry creation process itself is the prescription needed to address the various issues currently confronting the Japanese economy.

Part I brings together the Committee's understanding and conclusions regarding this theme by means of eight proposals.

To ensure that the proposals are achievable, the Committee studied such aspects as project profitability and the scale of finance required with a view to the actual locations where the projects could take place. The Committee envisioned eight different model regions including the “Kamaishi Industrial City Concept”, which is a model of an urban center for disaster reconstruction directly linked to the urgent program for industry and job creation in the area affected by the Great East Japan Earthquake, “Hamamatsu Industrial City Concept”, which is a model of a government ordinance-designated city, “Makinohara Industrial City Concept”, which is a model of a medium-sized city with a strong manufacturing base, and “Ibusuki City Vision”, which is a model of a city combining the latest medical care facilities that attract overseas visitors on medical tours with geothermal power generation, and summarized this under the eight-point regional vision. In this process, we sought to specify the kinds of primary, secondary and tertiary industries that would benefit and grow as a result, and the economic viability.

Together with Makinohara City, Shizuoka Prefecture, whose mayor Shigeki Nishihara gave presentations to the Committee, the Committee applied for and received funding in response to the public invitation in the “Biomass Industrial Cities Concept” brought forward under the fiscal 2012 supplementary budget. The Committee also plans to apply in response to the second public invitation in the fiscal 2013 budget in collaboration with Kamaishi City, whose representative also gave presentations to the Committee.

The Committee’s research has been focused on contributing in some way to the development of effective growth strategies by regional organizations throughout Japan, and it is hoped that the results of this research can be realized with the support of the various players that constitute “industrial cities”.

Part I Eight Proposals

Summary

1. Taking advantage of the four key policies released by the government, the Committee can expect effective regional growth strategies centering on renewable energy through consistent policies by the various ministries and agencies and the careful alignment of regional needs and actual conditions.

First, there is a need to assess the amount of available renewable energy in Japan. Compared to Germany, a world leader in renewable energy policy, with its expanse of flatland areas (50% farmland, 30% forests), Japan has minimal flat plains, but considering that 90% is rural, if the technology of turning “forests into oilfields” were to become possible, the two countries would indeed be comparable. Recalling Tetsuro Watsuji in *Fudo-ron* (Discussion of Climate and Culture), we can say that since Japan lies in the temperate monsoon zone and is an island nation with a large ground surface area acting as a solar reactor, the productivity of microorganisms is extremely high.

With the appearance of steam power generation and gasification power generation, whose low thermoelectric efficiency has to date been an issue, and small-scale dispersed oil power generation systems that produce about 50% of wood calories and combine with waste heat power generation to improve profitability, the wood biomass energy that can be generated by Japan’s roughly 25 million hectares of forests, which account for close to 70% of the national land, will make the most of Japan’s extensive forest area.

As a result, the vision of turning farmland and fishing grounds, which produce food products, into “gas fields” and forests into “oilfields” is certainly not a pipe dream. Innovation is rapidly giving concrete form to the vision of utilizing Japan’s strength as a nation blessed with an abundance of surface natural resources.

2. In considering regional growth strategies, a self-reliance in photo-thermal energy, which has strong demand throughout Japan, has a high likelihood of leading to the creation of new industries.

For example, Kumamoto Prefecture as a whole built up its available renewable energy including solar, biomass, geothermal and hydroelectricity, and this resulted in a growing realization that because half of the total energy produced is sufficient to meet the prefecture’s energy needs, the remaining half can be exported to function as a growth engine for the prefecture.

Of the renewable forms of energy subject to the feed-in tariff (FIT) system, shifting the disposal of aqueous organic waste such as sewage sludge, raw garbage, kitchen waste, and livestock waste, which consumes large amounts of energy, to the energy resources industry for stable energy supply 24 hours a day is the most effective approach. The emergence of breakthrough technology in gas fermentation efficiency has given rise to the potential to position biomass gasification and power generation systems as a pillar of regional growth policy.

Of the aqueous organic waste, local governments are responsible and budget for the disposal of domestic waste, and shifting this disposal to the renewable energy industry will deliver substantial savings in the final waste landfill costs.

3. Compared to other renewable energy, biomass energy in the form of methane gas, oil and ethanol has a significant ripple effect to other industries. It also contributes to development of general industries and the creation of high added value, including making the livestock industry part of the energy industry. Of the 5F products—food, fiber, feed, fertilizer and fuel—produced by the agriculture, forestry and fishery industries, fuel, which is the lowest priced, can have value through the FIT system, so all products created by these industries are profitable, and this will make these industries more attractive to the younger generation as well. This will facilitate self-verification of food safety, while livestock husbandry will enrich children's education, giving rise to new lifestyle innovation. In this light, the current phenomenon that about half of students at agricultural high schools are female can perhaps be viewed as a precursor of such a lifestyle innovation.

