

## Summary

### Study on Basic Zoning Information Concerning Renewable Energies (FY 2015)

The introduction of renewable energies is important not only as a countermeasure for global warming but also from such viewpoints as establishing energy security, developing autonomous and scattered energy systems and creating new industries and jobs. For this reason, in an effort to create basic data for the study of introduction and spread of renewable energies in coming years, the Ministry of the Environment (MoE) conducted the Study on the Potential for the Introduction of Renewable Energies in FY 2009 and FY 2010 and the Development of Basic Zoning Information in FY 2011 through FY 2014, thereby estimating the abundance as well as introduction potential of renewable energies (non-residential use of PV power, use of PV for individual buildings, wind power, small and medium-scale hydropower, geo-heat, solar heat and soil heat) and their possible introduction amount by different scenarios, and developing basic zoning information.

This present work is intended to refine the introduction potential of renewable energies having been studied, for the purpose of enhancing the understanding and convenience of the people, local public entities, and business operators regarding the use and introduction of renewable energies, promoting introduction of renewable energies, and making contribution to the countermeasures against global warming. This work is also intended to disclosure and provides the basic zoning information through additional collection and development efforts. To put it more specifically, the introduction potential has been developed for the land/ocean wind power generation, small and medium-scale hydropower and geo-heat use (heat pump). Further, efforts have been made to develop the design plan, design specifications and GIS data on introduction potential to configure a portal site for disclosure and provision of the basic zoning information.

#### 1. Refinement of the Introduction Potential of Each Type of Renewable Energy

##### (1) Refinement of introduction potential for wind power generation

###### 1) Updating the wind regime map

The abundance of land/ocean wind power generation was estimated based on the most up-to-date version of the wind regime map (land and ocean across the nation) developed in FY 2013 Survey on System Development and Others toward Expanded Introduction

of Renewable Energies" by the Ministry of the Environment (MoE). The result of this estimate registered approximately 1,490 million kW for land wind power generation and 2,790 million kW for ocean wind power generation amount by different scenarios.

## 2) Refinement of introduction potential for land wind power generation

The introduction potential and possible introduction amount by different scenarios were estimated based on the updated abundance under the same conditions as those in the past financial years. The result of this estimate registered approximately 290 million kW for introduction potential and 100 million through 280 million kW for possible introduction amount by different scenarios.

## 3) Refinement of introduction potential for ocean wind power generation

The introduction potential was re-estimated based on the updated abundance under the same conditions as those in the past financial years. The possible introduction amount by different scenarios was estimated as follows: Four scenarios of FIT unit price (15, 20, 22, 25 yen/kWh) × purchase period (for 20 years) and tentative calculation conditions for business workability were set up based on the most up-to-date cost information published by the Committee for Estimating Procurement prices, etc. in the Ministry of Economy, Trade and Industry. Based on these results, development enabling conditions (water depth meeting the requirement of  $PIRR \geq 10\%$  before tax) by wind velocity were set up and developable meshes were extracted for this estimate. The result of the estimate was approximately 1,410 million kW for introduction potential and approximately 40 million through 280 million kW for possible introduction amount by different scenarios.

## (2) Refinement of introduction potential for small and medium-scale hydropower

The abundance (after correction) with the existing hydro power plant deducted was estimated based on the abundance (after correction) developed in the previous-year work. The introduction potential was re-estimated by reviewing the maximum inclination angle as development disabling conditions. The possible introduction amount by different scenarios was estimated as follows: Three scenarios of FIT unit price (24, 29, 34 yen/kWh) × purchase period (for 20 years) and tentative calculation conditions for business workability were set up based on the most up-to-date cost

information published by the Committee for Estimating Procurement prices, etc. by the Ministry of Economy, Trade and Industry. Based on these results, development enabling conditions (unit price meeting the requirement of  $PIRR \geq 7\%$  before tax) was set up, thereby calculating the total of the virtual power plant capacity that could be developed. The result of the estimate was approximately 9.79 million kW for abundance (after correction), 9.01 million kW for introduction potential and approximately 2.66 million through 4.65 million kW for possible introduction amount by different scenarios.

