

# Demonstration Results Report NRECA for GRIP

By [David.Pinney@NRECA.coop](mailto:David.Pinney@NRECA.coop) on 30 Sept. 2020

## Overview

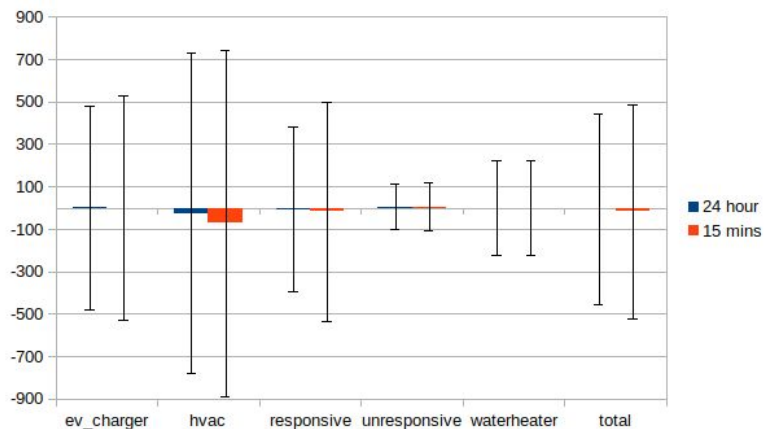
- This report describes Anticipate/Absorb/Recover models deployed as part of GRIP.
- Results include validation scores, user acquisition, and feedback.
- The supporting platform features were integrated with the PresencePG [platform](#) via the OMF HTTP API.
- Other models were not selected for platform integration, but are available for future integration under their [open source license](#).
- This report assumes familiarity with the features of the various models, which were described in our [alpha](#), [beta](#), and [release](#) reports.

# Technology Deployed

Area	Application	Source	Production	Maturity
Anticipate	<u>Distribution Load Disaggregator</u> , identification of control opportunities	<a href="https://github.com/dpinney/omf/blob/master/omf/models/disaggregation.py">https://github.com/dpinney/omf/blob/master/omf/models/disaggregation.py</a>	<a href="https://omf.coop/newModel/dissagregation/dep_disagg">https://omf.coop/newModel/dissagregation/dep_disagg</a>	Users
Anticipate	<u>Solar Disaggregator</u> , identification of undeclared DERs for safety	<a href="https://github.com/dpinney/omf/blob/master/omf/models/solarDisagg.py">https://github.com/dpinney/omf/blob/master/omf/models/solarDisagg.py</a>	<a href="https://omf.coop/newModel/solarDisagg/dep_solidis">https://omf.coop/newModel/solarDisagg/dep_solidis</a>	Validated
Anticipate	<u>Phase identification</u> of AML meters, enhanced control effectiveness	<a href="https://github.com/dpinney/omf/blob/master/omf/models/phaseld.py">https://github.com/dpinney/omf/blob/master/omf/models/phaseld.py</a>	<a href="https://omf.coop/newModel/phaseId/dep_phase">https://omf.coop/newModel/phaseId/dep_phase</a>	Users
Absorb	<u>Load and Storage Forecaster</u> , DER dispatch during extreme events	<a href="https://github.com/dpinney/omf/blob/master/omf/models/forecastLoad.py">https://github.com/dpinney/omf/blob/master/omf/models/forecastLoad.py</a>	<a href="https://omf.coop/newModel/forecastLoad/dep_forec">https://omf.coop/newModel/forecastLoad/dep_forec</a>	Users
Recover	<u>Anomaly Detector</u> , find anomalies to detect system and hardware failures	<a href="https://github.com/dpinney/omf/blob/master/omf/models/anomalyDetector.py">https://github.com/dpinney/omf/blob/master/omf/models/anomalyDetector.py</a>	<a href="https://omf.coop/newModel/anomalyDetector/dep_anom">https://omf.coop/newModel/anomalyDetector/dep_anom</a>	Validated
*	Supporting Platform Technologies	Various	Various	Validated

