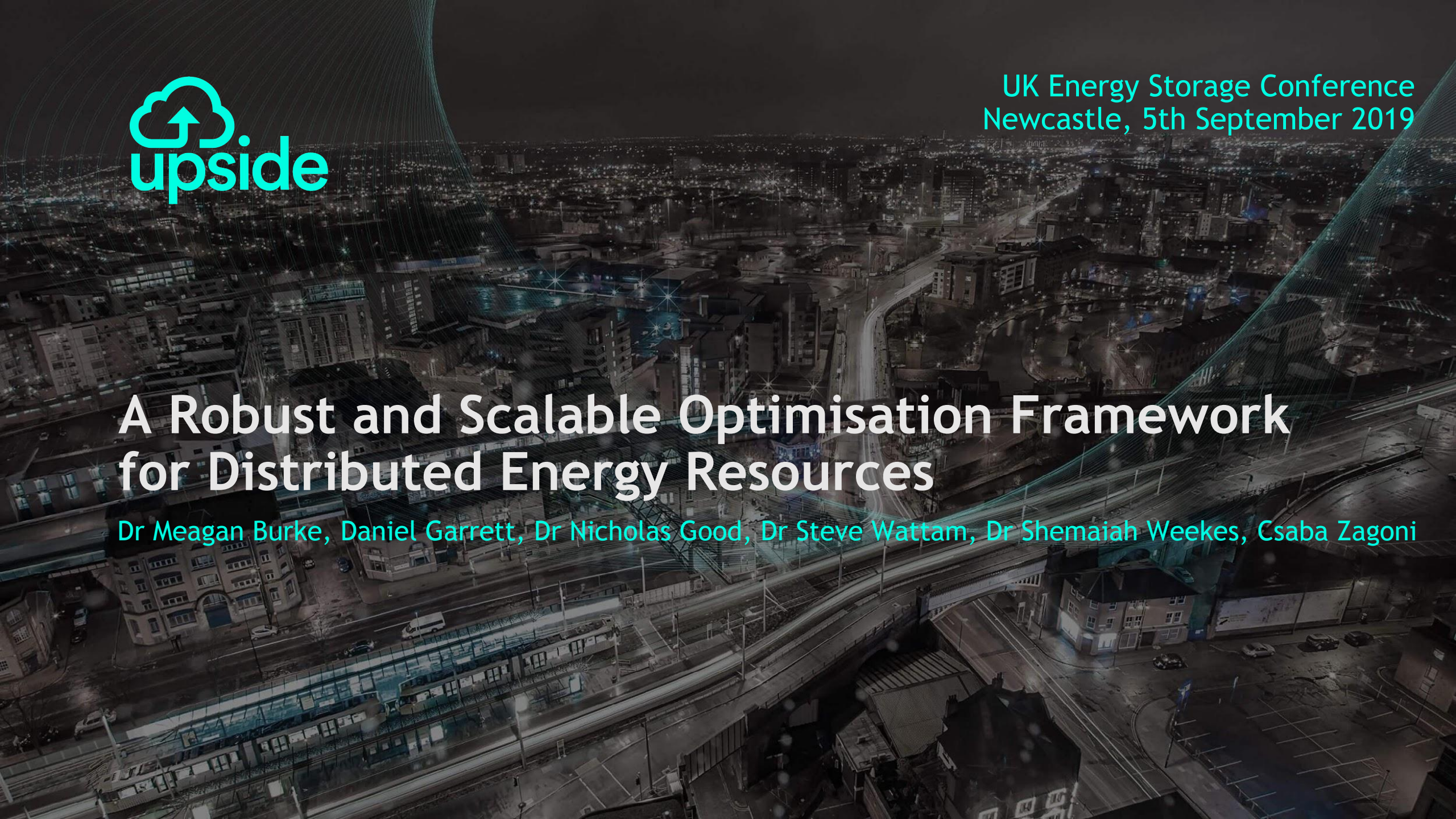

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UK Energy Storage Conference
Newcastle, 5th September 2019

A Robust and Scalable Optimisation Framework for Distributed Energy Resources

Dr Meagan Burke, Daniel Garrett, Dr Nicholas Good, Dr Steve Wattam, Dr Shemaiah Weekes, Csaba Zagoni

About Upside

Award-winning cloud platform, using advanced algorithms and artificial intelligence to manage and monetise very large portfolios of diversified and distributed energy assets.