### (3) Refinement of introduction potential for use of geo-heat (heat pump)

#### 1) Study on the refinement of introduction potential

To refine the estimation for FY 2014 work, a step was taken to review; (1) maximum load for stand-alone house, (2) annual air conditioning load in a stand-alone house and demand unit requirement, (3) ratio of air conditions (baseline) by building and category, (4) expenditure plan (repair charges), (5) kerosene price, (6) electric charges in stand-alone house, large-sized apartment-house and office building, (7) unit price for heat pump as air heat source and (8) setting of absorption type hot and chilled water machine COP.

#### 2) Re-estimation of introduction potential

The introduction potential was re-estimated based on the above-mentioned "(2) review of demand unit requirement in a stand-alone house". The result of this estimation was approximately 5,050 PJ/year.

Based on the above-mentioned review (1), the possible introduction amount by different scenarios was re-estimated. The result was 0 kW through 322 million kW for facility capacity and 0 PJ through 3,781PJ/year for heat supply.

Table 1 Introduction potential of geo-heat on a nationwide scale

Layer classification	Introduction potential for FY 2015(PJ/year)	Reference: Total for FY 2013 (PJ/year)
Small-scale commercial facilities	11	11
Intermediate-scale commercial facilities	18	18
Large-scale commercial facilities	106	106
Schools	87	87
Leisure facilities	7	7
Accommodations	28	28
Medical facilities	86	86
Public facilities	23	23
Large-scale apartment houses/office buildings	32	32
Stand-alone houses	2,041	459
Intermediate-scale apartment houses	2,612	466
Total	5,050	1,321

Table 2 Introduction potential for the use of geo-heat (heat pump) possible introduction amount by different scenarios

No	Case	Scenario	Facility capacities (10,000 kW)	Reference: Total for FY 2014 (10,000 kW)	Heat supply (PJ/year)	Reference: Total for FY 2014 (PJ/year)
0	BAU = preservation of the status quo	Without subsidies or the like	0	150	0	12
1	Combined use with other energies	Facility capacity 50%, annual thermal load 67%	365	519	103	65
2-1	Introduction of subsidies	Percentage of subsidies 33%	3,505	3,769	438	170
2-2		Percentage of subsidies 50%	14,729	5,338	3,696	413
3	Combined use with other energies + introduction of subsidies	Facility capacities 50%/Annual thermal load 67%/subsidies 33%	32,236	13,788	3,781	341
4	Assumed purchase	Supporting the same purchased price as the assumed purchase price (PV generation (10kW or more (100% purchase)) 36 yen/kWh	31,119	3,322	3,615	152
5	Technological development	Initial investment 20% off/running cost 20% off	2,203	2,691	283	132

## 2. Development of basic zoning information on each renewable energy

### (1) Development of basic zoning information on wind power generation

The basic zoning information list developed in the past financial years was updated. Eight pieces of information having higher priority which could be converted into GIS data within this fiscal year were put into GIS data. Further, action was taken to update the GIS data of the already developed data where the data of the part of an information provider has been updated.

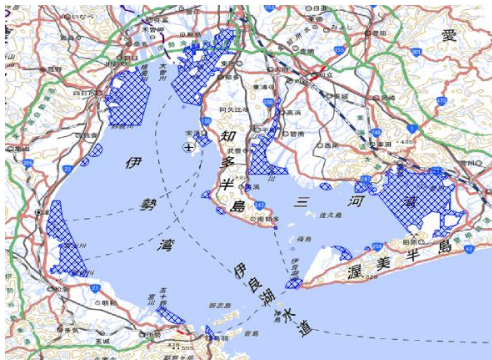


Figure 1 Harbor Area

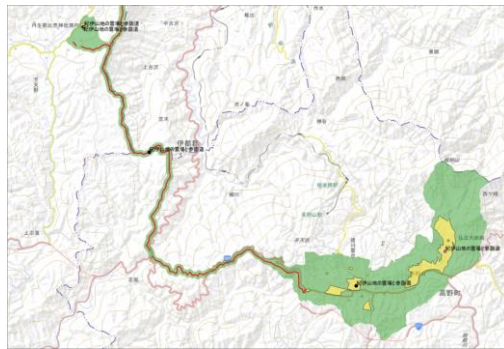


Figure 2 World Cultural Heritage Area

### (2) Development of basic zoning information on small and medium-scale hydropower

For the benefit of the local governments wishing to start a project of developing the small and medium-scale hydropower without sufficient information thereon, and the business operators for power generation wishing to have an easy access of the information on the spacious area considered as having a development potential for power generation, action was taken to establish a specific method of using the basic zoning information by means of GIS software, a method for selecting a candidate site for small and medium-scale hydropower development using the same information, and a method for an on-the-spot survey (local survey) at the selected candidate site using the same information.

