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Overview of wind energy policy and development in Japan

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ABSTRACT

This article reviews the history and current issues of wind energy development in Japan and considers the role of policy and future direction of wind energy. Past policy with its weak market focus did not increase wind energy share in Japan. The situation surrounding wind and other renewable energy changed dramatically after the Great East Earthquake and Tsunami and the subsequent Fukushima Nuclear Plant Accident in early 2011. The new Feed-in Tariff regime was introduced and the Electricity Sector Reform is slowly progressing. Although wind energy has much larger potential than other renewables in Japan, the FIT has not increased wind installation to date, and the number of bottlenecks has hindered large-scale market deployment of wind. The limited grid capacity, the current electricity market structure, and grid operating practices by the existing Electricity Power Companies have constrained the grid access of wind projects. A layer of regulations related to development permits increases lead-time, project uncertainty, and risk premiums. Difficulty in terms of social acceptance is also high due to some of the past mistakes which did not address local community concerns. Cost of wind energy is also high, compared with other countries, due to lack of economies of scale and other reasons. Japan needs to implement a more comprehensive policy package to address numerous bottlenecks and risks to increase wind energy share in its energy mix.

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1. Introduction

The purpose of the research is to review the history and current issues of wind energy and to consider the role of policy and future direction of wind energy in Japan. The article is composed as follows. Following the introduction, a brief history of wind energy policy and development in Japan is presented. Then, the influences of the 3.11 Great East Japan Earthquake and Tsunami and the subsequent Fukushima Nuclear Accident on the current energy policy debates are discussed. The fourth section focuses on the recent progress made in wind energy policy, which is considered critical for increasing renewable energy share. The fifth section discusses the current issues and agenda for wind energy utilization. The final section concludes the review by examining the relationships between the issues discussed and the directions which policy should take to increase the role of wind energy in Japan.

2. History of wind energy in Japan

As in many other countries, Japanese renewable energy support started after the First Oil Crisis of 1973. Before the oil crisis, Japan mainly relied on coal for energy needs during the recovery period post World War II and oil during the subsequent high economic growth period as the main energy source. Approximately 77.4% of the country's primary energy supply was from oil in 1973. In particular, the reliance on the Middle East was significant, as 77.5% of oil was imported from the region each year [1]. The oil crisis created the urgent need for the reduction of Middle East oil dependence by securing oil supply from other regions of the world and advancing energy saving as well as diversifying energy sources by developing new energy technology. For the latter purpose, the Sunshine Program was initiated by the Ministry of International Trade and Industry (MITI) in 1974. The Sunshine Program focused on four particular technologies, namely, solar, geothermal, coal and hydrogen. In 1979, the MITI also started the Moonlight Program, which supported the advancement of energy saving technology. The MITI created the New Energy and Industrial Technology Development Organization (NEDO) in 1980 to manage public RD&D of new energy and energy conservation technologies and to promote the market introduction of such technologies. In 1989, the MITI started another RD&D program called the Earth Environmental Technology Development Program, and integrated it, with the Sunshine and Moonlight Programs, into the New Sunshine Program in 1993.

2.1. Wind energy technology policy up to 2011

Fig. 1 shows government RD&D funding for wind energy in Japan. Wind energy was not chosen as a principal technology of the Sunshine Program, meaning that RD&D support for wind, which began in 1978, had much smaller total budget than solar or geothermal. Also, the wind RD&D support has been uneven over the years as seen in Fig. 1. Most of the RD&D support from the 1990s to the mid-2000s consisted of wind resource database establishment and grid stabilization technology development such as Japan Wind Atlas Development (FY1993),[1] field testing and data gathering projects (FY1995-FY2006), Local Area Wind Energy Prediction System (LAWEPS) development (FY1999-FY2002), wind database based on LAWEPS (FY2003-), energy storage development for large-scale wind farming (FY2003-FY2007), and weather forecasting system development (FY2005-FY2007).

This situation changed in the late 2000s. The Ministry of Economy, Trade, and Industry (METI, the successor of the MITI)[2] published three energy technology roadmaps in 2007, 2008, and 2009. The roadmaps included wind energy as a focus of technology development. For onshore wind, they targeted turbine upscaling, composite materials development, cost reduction, power quality improvement, power system control, wind power generation forecasting, grid connection control, grid stabilization, and high-quality low-wind turbine development. For offshore wind, the roadmaps listed the exploration of both seabed fixed foundation and floating foundation concepts, wind power generation forecasting, grid connection control, grid stabilization, energy conversion and storage system development as focus areas of RD&D [2]. The renewed interests in wind energy by the METI were the result of increased wind energy installation all over the world. The METI included wind energy RD&D as part of its Energy Innovation Program in 2008. This made the dramatic total budget increase from 2009 for the three multiyear programs, as seen in Fig. 1.

The Energy Innovation Program for Wind has three parts. The first was implemented from FY 2008 to FY2012, focusing on developing technology solutions for Japanese-specific weather and climatic conditions such as severe lightening and typhoon. The second program entirely focuses on offshore wind energy technology (FY2008–FY2014), consisting of three types of project: large-scale offshore wind system development; offshore wind demonstration for both fixed and floating foundation; and offshore wind resource measurement projects. The program is now extended to FY 2017. The third program actually started in FY 2007, emphasizing grid stabilization technologies such as storage and power control system development, and necessary data collection (FY 2007–2011) [4]. The NEDO implements most of these projects.

2.2. Market development policy for wind energy up to 2011

In Japan, the major energy policy is technology development policy and market policy has been very weak, and wind was no exception. The two main market policies for wind were capital subsidies and Renewable Portfolio Standards (RPS), based on “Special Measures Law Concerning the Use of New Energy by Electric Utilities”.

[1] Japanese fiscal year starts April 1st and ends on March 31st of the next calendar year.

[2] Japan implemented the administrative reform of national government agencies in 2001. The MITI became the Ministry of Economy, Trade, and Industry. In terms of these two agencies, however, the roles and contents have not been changed dramatically by this reform.