Major Customers	VERTIV. EDF
Major Partners	MACQUARIE BYD
Financial Backers	Legal & General, SYSTEMIQ, BULLDOG Innovation Group, MODERN ENERGY

- Headquartered in Manchester
- 35 person team
- Software engineers and data scientists

Ashden Award winner 2018 · Shell Springboard · 2016 Global Cleantech 100 ONE TO WATCH · Rushlight Awards · EDF ENERGY bluelab · businessGreen TECHNOLOGY AWARDS 2016 · edie LIVE

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Outline

Optimisation Framework

- The challenge and opportunity
- The optimisation framework
- Capabilities and applications

Research Application Example

- Outline of the HAVEN project
- Optimisation framework applied to a V2G-enabled domestic energy system
- Dispatch example and results

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The Challenge

Energy system is evolving and presents new challenges for System Operators and Suppliers.

Increased variable and distributed generation present system balancing challenges

Increased electrification of heat and transport impact time and magnitude of demand

Pressures to reduce carbon intensity and consumer cost

Solutions required which can utilise flexible assets in an optimal way to meet these needs.

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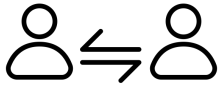
The Opportunity

Optimal asset control and dispatch can open up new revenue streams and business models, and support increased deployment of renewables.

Direct revenue streams (e.g. energy trading, reduction in UoS charges)

Grid services (e.g. balancing services, frequency response, constraint management)



Local energy markets and increased value from distributed renewables

Requires intelligent systems that optimise multiple assets against competing revenue streams, subject to constraints.

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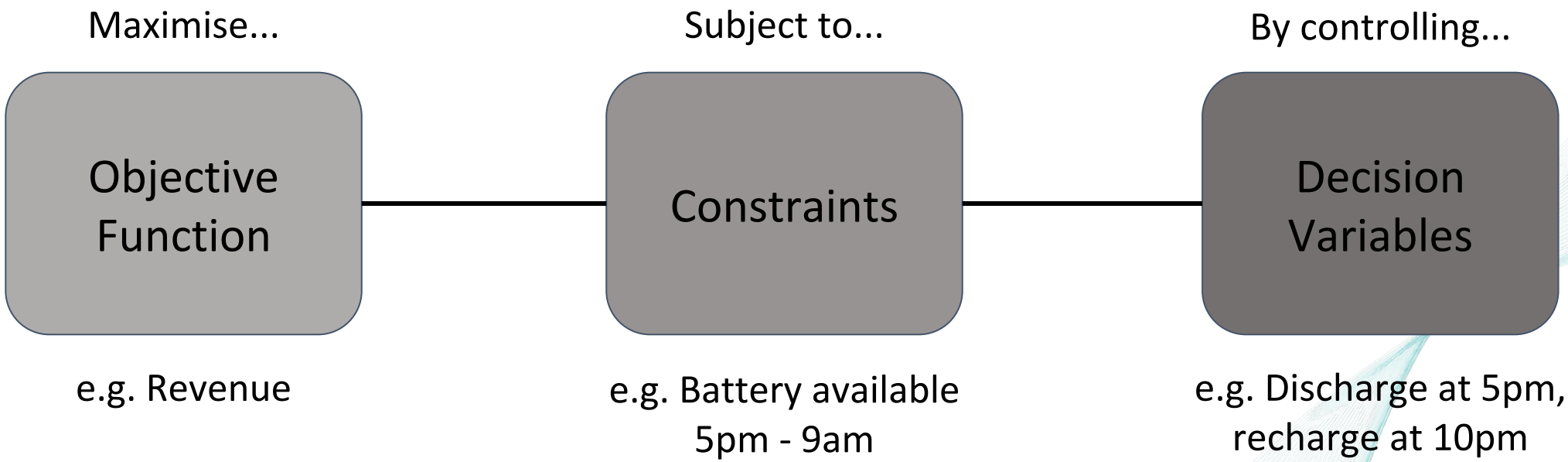
Mixed Integer Linear Program



