GreenSCIES - Green Smart Community Integrated Energy Systems

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#SESAAU2019

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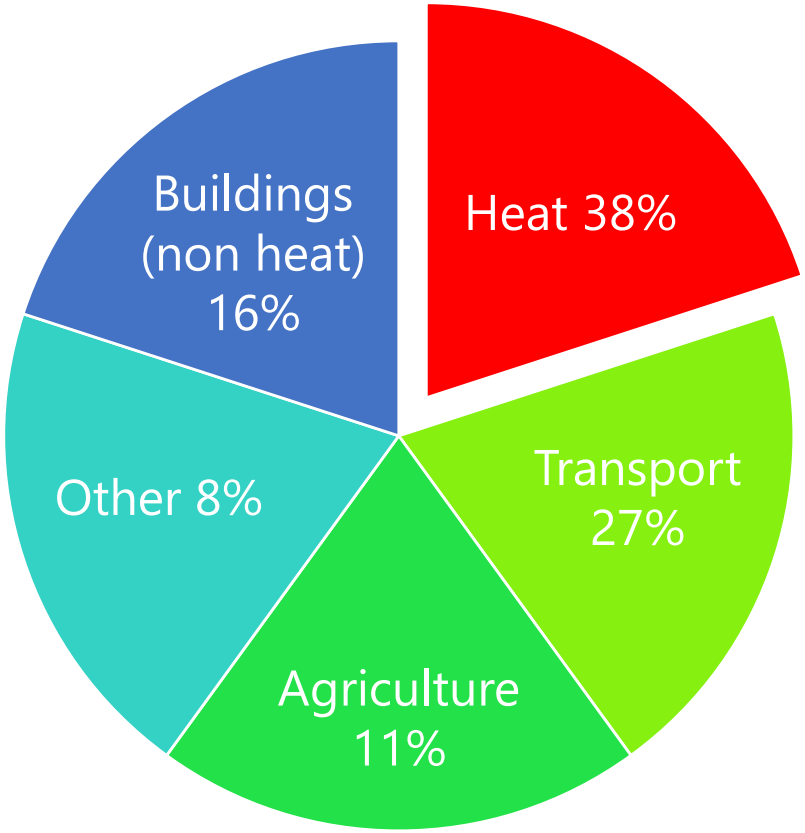
Decarbonisation challenge in the UK

Net-zero emissions by 2050

Build and extend heat networks across the country…

…Supplying 25% of London's demand by 2025

UK CO_{2e} emissions 2016



Source: Clean Growth - Transforming Heating Overview of Current Evidence December 2018, BEIS

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Project GreenSCIES

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Project scope/deliverables:

- ✓ Concept design
- ✓ Business models
- ✓ Stakeholder engagement
- ✓ Replicability

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Our team

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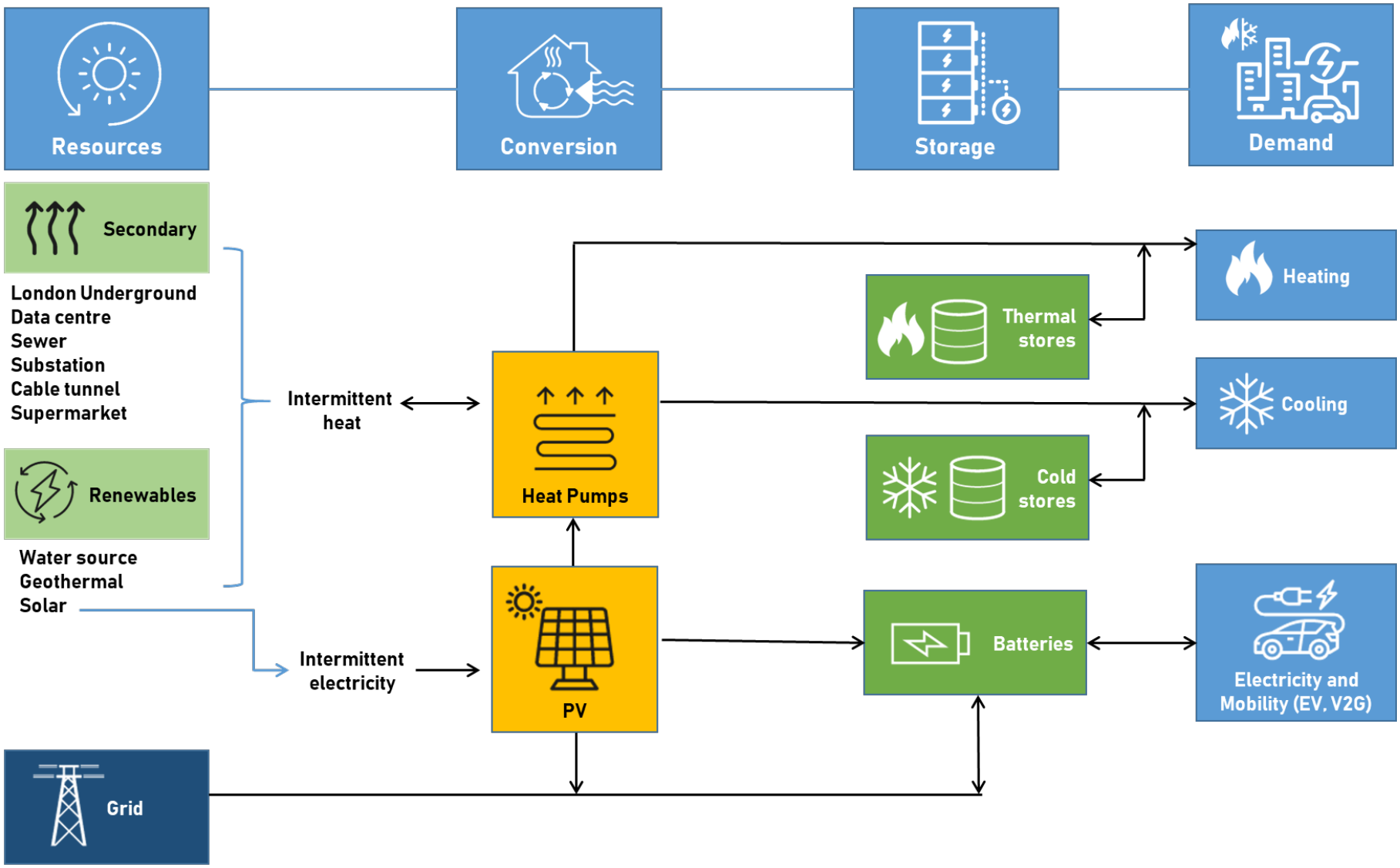
Our concept



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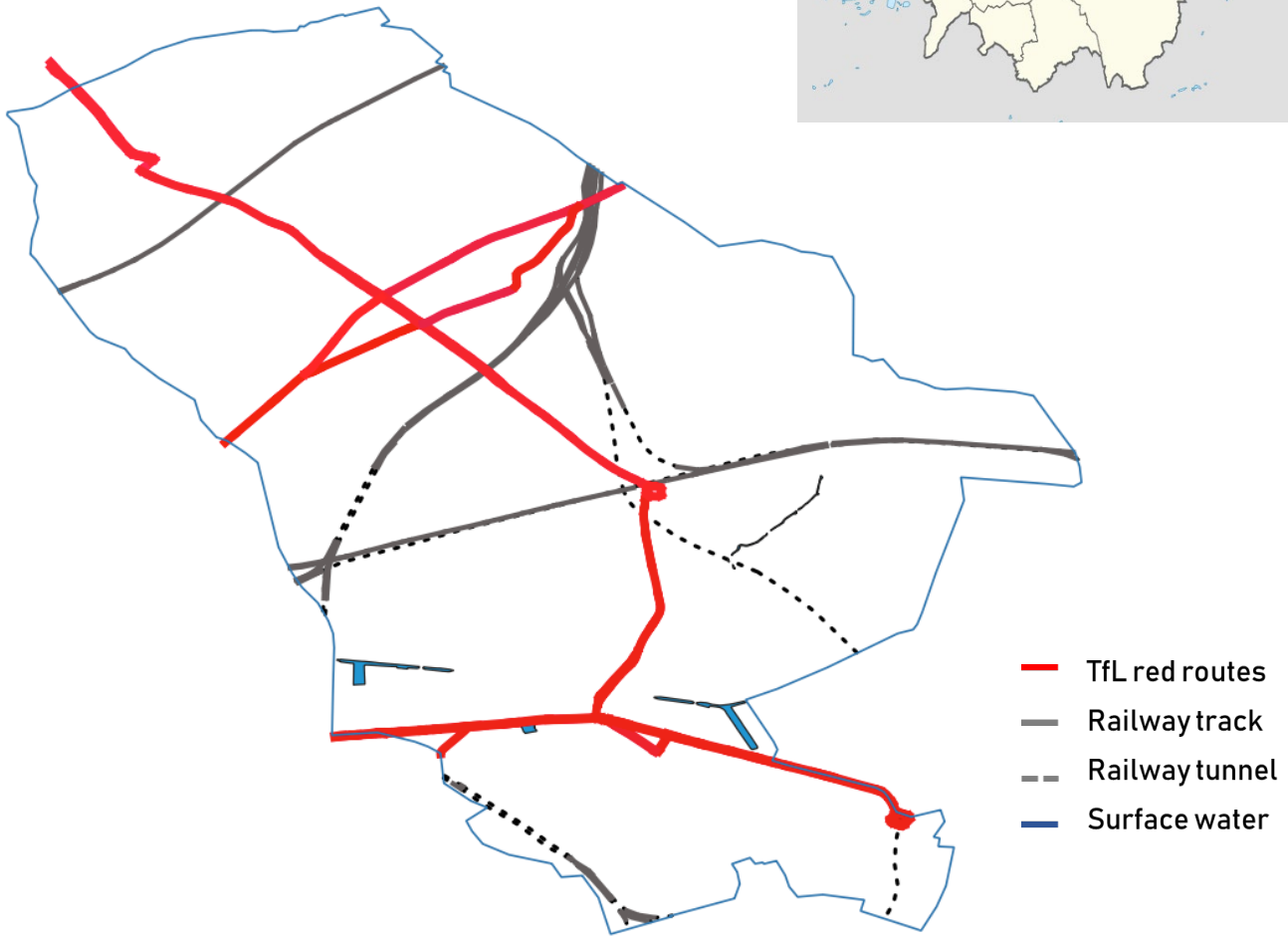
Study area

