

Study of kW Value with an Analysis of Measurement Data of Residential PV Power Systems

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Abstract

This presentation will focus on an evaluation of the value of electric power in terms of the residential photovoltaic (PV) power system with an analysis of measurement data. In the case where the values of a dispersed power source such as photovoltaic generation or wind turbine generation are evaluated, it is common to examine the kW value or the kWh value. In particular, the kW value shows the capabilities of the electric power generation of various power stations when the maximum electric power demand is generated.

For example, if one power station is generating to the installed capacity limit with maximum power demand, the kW value is 100%. In the case of the same power demand, the kW value becomes 50% at half the output of the installed capacity of the power station. Supposing that the kW value of the PV power system is high, the peak power shaving of thermal power stations will be possible. As a result, the construction costs of the power stations can be reduced.

The LOLP (Loss of Load Probability) method has been utilized for evaluating kW values. The LOLP is derived from outage probability. This method is applied to thermal power generation. On the other hand, a novel method, "K90" will be proposed to estimate the kW value of the PV power system.

The processes for obtaining the K90 value are as follows:

1. Measurements of power demand and PV power output data are taken.
2. Selection of a large power demand from duration curve of electric power is undertaken.
3. Sampling of PV system output data at high power demand is undertaken.
4. Calculation of the PV output data divided by PV installed capacity is done.

The sample data was measured for three years. These are not necessarily enough to estimate the kW value of the PV power system. Therefore, energy prediction is carried out to supplement the sample data of PV power output.

Site information of the weather and the PV power system are used for energy prediction. Types of solar cells such as mono crystal or multi crystal are also considered. The sample data for ten years was forecasted. Finally, The kW value of the PV power system is evaluated as 17.5% by the "K90" method.