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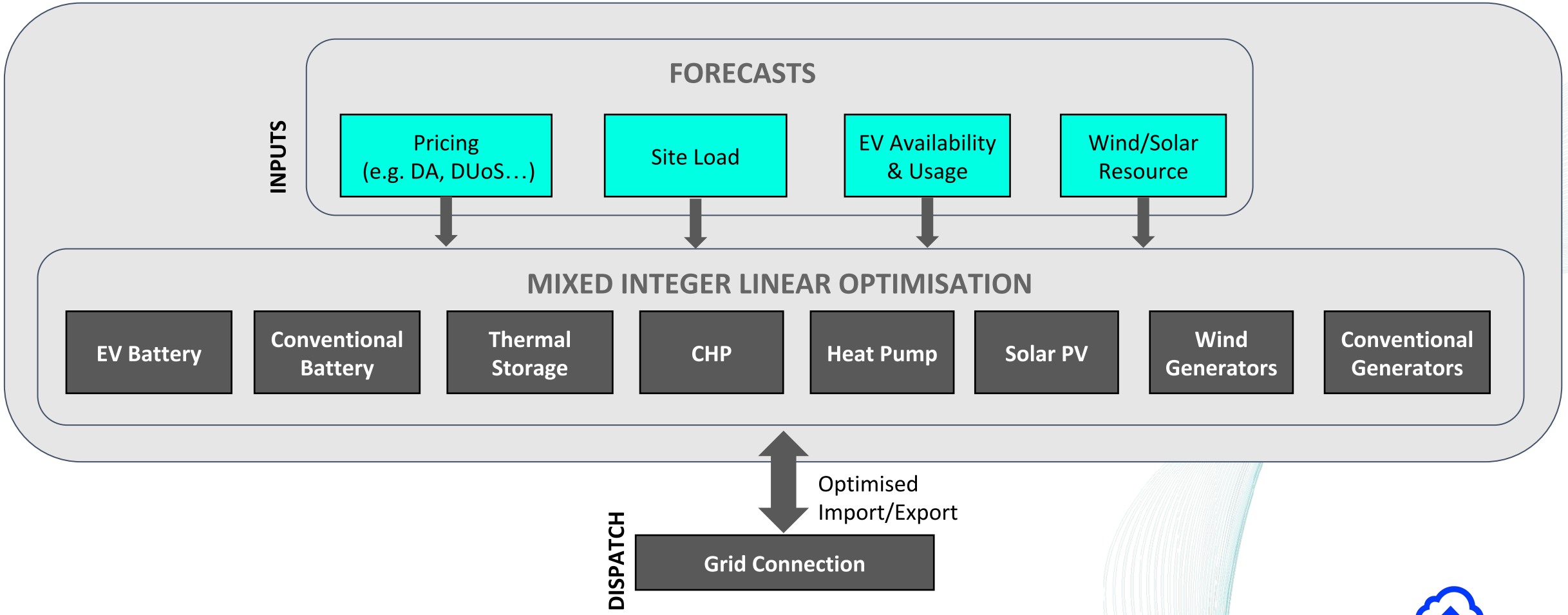
Upside Optimisation Framework (snap)



