



***Solar Forecasting for Low Voltage Network
Operations in Australia***

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ESIG Meteorology & Market Design for Grid
Services Workshop

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Our Mission: Deploying the data and tools needed to build the solar powered future!

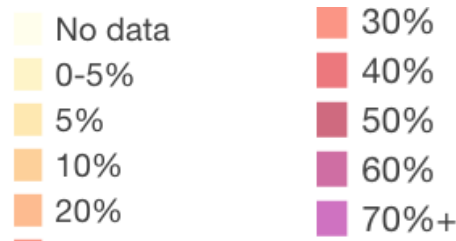
Make it easy for the hard-working folks building the solar future to get the job done!

Australia: High Penetration DER

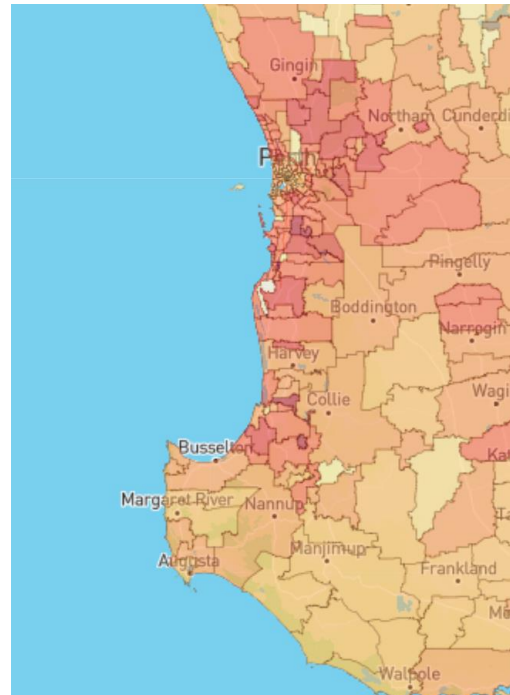
Snapshot of **DER**:

- 2M + BtM solar systems ()
- 100k BtM energy storage systems by 2025
- DER database via AEMO now being implemented

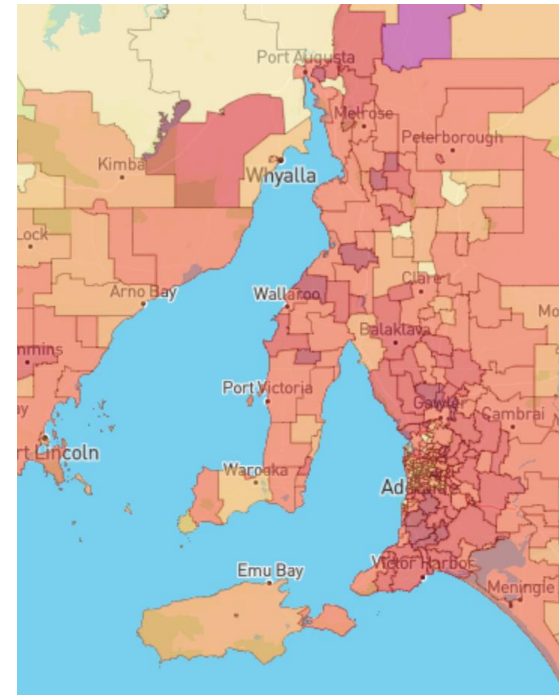
Credit: Australia PV Institute



Perth



Adelaide



Brisbane



R&D Project: Solar Forecasting for LV Network Operations

- \$4M Project, ARENA & Industry backed [2016-2019]



Australian Government
Australian Renewable
Energy Agency

ARENA

Deploying solar data tools to participating networks

Overall Objectives:

1. LV Network Visibility
2. Enable higher penetrations of solar

Objective: LV Network Visibility

LV Network Mapping of BtM Solar Actuals + Forecasts

Distributed PV metadata gathered & tagged by distribution network asset

We use satellite based estimates of PV power output to:

Partnered with
12 Distribution
Companies

- 1) generate rapid-update forecasts of their power outputs
- 2) validate against real-world PV Actuals

