Energy Superhub Oxford

Powering a zero carbon Oxford

Tim Rose, Programme Manager Energy Superhub Oxford

Pivot Power

UK Research and Innovation

pivot power EDF renewables

Oxford City Council

University of Oxford

Habitat Energy

Invinity Energy Systems

Kensa Contracting

Climate Emergency Declared 2019
Oxford Net Zero by 2040
Zero Emissions Zone 2022

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IUK 'Prospering from the Energy Revolution' (PFER)

UK Research and Innovation

INDUSTRIAL STRATEGY

Innovate UK

PFER – Smart Local Energy Systems

Demonstrators x3

Detailed Design Projects x 20+

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Local Energy Oxfordshire

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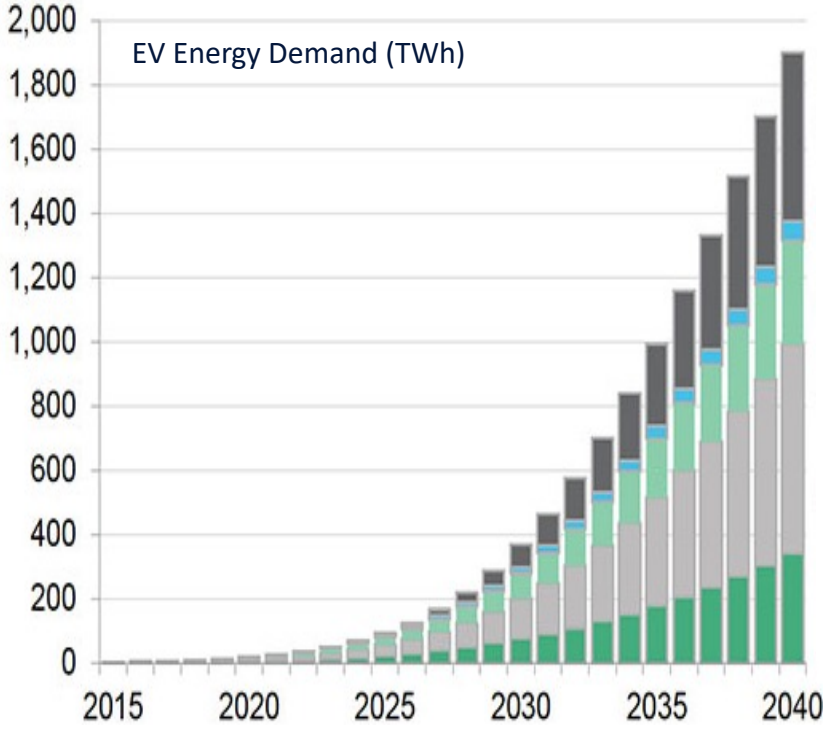
ReFLEX ORKNEY

Grid Stability

Grid Stability

EV Infrastructure



Source: BNEF

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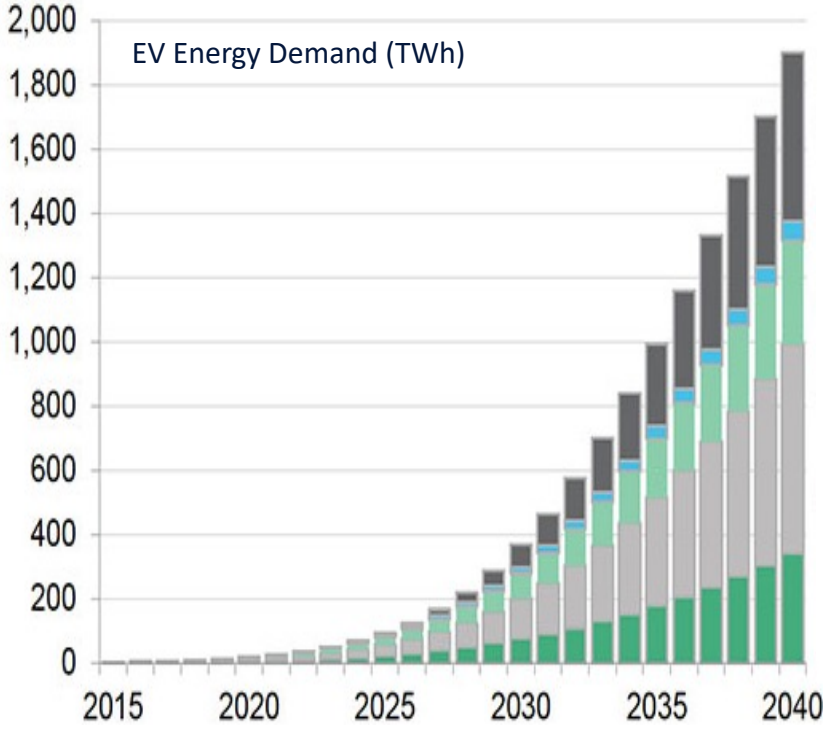
Grid Stability

EV Infrastructure



Source: BNEF

Inefficient Heating

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What is Energy Superhub Oxford?

Energy Superhub Oxford (ESO) is a world-first project pioneering an integrated approach to decarbonising power, transport and heat to accelerate Oxford's journey to zero carbon.

It will showcase a powerful network of:

- hybrid battery energy storage
- rapid electric vehicle charging
- low carbon heating, and
- smart energy management

providing a model for cities around the world to cut carbon emissions and improve air quality.

