

EPRI DATA ANALYTICS CASE

Customer-Owned Photovoltaic Forecasting

The Data Challenge

Ideally, electricity is instantaneously consumed as it is generated. When it's not, voltage and frequency change. Utilities work to predict electricity consumption in order to maintain stability and to cost-effectively schedule generation output so that it matches actual electricity consumption. The addition to the grid of distributed generation from solar and wind increases the complexity of load forecasting because the amount of energy output by both photovoltaic and wind systems is variable. There are forecasting models available for distributed generation that use system characteristics, such as location and size, and atmospheric data. What is needed is an application to help verify the models and to better forecast variable distributed generation using readily available data for distribution devices.

Solution Overview

Customer-owned photovoltaic forecasting is the collection and analysis of data to determine the amount of energy generated over time by photovoltaic systems installed at commercial and residential sites. The results are either historical or in real time, depending on the capabilities of the AMI. The results are available from two methods: from direct measurement of the output of a photovoltaic system using information reported by the device itself or indirect from data captured from the AMI, such as from distribution sensors or smart meters. The information output from the application is used to verify the output from models that forecast the energy production over time of photovoltaic systems. Or, if the data is available, in real or close to real time, it may be possible to estimate with good accuracy the impact of partial cloud cover on photovoltaic systems.

Potential Methods for Solving the Problem

Direct Measurement

Customer Owned

The customer-owned, direct method is the capturing of photovoltaic performance through communication with the photovoltaic system via the smart revenue meter.

Utility-Owned

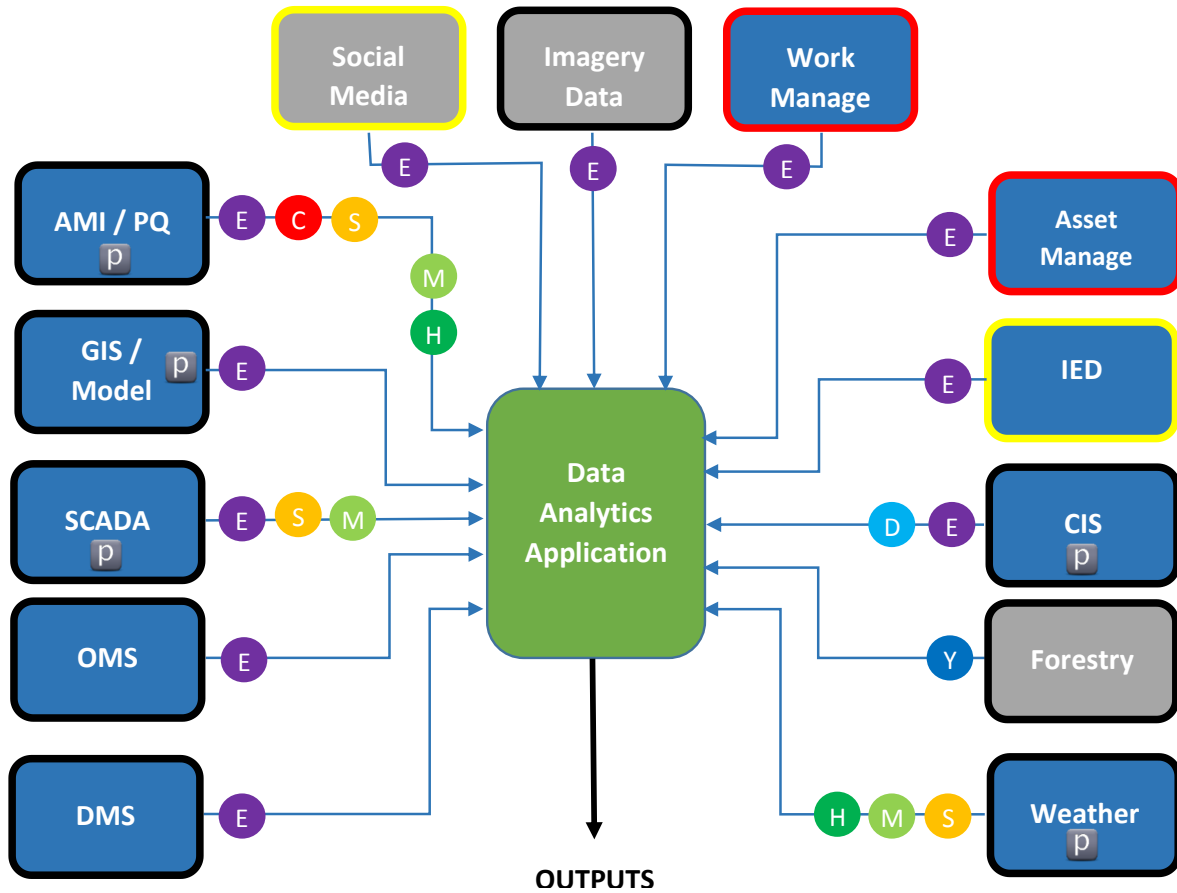
A utility-owned generation meter is a meter owned and supplied by the utility that is placed at a site in parallel with the revenue meter. The energy flow is such that all of the energy production from the photovoltaic system is output directly to the grid and not through the revenue meter.

Indirect Measurement

Indirect measurements are methods for calculating generation contributions of customer-owned photovoltaic systems without directly measuring the output of the photovoltaic system. The hardware for data collection is the smart revenue meter as well as distribution-level metering.

Available Data Sets

The data sets highlighted in the following figure are available in the EPRI Data Repository to solve this data analytics case.



Classifications of Data:

- Traditional Data Set
- New Data Set
- Structured Data
- Un-structured Data
- Format of Data Varies

p Denotes a primary data set used to solve this data analytics case.

Frequency of Measurement

- C Cycles
- S Seconds
- M Minutes
- H Hours
- D Days
- Y Months to Years
- E Event Driven