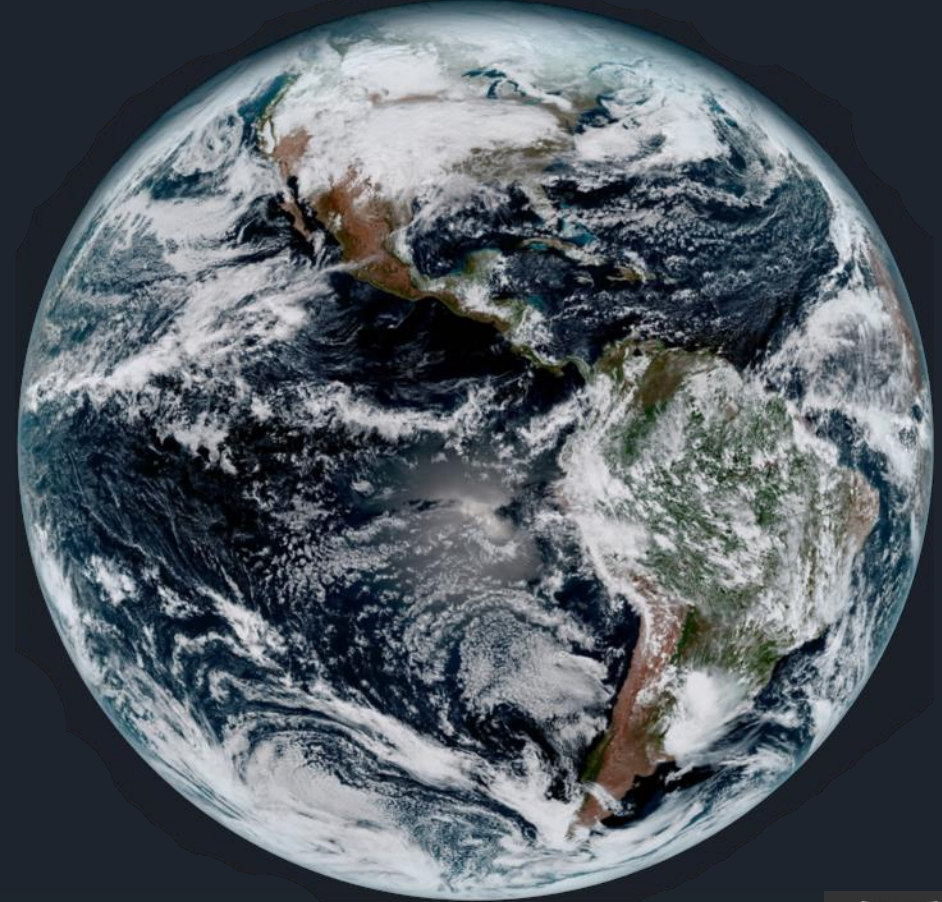


Key-Enabler: 3rd Generation Weather Satellites

Himawari-8 (2015)

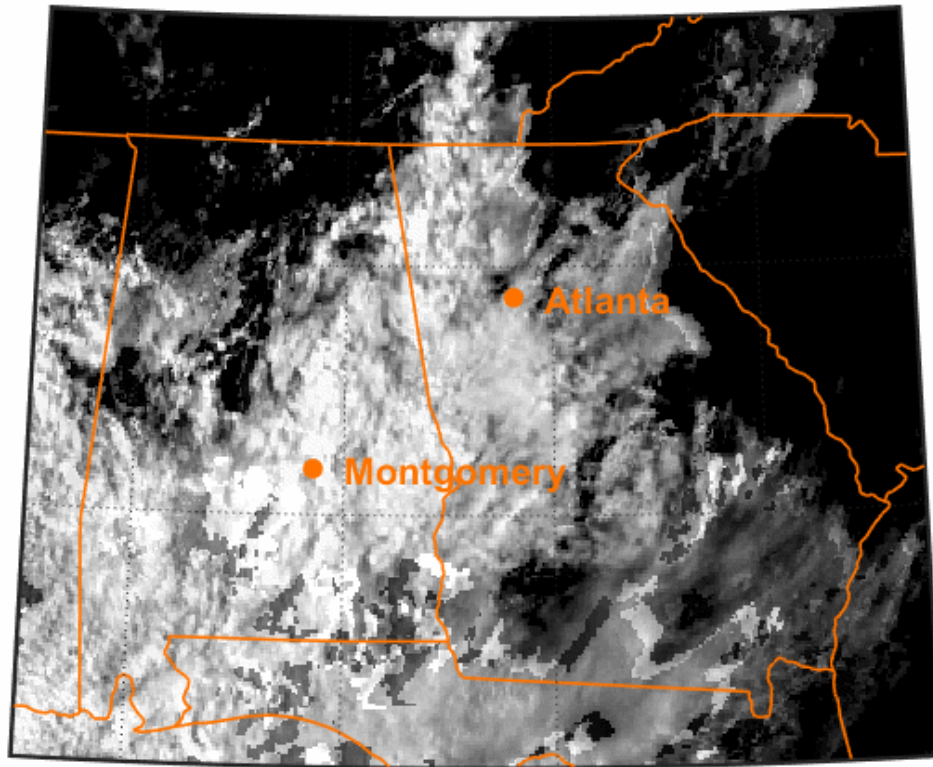


GOES-16 (2017)

