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SDGE
A Sempra Energy utility

AMI for Operations

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Workshop on Advanced Distribution Management System (ADMS) Test bed

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Project Overview

Develop algorithms for leveraging existing advanced metering infrastructure (AMI) to provide a foundational, pervasive secondary voltage monitoring network solution:

- Identify network model discrepancies
- AMI data-based insights
- Novel visualization tools
- AMI-based controls.

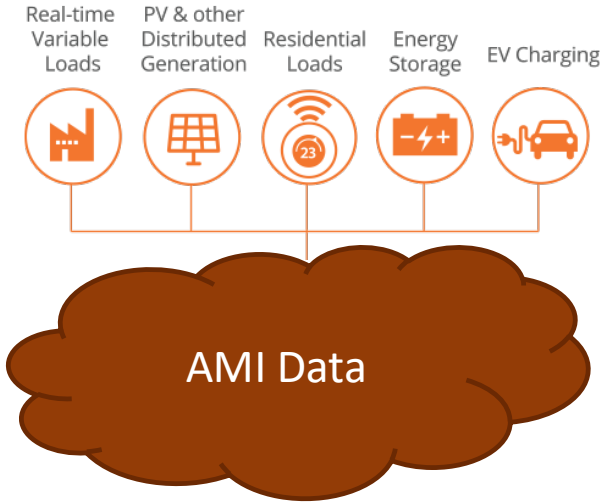
Technologies

Developing and demonstrating a data-driven paradigm for grid operations

Problem Statement

AMI provides a new paradigm for utility planning, operations, and controls:

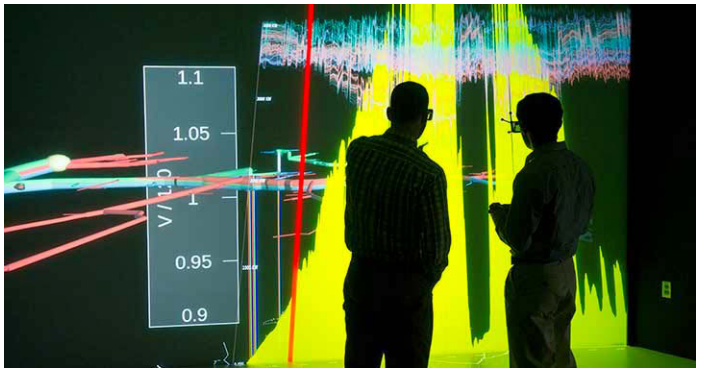
- Low-fidelity grid models
- Real-time awareness at the grid edge
- Processing and visualization of large data sets.



Leveraging the Energy Systems Integration Facility

The Energy Systems Integration Facility houses critical capabilities for the success of the project:

- Model conversion and validation tools
- Visualization (3-D and 2-D) tools used for developing newer techniques
- Potential use of real-time simulators (e.g., RTDS) for follow-on scope.



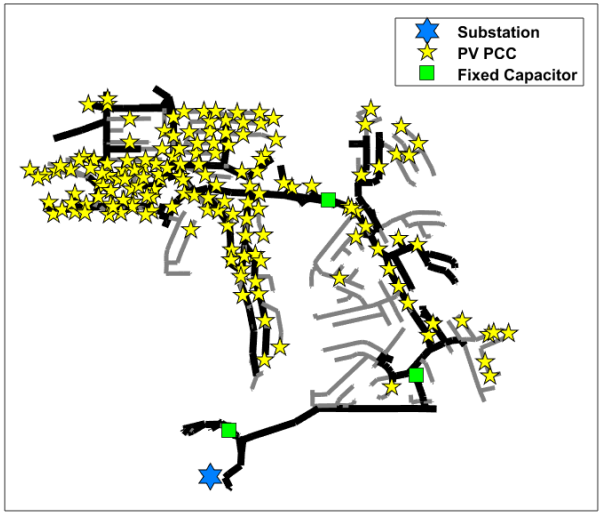
Overview of Technical Achievements

- Feeder model validation and synthetic AMI generation framework
- Developed method for identifying primary network model discrepancies
- Developed robust method for phase identification
- Developed methods for analyzing AMI data and providing operational insights
- Developed techniques for visualizing large AMI data sets using 2-D and 3-D tools.