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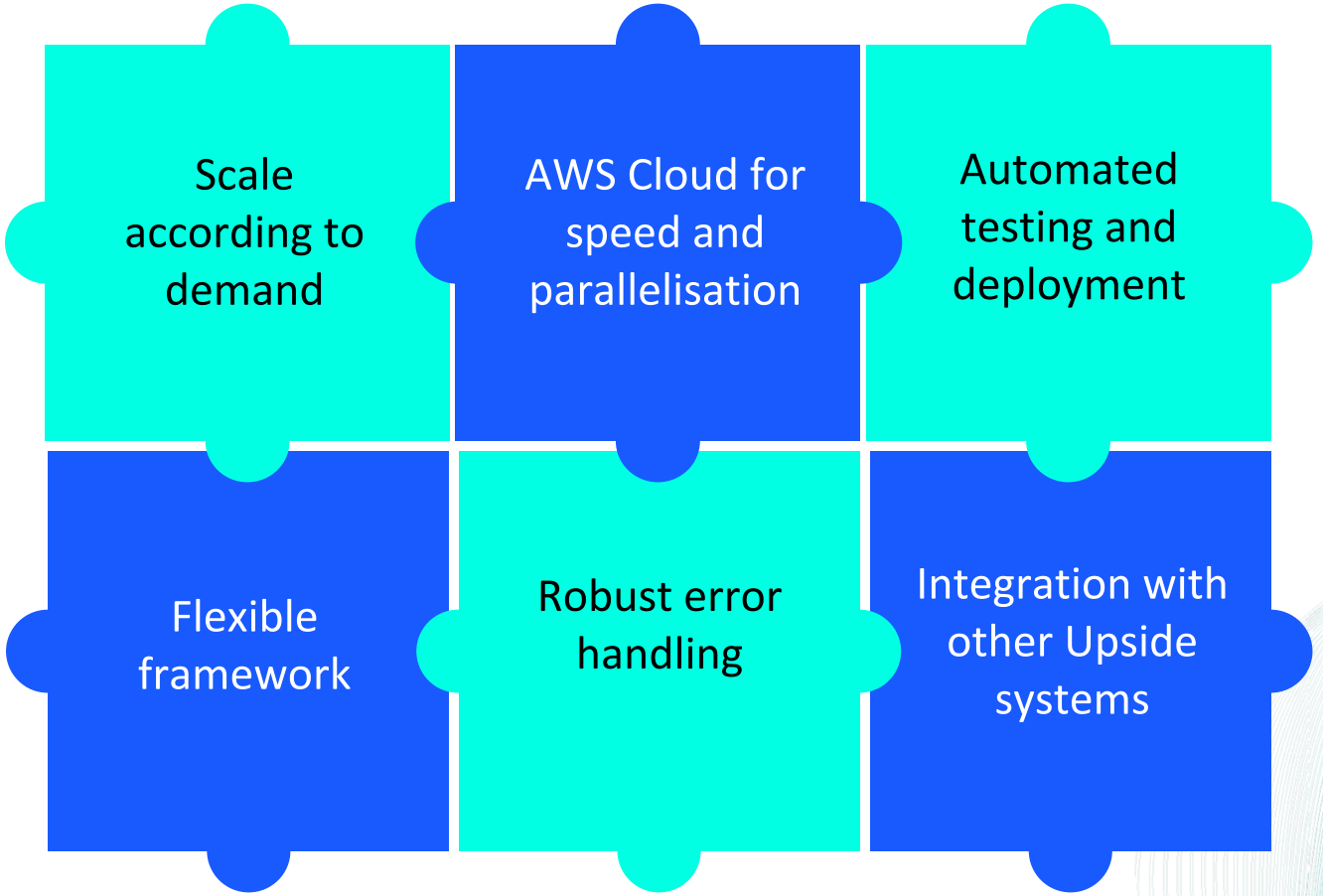
Capabilities

Production-grade framework deployed in commercial and research projects.