Target CO_2 Savings - 10,000 tonnes yr 1, 25,000 tonnes p/a by 2032

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OXFORD
CITY
COUNCIL


pivot power
EDF renewables


UK Research
and Innovation

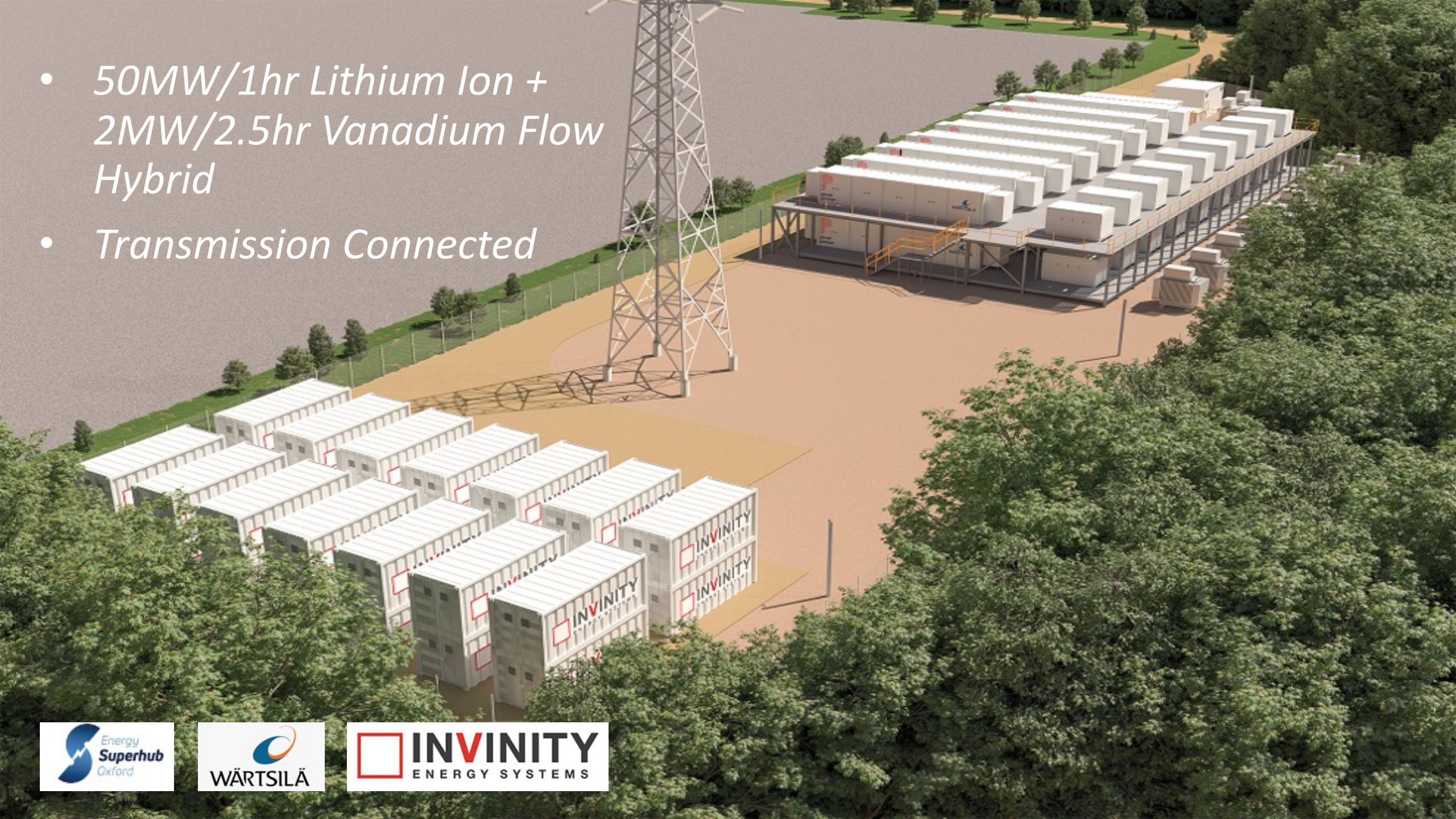

UNIVERSITY OF
OXFORD


Kensa Contracting
A KENSA GROUP COMPANY


HABITAT
ENERGY


INVINITY
ENERGY SYSTEMS


Energy
Superhub
Oxford



- *50MW/1hr Lithium Ion + 2MW/2.5hr Vanadium Flow Hybrid*
- *Transmission Connected*

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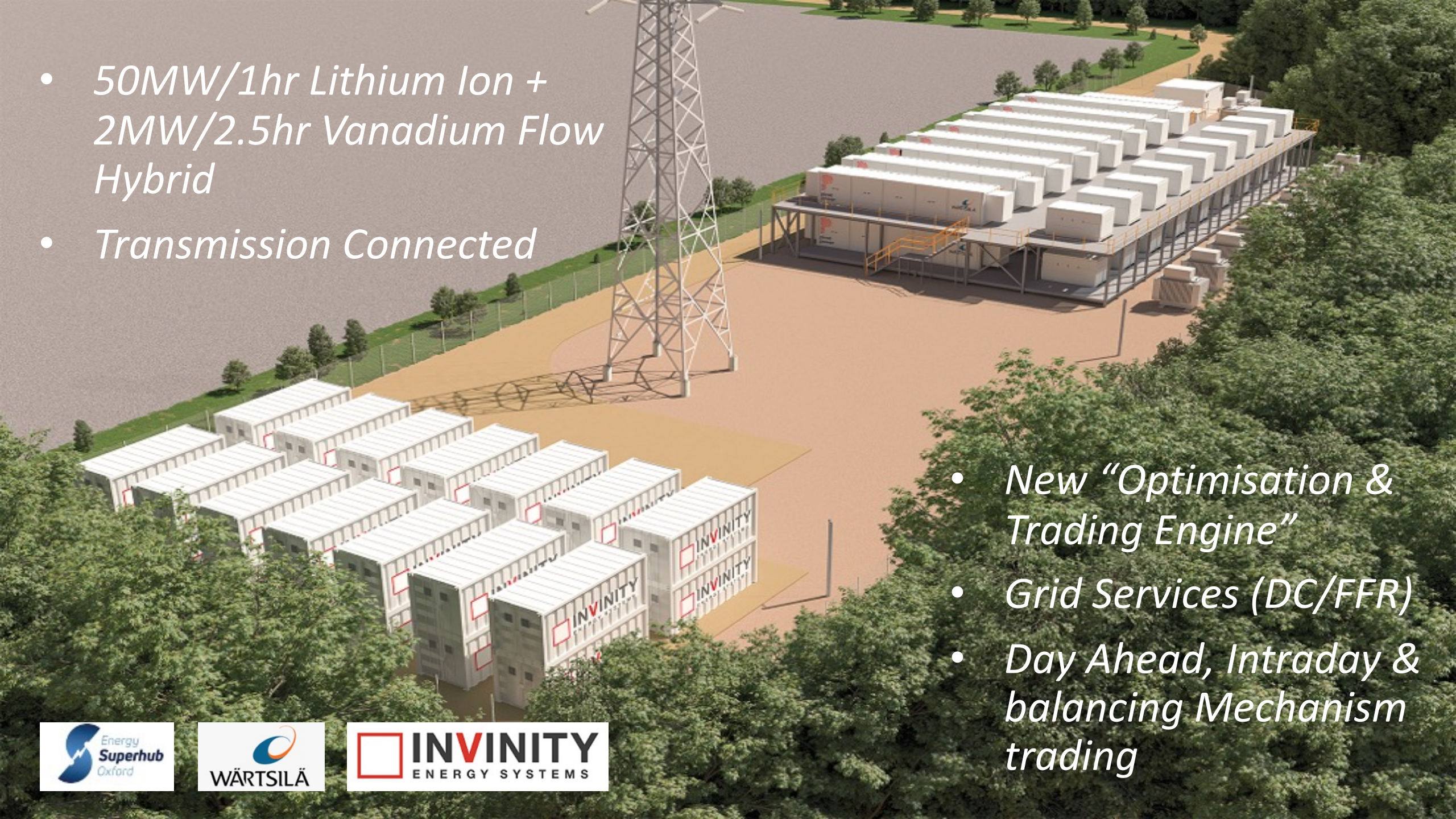
WÄRTSILÄ

INVINITY ENERGY SYSTEMS



- *50MW/1hr Lithium Ion + 2MW/2.5hr Vanadium Flow Hybrid*
- *Transmission Connected*

- *New "Optimisation & Trading Engine"*
- *Grid Services (DC/FFR)*
- *Day Ahead, Intraday & balancing Mechanism trading*

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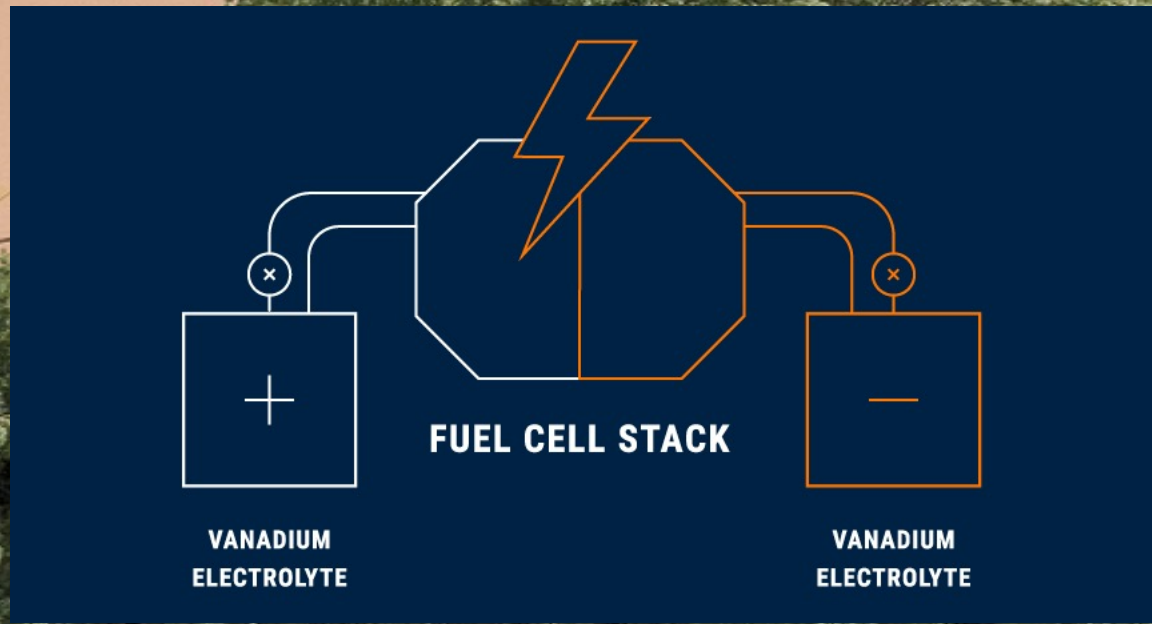
WÄRTSILÄ