London Borough of Islington

- Islington has the highest population density of local authorities in England and Wales – **13,875 people/km²**
- 40% social housing
- Many non-domestic buildings
- Extensive transport links



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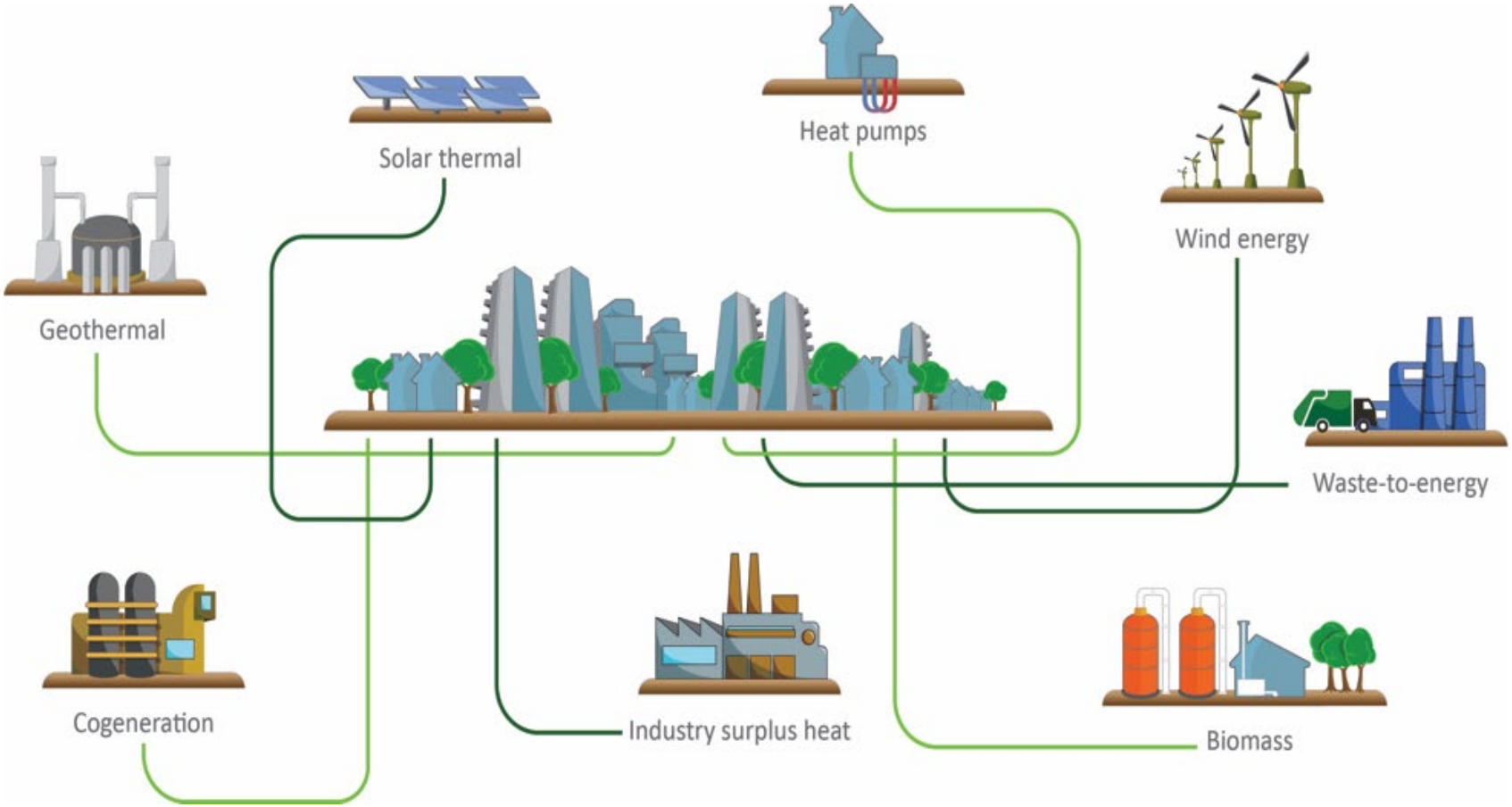
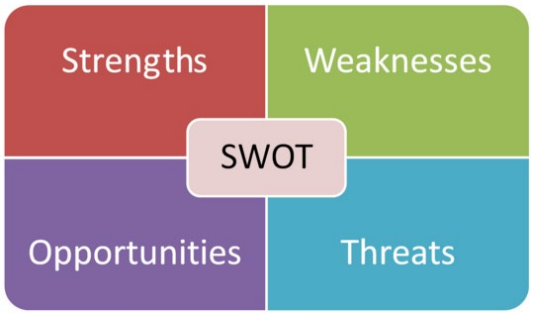
What are the smart technologies for Islington?





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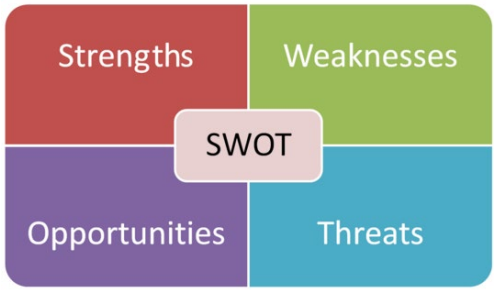
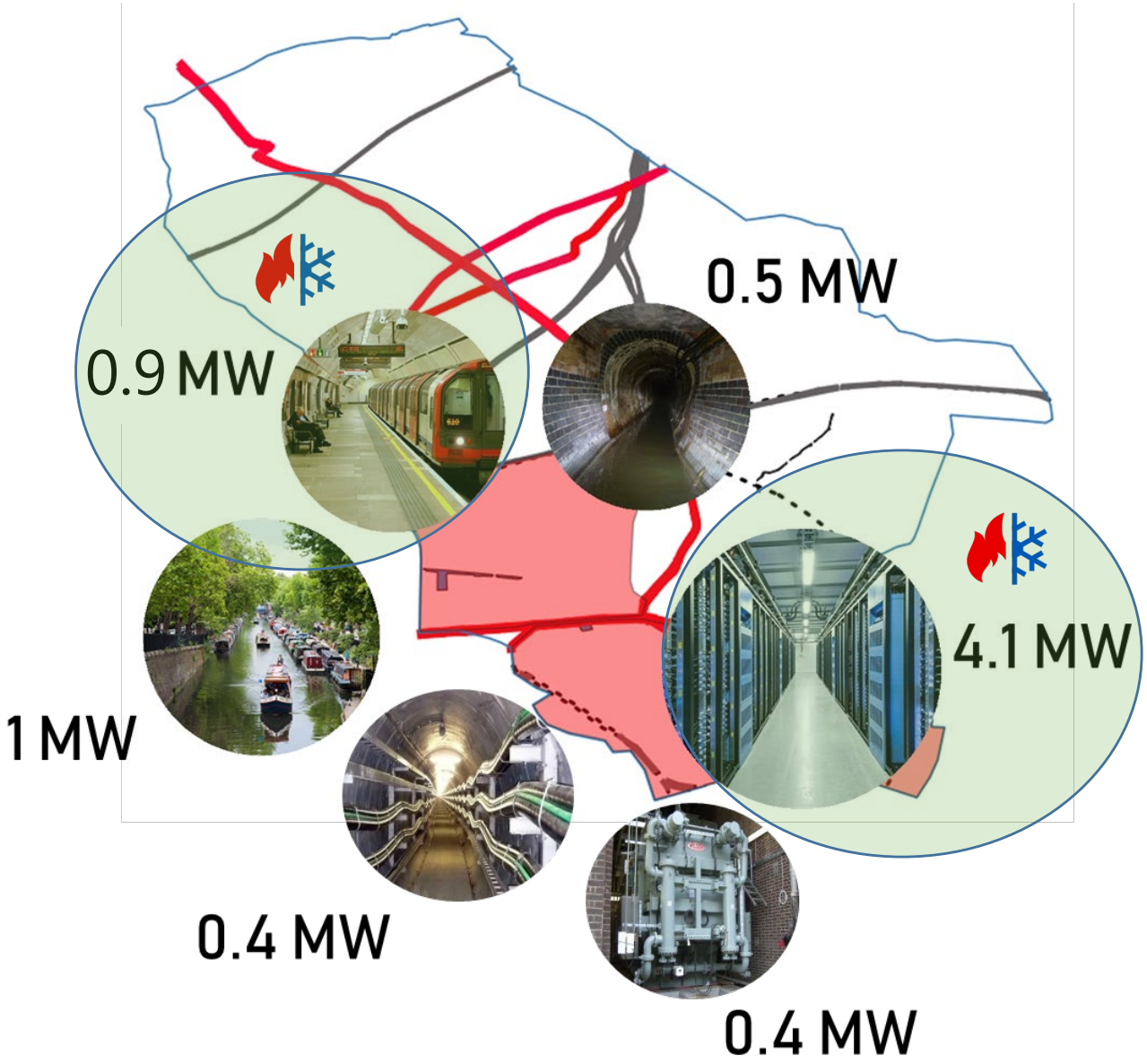
Secondary energy sources