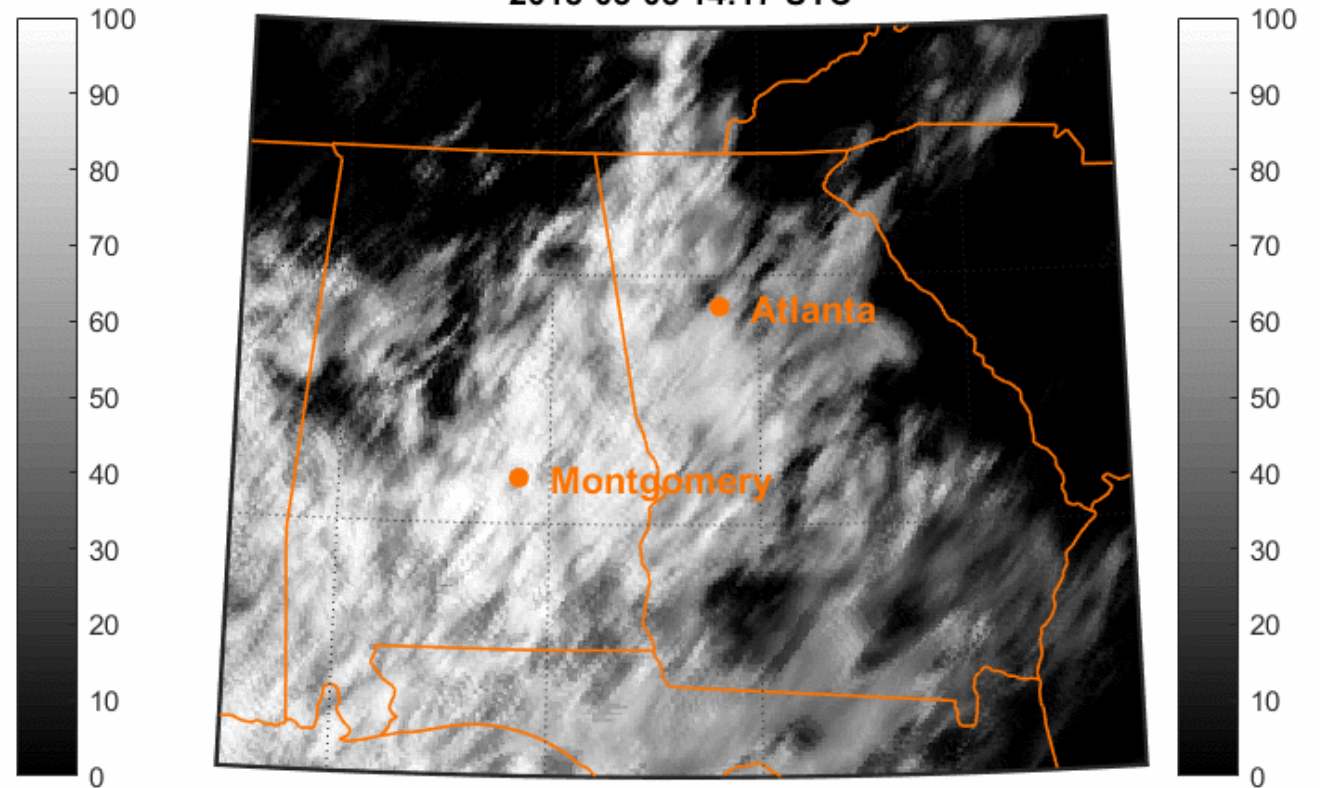


Core Technology: Semi-dynamical Nowcasting

observed estimated actual cloud opacity
2018-03-05 14:17 UTC



ensemble forecast, +0.00hrs
2018-03-05 14:17 UTC

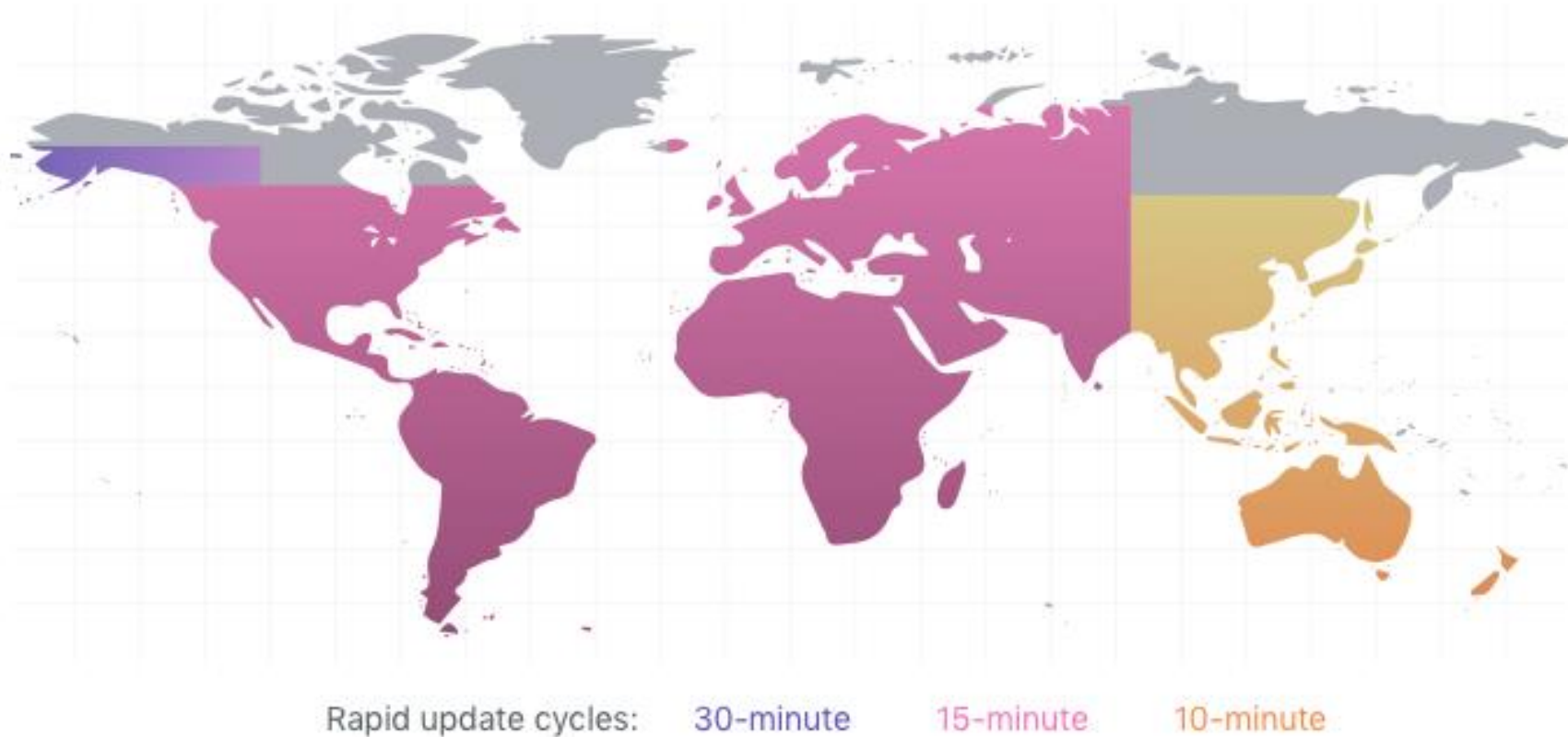


Cloud Observations

Example Forecast (0-2 hours)