INVINITY ENERGY SYSTEMS

- *50MW/1hr Lithium Ion + 2MW/2.5hr Vanadium Flow Hybrid*
- *Transmission Connected*



Flow Battery Layout

- 27 x 20ft Battery Units, stacked on two levels
- Total of 162 Battery Modules
- Inverters packaged in 1 x 20ft Container

- 6 VS3 Modules per 20’ unit
- 50kW Nominal Power
- 210 kWh Nominal Capacity
- 78kW Overdrive Power
- 11,000 L of V^{+} Electrolyte

Lithium Ion Battery

Commissioned and Live

1st Transmission connected

1st Tertiary connection

7000+ Samsung modules

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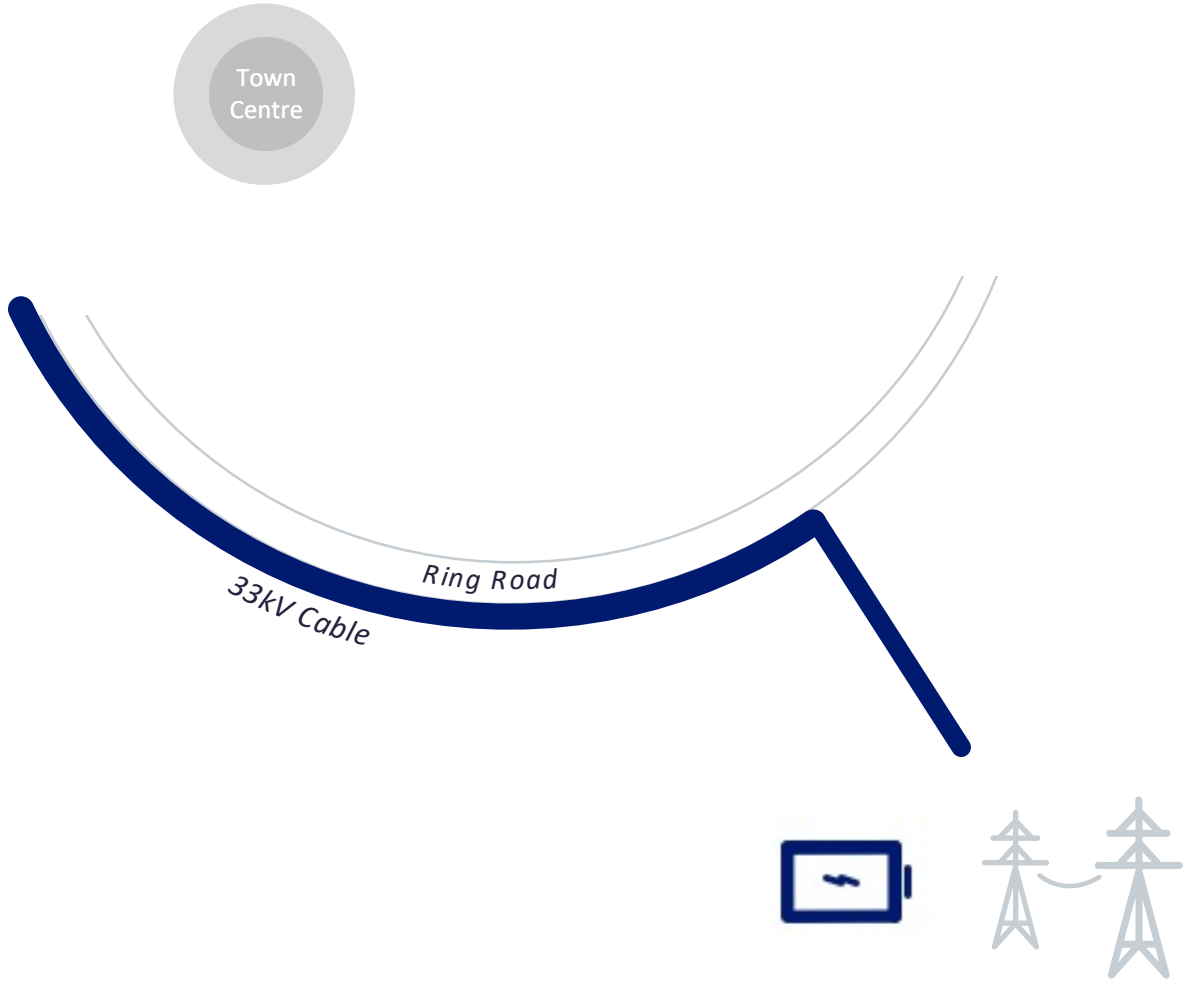
EV Network



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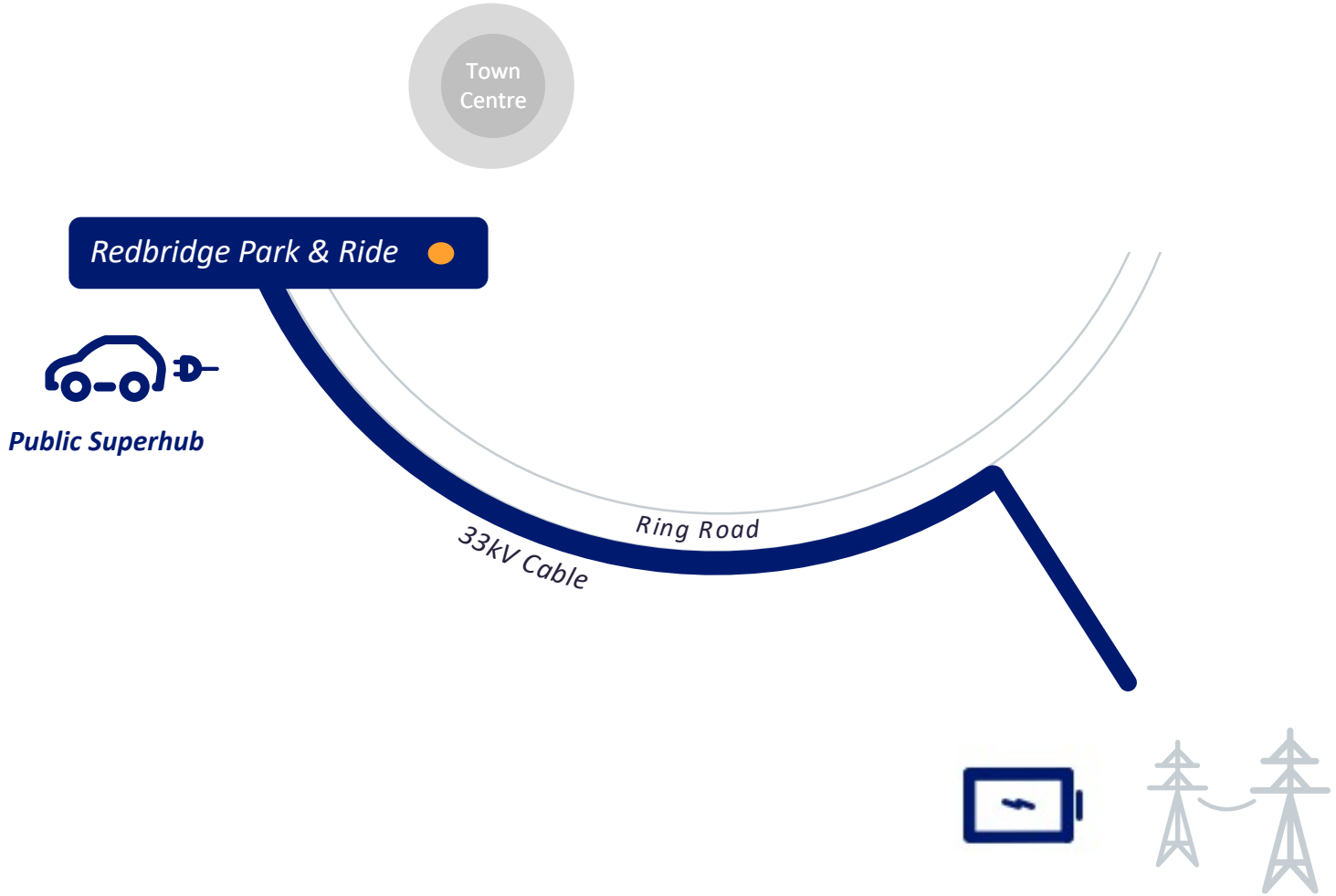
EV Network