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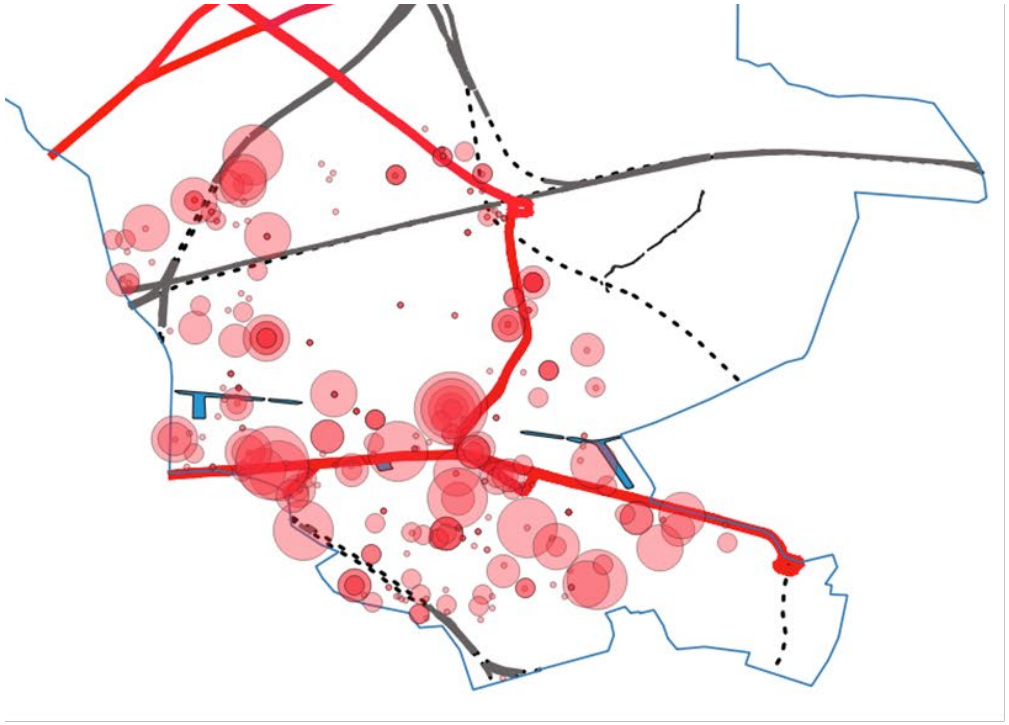
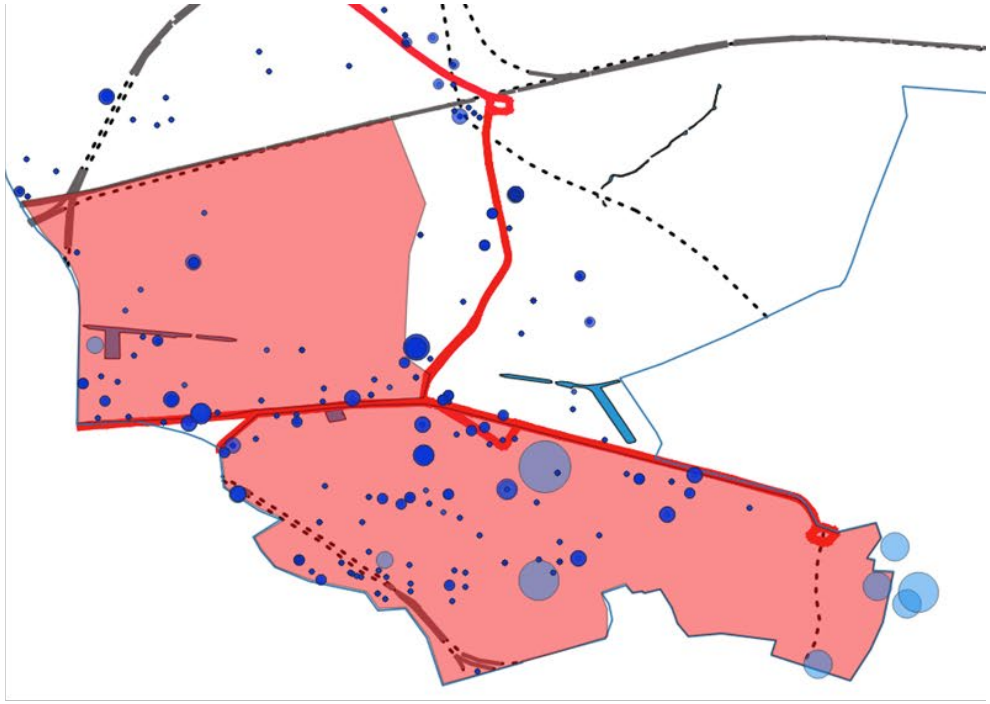
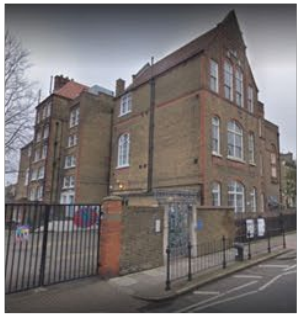
Heating and cooling demand mapping







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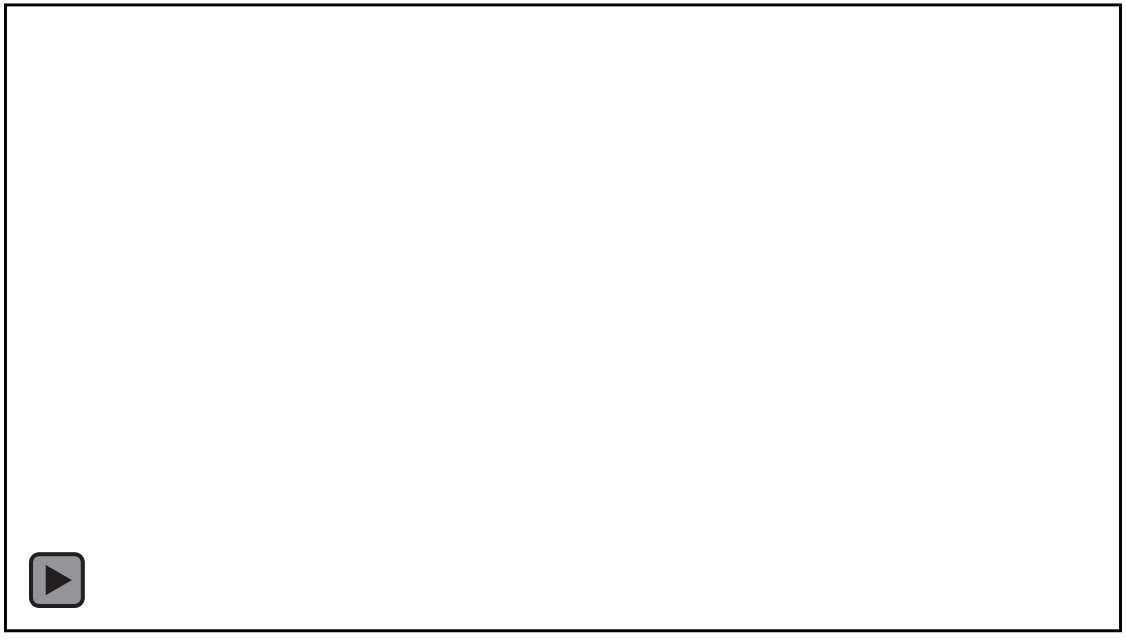
Site visits