Moreover, as in the case of CO-OP Sapporo, in the retail industry as well, new frontiers in manufacturing are being created with the development of low pressure gas cylinders, while new energy saving supply services that include the use of other renewable energy such as BEMS, HEMS or PPS are also being developed. High-pressure gas, which contributes to reducing transportation costs, is subject to stringent regulations that require handling licenses, and it is interesting to note that these low-pressure gas cylinders were developed to clear all of these regulations.

The assessment that with an equivalent output of two one-million-kW reactors, the power output of biomass gasification and power generation is small compared to nuclear power generation should be viewed in the light of its role as a small-scale dispersed power source, and also its effect as a means of creating new employment and industries in the various regions and as an investment multiplier.

Closely linked with local governments, these projects are not simply changing waste disposal to power generation, but are a means of providing a diverse range of options to local government in the distribution of project revenue according to their individual needs, such as (1) reducing the cost to residents of sewage treatment and raw garbage disposal, (2) providing high-yield investments for local residents in the form of revenue bonds (citizen bonds), and (3) investments in replacing water supply and waste water infrastructure or introduction of plant to reduce the volume of final waste for disposal where landfill capacity has already been reached.

4. While there are technical and policy issues facing the spread of biomass gasification systems, solutions are easily seen if we consider this from the idea of the five innovations.

In the technical aspects, technology to improve gas fermentation efficiency and solidify liquid waste is required, but expectations are high regarding the introduction of aqueous organic waste nano-treatment equipment widely used in the US or a breakthrough in Japanese-made air-cooled air blast dryers.

From the perspective of securing long-term and stable raw materials over the 20 years of the FIT period, the idea of actively producing algae, an alternative aqueous organic resource, as a raw material for gasification may have the potential to address such regional issues as population decline, reduction in the transient population including tourists, and the drop in aqueous organic waste resources with the contraction of the livestock industry.

This can also give rise to the approach of combining the production of gas fermentation material with the reuse of farmland covered with sandy soil of high salinity because of the tsunami, as in the case of the Kamaishi City Industry Revitalization Model. In Kamaishi, 37 ha of farmland inundated with seawater in the tsunami and now covered by 50 cm of sandy soil will be revived as aquafarms growing the raw material for biogas power generation.

Innovation can lead to securing the regional players that are critical in areas of population decline. Creative disruption—the essence of innovation—will happen to be realized in Japan in the form of "destructive creation" and "creative depopulation".

Despite Japan's abundance of natural resources, often debate seems to be resigned to the perception that the intensive use of farmland and forests in Japan is not possible, but if we look at this from a different perspective, the problem of a lack of farming successors itself can give rise to new possibilities.

Currently there are only five young successors for rich farmland of 400 ha that has been subject to farmland readjustment in Yamagata Prefecture's rice production area, so this can be seen in a positive light that over time the scale of farming will increase to an average of 80 ha of cultivated land per farm.

5. The biomass gasification and power generation project gives rise to these broad range of effects, but the widespread adoption of biomass energy is handicapped by the need to build consensus among the extremely diverse stakeholders. Considering the need to coordinate interests with the existing stakeholders over the establishment of "NIMBY facilities" for processing aqueous organic waste, and also that there are more than 14 related laws, adjusting and reconciling subsidies and the like among the administrative agencies concerned (national government ministries, prefectures, and municipalities) would be no simple matter.

However, if this is viewed from a different angle, examination of regional growth strategies focusing on biomass energy will lead to the situation where local residents will become proactively involved as stakeholders, including their places of employment etc. This process will shift to an opportunity to gain the know-how of consensus-building through the coordination of complex interests.

This in turn presents an ideal opportunity for strengthening the bonds among the most critical regional players for creating regional industries in communities that are suffering from aging and population decline.

6. With regard to the concern by administrative agencies on "how to attract private investment", it was confirmed that a wide gap in thinking exists between the administrative agencies accustomed to the idea of simple accounting, and financial institutions that think in terms of both periodic profit or loss (P/L) and B/S, including standards such as IRR (internal rate of return).

However, it is also fact that the administrative agencies are showing greater readiness for compromise, including establishing policies that will enable the use of the services of former financial experts to counter the adverse effect pointed out that "the project will come to an end once the subsidies for the initial investment dry up".

7. On the other hand, private-sector financial institutions are fundamentally very careful regarding credit exceeding about ten years, but when receiving applications for funding, more are making available services with insurance functions covering long-term operating risk, rather than merely "passively" examining the application as in the past.

With the arrival of the era of wildly swinging market prices for renewable energy, there is a growing expectation of financial derivative functions that can hedge against risk, such as the electricity futures market.