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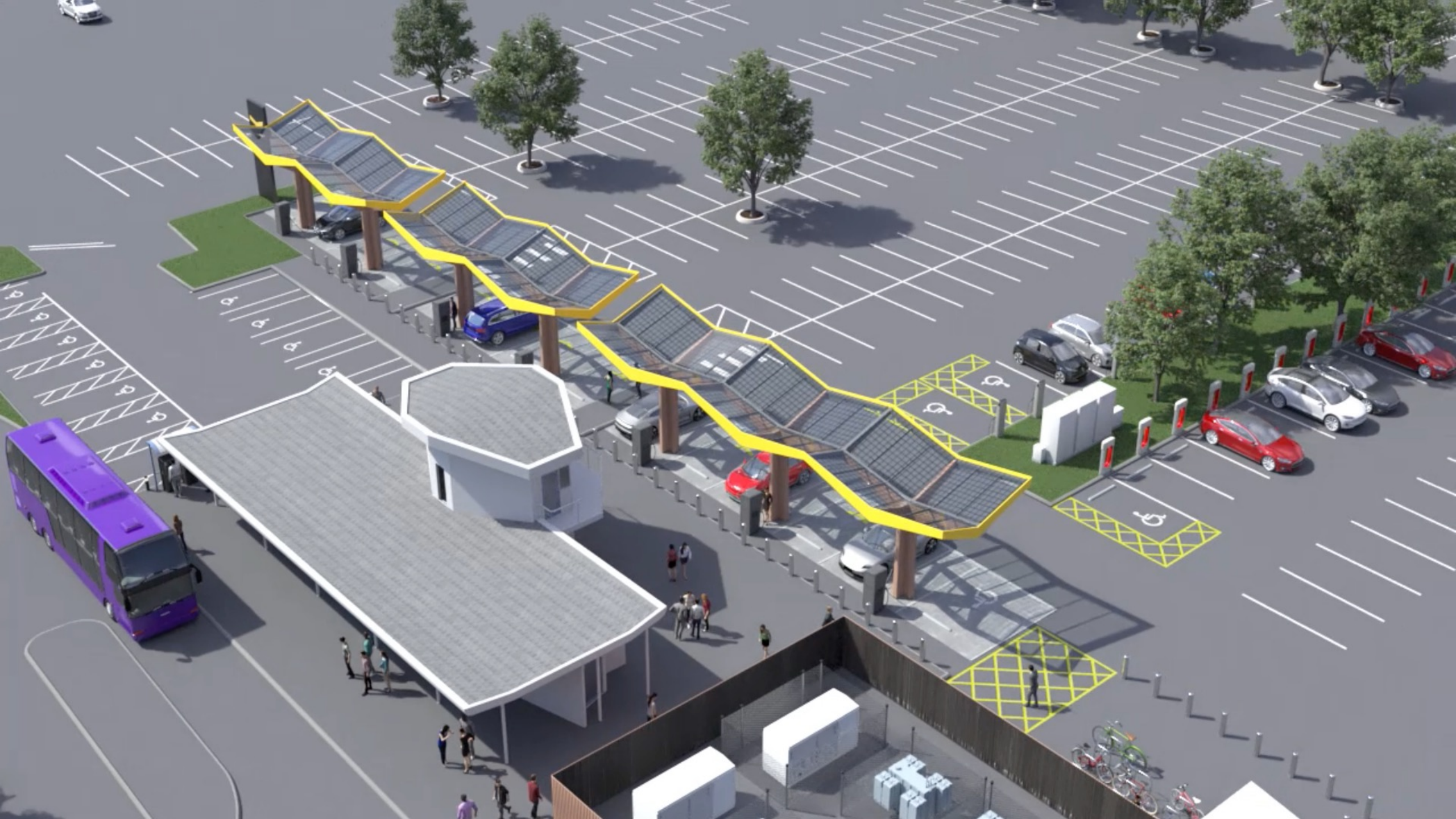
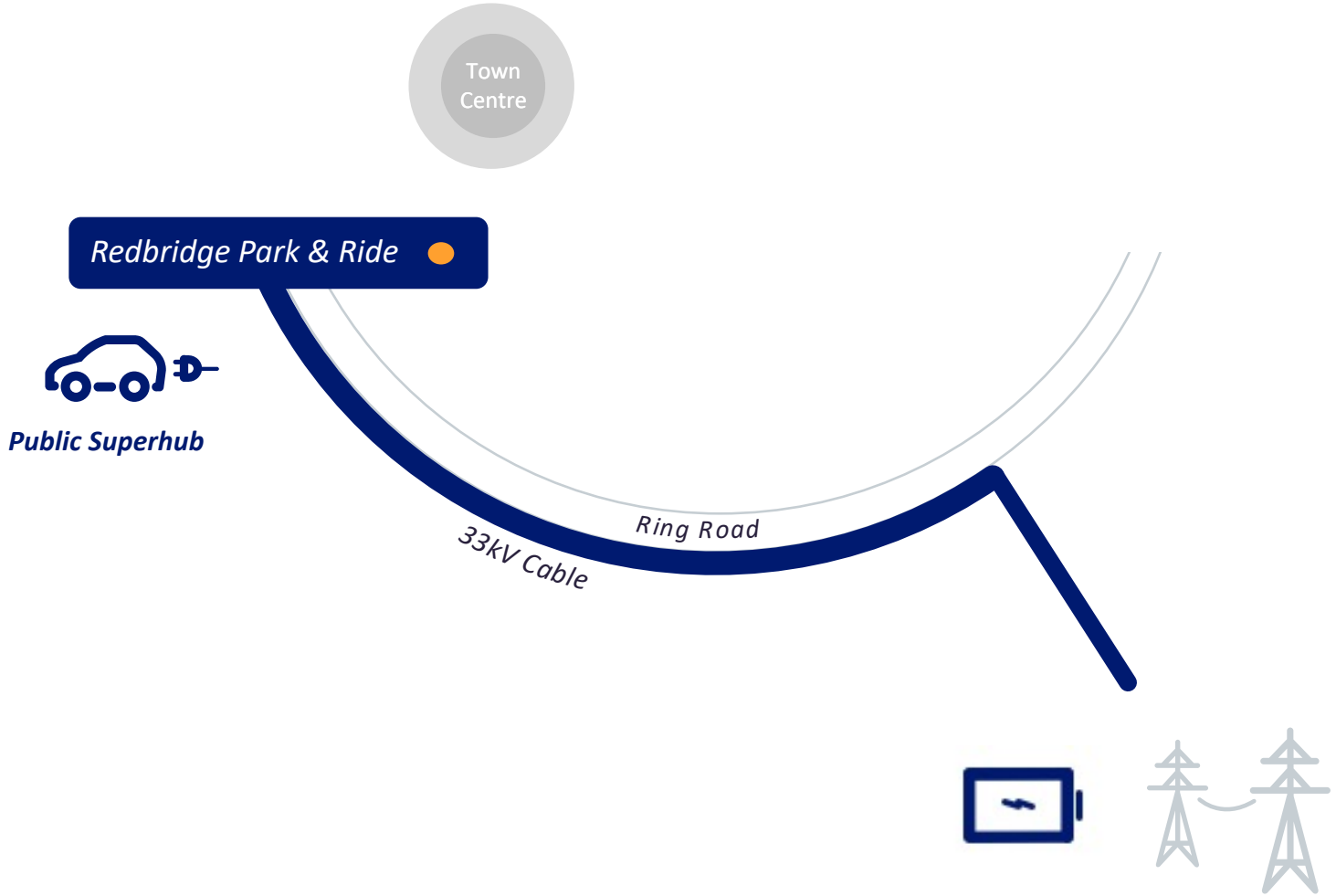