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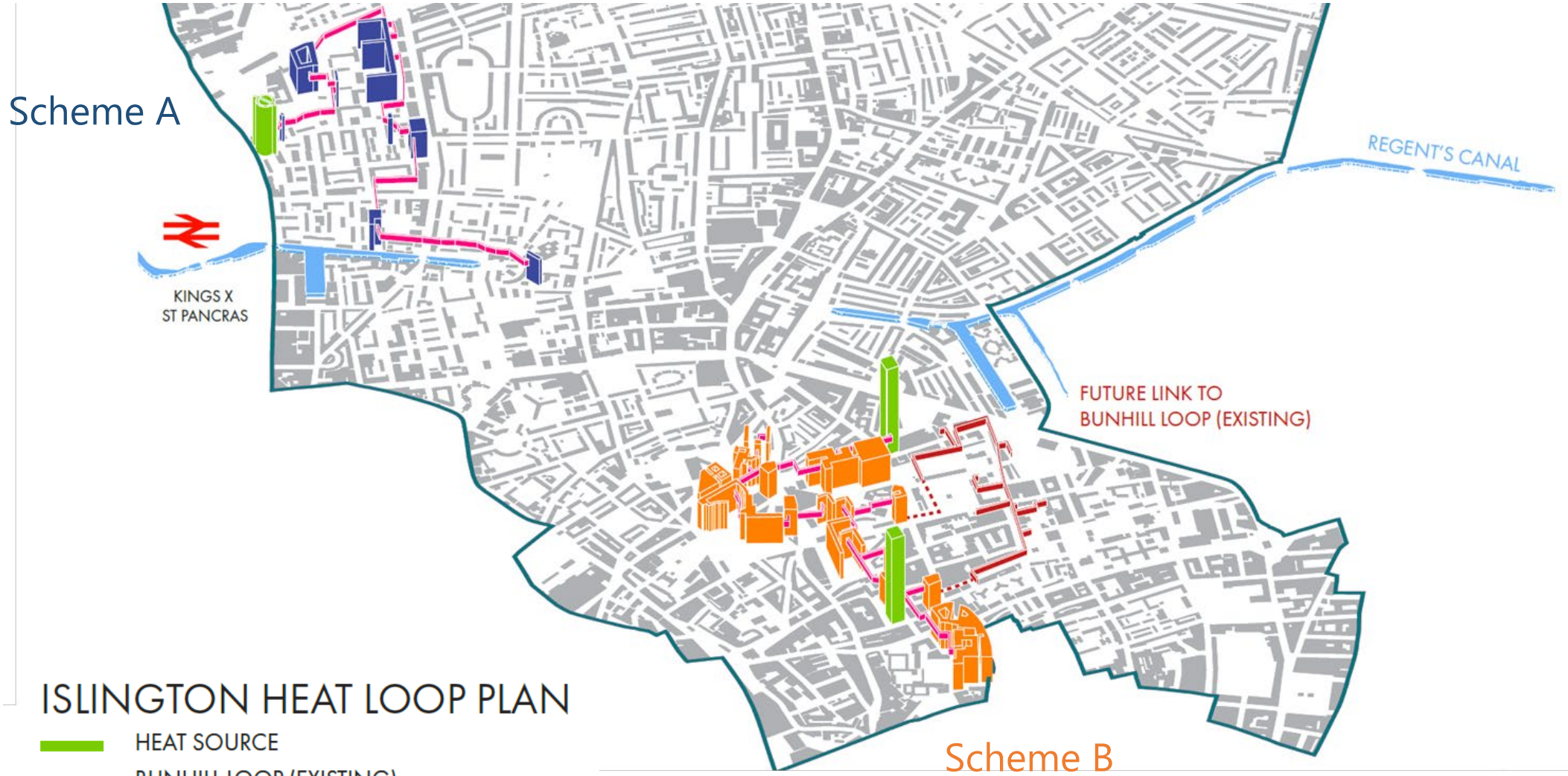
Network outline designs



