Transport | Energy Infrastructure | Knowledge & Enterprise

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# REVOLVE Model Webinar

## Optimising EVs and Storage for Consumer & Grid


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REVOLVE

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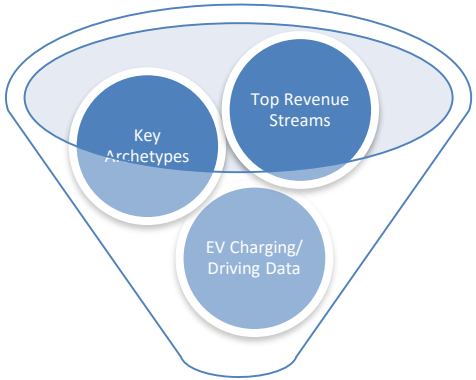
- We'll talk about the REVOLVE model, what its for and its capabilities.
- Show a few results from the model
- Discus potential uses for the model

What is REVOLVE?

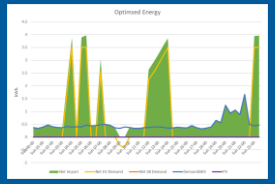
  - A model developed by Cenex used in a number of R&D projects to assess business cases and asset performance.
  - It models energy assets (e.g. EV charging, storage, PV) at half-hourly granularity.
  - It works either with a single site, or a portfolio of distributed assets.
  - REVOLVE is a perfect foresight optimisation model.
  - It optimises based on cost, from energy tariffs and grid services.
  - It can simulate and optimise up to 1,000 EVs.