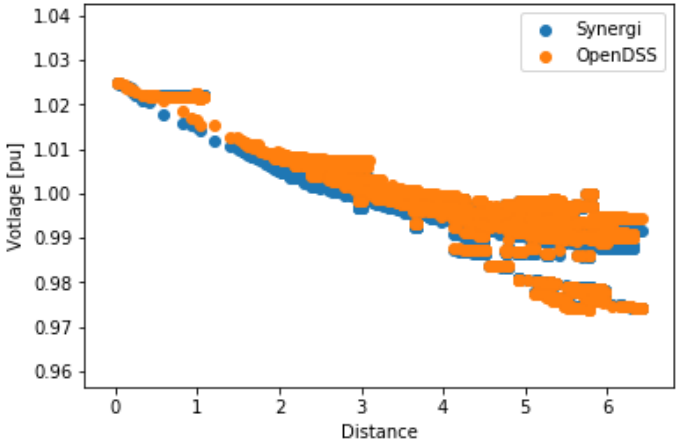
Feeder Data

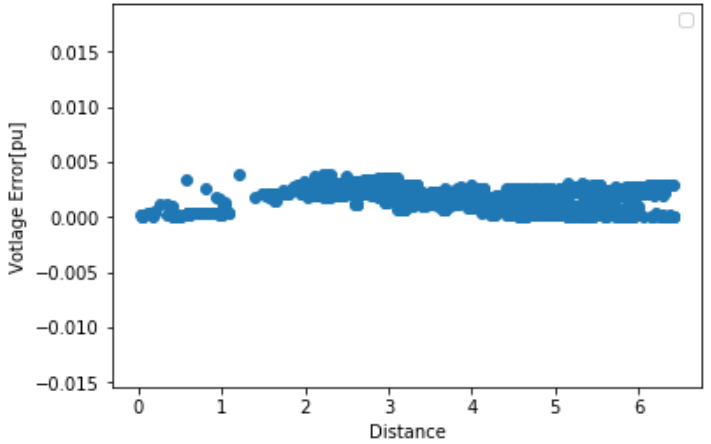
Utility feeder:

- Services approximately 4 sq. miles of geographic area
- More than 4,000 nodes
- Peak load approximately 10 MW
- Distributed photovoltaic (PV) generation 33%
- Substation load tap changer, capacitor banks.



Model Validation

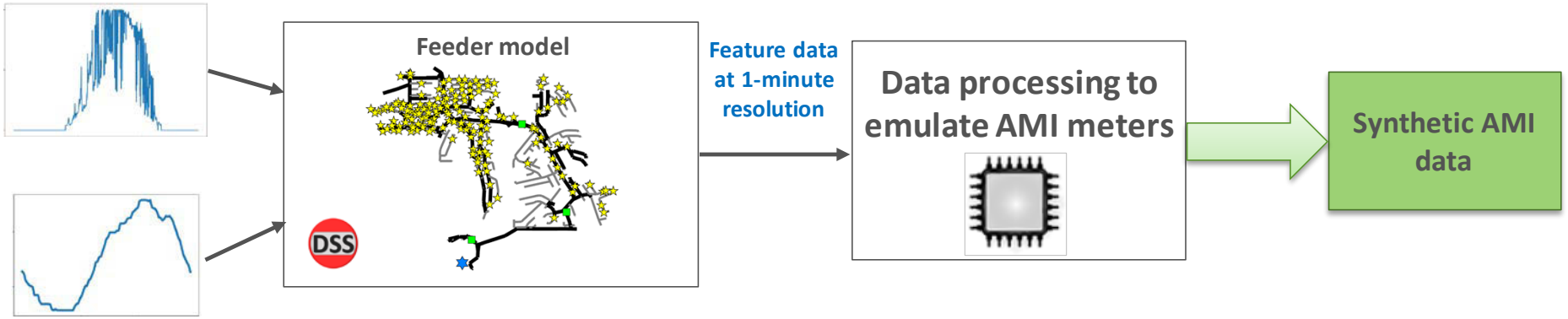




	Synergi	OpenDSS
Phase A	3.514 MW	3.548 MW
Phase B	3.507 MW	3.449 MW
Phase C	3.507 MW	3.535 MW

