EPRI DATA ANALYTICS CASE

Near-Real-Time Measurement and Verification for Grid Optimization Programs

The Data Challenge

Measurement and verification (M&V) methods have been developed to estimate the impact of grid optimization pilot projects, in particular, conservation voltage reduction (CVR) and volt-var (volt-ampere-reactive) optimization (VVO). The results of the pilot projects help estimate the impacts of larger scale projects once they are deployed. When these programs are used for energy efficiency or demand response, there is a need to track the impacts and ultimately the benefits in near-real-time instead of relying on impact factors derived during pre-deployment pilot projects. Near-real-time estimates of the impacts to the grid can assist the operations staff with both near-real-time planning of the grid—especially when there is a high penetration of distributed energy resources—and more accurate reporting of ongoing energy savings and demand reduction to interested internal work groups or external parties that may benefit from grid optimization programs.

Solution Overview

Robust algorithm(s) must be developed to determine the near-real-time impacts of grid optimization programs. The reporting interval will be determined by the requirements of the authority to which the benefits are being counted toward, whether an internal group at the utility or a regulatory body. For energy efficiency reporting, the report interval may be on the order of weekly, monthly, quarterly, or even yearly. The reporting time interval for demand response reporting may be as small as minutes or hours after the initiation or termination of the dispatch of the responsive loads or devices.

Potential Methods for Solving the Problem

The following lists some of the common methods used to determine the impacts of grid optimization programs. Based on the need to have the near-real-time impacts quantified, these approaches should be modified or new approaches and algorithms developed to meet this need.

Day-On/Day-Off Methods

- Protocol #1

- Comparable circuit method

- Median regression method

- Ordinary least squares method

Other Methods

- Model-based approach

- Comparable day approach **

- Direct measurement approach: compare before and after initiation and termination measurements **

** These basic approaches typically result in less accurate approximations.

Most of these methods involve statistical analyses of time periods, hours, days, or weeks, when the voltage of the circuit is at its normal level compared with time periods when the voltage is reduced to achieve a demand and energy reduction.

Available Data Sets

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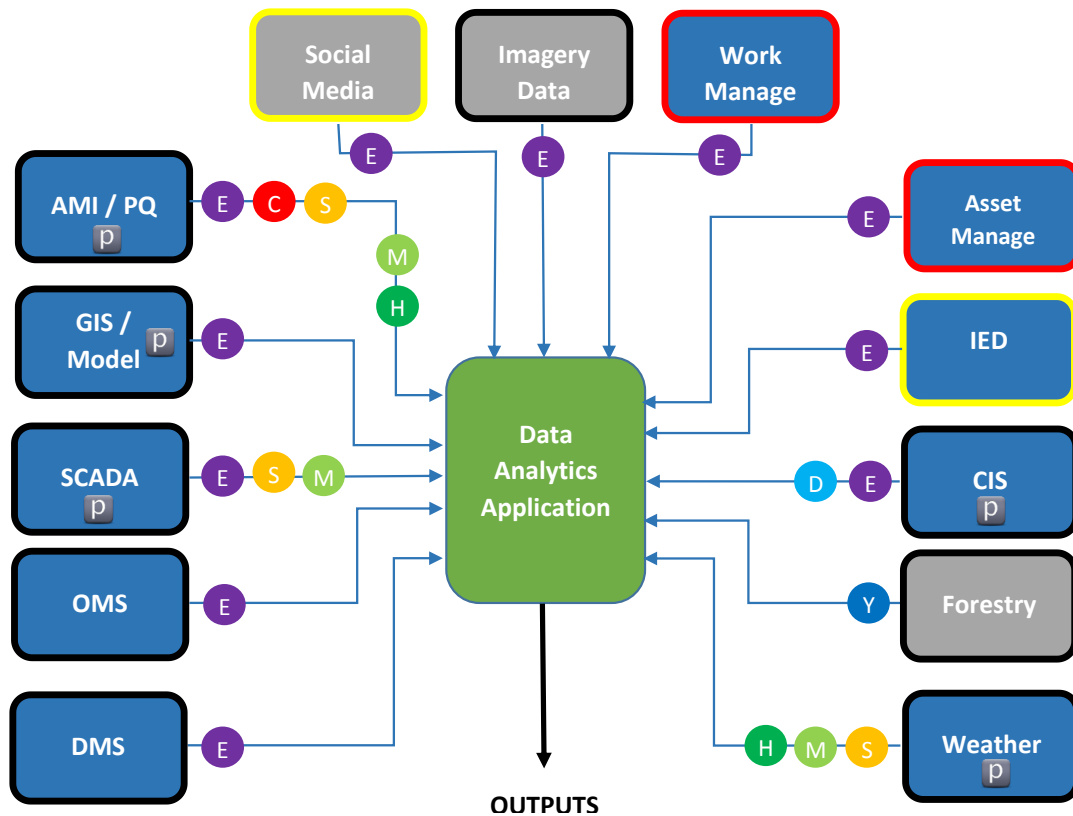
Classifications of Data:

- 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