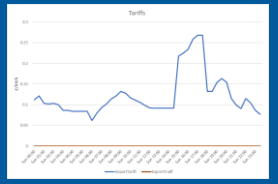
# HOW HAVE WE PREVIOUSLY USED REVOLVE



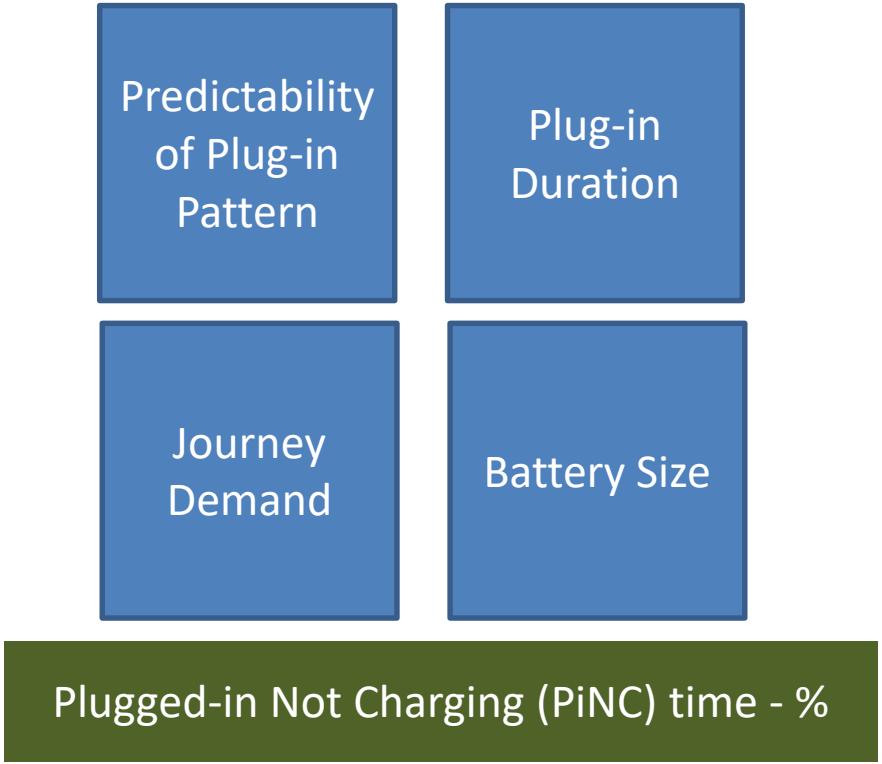

REVOLVE

## Optimised Charging Schedules & Grid Service Participation

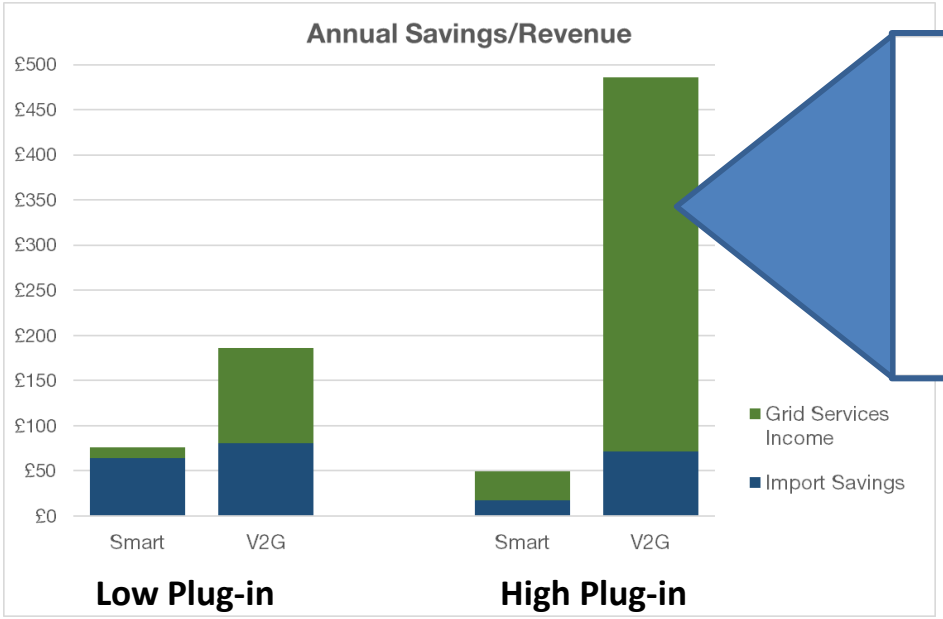


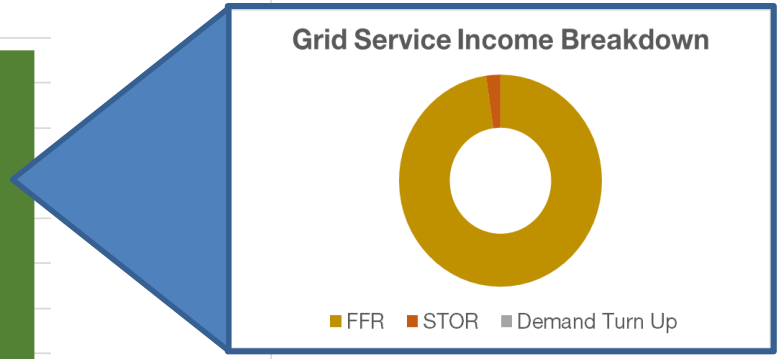



# Determining the Best V2G Customer Archetypes



# AVERAGE SAVINGS FROM A PORTFOLIO OF EVS WITH V2G




| | | |
|---|---|---|
| PiNC time | 24% | 74% |
| Approx. Annual Mileage | 6,500 | 1,750 |

Savings/Revenues are based against a counterfactual of a residential customer on a single rate tariff with dumb charging.
Smart/V2G bars are based on an Economy 7 tariff and access to TSO grid services.