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Network outline designs

Scheme A

Ambient loop (10-25°C) ~ 2km

Main heat source: LU + boreholes

9 housing estates

3 non-residential

11 Energy centres

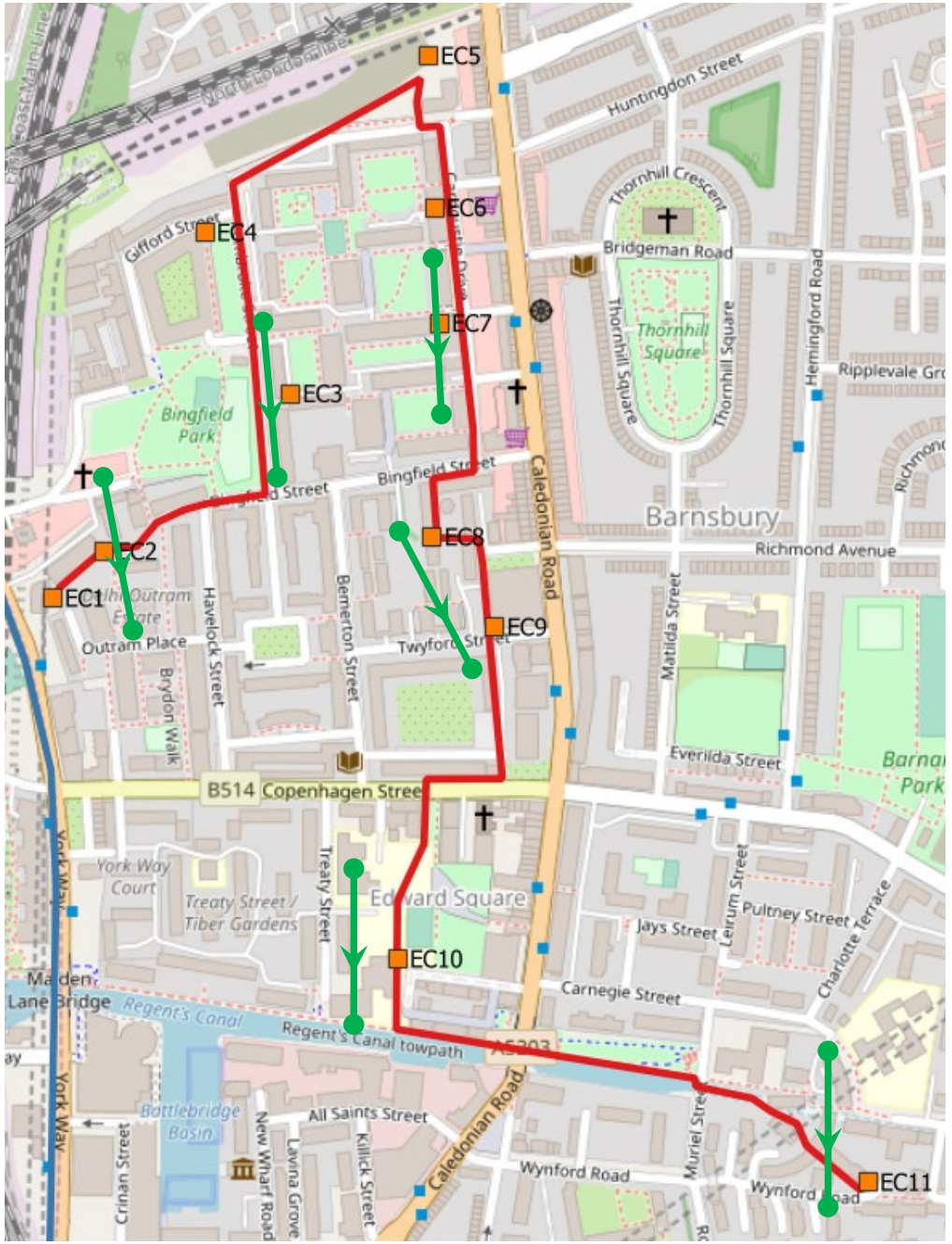
Peak heat demand: 6MW

Total heat pump capacity: 3.1 MW

Low cooling demand

Total PV capacity: 0.9 MW

10 EVs/Energy centre



Network outline designs

Scheme B

Ambient loop (10-25°C) ~2km

Main heat source: Data centres + boreholes

8 housing estates

7 non-residential

16 Energy centres

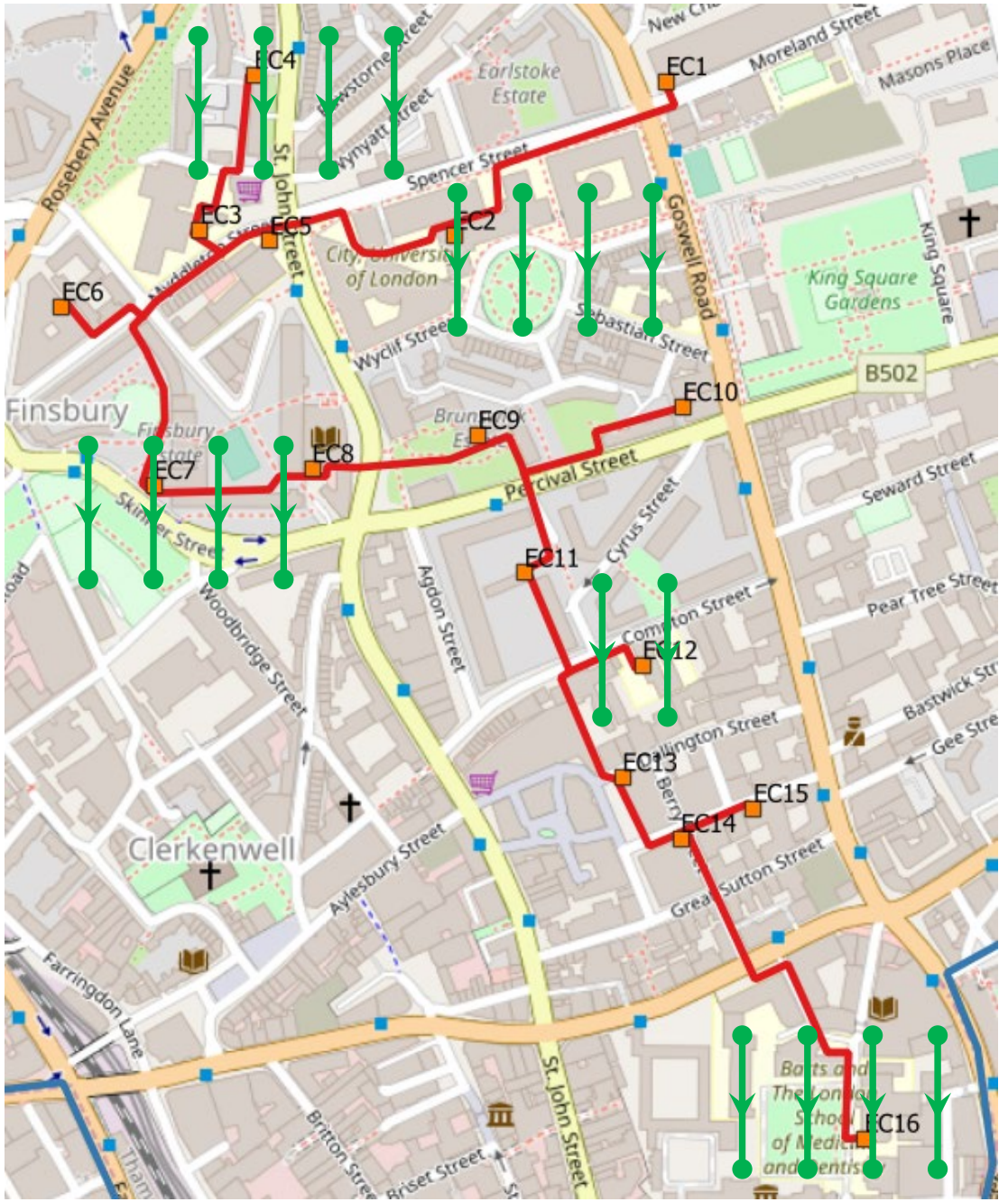
Peak heat demand: 15MW

Total heat pump capacity: 10.8 MW

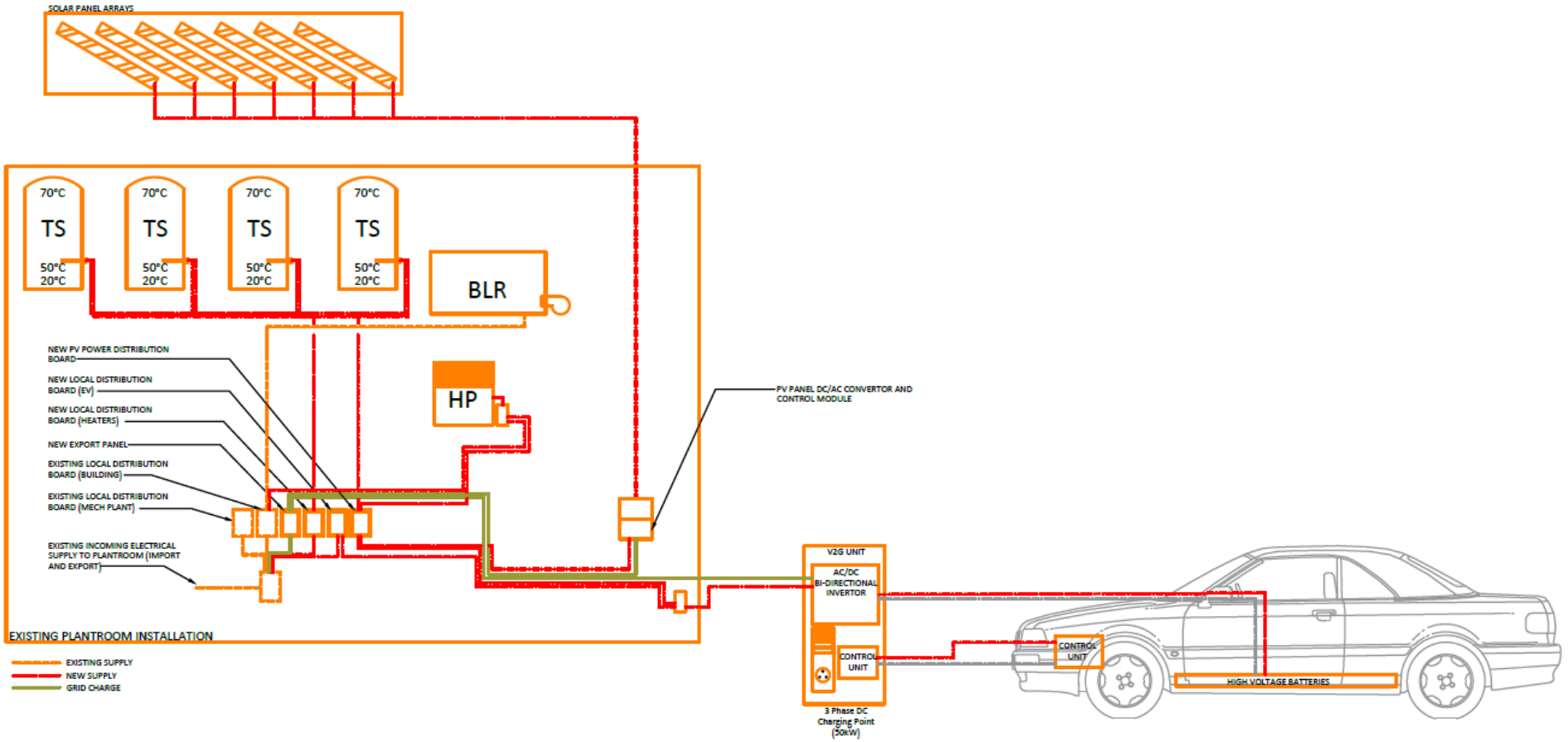
Constant cooling demand: 5MW

Total PV capacity: 0.8 MW

10 EVs/Energy centre



Electrical approach “Behind the meter”



Electrical schematic for an energy centre and bi-directional car charging

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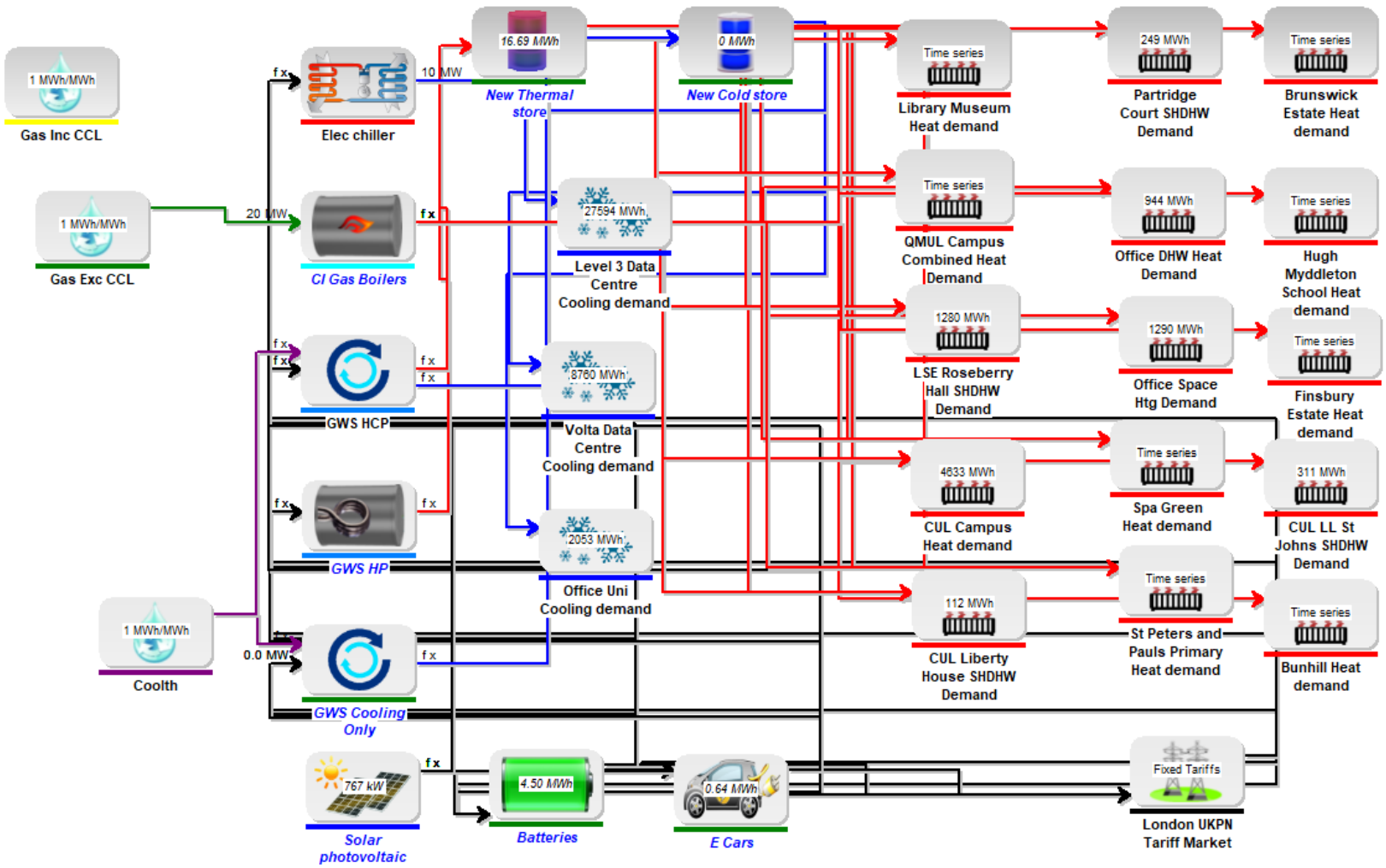
Techno-economic modelling



