

Citizen-led Renewable Energy Implementation: A case study of Nagasaki Prefecture in Japan

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Abstract

In Japan, since the Great East Japan Earthquake (March 2011), renewable energy has been positioned as a major energy source in maintaining self-sufficient energy schemes and realizing a low-carbon society. As a follow-up measure, the FIT (Feed-in Tariff) was introduced in July 2012. Under this scheme, regionally distributed energy was promoted, resulting in expanding the installed capacity of renewable energy by four times compared to before the scheme. Following this trend, Nagasaki Prefecture formulated the Nagasaki Comprehensive Plan and took steps to enact or amend ordinance to promote the introduction of renewable energy sources. Focusing on the resident-led renewable energy implementation strategies of Nagasaki Prefecture, this study aims to review its policy and identify the characteristics of its solar power projects and compare such with cases in other municipalities. It also discusses the challenges and obstacles for further expansion of renewable energy and the means to increase the participation of residents. While its achievements in terms of regional revitalization were recognized, several challenges were also revealed, such as the limited installation locations for solar panels in Nagasaki, the curtailment of solar PV generation in the Kyushu area without compensation, the uncertainty of securing profits due to FIT revision, etc. This study provides a reference to strengthen citizen-participatory energy projects at the local level in the midst of relevant policies that affect the economic feasibility of such projects, which keep changing.

Keyword: Citizen-led business/ FIT (feed-in tariff)/ Iida City/ Nagasaki prefecture/ Solar power generation

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1. Introduction

Since the Great East Japan Earthquake that occurred in March 2011, Japan has promoted the government's policy of securing sustainable energy and realizing a low-carbon society. In July 2012, the renewable energy FIT (Feed-in Tariff) system was introduced, and entry into the renewable energy field expanded (Agency for Natural Resources and Energy, 2021a). Nagasaki Prefecture formulated its "Environmental Basic Plan" and has enacted or amended ordinances to promote the introduction of renewable energy (Nagasaki Prefecture, 2021a). In recent, the "Fourth Nagasaki Prefecture Environmental Basic Plan" was formulated with the aim of providing guidelines for various policies, including the promotion of introduction of renewable energy (Nagasaki Prefecture, 2021a). The purpose of this study was to provide an understanding of Nagasaki prefecture based on local comparison, using case studies. One of these is Iida City, Nagano Prefecture in Japan,

which was chosen as a noteworthy example of a local renewable energy dissemination project, for comparison with projects in Nagasaki Prefecture. This research proposes mechanisms and systems that can be used to promote the introduction of renewable energy led by citizens in Nagasaki Prefecture. Furthermore, it proposes recommendations for future introduction in local areas that face similar issues. This paper is structured as follows. The research method is first described in section 2, the results of the survey are described in section 3, and section 4 provides recommendations to overcome issues related to renewable energy in Nagasaki Prefecture. Section 5 concludes the paper with a summary.

2. Methodology

This study was mainly conducted based on a literature review as well as interviews with relevant actors in Nagasaki prefecture. Literature searches were conducted using the Internet, newspaper articles, and previous studies. (1)

First, the current situation in Nagasaki Prefecture, especially as regards energy policy, and (2) the current situation and problems of renewable energy introduction projects led by citizens were investigated. (3) Next, of the renewable energy introduction projects that are currently unfolding throughout Japan, Iida City, Nagano Prefecture, was chosen as the subject for case study due to its citing in several studies conducted to date. (4) The characteristics of local industry, awareness of local residents, natural environment, and structure were next investigated.

3. Results

3.1 Brief overview of renewable energy policy of Japan and Nagasaki Prefecture

The Japanese government has been forced to reconsider its energy policy, in the light of the domestic and international situation. Other issues that affect various regions of the country include declining birth rates, reduced state of industrial activity, aging population, as well as competition from emerging economies. Regarding foreign factors, the Paris Agreement and the adoption of the 2030 Agenda for Sustainable Development in 2015 can be mentioned. In this relation, the Government of Japan has released the 5th Basic Environmental Plan (Ministry of Environment, 2018) and the 6th Basic Energy Plan (Ministry of Economy, Trade and Industry, 2021). In which, renewable energy is positioned as a major energy source in the mid- to long-term. Nagasaki Prefecture formulated the “Fourth Nagasaki Prefecture Environmental Basic Plan” following such trends of the Japanese government. This aims of preparing for disasters and the related damage, which have been on the rise in recent years, and has achieved the GHG reduction targets declared in the Paris Agreement, and has provided direction to Nagasaki residents, companies and organizations in the prefecture. In particular, it shows four basic goals (Creating a carbon-free society, creating a community where people and nature coexist, and creating a sound material-cycle society, and creating a safe, secure and comfortable environment) and the measures for them. The solar panel installation project dealt with in this research is classified under “Creating a carbon-free society” in the first goal.