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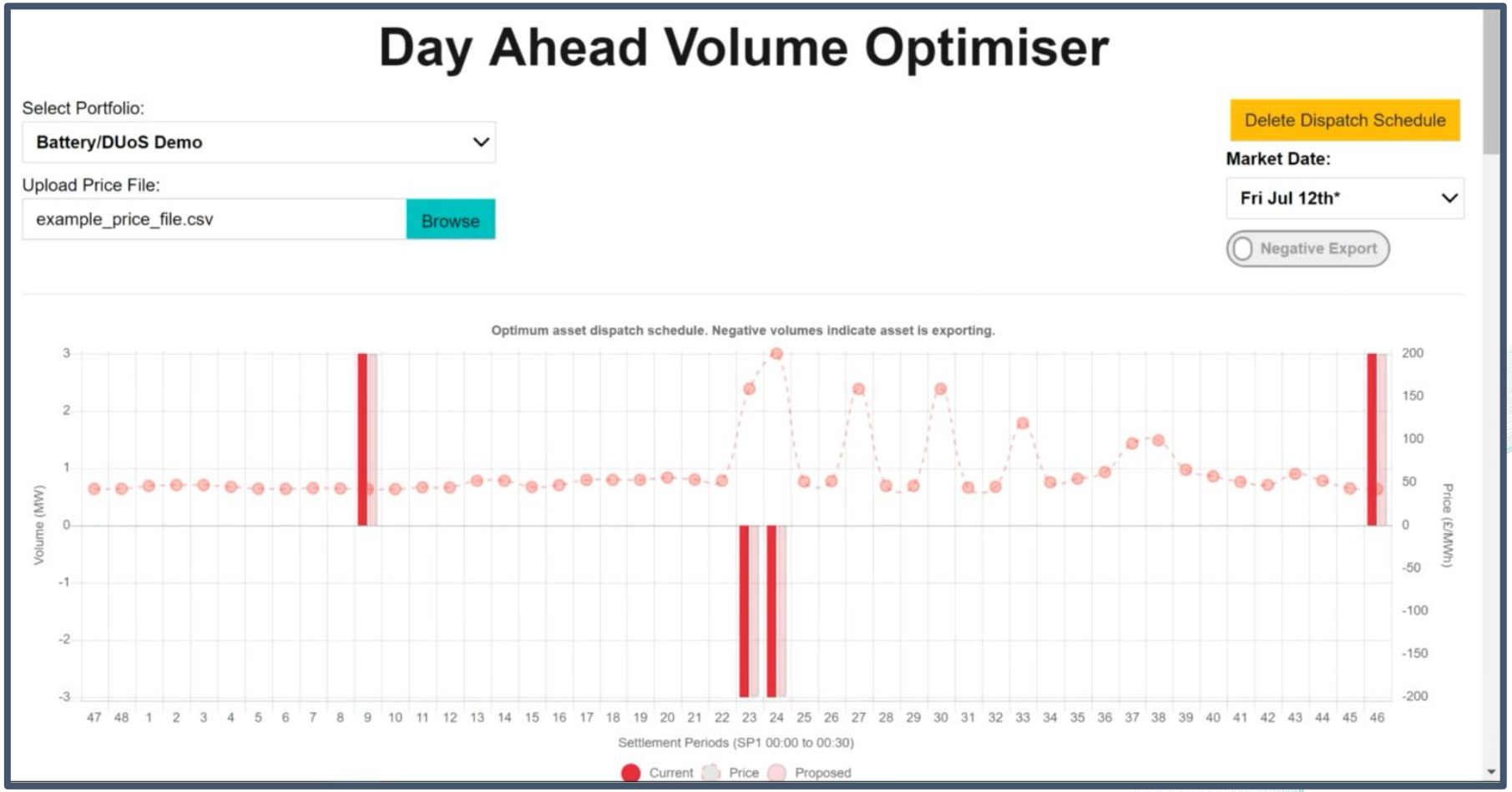
Applications
Commercial & Research

Applications - Commercial



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Applications - Research

HAVEN (Home as A Virtual Energy Network)

One-year project examined the value V2G/V2H enabled EVs could provide in the context of a domestic home energy network of storage and generation assets.