## Technology Covered

| Technology | Inputs/Functionality |
|---|---|
| EVs | Plug in times and driving demands |
| PV | HH generation profile generated from array parameters |
| Wind | HH generation profile generated from wind speeds and power curve |
| Battery Storage | Power, storage capacity, charging/discharging efficiency |
| On-site dispatchable generation | Start costs, running costs. |
| Dumb charging | Power and efficiency |
| Smart Charging | Optimised to minimise cost |
| V2G | Bi-directional charging, optimised |
| Grid constraints | Maximum site import and export power |

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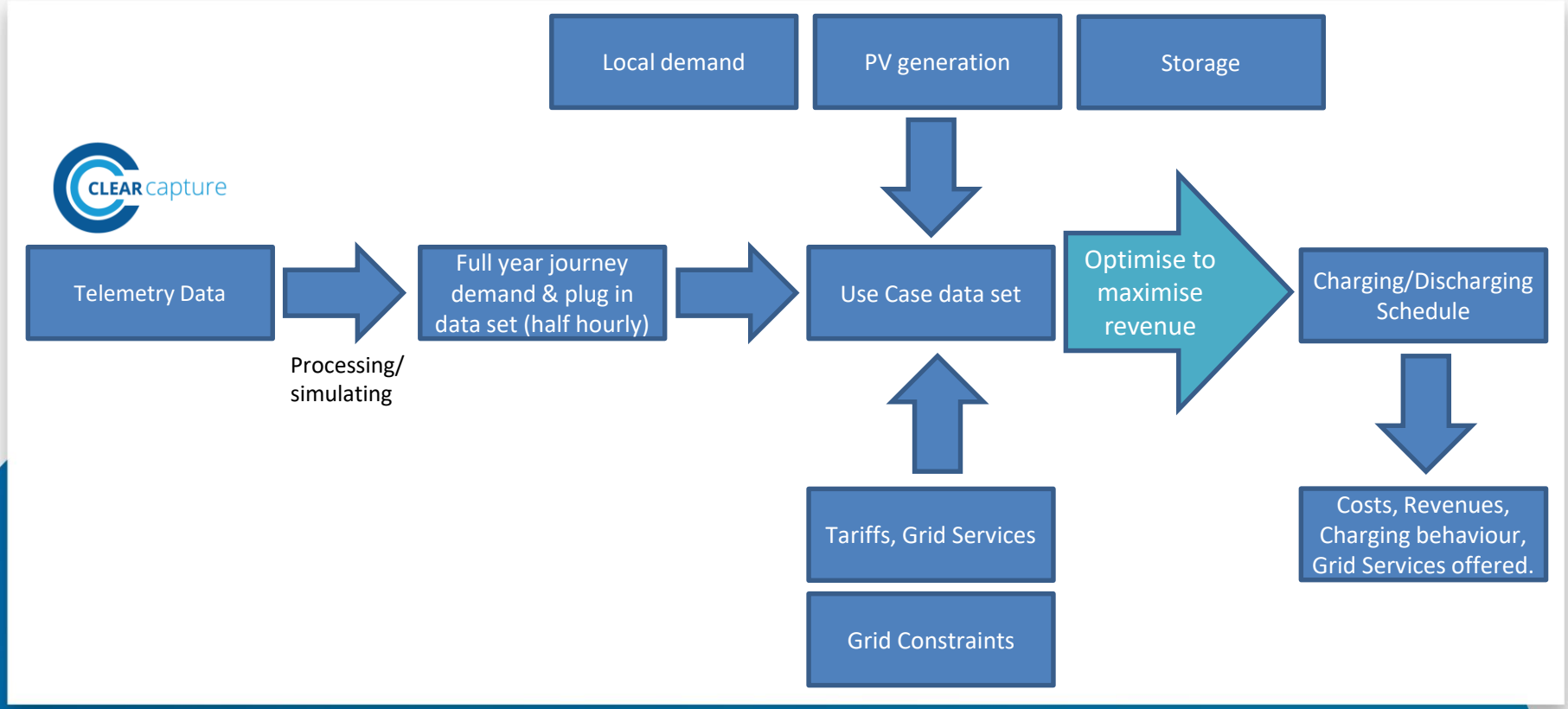
## Markets and Revenue Streams

| Market | Inputs |
|---|---|
| Import Electricity | Half hourly varying power price (£/kWh) |
| Export Electricity | Half hourly varying power price (£/kWh) |
| Generation Tariff | Fixed revenue per kWh of generation |
| Grid Services (Reserve and response type products) | Availability price (£/MW/h), Utilisation price (£/MWh), minimum call length (h), utilisation percentage. |