3.2 Issues of introducing renewable energy in the region

The introduction of renewable energy in the region can be tackled by local residents and local actors with the aim of raising the level of acceptability through smooth dissemination (Toyoda, 2016). In addition, since most of the renewable energy can be acquired from the natural environment, it is possible to generate electricity by solar power generation provided appropriate sunlit land can be secured. Therefore, as well as protecting the global environment and involving sustainable economic activities and coexistence with nature, it has the potential to lead to regional revitalization (Kobayashi, 2019). In addition, Japan is surrounded on all sides by the sea, and most of the energy used to generate electricity domestically currently depends on imports from overseas (Agency for Natural Resources and Energy, 2021b). If the introduction of renewable energy in the region can be promoted, it has the potential to solve several problems in Japan simultaneously. However, various challenges act as barriers to introducing renewable energy in the region. First of all, since certain natural resources in the area are used, the understanding of local residents and local governments is essential, so care needs to be exercised when introducing it. Many problems resulting from reflected light have been reported in the prefecture due to the installation of solar panels. Second, relying on businesses outside the region for the introduction of renewable energy makes it difficult for the region to benefit economically [10]. In reality, many of the domestic renewable energy suppliers and investors are outsiders headquartered in the metropolitan area. Only a small number of cases (22%) are based on local businesses (Shirai, 2018). Since feed-in tariffs were introduced, the adoption of renewable energy in the region has been implemented in many locations across the country. although there are differences in the mechanism and scale. However, there are certain commonalities, such as: (1) enhancement of regional autonomy, (2) the need for good relationships between the project and local residents and investors, and (3) establishment of a system of local return and circulation of profits from energy business. Of these, the case of Iida

City, Nagano Prefecture has been reported in various studies. Iida City, Nagano Prefecture has a track record of self-government systems since the 1950s, and from 1994, the "Renewable Energy Ordinance" was enacted to promote higher awareness of the residents that the benefits of commercial use of the local environment by residents should be attributed to the residents. The city has received much praise for its integrated environmental conservation activities (Tokei station Nagano, 2021). This research compares the renewable energy introduction project in Nagasaki Prefecture with the project in Iida City, Nagano Prefecture, which is considered a noteworthy example, and proposes future related business opportunities for Nagasaki Prefecture.

3.3 Practice example: a case of Iida City, Nagano Prefecture, Japan

Iida City, Nagano Prefecture, Japan is located in the southern part of Nagano Prefecture (Figure1), with a total area of 658.66 km² and a population of approximately 95,000 (as of October 2021). Nagano is a well-known winter tourist destination due to its heavy snowfall, and attracts many skiers, .However, since Iida city is located on a southern slope, the amount of snowfall is less, making it suitable for solar power generation. Solar panels were first installed there in the 1990s, ahead of Japan's first basic environmental plan.

The regional characteristics of Iida City include the multi-layered nature of environmental efforts and the activity of local government activities, as represented by district community center activities (Tokei station Nagano, 2021). Iida City established the "Iida City Basic Environmental Ordinance" in 1996, aiming to harmonize all activities from daily life to business activities with nature, which led to the "Iida Environmental Plan", the basic environmental plan of Iida City. The plan has undergone five revisions to date (Minami Shinshu Ohisama Shinpo homepage). However, Iida City's renewable energy efforts are evaluated not only in the above-mentioned efforts centered on local governments, but also in various aspects such as the history of self-government activities and awareness of local industries and the environment of residents (Tokei station Nagano, 2021). This study focuses on a comparison of projects led by Ohisama Progress Energy Co., Ltd., established by an NPO corporation, a citizen group of Iida City, which became the model for projects in Nagasaki Prefecture.