Global, Rapid Update Coverage

Solcast operates a global, rapid update solar forecasting system



Data Capability: Weather & Power output

Data Product Timescales:

- Forecast 0 to 4 hr rapid update ensemble **nowcast**, & +7day fcast
- Live Near real-time estimated actuals from satellite, -7 days
- Historical From yesterday back up to 20 years

Available Resolutions:

- Temporal 5, 10, 15, 30 or 60 minutes
- Update Every 5, 10 or 15 minutes
- Spatial 1-2km



Solar Radiation Data

Accurate solar irradiance and weather data with global coverage: historical, real-time and forecast.



Utility Scale Solar Forecasts

Solar power forecasting for solar farms or solar parks, delivered via API.



Rooftop Solar Forecasts

Solar power forecasting for rooftops - just one, or thousands.



Grid Aggregations

Thousands of PV systems grouped by market regions or grid assets. Forecasts and estimated actuals updated every 10 to 15 minutes.



Grid Aggregations: Behind the Meter Solar



Grouping solar PV power output by:

- Geographic or market regions
- Network assets

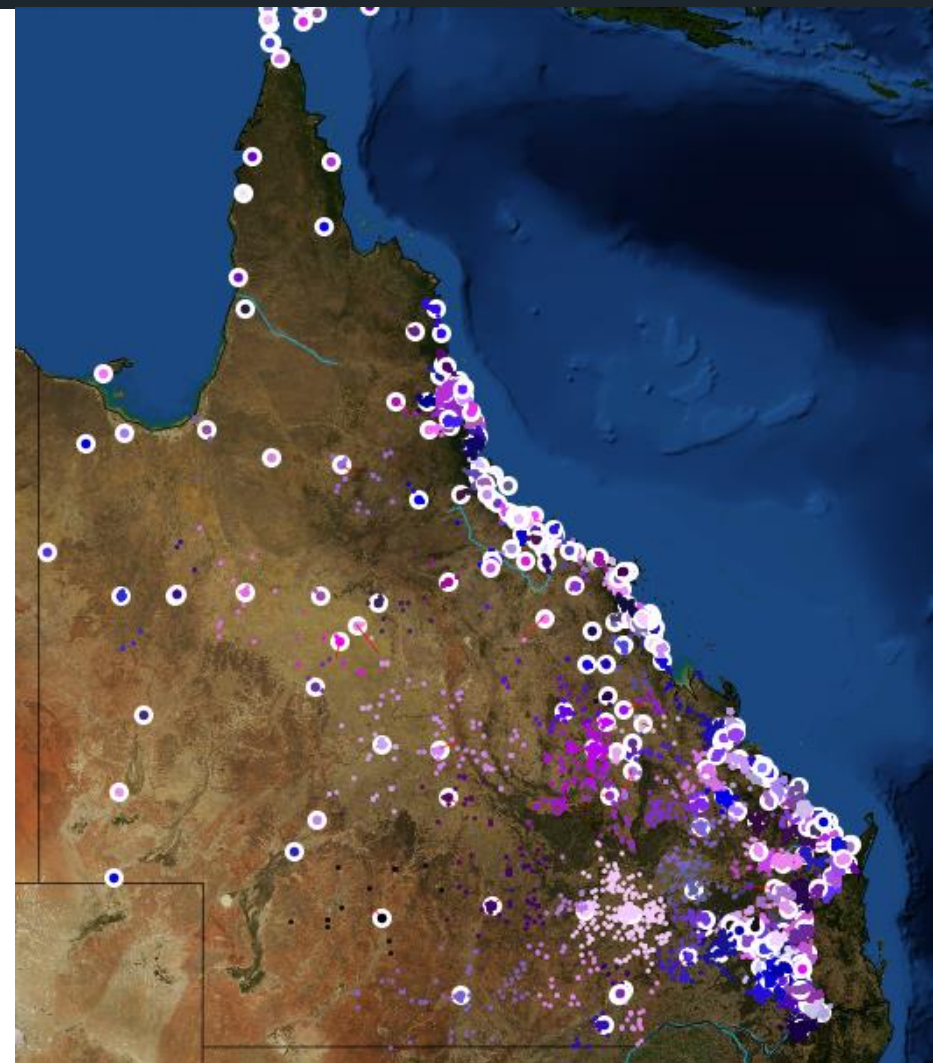


Grid Aggregations: LV Network Applications R&D

Solar forecasting and estimated
actuals at the LV network level

12x distribution networks in
Australia, BtM solar mapping

Zone substations, LV feeders, VPPs

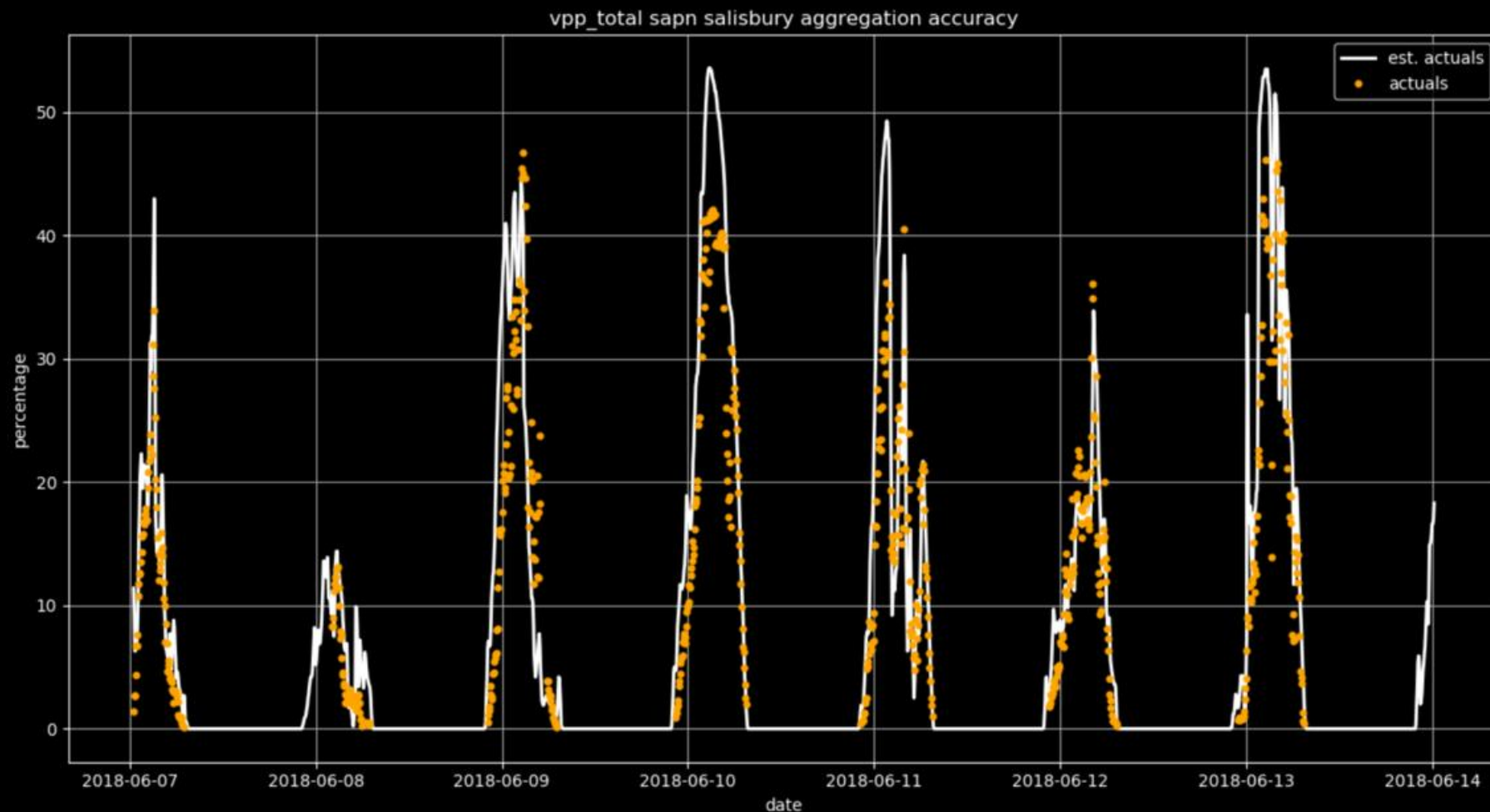




South Australia Power Networks: VPP forecasting

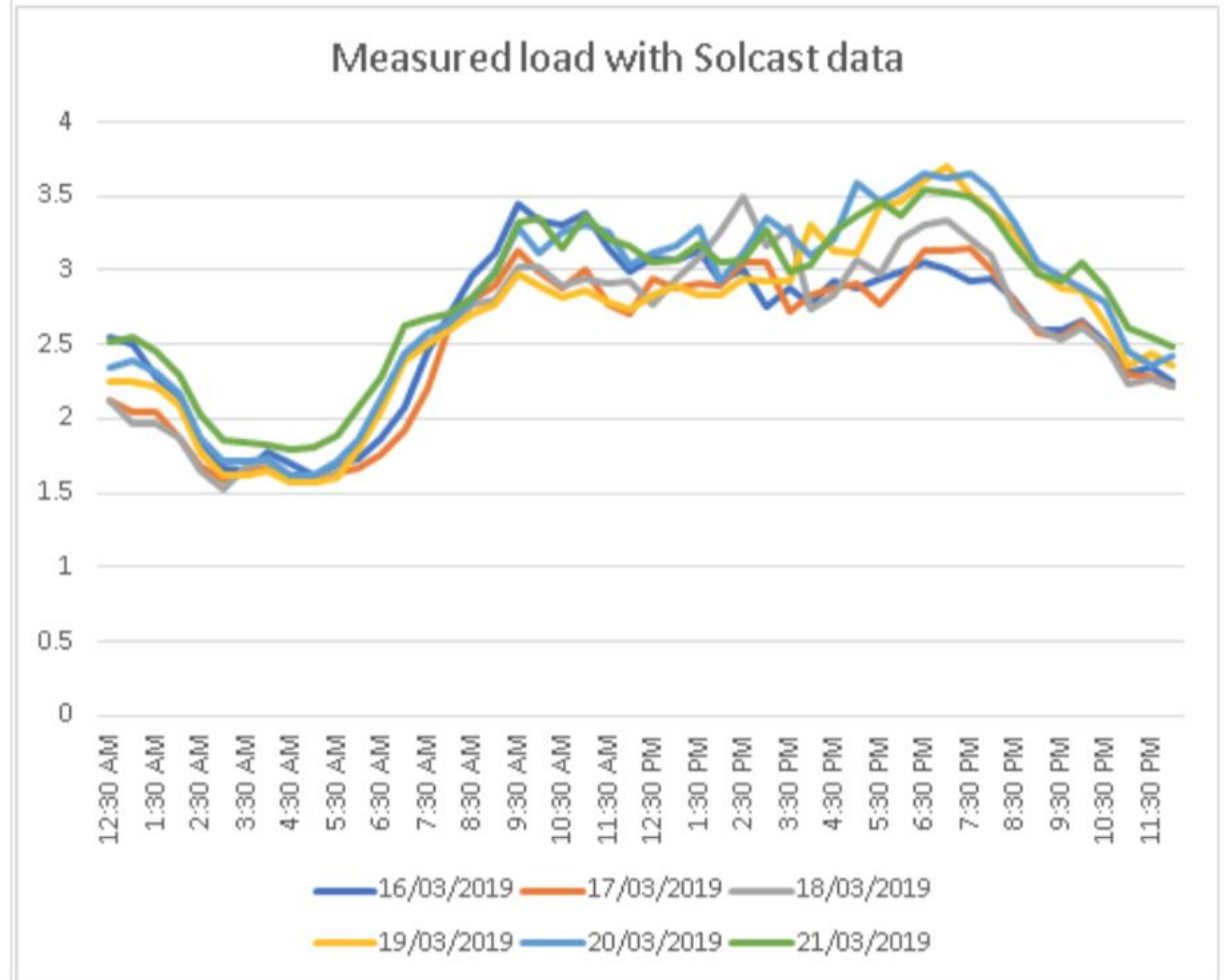
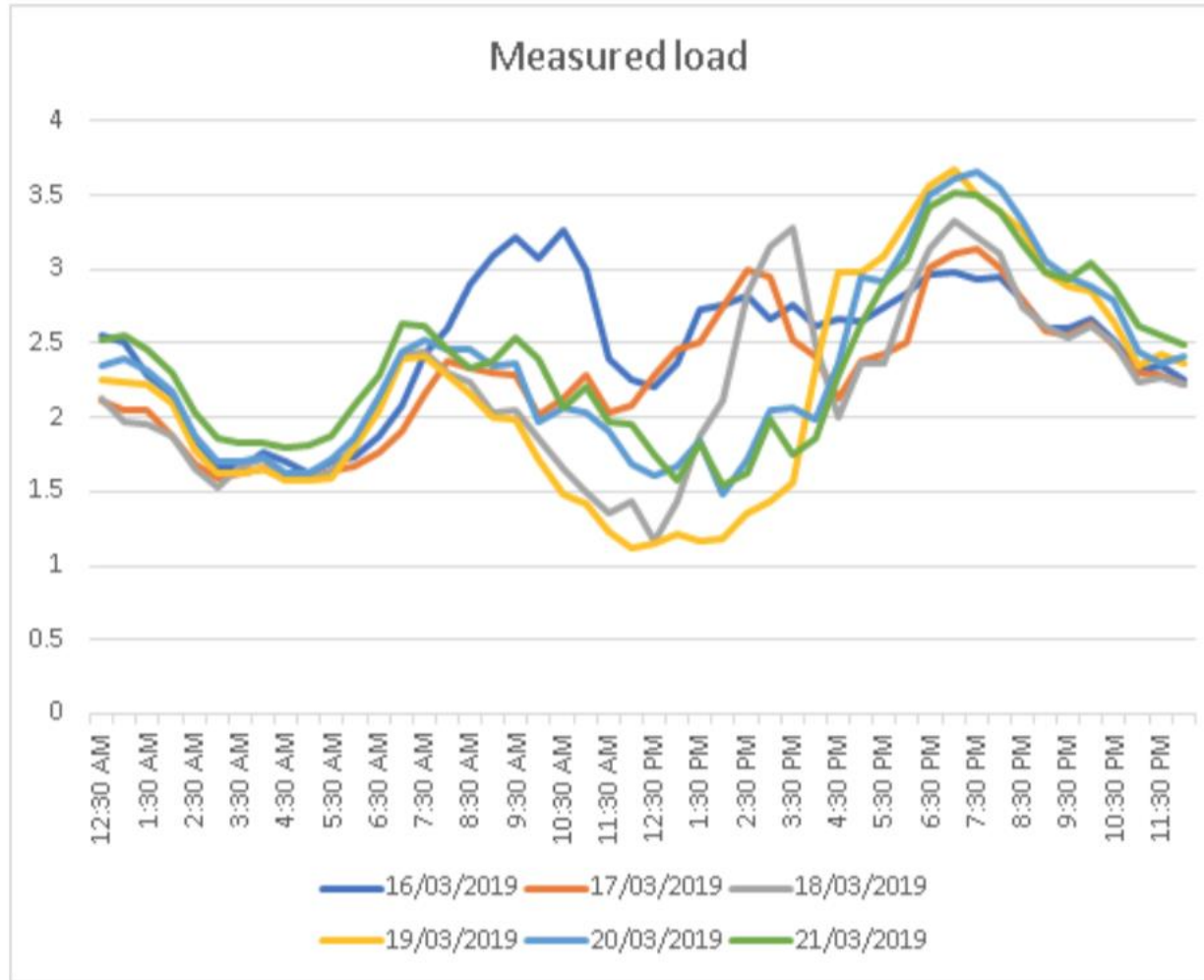
Virtual Power
Plant forecasts

