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Evaluation of Inland Wind Resource Potential of South Korea According to Environmental Conservation Value Assessment

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Abstract

In order to analyze the effects of environmental regulation on wind power dissemination quantitatively, the country's inland wind resource potential has been estimated using the Environmental Conservation Value Assessment Map and the South Korea Wind Resource Map. The evaluation matrix of wind resource potential is formed by classifying environmental regulations into strong, intermediate, and weak, and economic feasibility into high, middle, and low. The purpose is to estimate inland wind resource potential in order to mitigate the environmental regulation needed to attain the national dissemination target of wind power and determine the most suitable level of the incentive policy.

Keywords: Wind Resource Potential Matrix, Environmental Conservation Value Assessment Map, Wind Resource Map

1. Introduction

The *6th Power Supply and Demand Master Plan (2013-2027)* announced by the Ministry of Trade, Industry & Energy (MOTIE) in February 2013 presented the ambitious goal of expanding the use of renewable energy as a proportion of total power generation from 2.3 % (as of the end of 2012) to 12 %, i.e. an installed capacity of 20 %. According to the plan, wind power must be responsible for providing 17.2 GW, which is 53.6 % of the cumulative 32 GW capacity of renewable energy by 2027, the final year of the plan.[1]

However, as of the end of 2012, the installed capacity of wind power was only 485 MW. The plan calls for the additional installation of 4,720 MW, which is ten times the cumulative capacity recorded in 2012, by the end of 2017, 10,754 MW by the end of 2022, and 1,180 MW by 2027.

The basis for such an exponential expansion of wind power dissemination is that wind power is the

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most economical of all renewable energy sources, as indicated by the Levelized Cost of Energy (LCOE) Analysis Report for 2011. [2] Moreover, wind turbine manufacturing is regarded as a next-generation industrial engine with the capacity to continue the advancement of the heavy machinery industry in South Korea.

MOTIE switched the incentive policy from the Feed-In-Tariff (FIT) to Renewable Portfolio Standards (RPS), assigning the renewable energy supply obligation to major power companies beginning in 2012, and carrying out various support programs, such as 2.5 GW South-Western Offshore Wind Power Implementation Plan, in order to realize the renewable energy dissemination policy.

Despite that, the power companies were required to pay USD 16 million in charges to attain only 65 % of the RPS obligation as of the end of 2012. The main reason for this failure to satisfy the RPS is the shortage of wind power dissemination, which is supposed to play the main role in the dissemination of renewable energy. For its part, the wind industry, including the power companies, has pointed to excessively restrictive environmental regulation as the reason. As a matter of fact, fifty-three applications to construct wind power plants (total installation capacity of 1.8 GW) may not have been approved due to the environmental regulation as of the end of 2012.

To formulate a proper policy when the dissemination of renewable energy conflicts with the environmental protection regulation, a review of the impact of environmental regulations on actual wind power dissemination based on objective and quantitative data is necessary. As such, this study uses the Environmental Conservation Value Assessment Map and the South Korea Wind Resource Map to estimate the country's inland wind resource potential according to the environmental regulation and an economic feasibility scenario to quantitatively assess the impact of environmental regulation on wind power dissemination. Jeju Island is excluded from the analysis of this study because it is implementing its own wind power dissemination guideline under its status as a Special Self-Governing Province. In addition, any islands not connected to the inland by an overland route are also excluded from this analysis.

2. Analysis Data

2.1. Environmental Conservation Value Assessment Map

The Environmental Conservation Value Assessment Map (ECVAM) classifies the environmental value of land with regard to its efficient conservation and utilization according to Article 15-2 (Development and Dissemination of Environmentally-Friendly Planning Techniques, etc.) of the Framework Act on Environmental Policy. [3]

The assessed items of the ECVAM include the 57 types of regions designated for legal conservation use, i.e. ecological landscape conservation regions, natural reserve regions, wild animal special protection areas, wetland protection regions, waterside areas, soil conservation regions, specific islands, natural parks, stream areas, coastal areas, underground water conservation areas, drinking water resource protection areas, natural environmental conservation regions, green regions, restricted development areas, urban parks, conserved mountain areas, natural protection areas, agricultural promotion areas, land readjustment regions, etc. and the 8 types of environmental/ecological value including the following: diversity (species diversity, etc.); naturalness (age-class, ecological naturalness, etc.); rarity (protected/ endangered species diffusion map, etc.); vulnerability (adjacency to roads, adjacency to urban areas, etc.), safety (emergencies, etc.); and connectivity, potential value, etc.

The final regional assessment class of ECVAM is assigned by reiterated calculation of 65 thematic maps for each assessed item assigned to classes 1~5 (class 1 being the highest conservation value). Class 5 refers to already-developed regions.