A schematic of the overall energyPRO model used in the analysis for Scheme B

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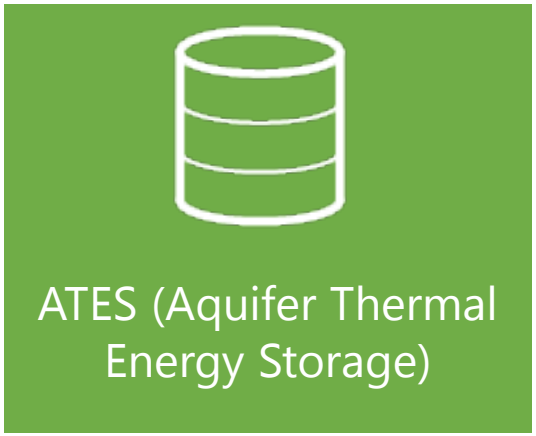
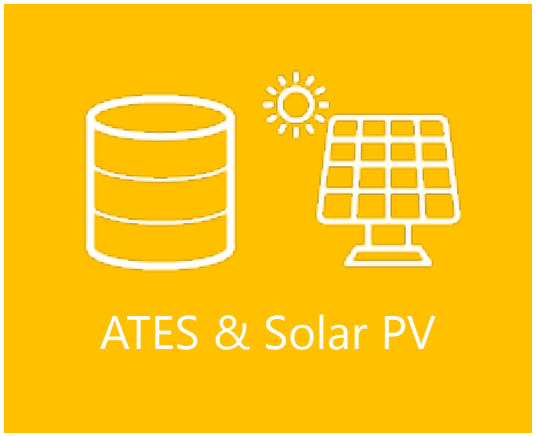
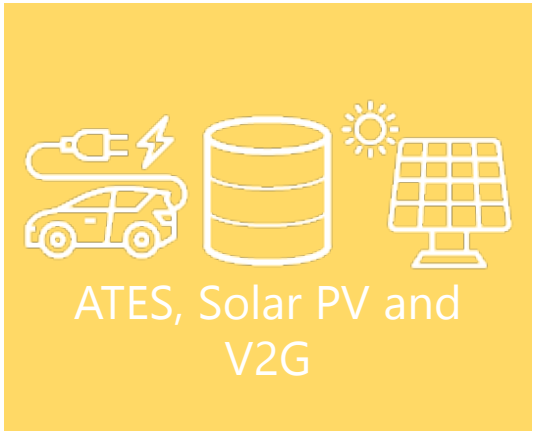
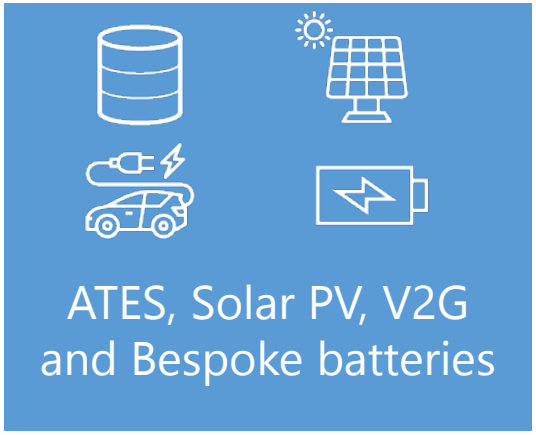
Modelling scenarios

The following scenarios were modelled for each Scheme:









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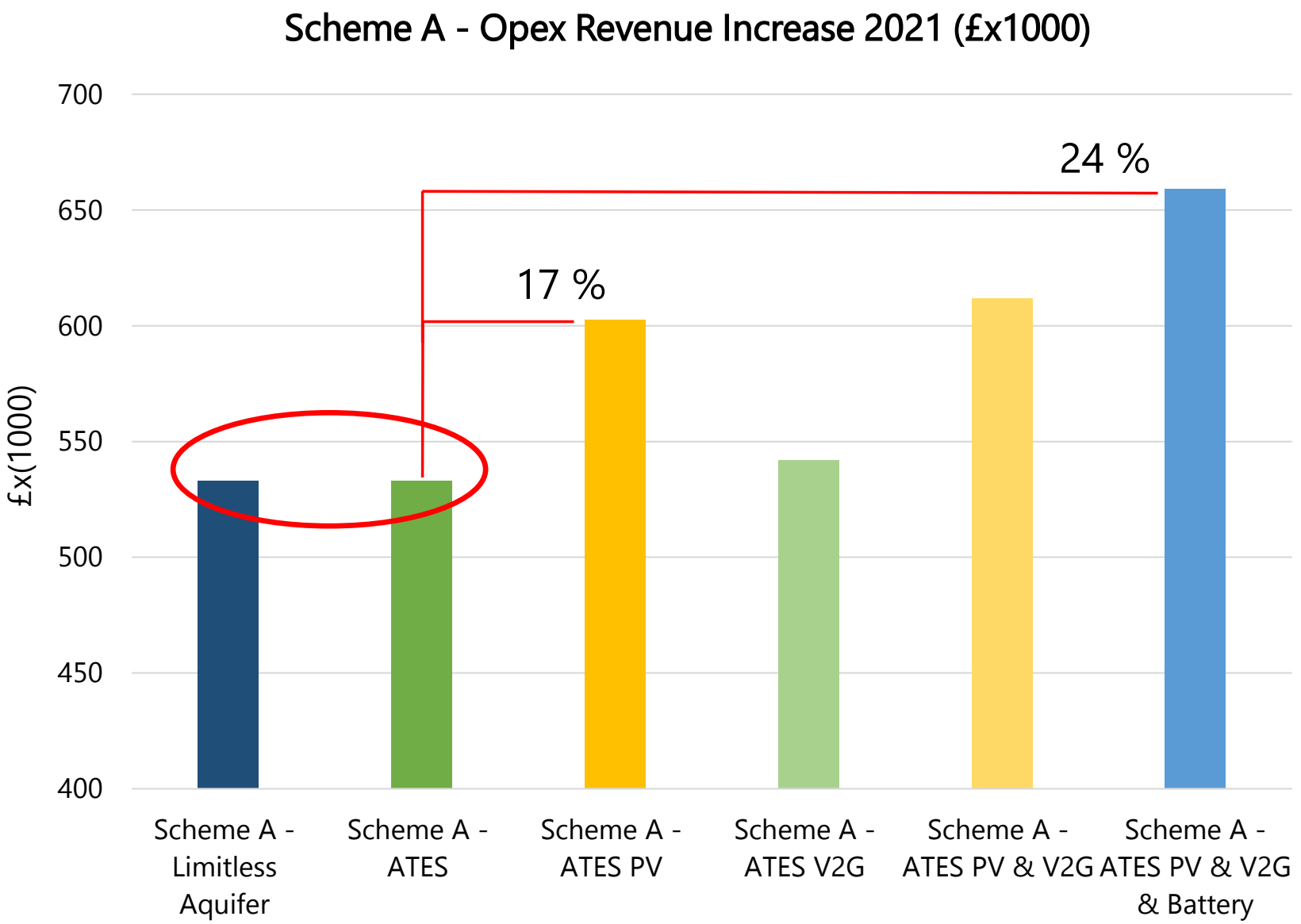
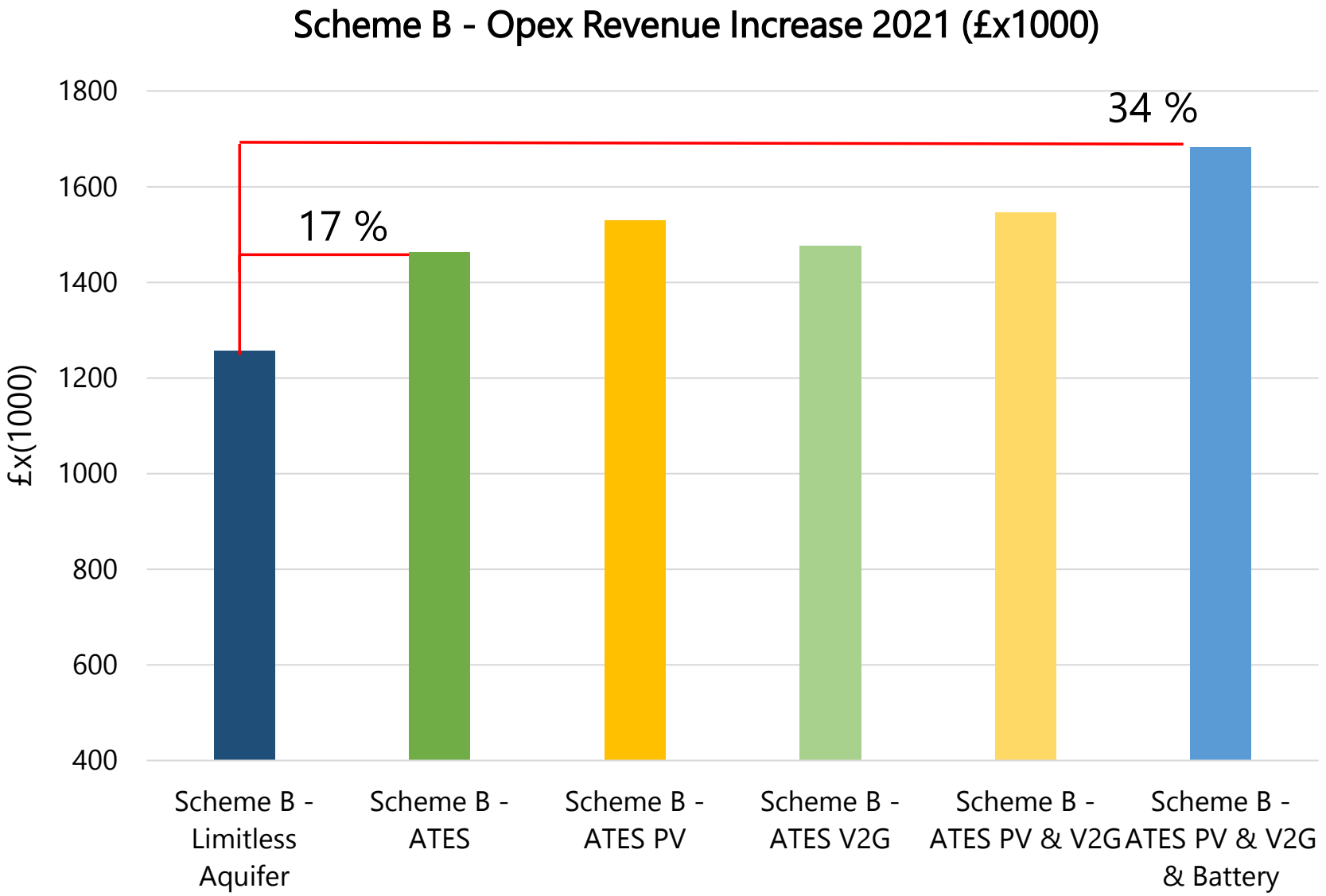
Operational costs savings