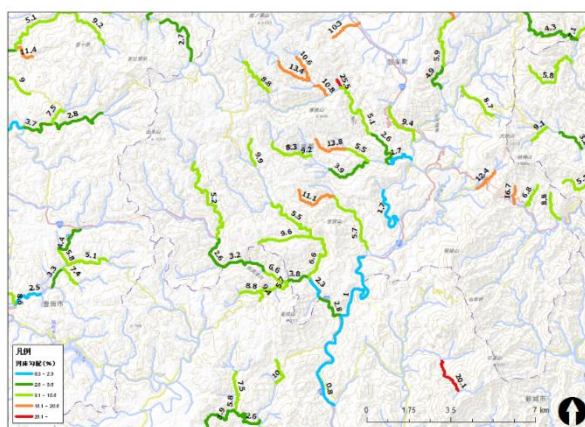


Figure 3 Basic zoning information (head of water channel) for candidate selection

### (3) Development of basic zoning information on the use of geo-heat (heat pump)

To provide community-based information useful in the introduction of geo-heat (heat pump), a study was made through coordination with the authors of information to convert into GIS data two pieces of information; (1) Overview of land subsidence areas in Japan (the Ministry of the Environment (MoE)) and (2) FY 2009 survey of ground water abundance (Ministry of Economy, Trade and Industry). As a result, conversion into GIS data was achieved for the data where conversion into GIS data was possible and was considered to bring about effective results.

## 3. Disclosure and provision of basic zoning information and study of the system

### (1) Creation of portal site design plan

A plan has been worked out to implement the portal site program developed in the reports of past financial years and the GIS system configuration/operation method (proposal). In working out the plan, the contents developed in the FY 2014 work were reviewed and re-developed. Further, in an attempt to improve the basic specifications of the portal site, addition of new specifications was studied.

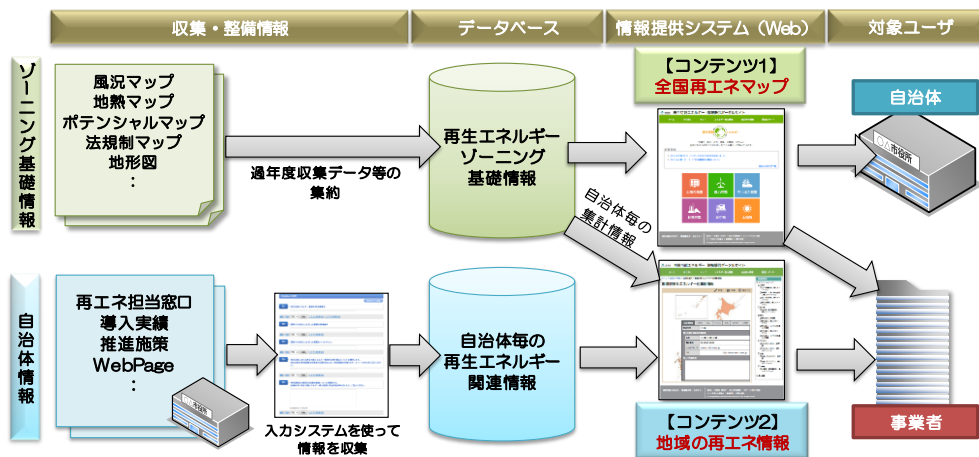


Figure 4 Overall conceptual illustration of this system

### (2) Development of portal site design specifications

Based on the functions and data required from the portal site and GIS system developed in past financial years, the design specifications were re-developed and re-studied in an effort to work out design specifications characterized by enhanced feasibility and efficacy.



Figure 5 Screen design (proposed)

### (3) Development of GIS data for introduction potential

A study was made to find out more effective information classification method for easier access to the GIS data on the portal site by business operators. The GIS data newly developed this fiscal year was Shape file, which is the GIS's de-facto standard.