NAME :Yuki KAWACHI
COUNTRY : Japan
REGISTRATION NUMBER : 6971

GROUP REF. : C6
PREF. SUBJECT :PS2
QUESTION N° : 2.10

1. Background

In Kansai, the grid load fluctuations on distribution lines are estimated based on the current and voltage data and monthly power usage observed at substation. In order to control the current and voltage of distribution lines adequately, the effect of interconnection of power generation facilities such as PV panels should also be taken into consideration.

Previously, PV power generations interconnected to distribution lines were calculated by the multiplication of following three factors; solar radiation, PCS capacity and correction factor. (Fig.1) The solar radiation was the estimated value based on the local weather forecasts, the PCS capacity was the sum of the capacity of PCSs installed in the Kansai region and the correction factor was our original factor that considers geographical conditions.

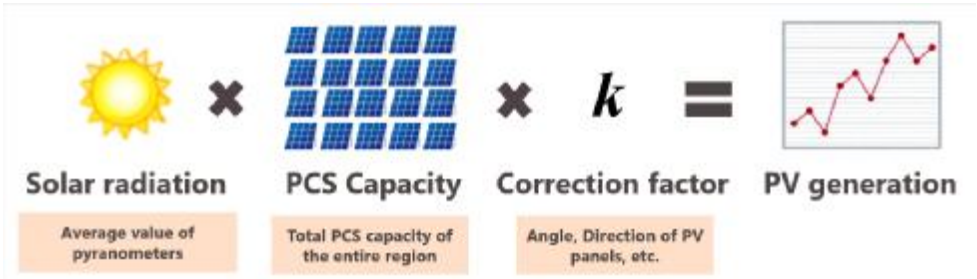


Fig.1: Previous calculation of PV power generation

PV power generations were roughly calculated and forecasted as a total value of the entire Kansai region, however, the forecast errors have been larger in recent years due to increasing installations of PV panels, which have had bad effects on the control of distribution lines or supply and demand adjustment operations.

Then we conducted two changes on the calculation method in order to improve the accuracy of PV power generation forecast.

2. Solar radiation forecast utilizing satellite imagery estimation

One change is about the forecasting method of solar radiation.

Previously, solar radiation was estimated only as a total value of the entire region by referring to public information such as weather forecasts or pyranometer data. With this method, it was difficult to neither deal with those areas where pyranometers were not installed nor estimate the solar radiation considering the regional introduction statuses of PV panels.

In order to estimate the solar radiation with a higher accuracy and resolution, a system that estimates solar radiation by analyzing meteorological satellite images was introduced. (Fig.2)

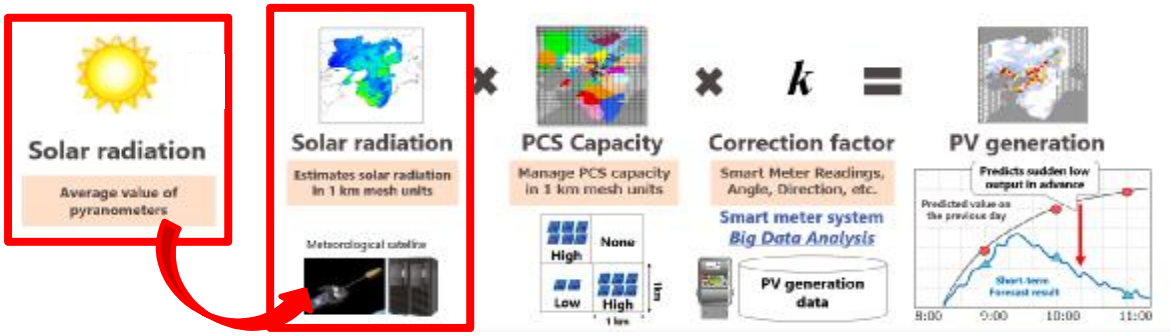


Fig.2: Introduce of satellite imagery estimation

This system considers the movement of clouds referring the meteorological satellite images and enables us to estimate solar radiation for each 1km mesh every 30 minutes. With this system, it is possible to estimate solar radiation at those points even where pyranometers are not installed.

Furthermore, more accurate value of PV power generation can be estimated by considering how many PV panels are installed in each 1km mesh.

3. Forecast correction by utilizing smart meter data

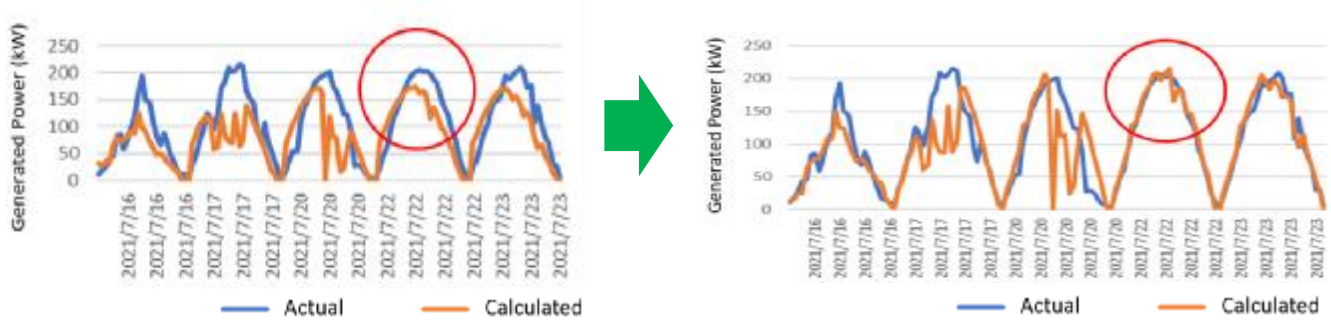
The other change is about the forecast correction.

With an aim to make the calculated PV power generation more accurate, we set the correction factor to the PV power generation obtained by multiplying estimated solar radiation and PCS capacity.

Previously, the correction factor was set only considering geographical factors such as angle or orientation of each PV panel. Then we tried to utilize the actual PV power generations measured by smart meters for the forecast correction. As for the PV generators that adopt all-quantity buyback system, the actual PV power generations obtained by smart meters and their estimated values were collected for 1 month and the ratios of both values were calculated in 30-minute increments to derive new correction factor.

In order to verify the efficiency of using new correction factor, the actual power generation and the calculated power generation of a distribution line were compared with and without adopting new correction factor. The result showed that adopting new correction factor reduces calculation errors and enables us to obtain more accurate PV generation forecast. (Fig.3)

We are considering further ways to improve the accuracy of PV generation forecast.



WITHOUT adopting new correction factor WITH adopting new correction factor

Fig.3 Verification of the efficiency of new correction factor