The project in Iida City began with the establishment of Ohisama Progress Shinpo Co., Ltd., led by an NPO, Minami Shinshu Ohisama Shinpo. This project consists of a civic group organized by local residents who invested in Ohisama Progressive Energy, which itself invested in solar panel installation companies and roof providers, as well as sale of the generated power to electric power companies.

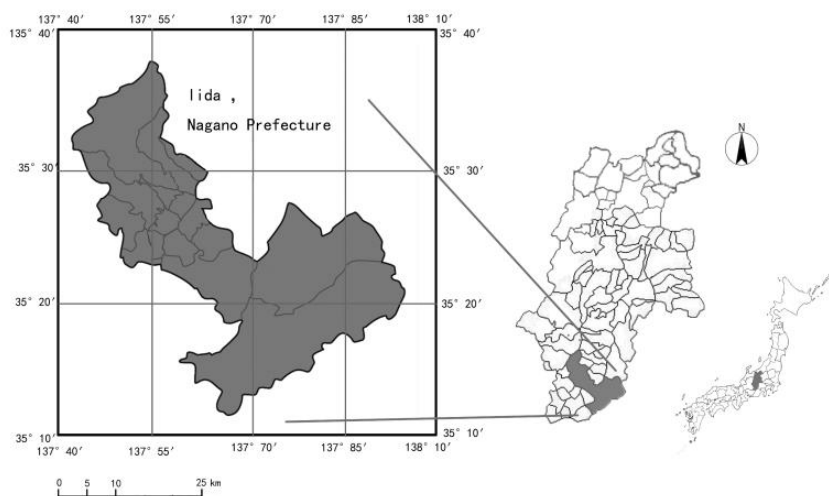


Figure 1. Location of Iida City

The characteristics of the project in Iida City, Nagano Prefecture are (1) a long history of self-government for energy policy, (2) business involvement of local companies, and (3) the residents' awareness and participating, (4) local governments supporting citizens' businesses. First of all, regarding self-government activities, Iida City has practiced this since the 1950s, and while there are other municipalities that advocate energy autonomy, Iida City has established and put into practice a mechanism for promoting renewable energy projects in which local autonomy organizations play a leading role. Local public halls and other public building earn income from selling electricity by installing solar panels, as well as use it as an emergency power source. Further, the profits obtained can be used in support of the district's activities to help local residents. Another factor is increased receptivity towards solar power. Shirai (2018) points out that the utilization of electricity sales revenue at the stage of installing solar panels or after installation has the effect of enlightening the interest and knowledge of local residents in introducing

renewable energy (Shirai, 2018). Ohisama Progress Energy Co., Ltd. is the parent organization of NPO Minami Shinshu Ohisama Progress. This NPO not only promotes environmental conservation, but also manages organizations that share such objectives as well as community development and education, and contacts related organizations (Minami Shinshu Ohisama Shinpo homepage) (Figure 2). The NPO comprises not only people involved in Iida City but also participants from outside, which greatly increases awareness that the community can take the initiative. Furthermore, Iida City, the regional local government, introduced the 'Ordinance on Sustainable Community Development by Introducing Iida City Renewable Energy'. This ordinance supports projects to earn income from selling electricity using local resources, and provides support to struggling companies if their aim is to support local citizens. In so doing, the Ordinance became a mechanism to support businesses that invest in projects aimed at benefitting society or the environment (Iida City Web Site).