Revenue bonds, which, with tax exemption, account for about 60% of funding for local governments in the US, were first set up in Japan in 2011, and although they were looked on with anticipation as small financial products aimed at local residents, little more came from them as local governments found that they could borrow from financial institutions at a lower rate of interest.

Revenue bonds are not tax or assistance from the national government, but bonds that repay principal from the business earnings of local governments, and are combined with their own tax incentives. A lack of laws guaranteeing prior redemption compared to the US and no tax incentives are viewed as reasons that they are not used widely in Japan, but a key difference is that under the US federal system, industrial policy and securing the necessary finances is a responsibility of the state or local government. Incidentally, funding for building the NY Yankees Stadium was obtained through revenue bonds issued to residents by the City of New York for the purpose of regional promotion.

In the future there may be a need to look at such finances and tax incentives in discussions on Japan's "regional system", which will also play a role in industrial policy.

In this light, the Committee puts forward the following specific policy proposals: (1) establish a system of tax exemptions with a view to expanding the use of revenue bonds; and (2) establish laws similar to US federal laws guaranteeing prior redemption of revenue bonds.

8. There has been a shift to policies with greater emphasis on ensuring a sustainable return to the local region and project profitability through screening regarding regional growth industries creation policies centering on renewable energy, policy coordination among the ministries and agencies, and actual conditions and debate after the start of FIT in July 2012.

“Kasumigaseki” has begun to show a shift in policy thinking and adjusted its course, including preventing duplication in FIT and other subsidies, and moving away from subsidies to investment support, and from initial capital investment support to support for maintaining operational profitability.

Moreover, while the regional low-carbon investment fund of the Ministry of Environment has been allocated in the fiscal 2013 budget for investments rather than subsidies, it is preferable for regulations on local government business operations stipulated in the Local Public Enterprise Act to be relaxed. This will in turn facilitate a diverse range of finance from both the public and private sectors for local public enterprises, and, in conjunction with FIT, make it easier to ensure project profitability and more targeted regional industry creation centering on renewable energy. This is welcomed as a major first step.

Part II Specific eight-point regional vision

Summary

In view of the diverse regional industrial structures, the Committee put forward this eight-point regional vision as sites for promoting and realizing the eight proposals.

A government ordinance-designated city, Hamamatsu in Shizuoka Prefecture administers a large waste water network from Sakuma Dam to the Tenryu River Basin following municipality amalgamation. The balance of the waste water special account is at the ¥20 billion yen level, and every year the deficit from the service is covered from general accounts.

Throughout Japan water supply and wastewater infrastructure is reaching the point where it needs to be replaced, but questions have been raised about whether the investment necessary for replacement of this scale is possible in this era of imminent and substantial population decline. Against this backdrop, the Committee examined project profitability in the case where the Hamamatsu sewage treatment service supplies renewable energy fuel.

In this case, assuming that gasification and power generation can produce roughly 90% of the calories generated by US-made organic nano-grinders, and also premised on the use of FIT, we calculate that an initial investment of about ¥7 billion can be repaid from revenue in just under six years (eight years if the construction period is included) (IRR 18.5%).

Makinohara in Shizuoka Prefecture is a medium-sized city with a strong auto-related manufacturing presence, including Suzuki Motor Corporation and Yazaki Corporation. The city is located within 30 km of the Hamaoka Nuclear Power Plant, and without a large-scale power source to replace nuclear power, it will not be able to maintain its manufacturing base.

Therefore no time has been lost in seeking to build consensus with and among local residents and local companies over such issues as the resumption of nuclear power generation, alternative energy for nuclear power, future regional growth strategies, and how best to prepare for the anticipated major Nankai Trough earthquake. In this light and considering the idea that the region’s future lies in renewable energy, the city is beginning to look at biomass gasification and power generation facilities linked with general waste disposal facilities—NIMBY facilities—based on proven data from US-made organic nano-grinders.

Taking the opportunity of a successful application in the “Biomass Industrial Cities Concept” in the fiscal 2012 supplementary budget, the city is planning to run trials on whether it is possible to process tea field pruning waste, which is difficult to convert into pellets because of the high oil content, through the oil refining plant which currently uses unused wood material and scrap wood.

Kamaishi in Iwate Prefecture has already embarked on boiler power generation that processes wood-based earthquake debris that contains salt. The boilers being used for this process are designed to enable the replacement of only those parts that corrode due to the salt content over the course of 2–3 years. However, nothing has been started whatsoever on disposal of aqueous organic waste, such as night soil, livestock waste, and fish residue, so Kamaishi is seeking to obtain gasification data from Taisei Corporation from trials the company conducted with the city several years ago to replace its own data washed away in the tsunami so it can begin work on ascertaining the amount available.

