

# EPRI DATA ANALYTICS CASE

## Virtual Monitoring of Distribution Lines

### The Data Challenge

As the distribution grid becomes more integrated with the transmission and central-plant generation systems, utilities will seek to have more visibility into the real-time operations of their distribution grid to improve reliability, power quality, and grid efficiency. Utilities will want to avoid costly monitoring-point installations in favor of using existing sensors to extrapolate operational parameters of unmonitored points on the grid.

### Solution Overview

Robust algorithms must be developed to accurately reflect the operating parameters of unmetered segments of the distribution grid. Data from existing supervisory control and data acquisition (SCADA) monitoring points, smart meters, distributed energy resources (DER) monitoring points, and the system model can be combined to estimate voltage, current, and other measurements.

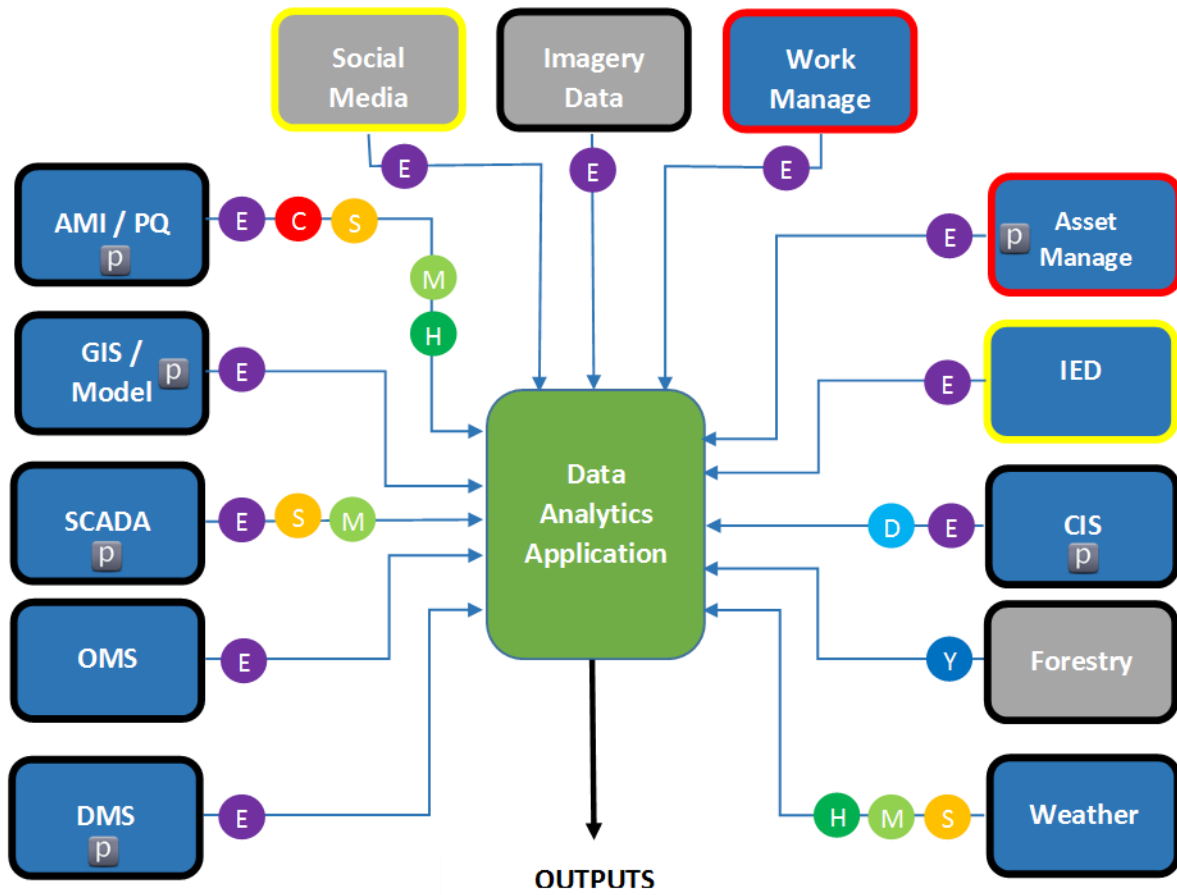
### Potential Methods for Solving the Problem

The primary method in use today is one that uses the available real-time measurements from SCADA as inputs in the application and/or distribution management system solving the power flow analysis. This method relies on the system model to calculate the power measurements at points of interest along the feeder. The advantage of this method is that the measurements of interest can be calculated for all points along the circuit with one power flow analysis. This can be thought of as a top-down approach—the known measurements are used to determine the values of the desired quantities down line of this point measurement.

The second method is to aggregate the measurements of the smart meters to the points selected as the virtual monitoring points. The aggregation of the measurements can be viewed as a bottom-up approach. Meter measurements are combined to calculate the power measurements of the next source-side node, which typically is the distribution service transformer. The calculated values of the service transformer monitoring point are then combined with other calculated service transformer values to determine the measurements of the next source-side monitoring point of interest. Theoretically, this method could be used to aggregate data and perform an analysis to determine the operating parameters at the circuit breaker.

### 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