SC 6: ACTIVE DISTRIBUTION SYSTEMS
AND DISTRIBUTED ENERGY RESOURCES

PS 2: Innovative Planning and Operation
of Active Distribution Systems

Paper ID 11158

Behind-the-Meter PV Estimation for Grid Awareness and Enhanced Visibility

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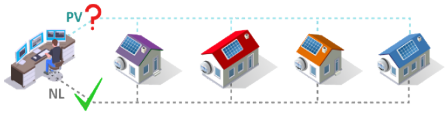
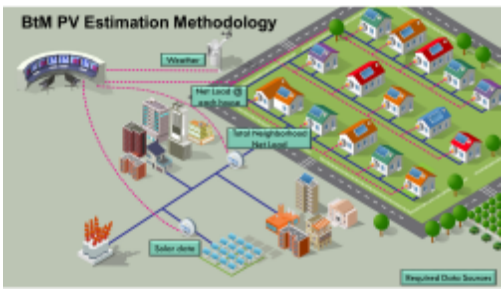
Motivation

- Lack of situational awareness for utilities
- Lack of visibility to PV generation and behind-the-meter (BtM) loads



Existing Methods and Approaches

Method		Drawback
Scaling methods		• Simple but less accurate
Weather based methods	NSRDB Typical Meteorological Year (TMY)	• Less accurate • Limited temporal and spatial resolution
	Third-party tools	• Cost • Lack of field operational information



Real World Scenario

- Around 90 houses in the customer neighborhood
- Utility solar region located 17 miles away from the neighborhood
- 2.742MW rating, 3 phase solar plant
- Metrics: Normalized Mean Absolute Percentage Accuracy

$$\left(1 - \frac{1}{T}\sum_{t=1}^{T}\frac{Estimated_t - Measured_t}{Nameplate\ Rating}\right) \times 100$$

Real World Scenario

Results

- Estimated aggregate BtM PV generation to a reasonable accuracy on both sunny and cloudy days
- GRIDWAVES estimates aggregated BtM PV generation with an average accuracy of ~90%
- Scaled PV and NSRDB Typical Meteorological Year (TMY) weather-based PV estimates shows lowest correlation to measured data
- Proposed algorithm and third-party estimated PV correlates closely to the measured data

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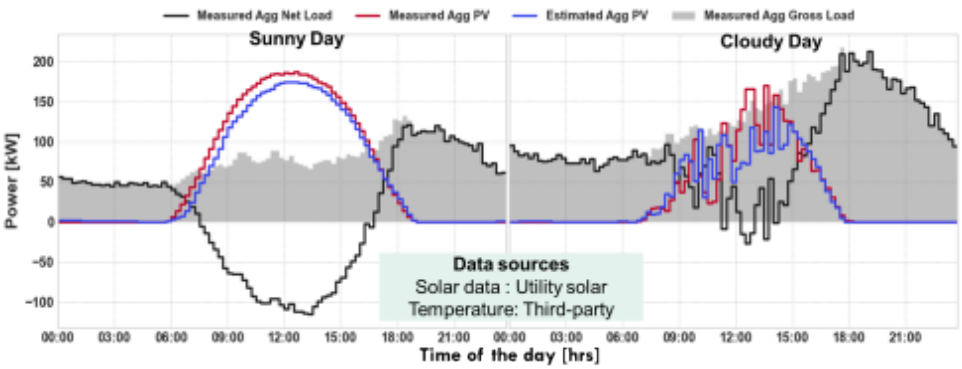
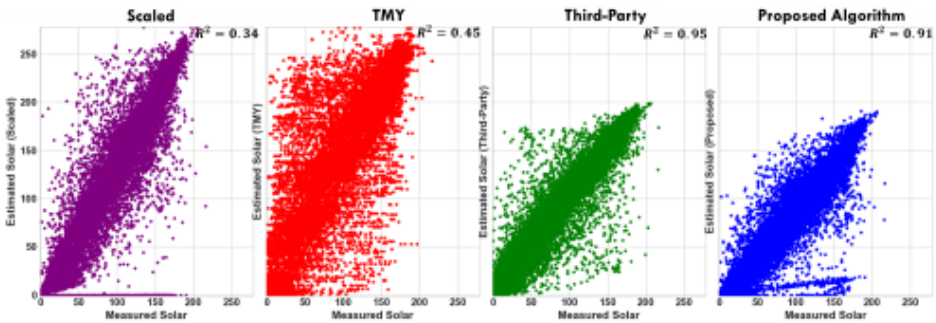


BtM PV Estimation on Typical Days



BtM PV Estimation Results Correlation for Varying PV Estimation Methods

Conclusion

- Reduced errors in estimating BtM PV helps utilities make better decisions to reliably integrate and utilize DER
- Proposed algorithm:
    - Requires minimal data with no additional cost
    - Auto-detection of houses with BtM PV installation
    - Considers field information
    - Accessible for utilities