EV Network



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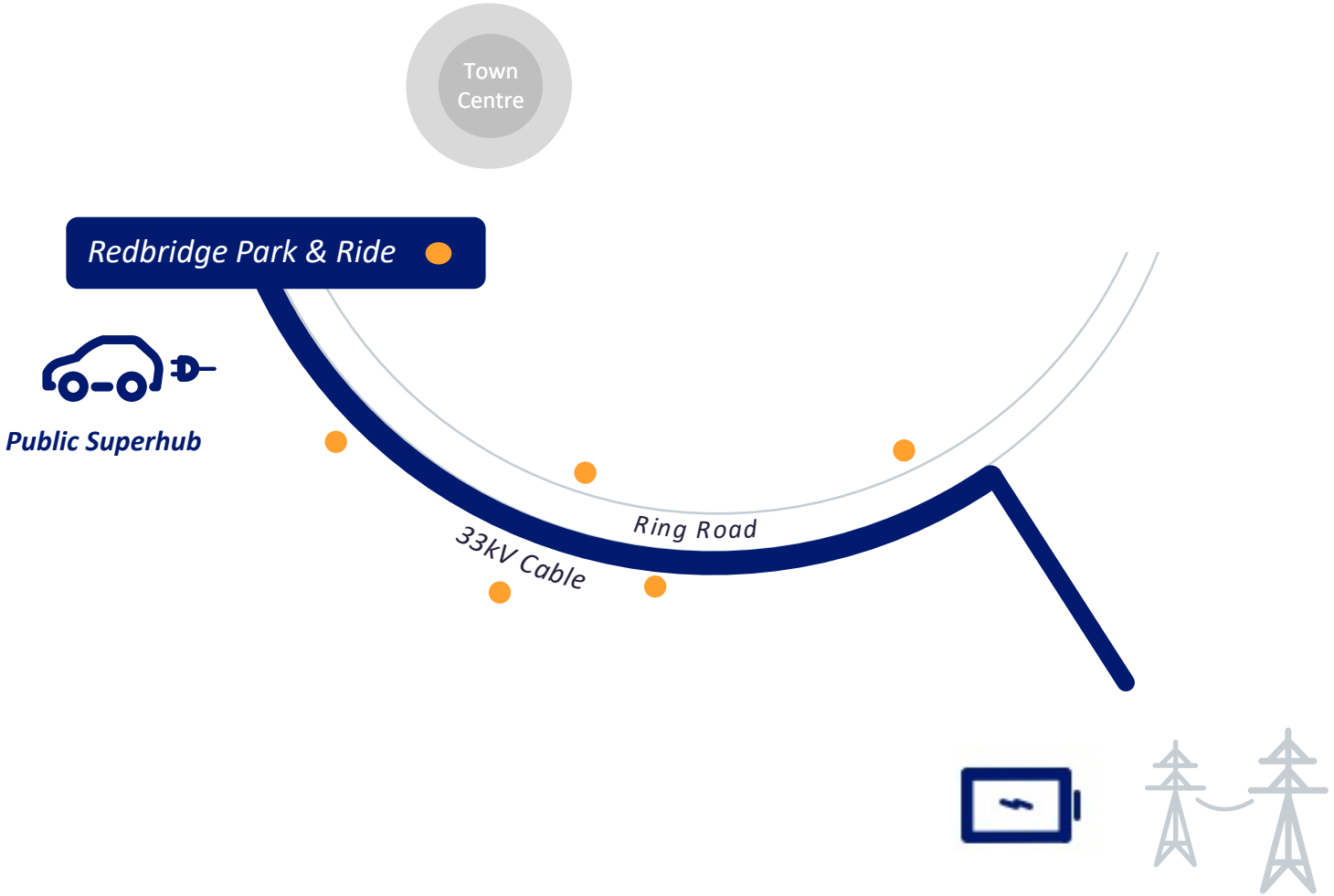

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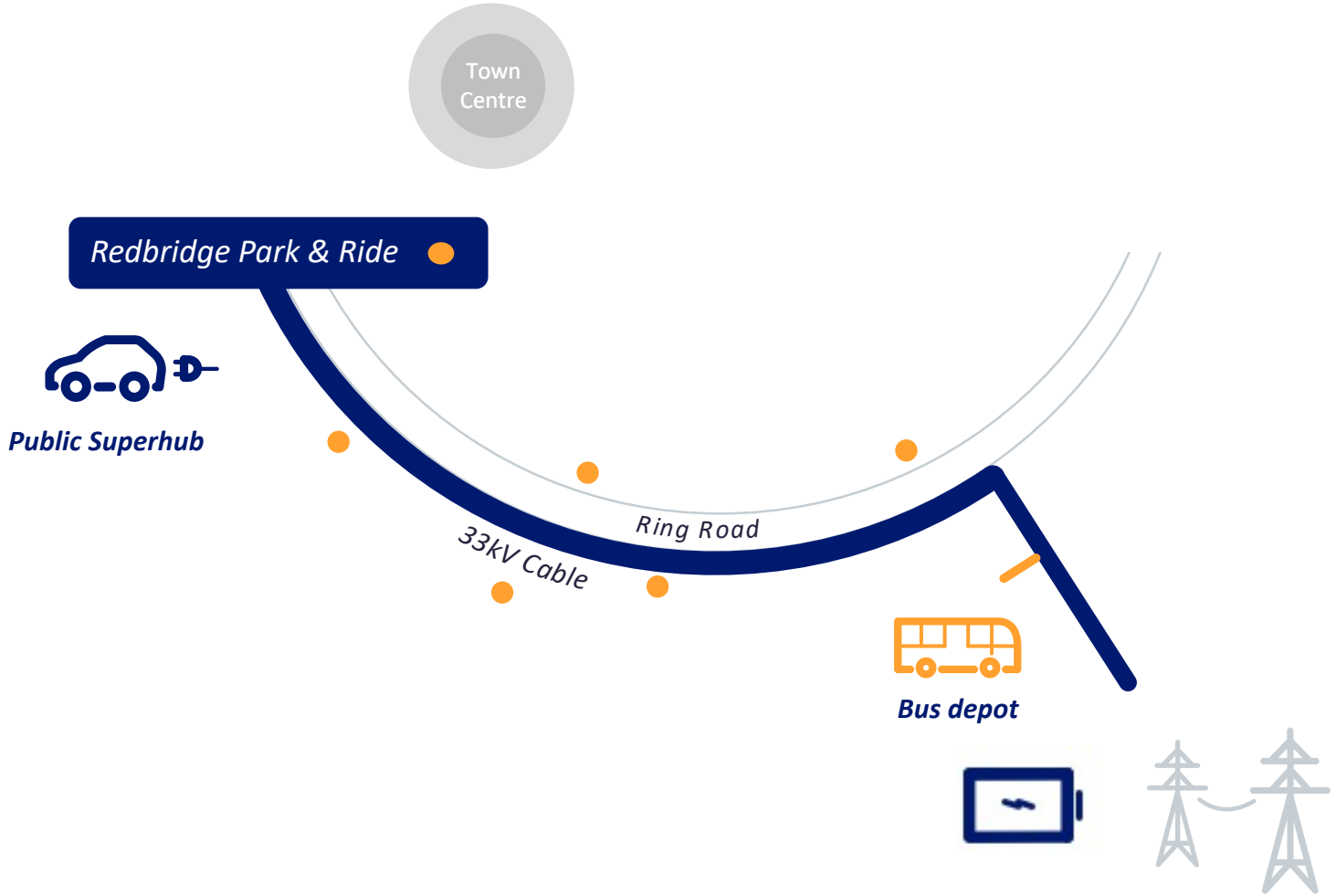