## Distribution Load Disaggregator - Detail

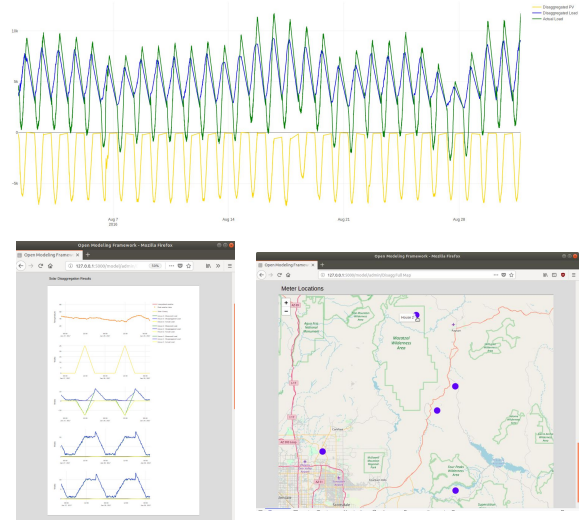
- Conclusion:
  - Ridge regressor trained on GLD-based simulation set outperforms NILMTK
- Validation:
  - Summary results at right
  - Full validation report: [link](#)
- Users:
  - wipco.com
  - pvrea.coop
  - mondo.com.au
- Feedback:
  - Interest in testing via utility sub-meter (sense.io), availability low



96 houses with random variation (48 types), 50/50 train/test split, 24 hour chunks compared to baseline

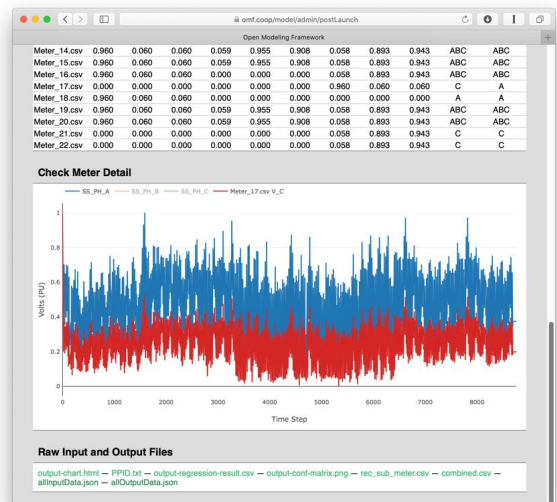
# Solar Disaggregator - Detail

- Conclusion:
  - LBNL solar disagg model capable of operation using data coops have on hand
- Validation:
  - RMSE under 5%, fully reliable given typical installations >4kW
  - Full validation report: [link](#)
- Users:
  - None.
- Feedback:
  - Low interest in model due to low rooftop solar penetrations among coops, usage increase expected as this changes



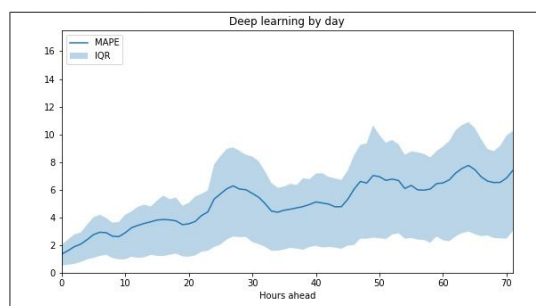
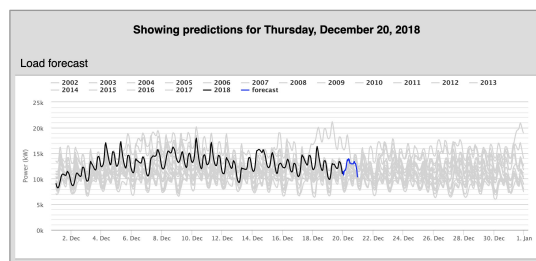
# Phase identification - Detail

- Conclusion:
  - Meter phase identification through correlation with voltage at substation highly reliable
- Validation:
  - 100% accuracy on Tanzania and taxonomic feeder test sets.
- Users:
  - swrea.com
  - horryelectric.com
  - precorp.coop
- Feedback:
  - Recent NREL [publication](#) suggests this method not as effective in the presence of DG
  - Method can be enhanced by initiating voltage regulator tap changes at known times