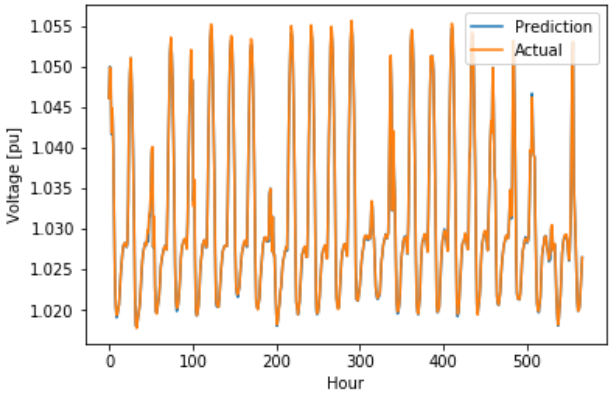
An accurate validated model in OpenDSS for further studies

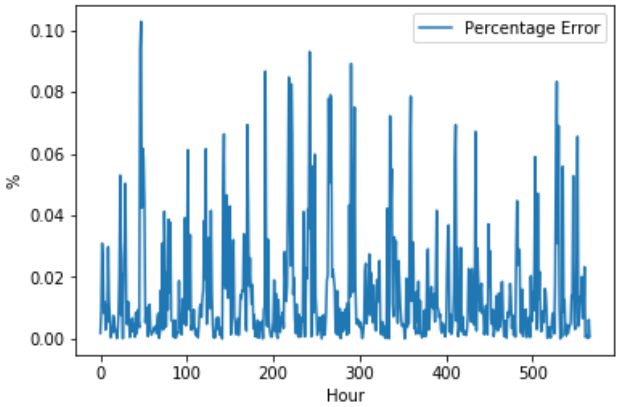
Framework for Synthetic Advanced Metering Infrastructure Generation



Identifying Model Discrepancies

- Generate a single real-time voltage on the primary side of the transformer
- Compare against planning models and check for discrepancy.

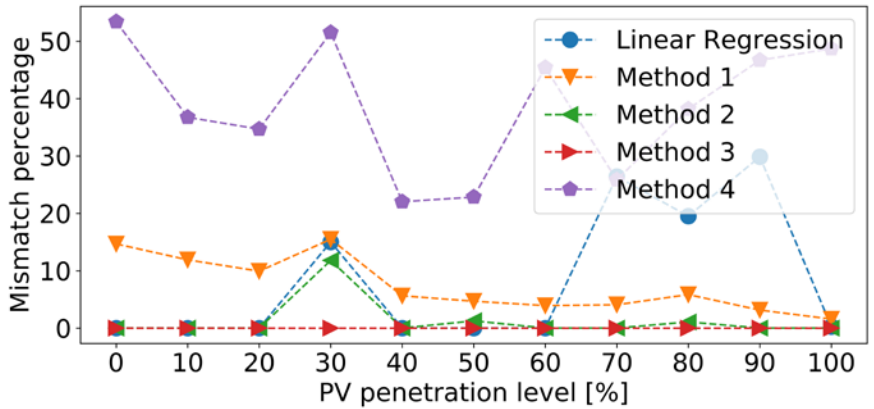




Mean error: 0.0146%, maximum error: 0.1028%

Customer Phase Identification

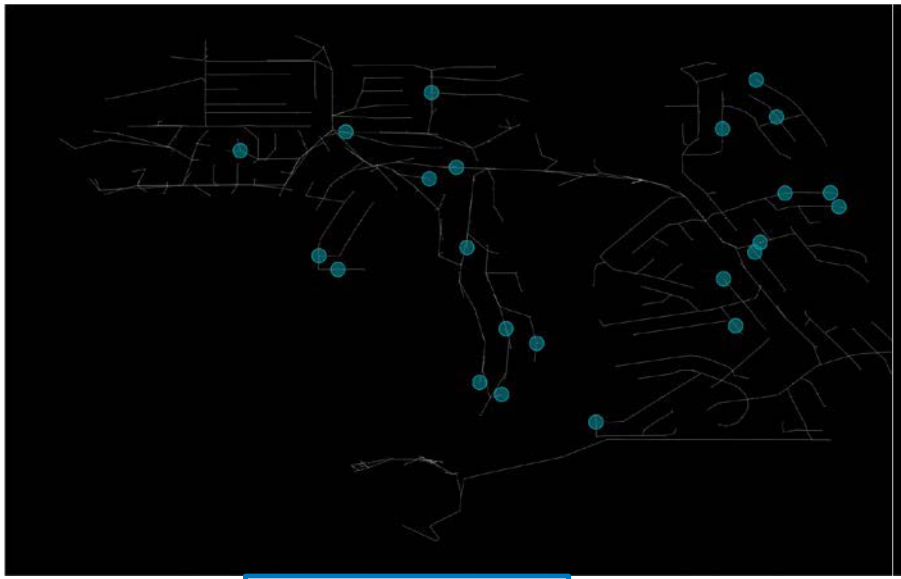
- Customer phasing information is an important source of model errors.



