Energy and environment

Day-ahead forecasting technologies for PV systems

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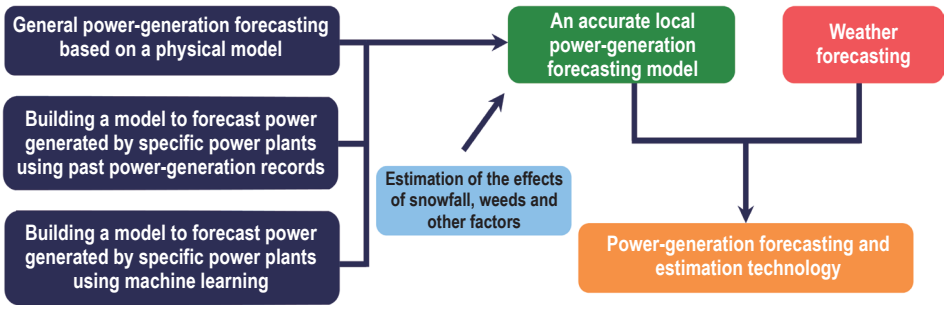
Purpose of Research

More and more Photovoltaic (PV) systems will be installed in the future as the mass-introduction of the renewable energy takes hold. While they are reliable with the projected operation period of 20 years or longer, the amount of power they generate depends on the weather conditions, which vary day by day. Therefore, for the post-FIT era, it is important to accurately predict power generations day ahead, considering the power-generation properties, equipment configurations (which differ from plant to plant), the effects of shadows at different times of the day, and the daily weather conditions. The aim of this study is to develop a technology for analyzing power-generation properties applicable to various PV systems from residential systems to mega-solar, as well as a technology for forecasting power generation a day ahead.

Summary of Research

Progress in technology for predicting the flux of solar radiation has made it possible to accurately forecast the amount of solar radiation in specific areas such as power-plant locations and certain regions. In this study, we are creating a model for accurately predicting power generation that considers the configurations and features of PV systems in a targeted area, and developing technology to forecast and estimate power generation that combines usefulness evaluations on such forecasts for power producers and aggregators, anticipating the post-FIT era. This power-generation forecasting and estimation technology uses, as input, a variety of data including past power-generation records and weather conditions and forecasts, and combines several models including a physical model, a model using past results and a model using machine learning, with the goal of achieving accurate predictions.



Points

Accurate day-ahead power-generation forecasting for the post-FIT era

Comparison with Conventional or Competitive Technologies

The features of each power plant can be considered by combining various methods including a physical model, a model using past results and a model using machine learning. We are developing machine learning model witch does not require long-term data, and a forecasting method that does not depend on a system's scale or configuration.

Expected Applications

- Forecasting power generated by a residential PV systems on the next day
- Forecasting the power generated by a large-scale PV systems on the next day
- Estimating power generation and assessing business feasibility when planning a power plant

Challenges in Implementation

Pursuing further accuracy via prediction and analysis using detailed chronological data on a number of power plants

What We Expect from Companies

- Power producers that kindly provide us with power-generation data
- Joint research proposals that combine power-demand data, including energy management, to utilize power-generation forecast data

Future Developments

Power-generation forecasting of individual PV systems using flux in solar radiation estimated from satellite data.

■ Associated System:
NEDO, Technology development for driving PV systems as primary power sources/Advanced common fundamental technology development/Development of technology for predicting flux in solar radiation, aiming at power-generation forecasting in the near future/"Research and development on power-generation forecasting and estimation technology" is ongoing (from July 2020 to February 2023).