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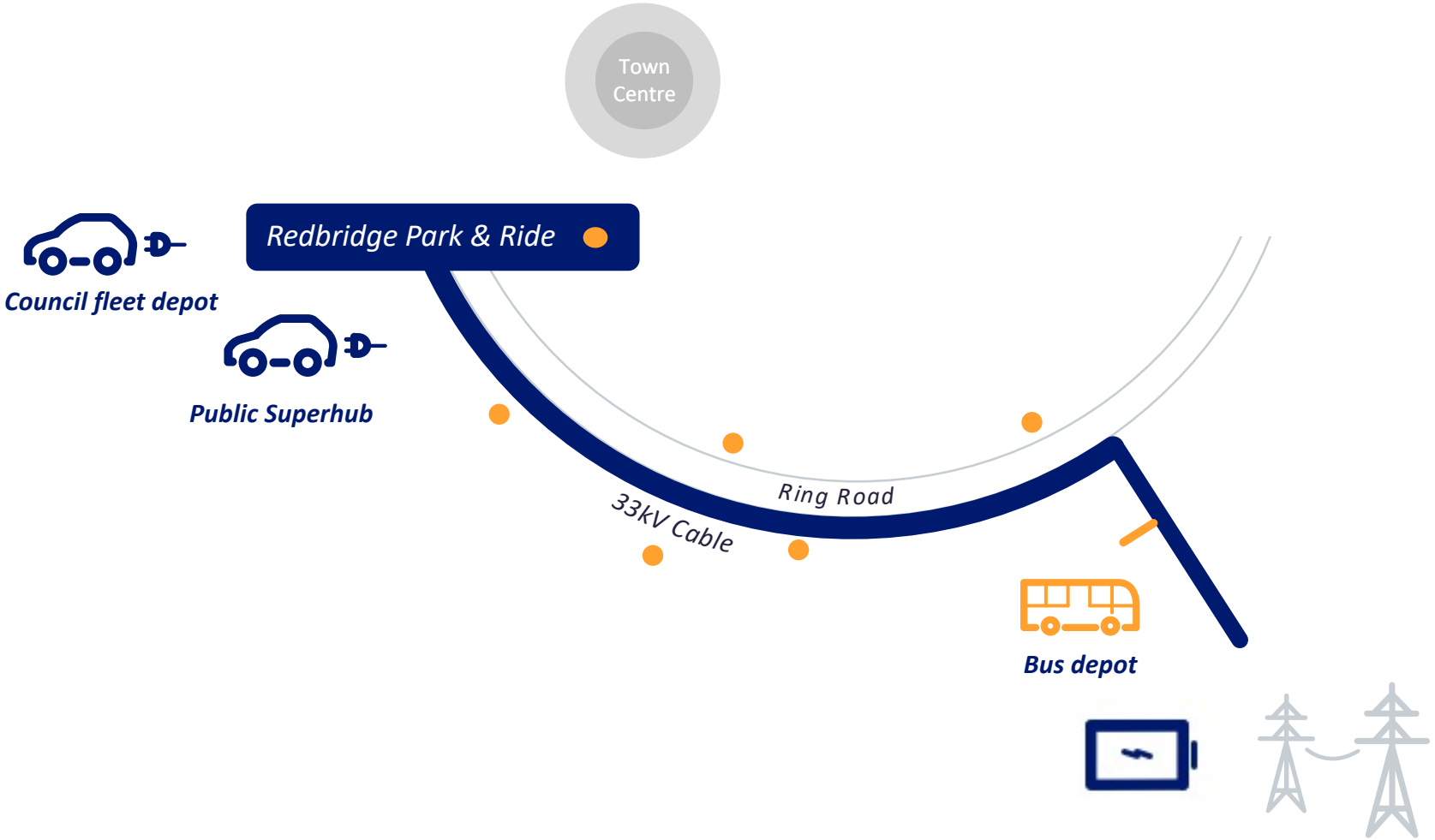

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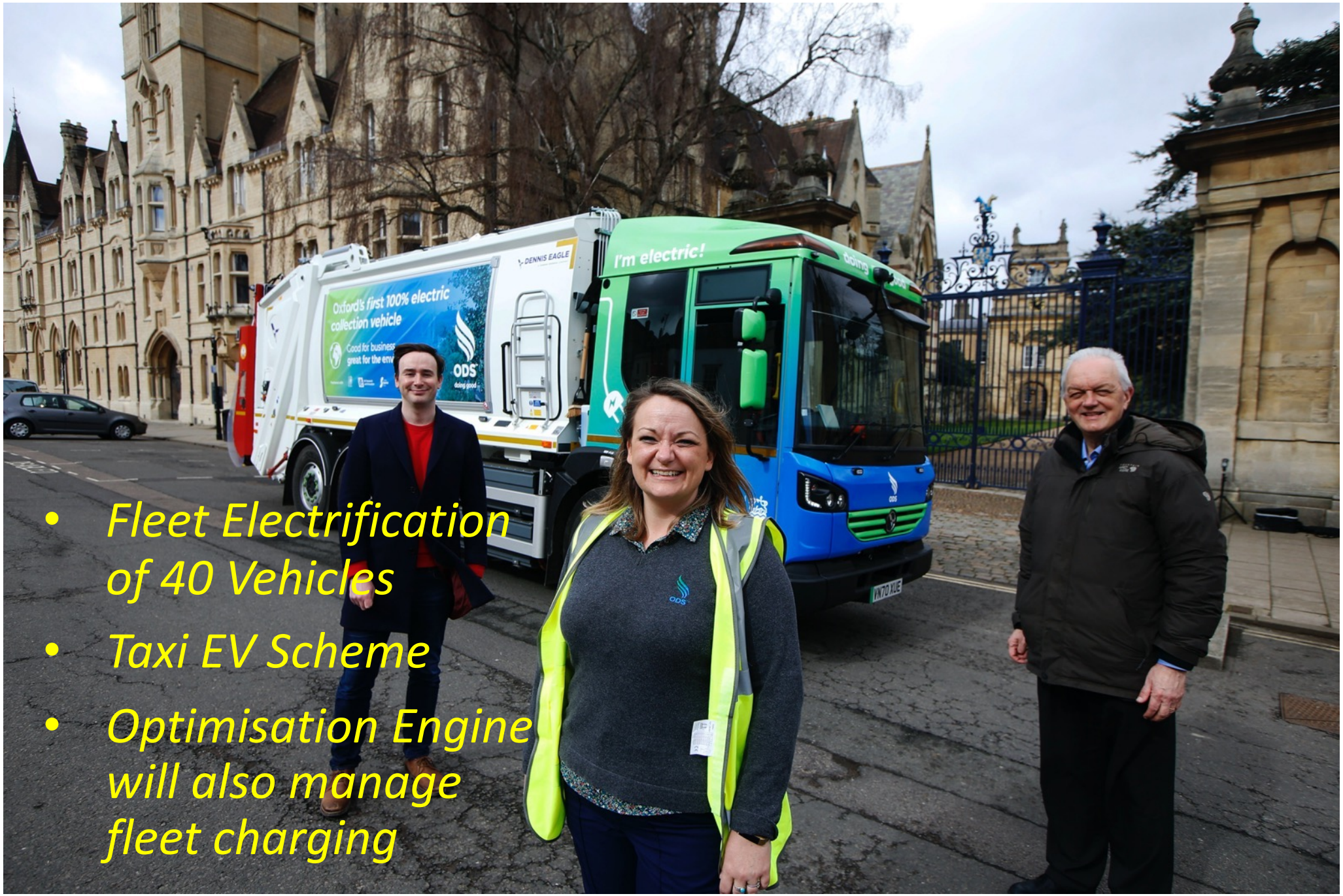