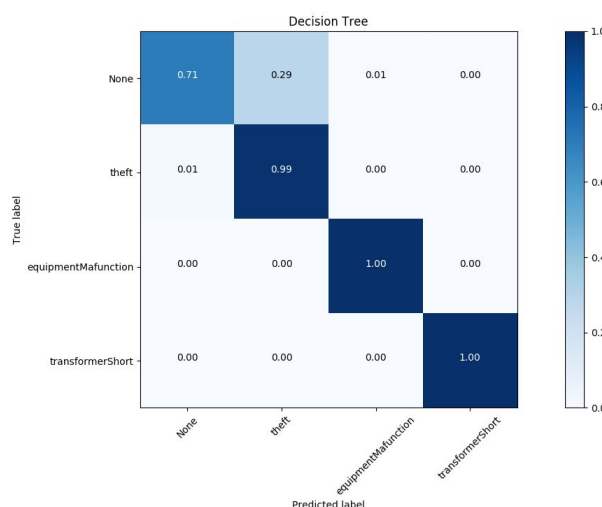
# Load and Storage Forecaster - Detail

- Conclusion:
  - Neural network methods provide a competitive load forecasting capability for demand dispatch
- Validation:
  - Day-ahead hourly MAPE under 4%
  - Full validation report: [link](#)
- Users:
  - capitalelec.com
  - cbpower.coop
  - ceca.coop
  - delaware.coop
  - irea.coop
  - mycentral.coop
  - pvrea.coop
  - unitedpower.com
- Feedback:
  - Detailed export needed (implemented)
  - SCADA integration remains a one-off challenge



# Anomaly Detector - Detail

- Conclusion:
  - Decision tree methods provide good anomaly detection on GLD-based sim-trained anomalies
- Validation:
  - 92% accuracy (see right)
  - Full validation report: [link](#)
- Users:
  - ntecpower.com
  - ncsu.edu
- Feedback
  - User acceptance relies on high accuracy, consider sacrificing false-negative rate
  - Model might be best applied to meters with known high bill complaints

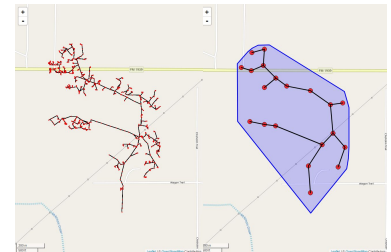
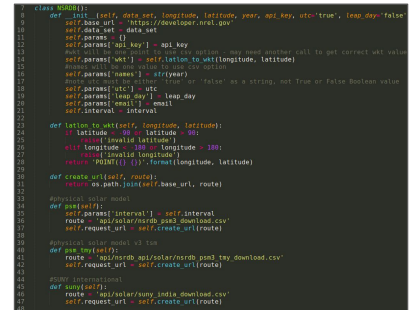
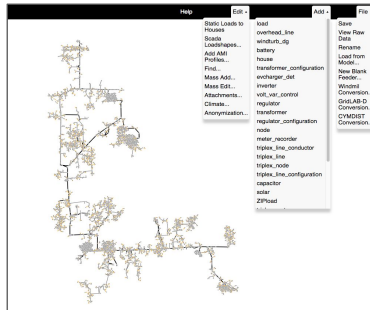


6 months simulation time, Olin Barre GH, all anomalies mixed (1% chance each per time step), 90/10% train/test

## Supporting Platform Technologies - Overview

OMF.coop enhanced to provide comprehensive feature set to GRIP platform:

- Circuit visualization scalable to full distribution sizes (c. 10k buses)
- Geospatial visualization and simplification
- Weather data ingest from NOAA sources (solar, wind, historical, forecast)
- Enhancements to data import (Cymedist, Windmil)



## Supporting Platform Technologies - Circuit Import

- Circuit import/conversion a key platform feature.
- Pre-GRIP, conversion success rate for Windmil was 5%, i.e. only 5% of circuits ran powerflow after conversion.
- Test suite enhanced and automated for 100 representative circuits.
- Current success rate 94%.
- Cymedist conversion testing limited by lack of data. Existing code was extensively refactored in anticipation of data partner recruitment.