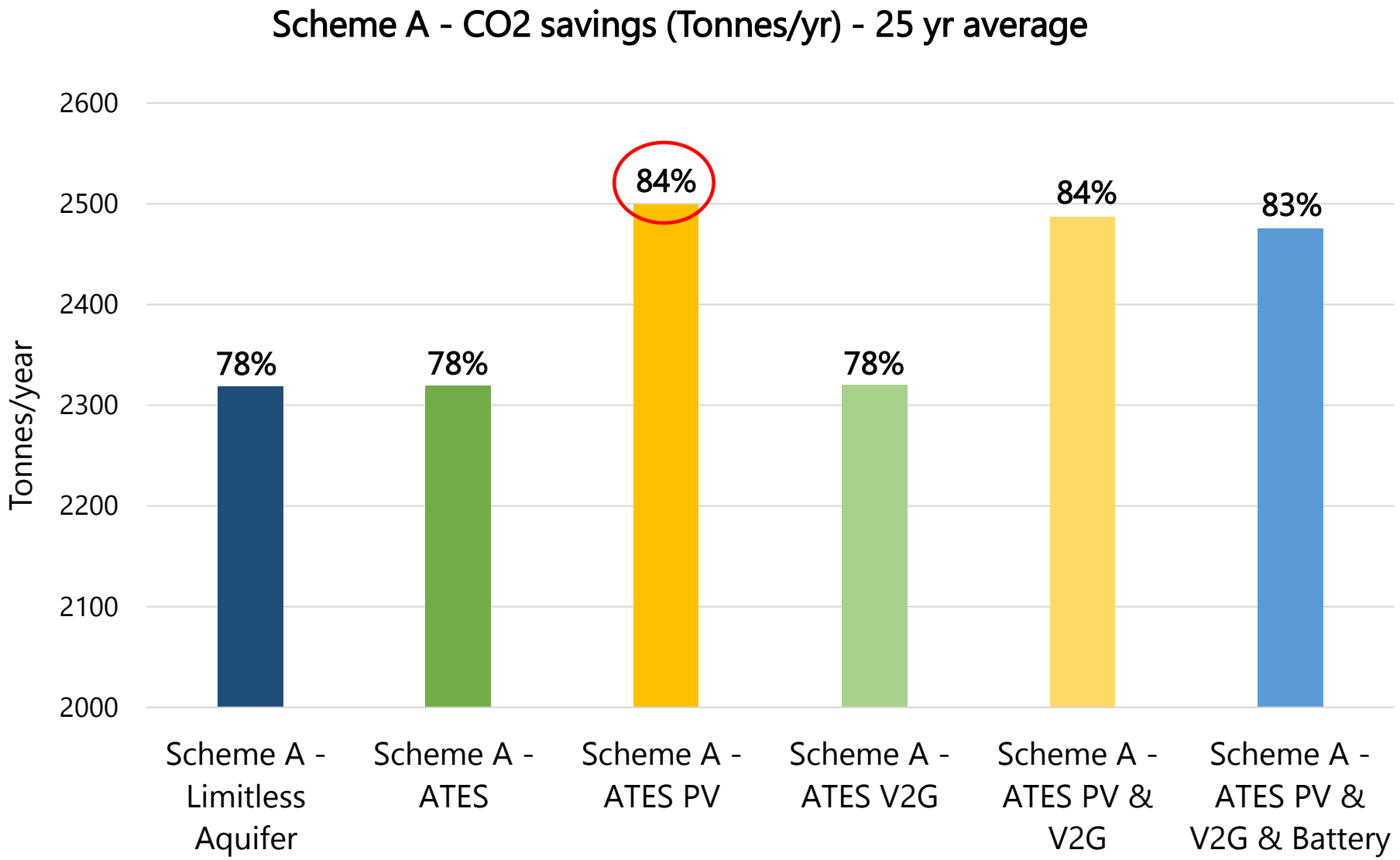
Reference base case: gas boilers

Operational cost savings



Reference base case: gas boilers

Carbon savings



Reference base case: gas boilers

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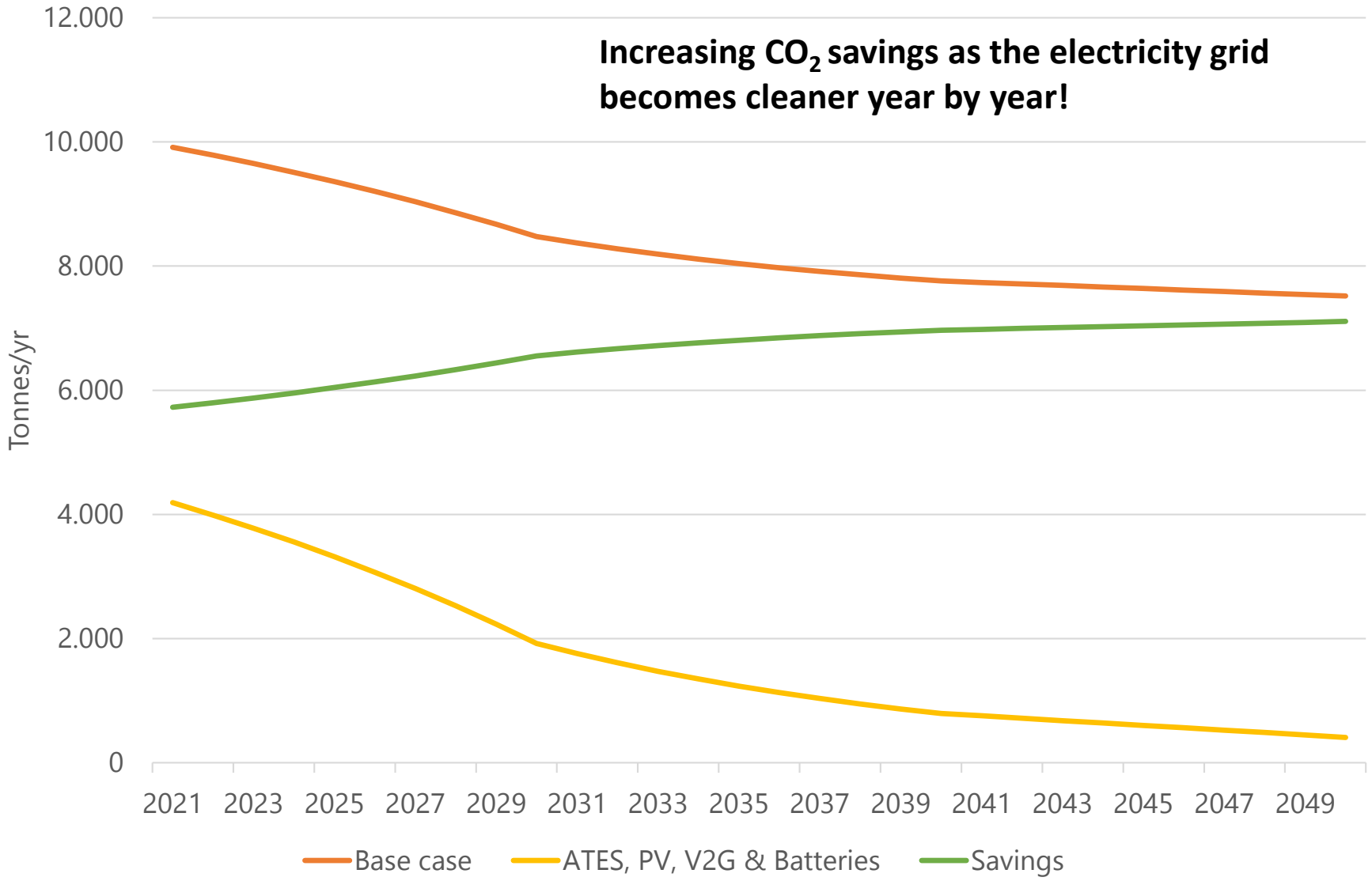
CO_2 Emissions 2021-2050



