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Presentation Title: Big Data and Demand Response: How Big Data Analysis Techniques Can Provide M&V Results in Near Real-Time

Abstract: The wide scale implementation of advanced metering infrastructure (AMI) provides Measurement and Verification (M&V) analyses of Demand Response (DR) programs with high resolution energy usage data previously only available through a small, metered sample of participating homes. The data required to analyze a single event for a Residential DR program with 60,000 participants has approximately 60 million rows of data. With AMI data for a census of the program participants, it is possible to identify every non-responding thermostat (NRD), analyze phased event start times, incorporate optouts and select a representative control premise for every individual participant in near-real-time. For M&V of DR programs using AMI data to provide accurate, reproducible work quickly and efficiently, certain Big Data techniques including multi-core functional programming, matrix-based calculations and vectorization make up the core of the analysis. These Big Data techniques provide powerful data quality control, step-by-step error checking and visualizations, transparent and repeatable calculations, and near-real-time results once the data is received from the utility. This paper provides an in-depth discussion of how these Big Data techniques have been used in the impact evaluations of AMI data based Residential DR Programs over the past 5 years.