At right, VPP
estimated
actuals against
local PV
actuals



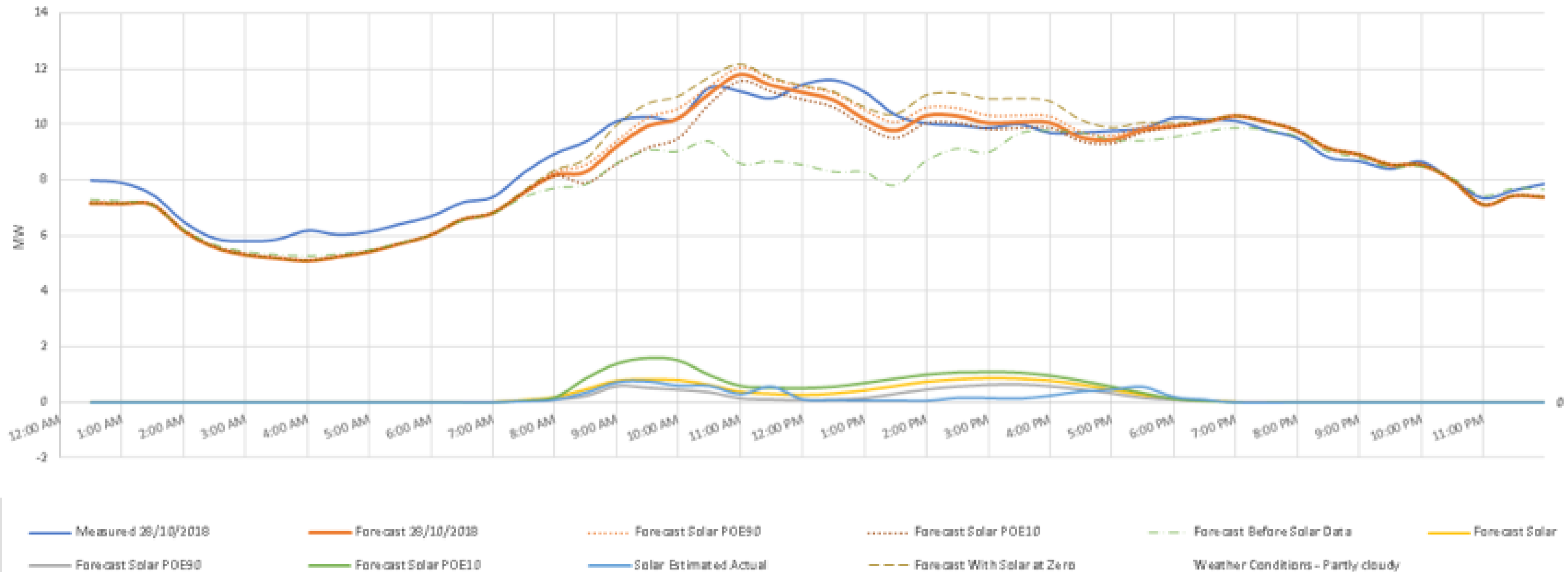


Essential Energy: Zone substation gross demand



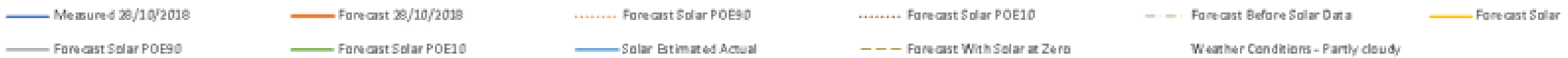
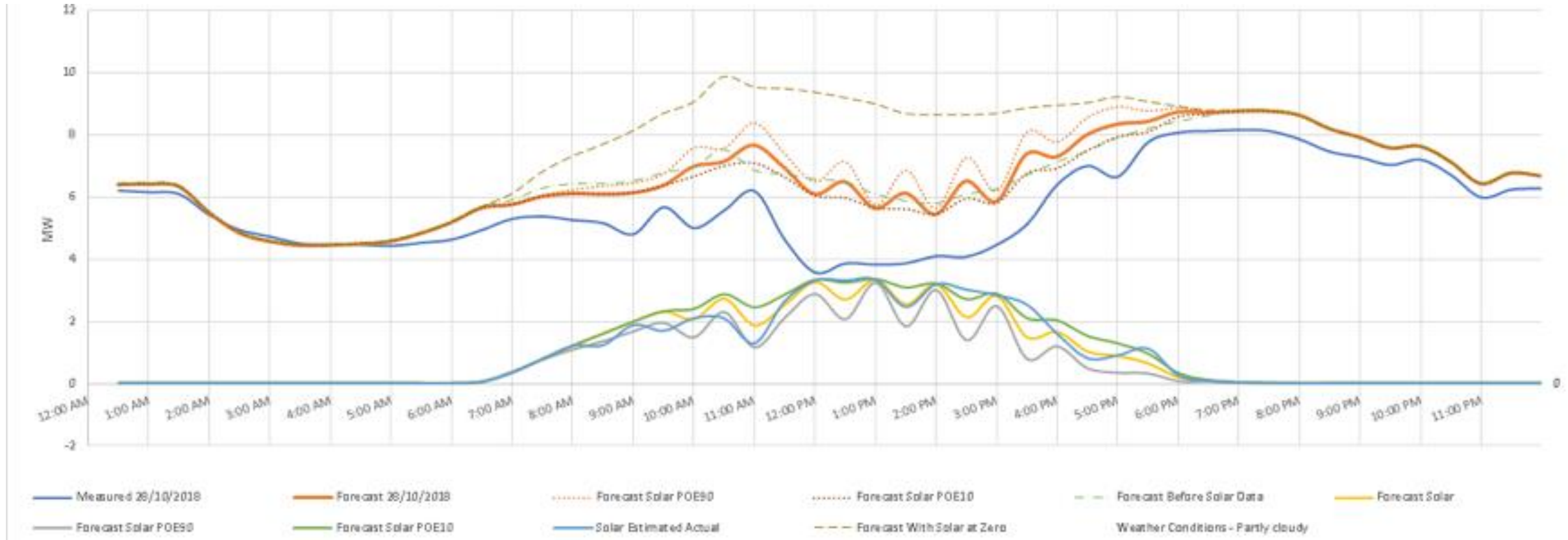