Presence of PV impacts phase ID accuracy

Advanced Metering Infrastructure-Based Analytical Insights

- What areas of the feeder see voltages exceed a certain threshold? How deep are the exceedances and how do they correlate with weather?
- How many electric vehicles, and when and at what levels do they charge?

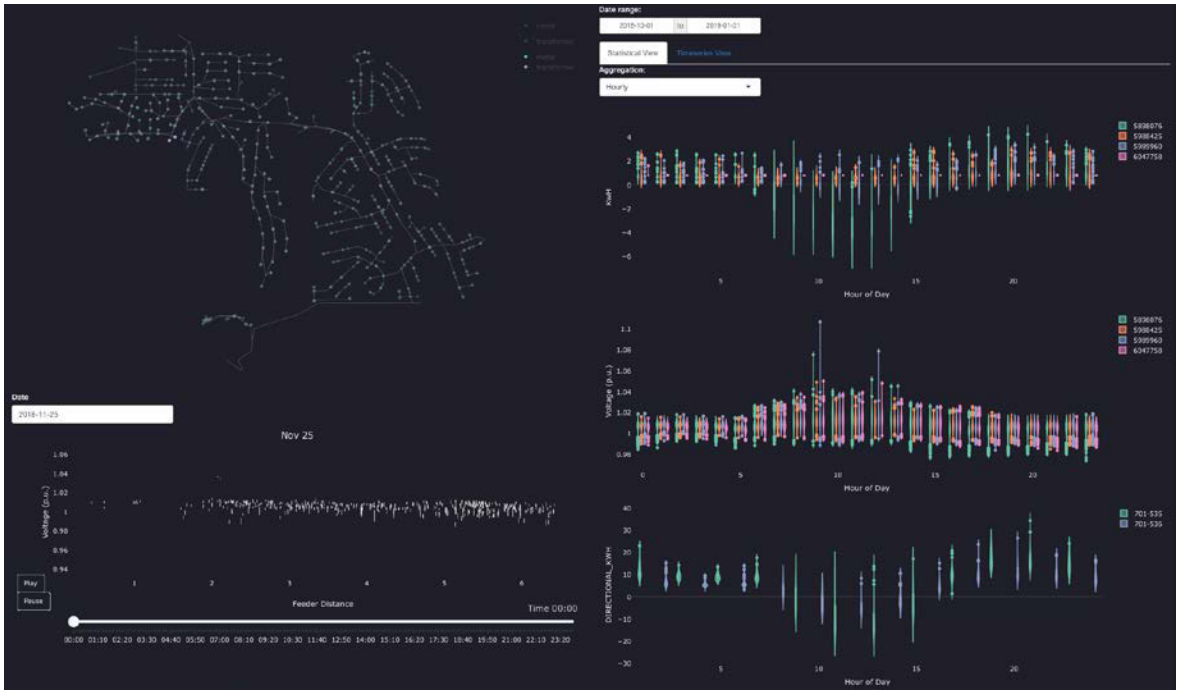


Potential EV locations

Locations of voltages exceeding a certain threshold

Advanced Visualization Techniques

- Interactive 3D & 2D tools for visualizing essential information from vast amounts of AMI data



Key Findings

- Primary model discrepancies can be identified and located using AMI-based analytics
- Real-time awareness of grid edge provides critical tools for enabling distributed energy resource integration
- Analytics and visualization techniques are key to enabling increased use of AMI data.

Thank you

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