# HOW IT WORKS

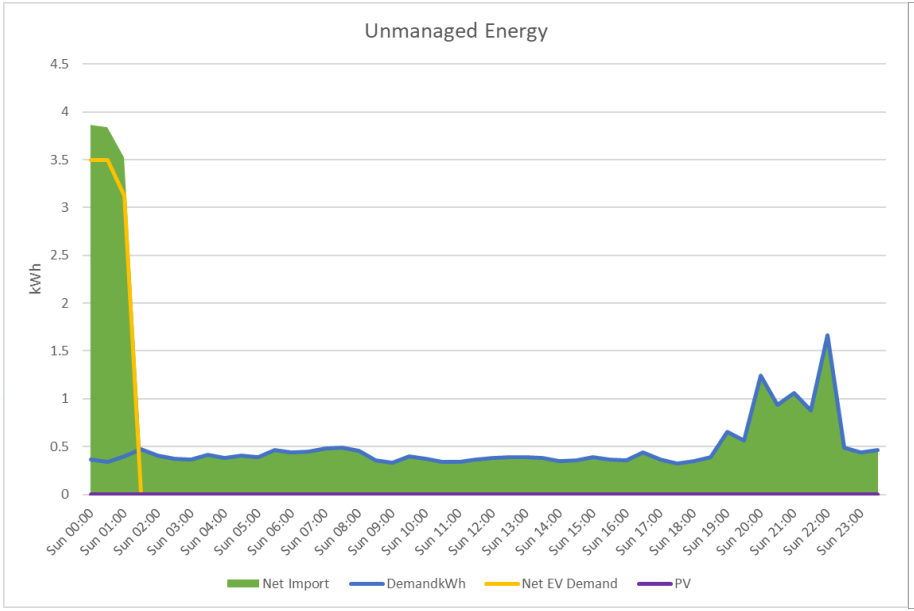

Local demand
PV generation
Storage
CLEAR capture
Telemetry Data
Processing/ simulating
Full year journey demand & plug in data set (half hourly)
Use Case data set
Optimise to maximise revenue
Charging/Discharging Schedule
Tariffs, Grid Services
Grid Constraints
Costs, Revenues, Charging behaviour, Grid Services offered.