Essential Energy: Zone substation demand forecasting

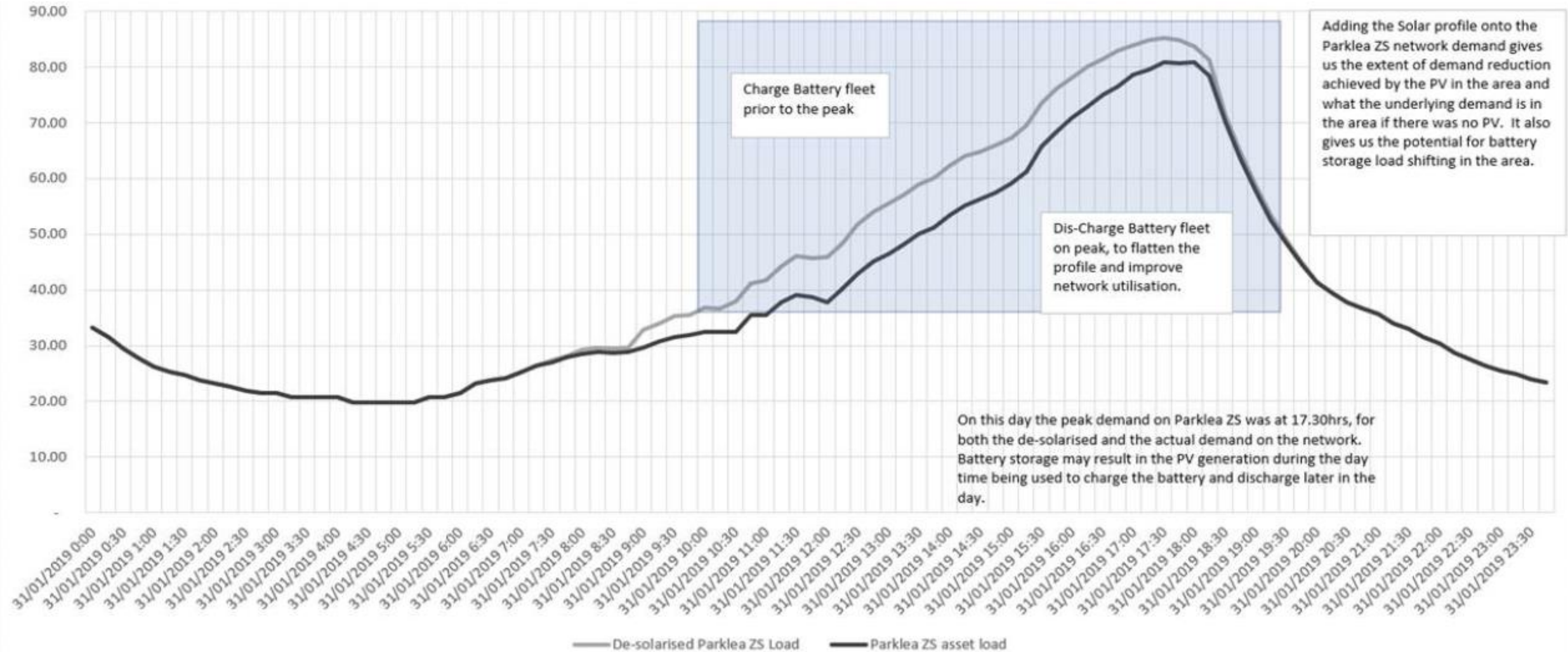




Essential Energy: Zone substation demand forecasting



Endeavour Energy: Peak Demand & DER



Upcoming Technical Paper

“The Value of Solar Data Services for Low Voltage Network Operations”

- Detailing 8 primary use cases for solar data by LV network operators (distribution companies)
 - + approximately 15 secondary use cases
- Released Q3 this year on <http://solcast.com>

Implications for Markets: Distribution System Operators

- High penetration DER motivating new market model(s) for distribution network operations
 - Emerging market models for arbitrage of DER based services via distributed energy markets (e.g. the 'deX')
- DNSP – regulated power quality, voltage limits, responsible for poles & wires; not permitted to 'manage energy'

Implications for Markets: Distribution System Operators

- DNSPs are however active on pilot projects & trials in this space; DSO model testing: **More soon via upcoming papers**

TABLE II
ROLES AND RESPONSIBILITIES OF DSO OUTLINED IN INTERVIEWS

Optimization and operations	Network planning	Market operations
Orchestration of energy storage DER	Minimizing network upgrade costs driven by passive BtM solar	Incentivizing/valuation of services provided by DER assets
Dispatch coordination of active DER assets	Targeted active DER deployment to minimise network augmentation	Creating platforms for DER capacity exchange
Visibility of DER	Hosting capacity (Assessing connection agreements for further installations of BtM solar)	



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