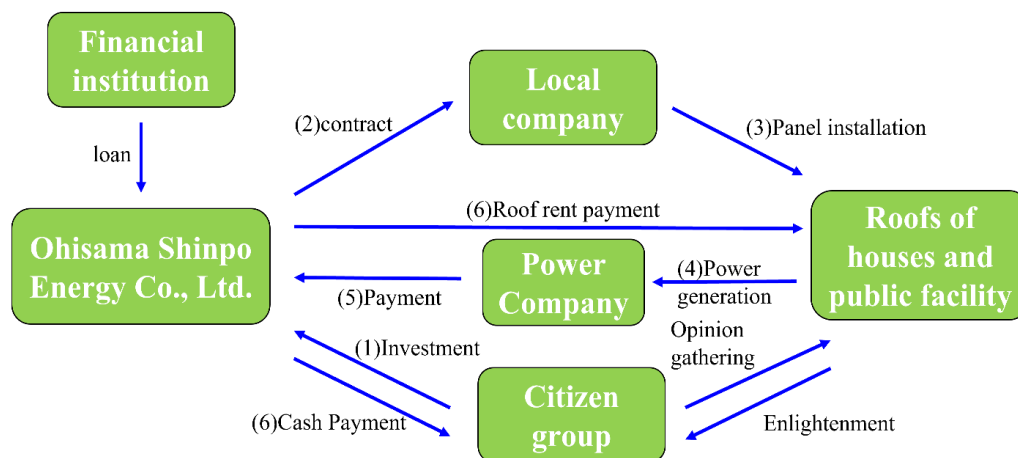


Figure 2. Iida City Project Structure (Image source from: depicted by author based on below web. <https://ohisama-energy.co.jp/business/energy-creation/mega-sunpo/>)

3.4 Nagasaki Prefecture

3.4.1 Basic information of Nagasaki Prefecture in Japan

Nagasaki Prefecture is located to the west of Japan and has a relatively warmer climate than other regions in Japan and provides sufficient daylight hours for solar power generation. It has a population of about 1.3 million and an area of 4,131km² (Nagasaki Prefecture. 2021b). The

prefecture has prospered as a port city since ancient times and was used as a base for foreign trade before the modern era. It developed as a coal producing area until the 1970s, during which the country underwent an energy revolution. As a symbolic site, within the prefecture is an island, shaped like a warship, or Gunkan-jima, which supported Japan's economic growth. Nagasaki itself is closely linked with Japan's the shipping

industry and has numerous shipyards. Nagasaki Prefecture has tourist destinations such as the Peace Park and Dejima, an island that was used as a trading hub before modern times and was experiencing a rise in tourist numbers prior to the Corona crisis (Nagasaki newspaper, 2021). Currently, the local economy is in a state of exhaustion due to factors such as the change of domestic industry, the rise of emerging economies in the region since the latter half of the 1990s, and the declining birthrate and aging population that began in the first half of the 2000–2010 decade. The creation of new industries has therefore become an urgent issue.

3.4.2 Citizen-led renewable energy project in Nagasaki Prefecture

As mentioned in the previous section, the introduction of renewable energy in the region requires consensus building between actors in the local community, but it is unclear what form such consensus building should take in Nagasaki. Environmental Counseling Association Nagasaki, an NPO mainly ran by the prefecture started a business to install solar panels on the roofs of public halls and elementary schools in May 2013. However, it is currently difficult to earn an income from selling electricity due to the increased amount of power generated by renewable energy in the Kyushu Electric Power jurisdiction, and many plans to install solar panels have had to be cancelled.

3.4.3 Comparative analysis with the case of Iida city in the Nagano Prefecture

(1) Prior to commencement of projects

The project conducted in Iida City, Nagano Prefecture, has been pointed out as a good example of a citizen-led solar panel installation project in previous research. Preparations for the project were well underway before the project had actually started, owing to the extent of self-governance activities carried out by citizens based in public halls and efforts by local governments ahead of the national environmental basic plan. Thus there was a high level of public awareness, which meant the enabling conditions for environmental efforts were already present.

According to Shirai (2018), self-governing activities concerning the environment have taken

place in Iida City since the 1950s, which were to assist in aspects of business promotion carried out at later. Such activities have included social education conducted in public halls based on the concept of ‘problem-solving learning’, puppet shows and seminars – all of which have promoted an environment for learning in support of the city’s self-development.

On the other hand, in Nagasaki Prefecture, there are many questions about the history of public hall activities. This may be due to the prefecture’s focus on development of industry in support of the growth of Japan’s economy, such as shipbuilding and coal mines. The prefecture’s basic environmental plan has already undergone four revisions, and while it might appear awareness of the environment was low, due to the nature of the work that the residents were engaged in but This fact may differentiate it from Iida City.

(2) Involvement of companies in related businesses

Projects in both cities were led by citizens; however, differences exist in the way companies became involved in the projects. The project in Iida City, Nagano Prefecture began with the establishment of Ohisama Shinpo Energy by the NPO, Minami Shinshu Ohisama Shinpo, which is composed of citizens aiming to popularize solar power generation together with members of a restaurant association in Iida City (Ohisama Shinpo Energy Website). Its parallel in terms of purpose in Nagasaki Prefecture, is Ohisama NET Nagasaki, which aimed at promoting renewable energy through an NPO, Environmental Counseling Association Nagasaki, through citizen-led dissemination.