Reference base case: gas boilers

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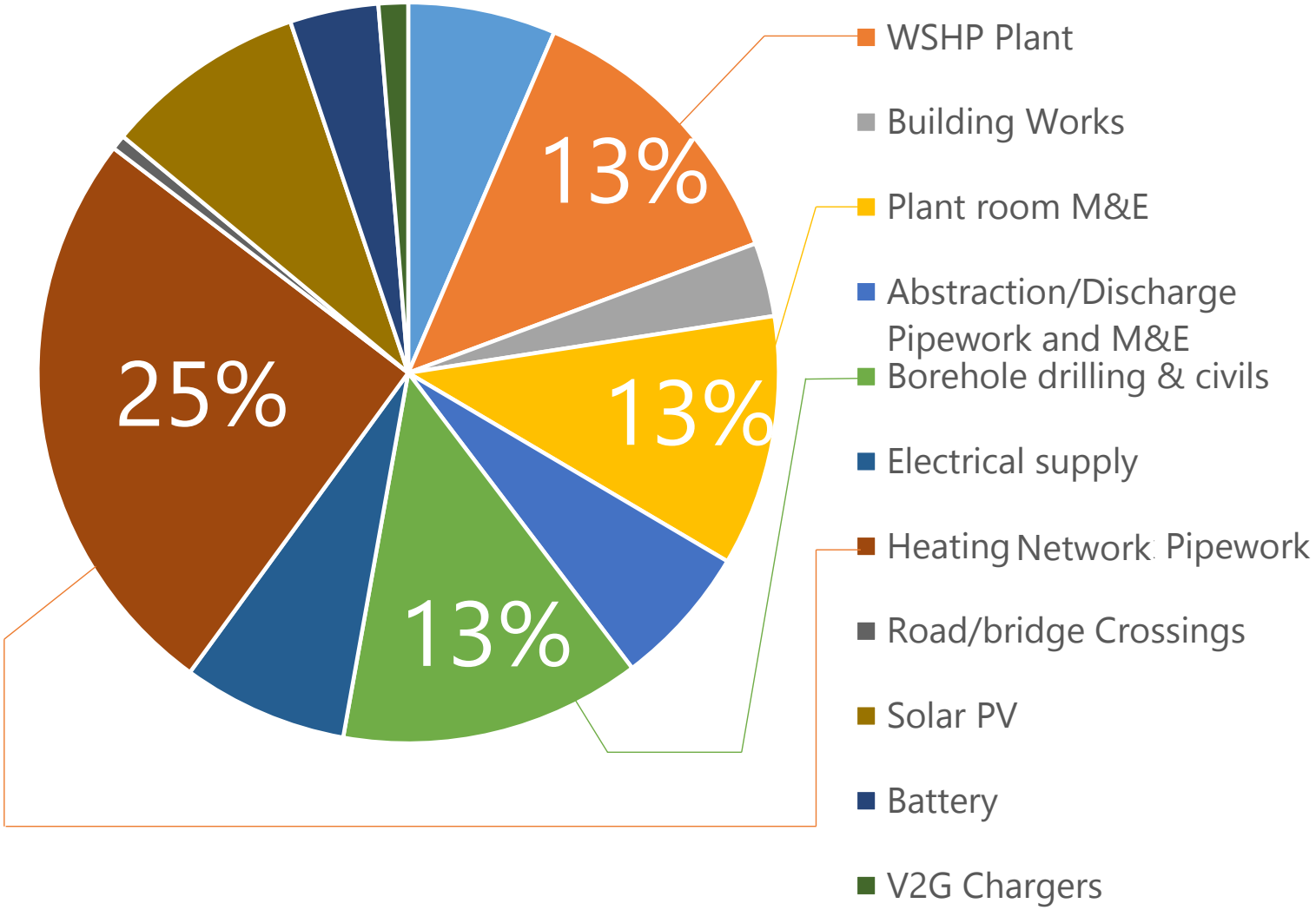
Capital costs and payback

ATES, Solar PV, V2G and Bespoke batteries



11 years payback period

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Impact in Islington

Low carbon heating and cooling to more than 3500 homes , 10,000 residents

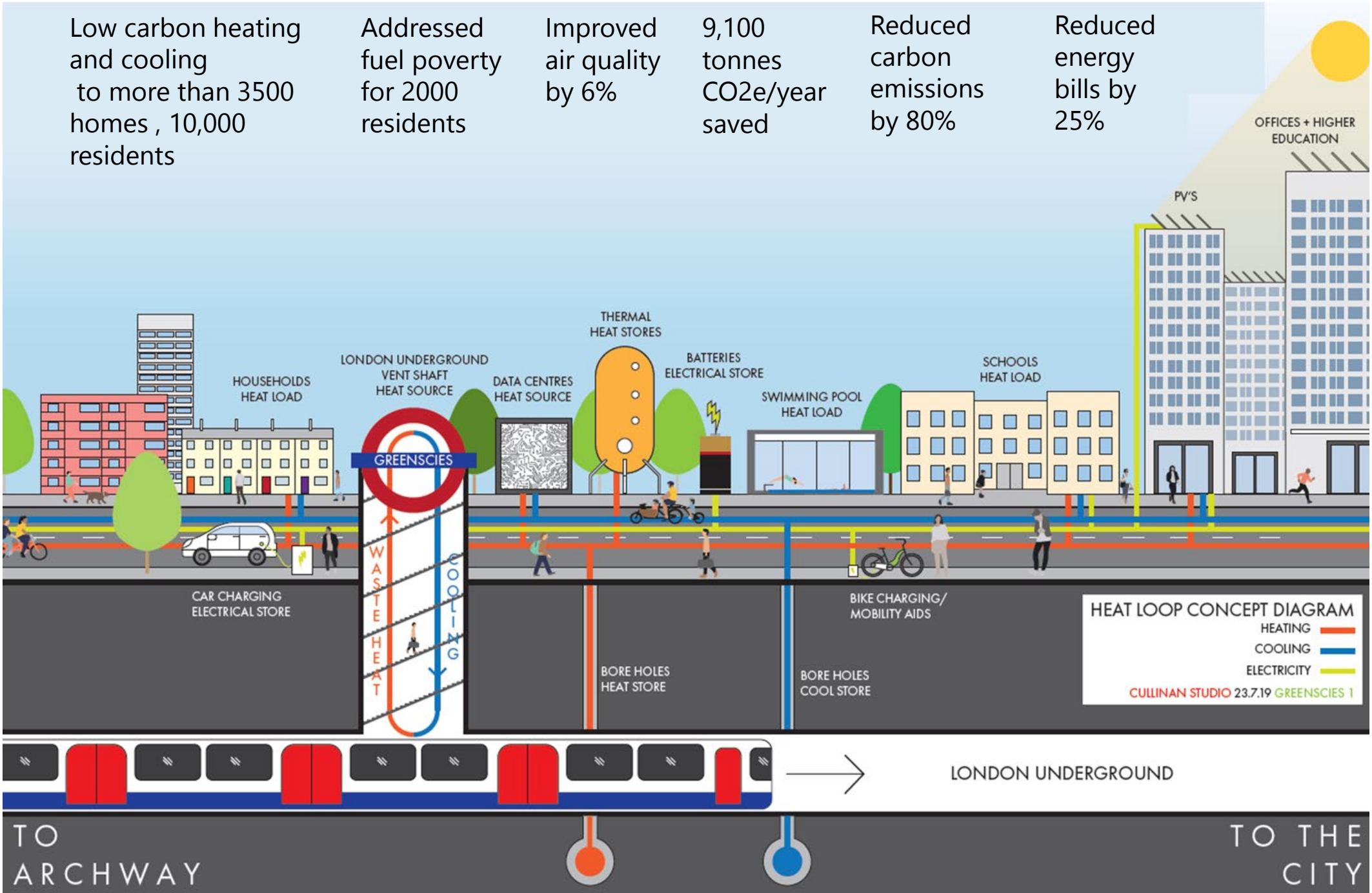
Addressed fuel poverty for 2000 residents

Improved air quality by 6%

9,100 tonnes CO2e/year saved

Reduced carbon emissions by 80%

Reduced energy bills by 25%



Next steps

Detailed design

Detailed stakeholders engagement

Detailed modelling

Case studies

Addressing **barriers to replication**

Knowledge transfer and international engagement

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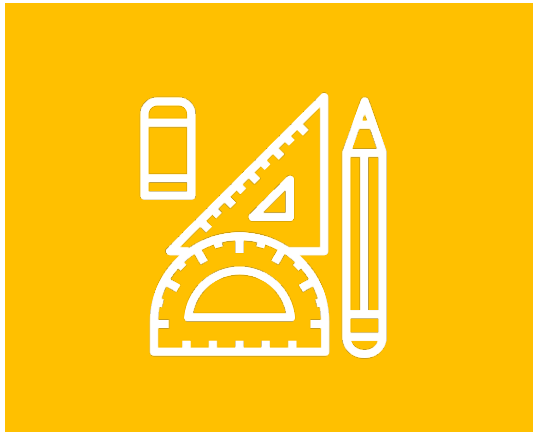
Summary and conclusions



- Integrated smart energy networks in London can be viably realised and deliver a significant reduction in energy bills for residents and businesses alike.
- Very significant carbon savings with around 80% reduction over the base case. This will tend to 100% as the grid decarbonised further.
- Detailed design of the proposed schemes is required.

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Thank You

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