- *Fleet Electrification of 40 Vehicles*
- *Taxi EV Scheme*
- *Optimisation Engine will also manage fleet charging*

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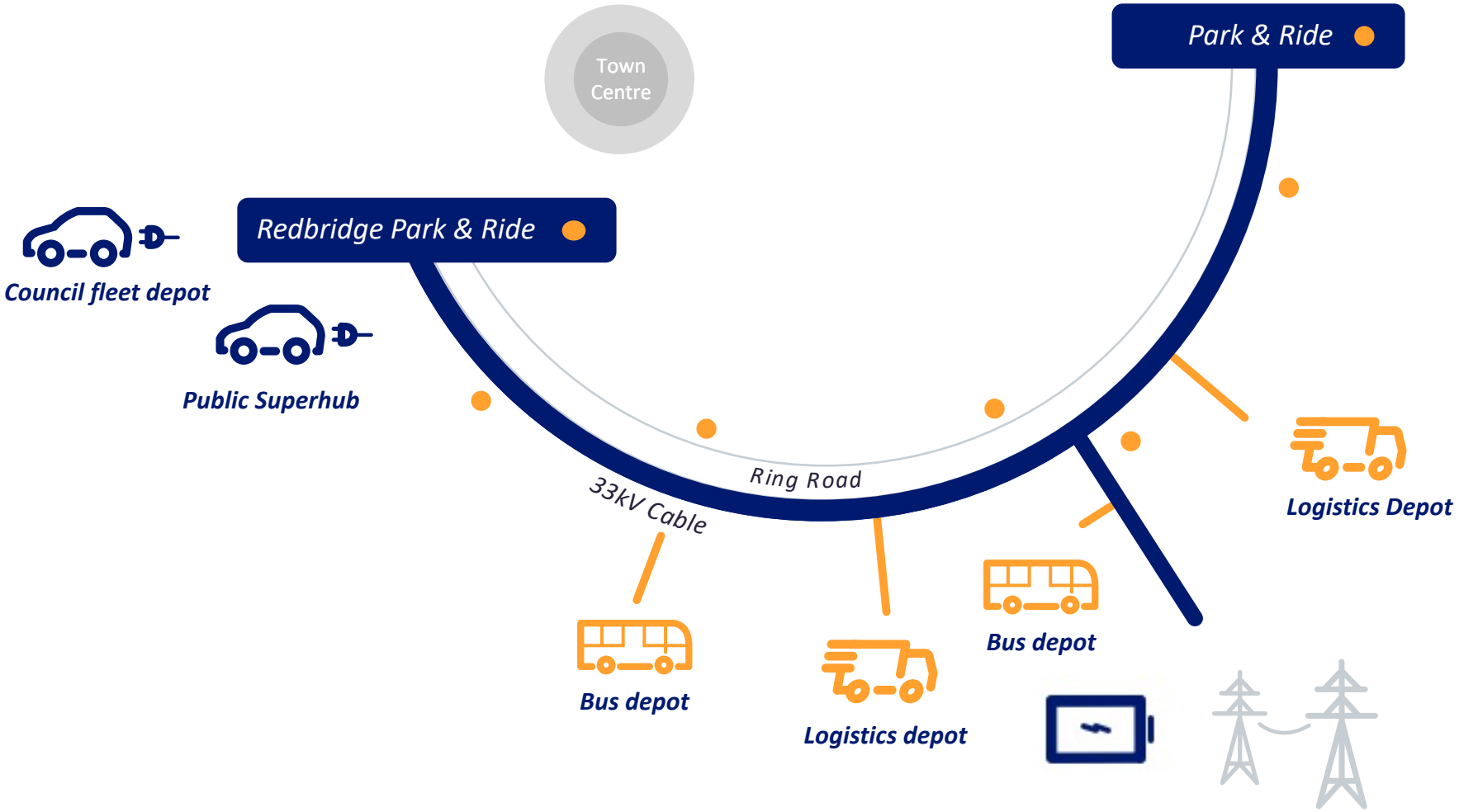
EV Network



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Renewable Heat

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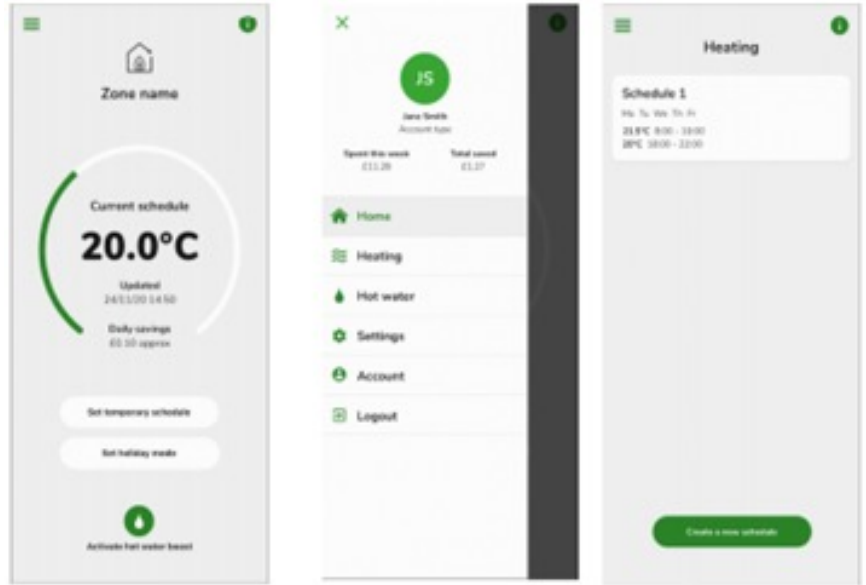
Renewable Heat