However, the difference from the project in Nagasaki Prefecture is that the companies that cooperated with the project in Iida City were not limited to those related to the project, and that the project was rooted in the city and initiated by it through proposing cooperation (Shirai, 2018).

(3) Citizen’s awareness of projects

There is no doubt that awareness of the environment has changed in Japan, due to factors such as the adoption of the Paris Agreement as well as the increasing prevalence of abnormal weather caused by global warming in recent years, the effects of which occur on a global

scale. However, it is possible that differences in environmental awareness exist between Iida City and Nagasaki Prefecture due to the histories and industries associated with each city. According to Shirai (2016), in Iida City, Nagano Prefecture, awareness of the environment has historically been high, and installation of solar panels has proceeded smoothly. Further, public sentiment towards installing solar panels has been maintained along with development of the business side of it, with the knowledge that it returns profits, which has deepened public awareness of the business and environmental conservation (Shirai, 2016).

Toyoda (2016) states that one of the conditions for a 'citizen-regional joint power plant' is to be able to contribute to the community, such as through returning a certain portion of profits to citizens and the community in some form. In the case of the project in Nagasaki Prefecture dealt with in this study, the project started in very similar way to that of Iida City, but the returned profits are much lower, and no events related to the project took place.

(4) Types of system

A difference also exists in the concepts behind the overall systems, in that the government directed the system related to Iida City with the aim of further promoting a project that was started based on a citizen-led initiative, while in Nagasaki Prefecture the project and the system existed independently and involved rice fields.

Yatsuki (2014) states that the formation of a small-scale decentralized energy system requires the establishment of a region-specific system. In the case of Iida City, Nagano Prefecture, a system was established to maintain promotion of the project as well as return profits to the region during its development, while in Nagasaki Prefecture the prefecture established a basic environmental plan prior to the project, in which various ordinances resulted based on the plan. However, the system did not support the project per se, thus the project and the ordinance existed independently of each other.

Furthermore, Shirai (2016) points out that the Renewable Energy Ordinance enacted by Iida City has led to the linkage of multi-layered environmental efforts and local citizenship

activities, which cannot be said to have occurred in relation to the self-governance activities in Nagasaki Prefecture to such extent.

4. Discussion and Conclusion

Citizen-led renewable energy not only contributes to conservation of the global environment, but also greatly helps in the expansion of local industry based on a model in which profits are returned to residents and local governments. This survey targeted renewable energy introduction projects carried out in Nagasaki Prefecture and compared them to those in Iida City, Nagano Prefecture in terms of the flow leading up to the start of the projects, company involvement in the business, and citizens' awareness of the business. Several points of insufficiency were found with regard to the system used in Nagasaki Prefecture. With Iida City, the results of self-government activities have accumulated since the 1950s, and the hurdles were low to inception of the project. Various events were held in the city related to the city's self-governance activities, and the level of citizen participation was very high. On the other hand, it is unclear how the public facilities in Nagasaki Prefecture were used by the residents. In Iida City, the public hall is regularly used not only for environmental conservation activities but also other events, making it a familiar gathering place for citizens. In addition, the Renewable Energy Ordinance enacted by the city has ensured activities it carried out through self-governance were consistent with environmental conservation activities, further raising awareness among residents. Therefore, it could be concluded that Nagasaki Prefecture needs to take measures such as establishing a system that allows residents to actively use public facilities such as public halls, carry out environmental conservation activities, and hold regular events. In addition, with regard to residents voluntarily setting up companies aiming to contribute to the community, the government should not only encourage participation of residents by providing coordination in self-governance activities, but also support the self-governance activities that provide benefits to the community. While the introduction of renewable energy in the region is based on citizen participation, further projects

can be expected to appear if local businesses and governments support residents in such endeavours. Efforts to introduce renewable energy into local regions are being carried out by various local governments in Japan, which if seen in a broader context can help solve the problems currently faced by Japan and at the same time help the country with regards to meeting its international obligations. However, as a precondition for introducing renewable energy in each region, it is necessary to understand the ways in which businesses are connected with local residents, build up a series of activities through self-governance, develop related local businesses through investment by residents, and support resident-led activities.

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