One of the major problems Kamaishi is facing in reconstruction is how to use 37 ha of farmland that was inundated with seawater in the tsunami and now covered by 50 cm of sandy soil. As there are no problems in

gasification using marine grass containing salt, examining the feasibility of aquafarms on this farmland growing algae for use in gasification is being considered.

CO-OP Sapporo has quickly become a major established player in the energy industry as a national price maker in kerosene. Using a points system, CO-OP Sapporo recovers about 700,000 liters of waste cooking oil a year, which it then refines into BDF for use in its fleet of 350 delivery vehicles. This has been recorded in the Guinness Book of Records as the largest scale of use for a single enterprise.

CO-OP Sapporo has also been conducting research and trials of the recycling business model using vegetable scraps and other raw waste generated by its own stores for gasification, and liquid fertilizer for farmers. Concurrent with this, it is also implementing energy saving and optimum power purchasing models, including making their own stores more energy efficient.

With the launch of the FIT system in July 2012, CO-OP Sapporo began aiming at making the service industry more energy efficient and shifting to become part of the energy industry. This includes starting 2MW solar power generation through FIT in Obihiro, technological research aimed at improving gas fermentation efficiency in conjunction with Rakuno Gakuen University, and confirmation of the marketability of methane gas from livestock waste gas purification together with NEDO and Hokkaido Gas.

The data CO-OP Sapporo obtained revealed that price arbitrage functions fully between methane gas sales price and the power purchasing price through FIT. Together with local manufacturers, CO-OP Sapporo is also developing new means of gas storage and transportation by way of low-pressure gas cylinders that do not require high-pressure gas handling licenses.

CO-OP bonds are also being issued for members as a means of obtaining funds for energy-efficient stores and solar power generation projects, but the number of applications for the bonds is several times the number of bonds to be issued, so being in the position of having to decline so many applications has been a pleasant surprise.

Ranked highest in sales among all CO-OPs throughout Japan, Hokkaido CO-OPs are sending a message that there are also financial instruments in Japan that have the overwhelming support of housewives and women who are looking to make a contribution to a better environment.

Advanced medical facilities in Ibusuki, Kagoshima Prefecture are providing the latest medical care using charged particle radiotherapy, which has yet to be adopted widely in Japan. This, along with endoscopic diagnosis and treatment technology that is second to none overseas, is an advanced medical care system in which Japan excels. This was initiated through the drive of the owner of Shin Nippon Biomedical Laboratories, a local company specializing in animal testing, and untiring consensus-building with local parties concerned. This is also an example of a model that succeeded with the strong support of local financial institutions.

In renewable energy, this is a model that effectively utilizes huge underground magma resources of Ibusuki hot springs with wide-ranging support from NEDO.

We will examine this as a specific renewable energy industrial city model that holds the key to Japan's future regional growth strategies for supplementing the transient population from overseas including visitors on medical tours, and restricting the drain of local wealth through self-reliance in energy, which is the largest item of local consumption.

Located in Chiba Prefecture, Japan's leading vegetable, livestock and fishery production area bordering on the Tokyo Metropolitan Region, the agricultural corporation in Choshi is responsible for the daily disposal of the huge volume of food residue from theme parks and "Kasumigaseki". The cost of disposing such aqueous organic waste is much higher in the Tokyo Metropolitan Region than in the rest of Japan (disposal cost per kg of ¥15–30 in Kanto compared to ¥2–10 in other regions), and this disposal service alone is quite profitable.

Against this backdrop and with a view to launching renewable energy business operations, the agricultural corporation, which also disposes industrial waste, is aiming at building a biomass industrial city focusing on an aqueous organic waste gasification and power generation system capable of operating 24 hours a day provided raw material from major consumption centers can be secured, as opposed to solar power generation, which cannot provide a stable rate of operation.

The drawback of this system is that it requires an amount of initial investment that is much greater than the scale of the corporation's business operations to date. To overcome this so as to meet funding checks by private financial institutions, the corporation is pushing ahead with system innovation that will give rise to a synergy between the industrial disposal service and renewable energy service by bringing forward the abundant cash flow from its main business of waste disposal.

Blessed with an abundance of water, forest and ocean resources and adjacent to the Shirakami-Sanchi UNESCO World Heritage Site, Fukaura-machi in Aomori Prefecture is a typical small-scale urban district with a population under 10,000 that is facing issues of aging and depopulation. Farming is also subject to extensive wildlife damage. Local residents have started to explore the biomass industrial city concept that can pave the way for a truly sustainable regional community using natural resources including renewable energy.

The Committee is currently examining the feasibility of a specific biomass industrial city concept in various livestock production areas with trial calculations of the profitability of gasification power generation projects dividing poultry manure, which to date has been the most difficult to gasify, and cow manure, which is relatively easy to gasify.