- *Smart controls +*
- *Load shifting +*
- *Time of Use Tariffs*

=> Reduced network loads

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Renewable Heat

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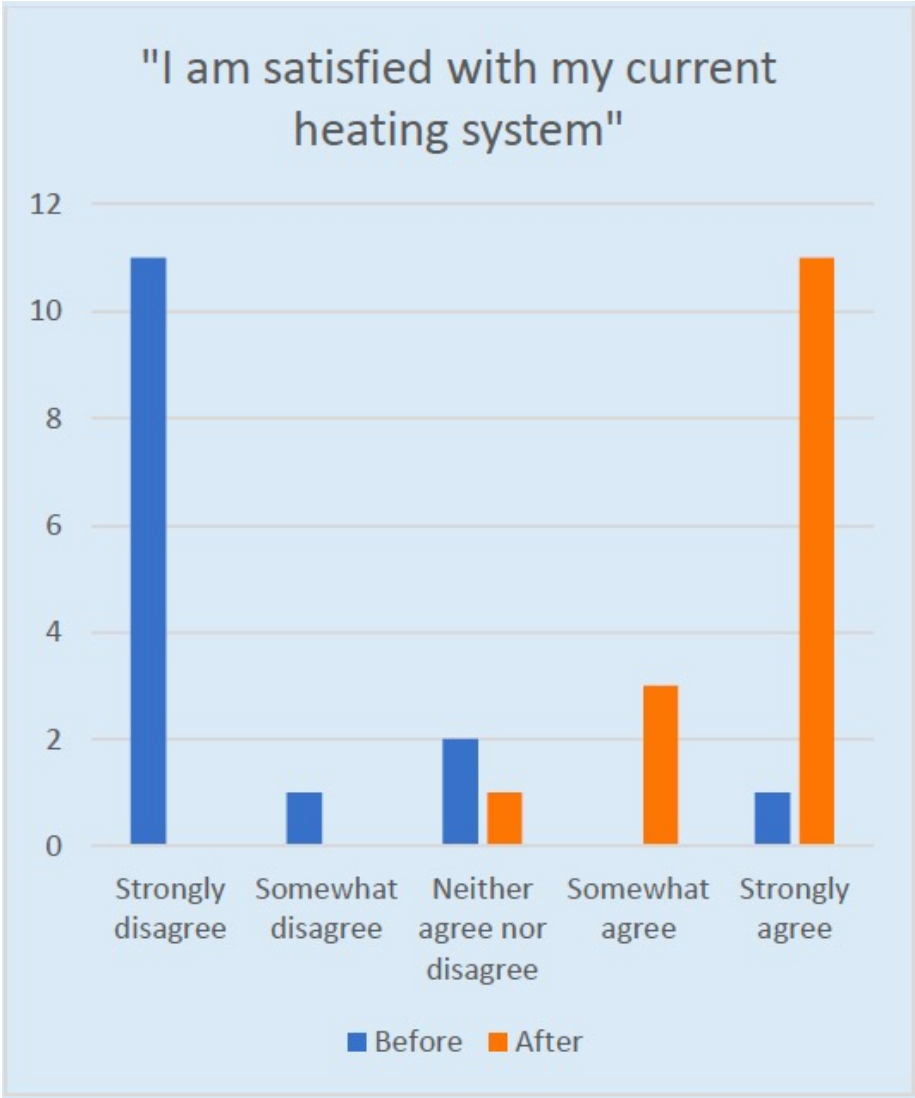
First 57 social housing properties installed & commissioned

Renewable Heat

- *Initial feedback from residents very positive*
- *Quantitative data starting to flow, allows individual property heating analysis*
- *Tariff switching recommendations have changed from Time of Use to nighttime tariff*



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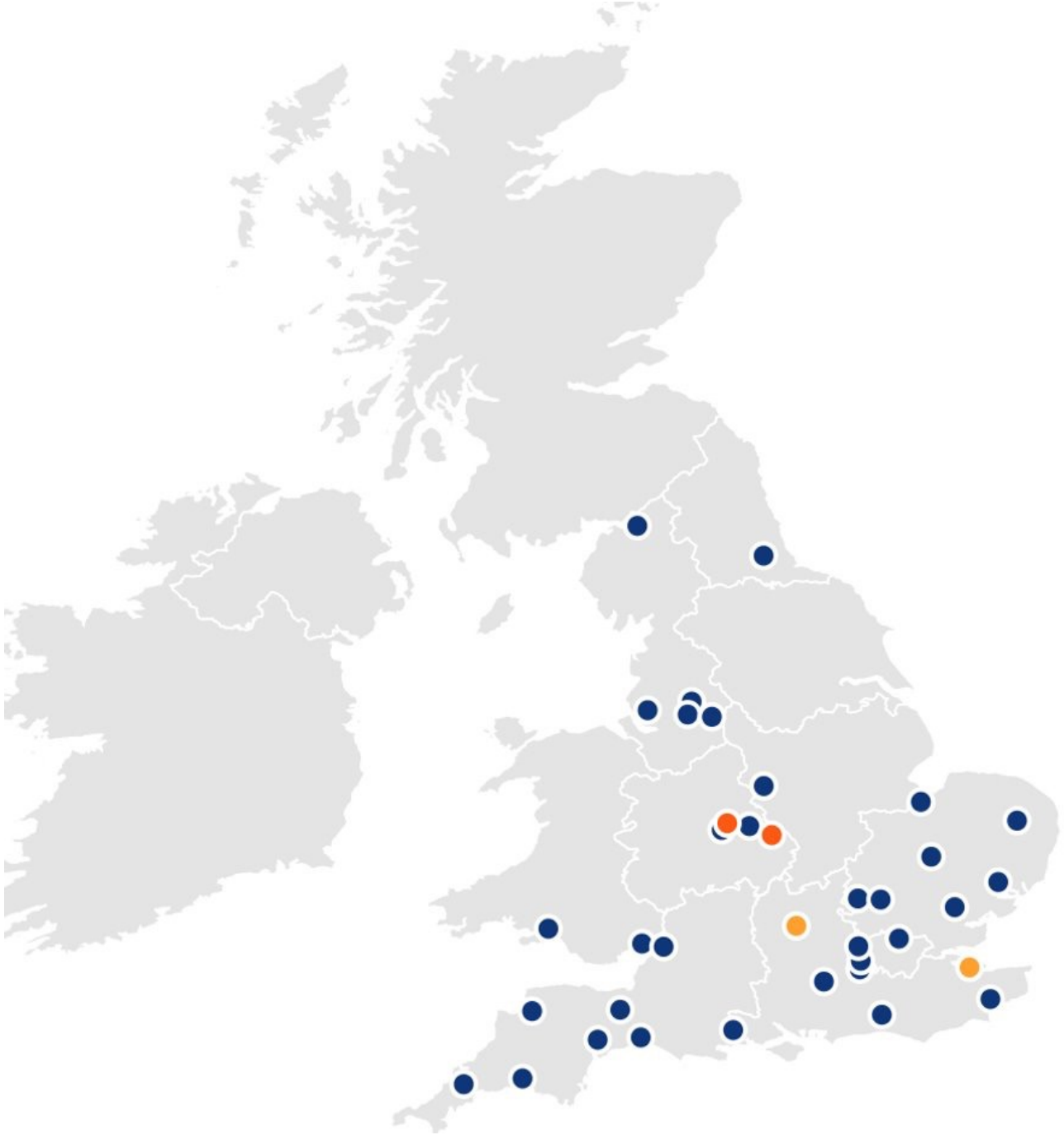
ESO Integration

- Objective of PFER & Smart local Energy Systems to maximise benefits between transport, heat and power
- Integration between Battery and EV Network at connection point
- Island Mode – catering for grid outages/maintenance
- OTE management of fleet charging as well as battery optimisation – initially simulated
- Heat is distribution network connected, separate optimisation system

Beyond Oxford…

- Up to 40 sites
- All direct National Grid connections
- Coventry & Birmingham batteries under construction
- Flexible Superhub structure



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Challenges

- Regulatory regime not built to support innovation
- Ofgem Targeted Charging Review
- Removal of Renewable Heat Incentive
- Public procurement and legal processes
- Planning delays
- The unexpected… Covid etc.
- Energy market volatility and wholesale pricing impacts

Lessons Learned – The good stuff…

- IUK project oversight helpful including project governance
- Council support & ambition – critical full council buy-in from the start
- Team dynamics very strong
- Some technical & development challenges, but not a major driver of delays (flow aside)
- Huge amount of learning in battery procurement and construction, likewise cable route
- University and wider academic and local cleantech awareness
- Covid learning

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Coming up…

- As assets go live, shift to data collection and evaluation
  - Oxford University – Social, environmental and technical
  - IUK evaluation partners
- Community Engagement
  - Local community awareness & uptake
  - Schools engagement

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In Summary…

More Renewables

High Speed Charging

Clean Efficient Heat

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Thank you

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