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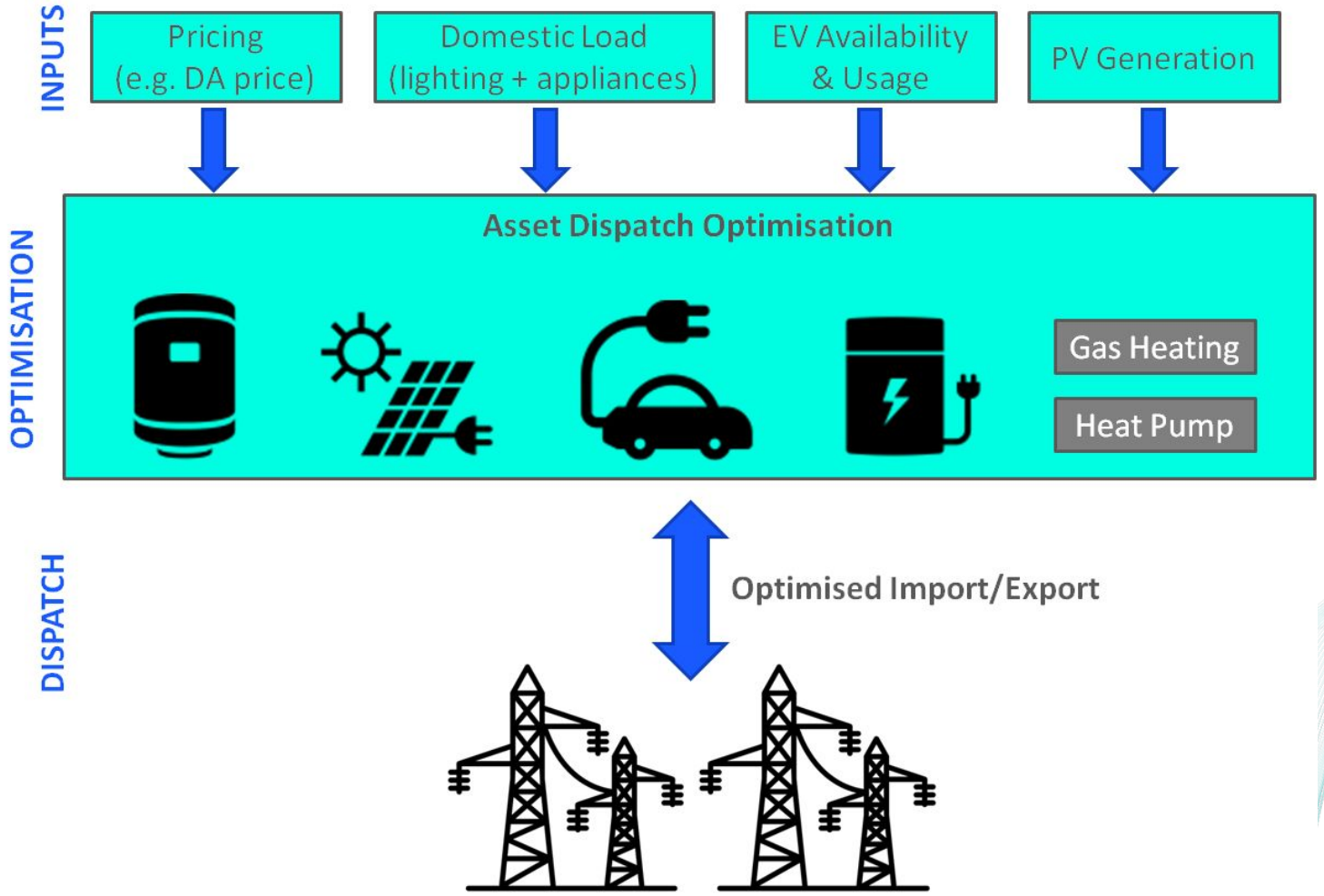
Framework Applied to HAVEN