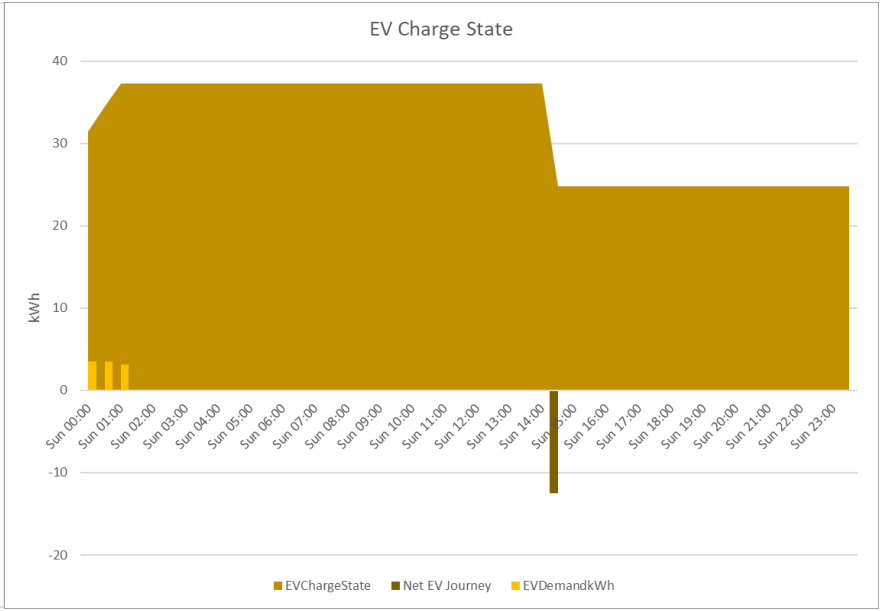
# Detailed Simulation Results

Example EV charging schedules from a portfolio of 60 modelled

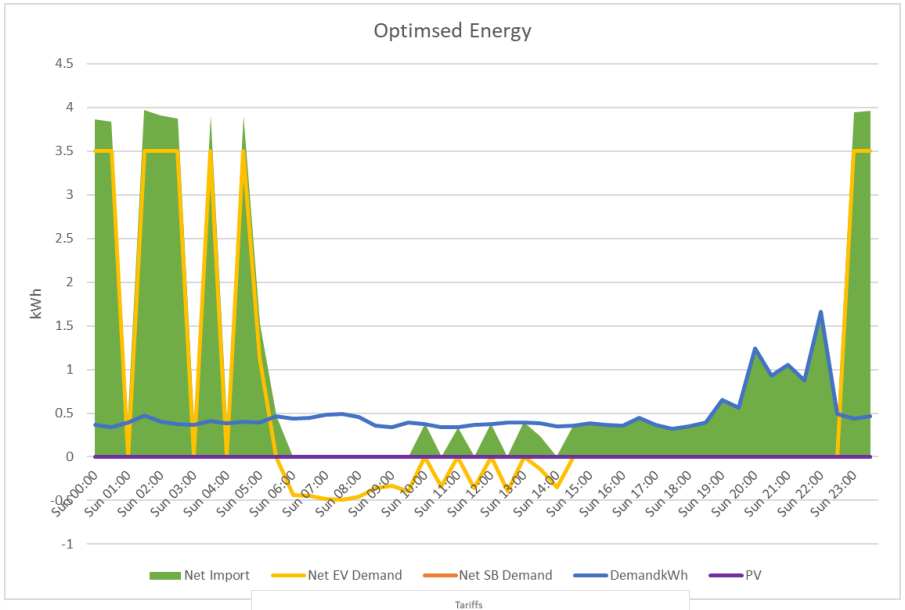
## DETAILED OUTPUTS – UNMANAGED (DUMB CHARGING)

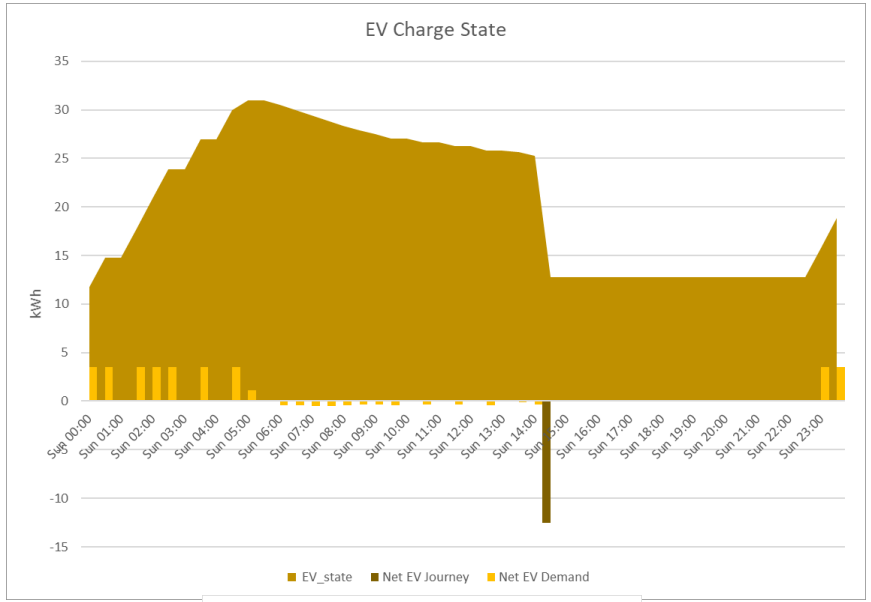
# Full day simulation for Sunday in week 16 (single EV displayed)