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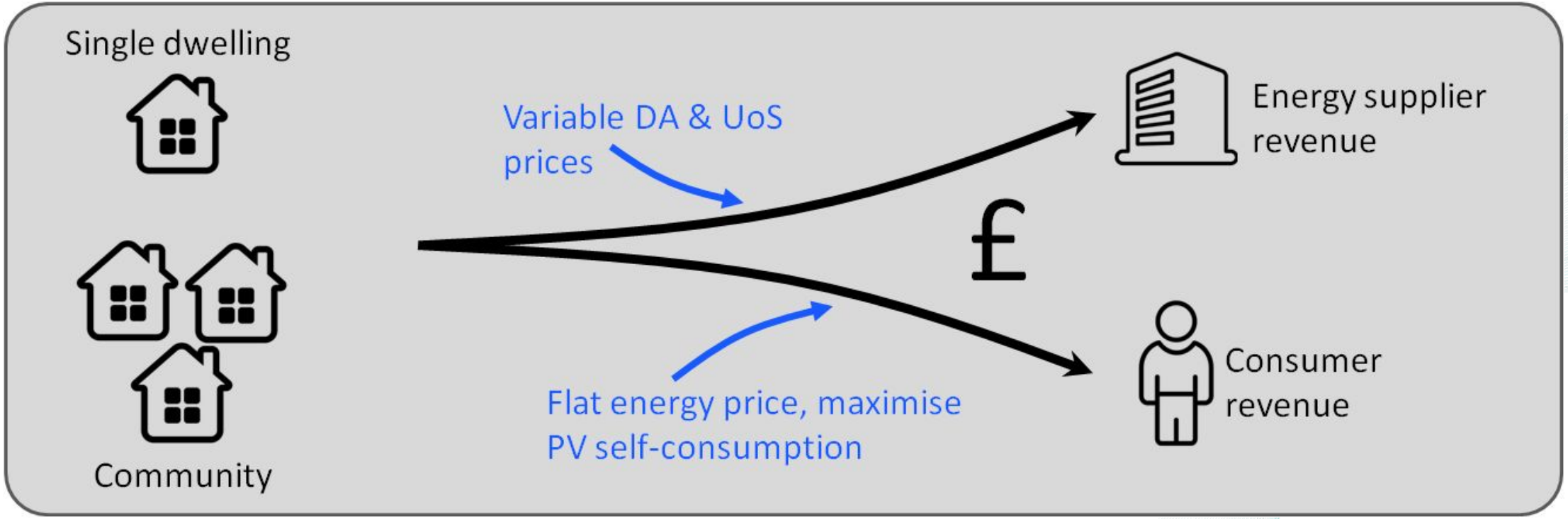
Supplier or Consumer Revenue