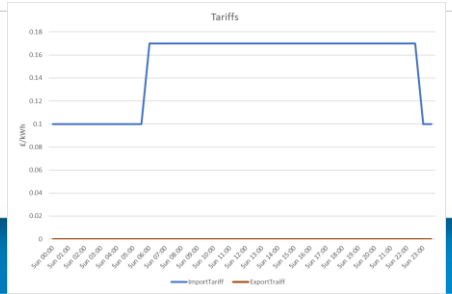


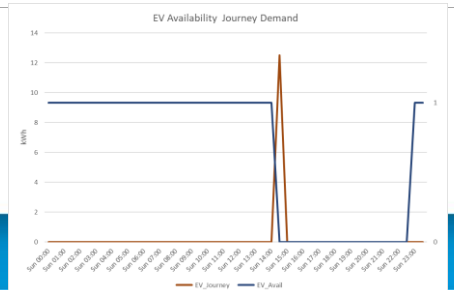



# DETAILED OUTPUTS – OPTIMISED (V2G)

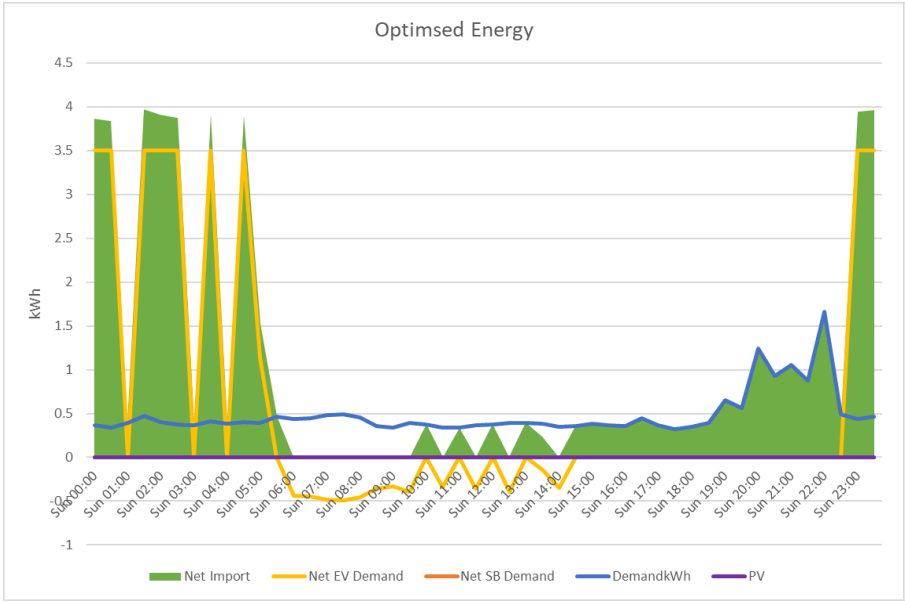


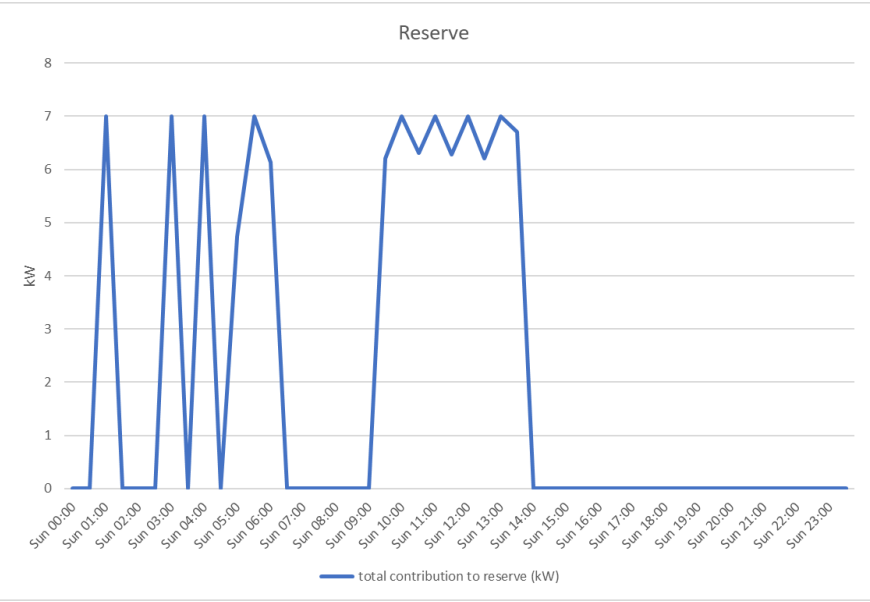



# DETAILED OUTPUTS – GRID SERVICES OFFERED



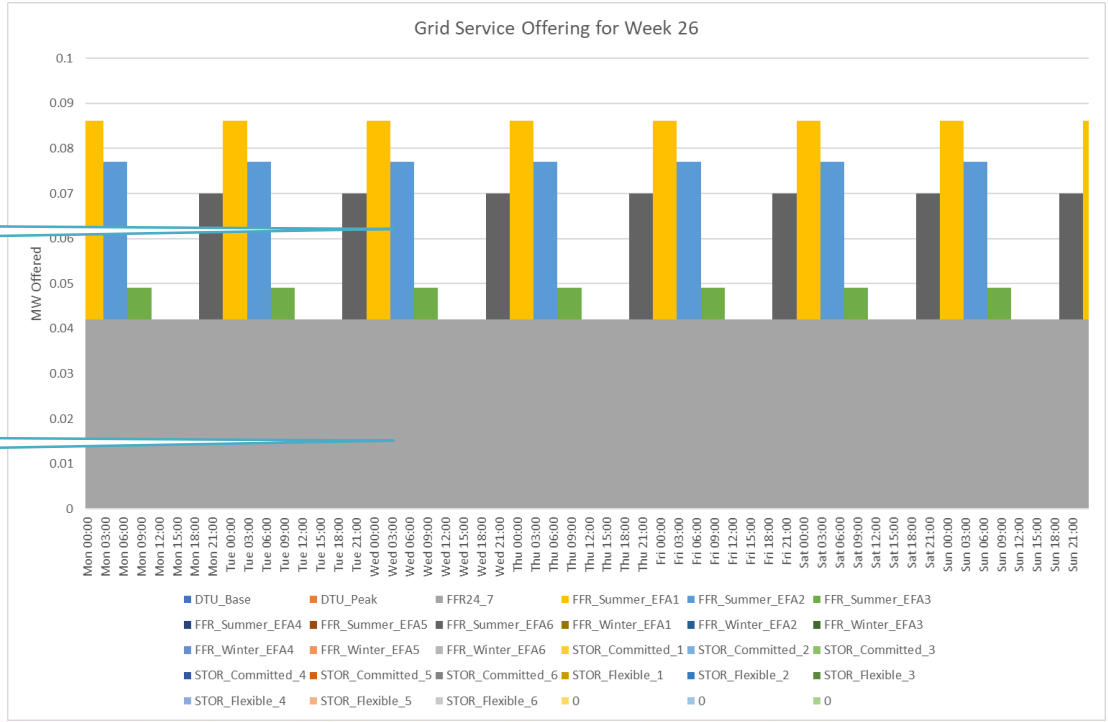



## DETAILED OUTPUTS – TOTAL GRID SERVICES OFFERED

# Grid services offered from entire portfolio

FFR EFA

FFR 24/7



# Broader Applications for REVOLVE

## How REVOLVE might be able to help you

## BROADER APPLICATIONS

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It can provide insights such as:

- Average annual income from grid services for a V2G charge point within a larger V2G portfolio.
- Annual savings due to increased PV self-consumption for a PV + EV combination.
- Energy costs for a site with renewables, a grid constraint and a battery.
- Savings from smart charging with any given half hourly time of use tariff.
- Additional energy from renewables consumed due to an onsite battery.
- The operation and revenue for a stationary battery operating in balancing services.
- How much value Smart charging can capture versus V2G for different customer archetypes

Potential Projects:

  - V2G business case
  - Sizing PV and storage against a local demand
  - Business case for storage batteries co-located with renewables
  - Mitigation against network connection constraints

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# Thank you for listening

# Questions..


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