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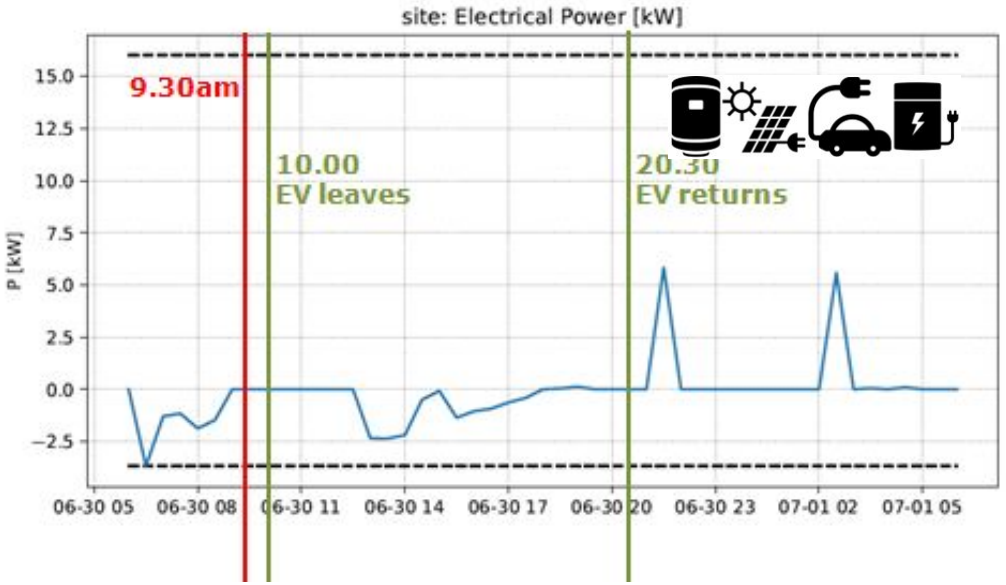
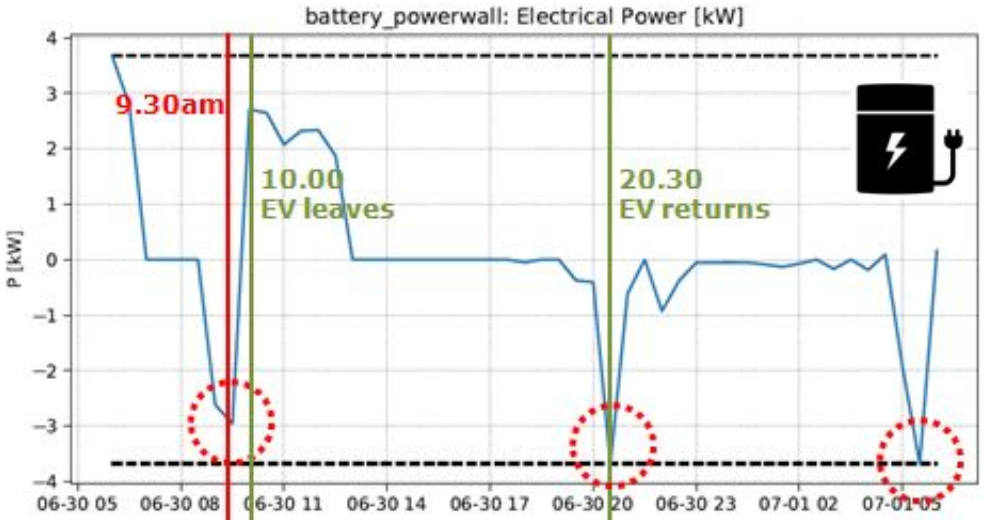
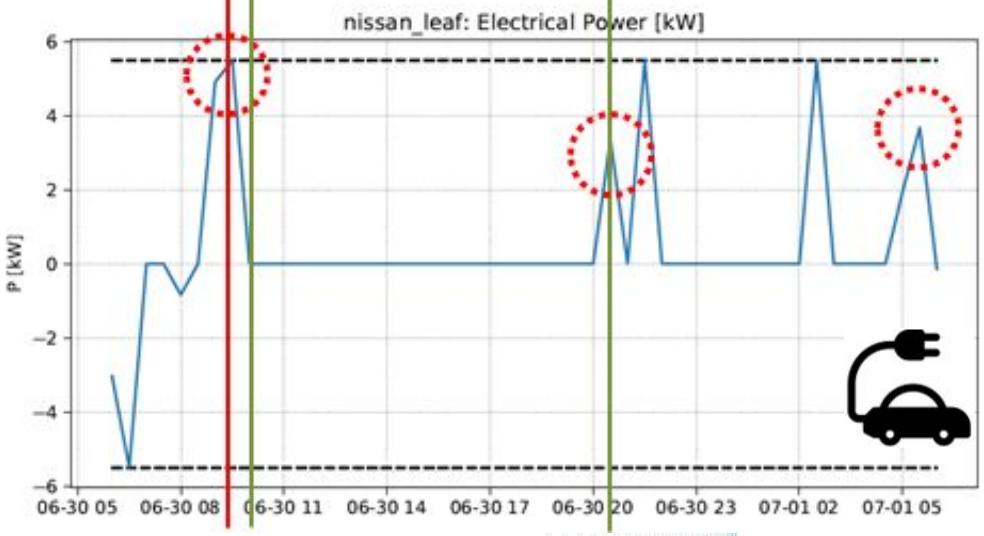
Example Dispatch - 24hr period







Charge shifting between assets

Charging overnight to reduce energy and UoS costs.

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Financial Results - per customer

Energy supplier revenue per annum (DA + UoS)

All assets

£500

V2G/V2H only

£100

Consumer revenue per annum (self-consumption of solar PV)

All assets

£300

V2G/V2H only

£70

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Summary

- Upside have developed a robust and scalable optimisation framework for distributed energy resources.
- The framework is currently used in commercial applications and large-scale research projects.
- We welcome research collaborations and expressions of interest as we grow our team.

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