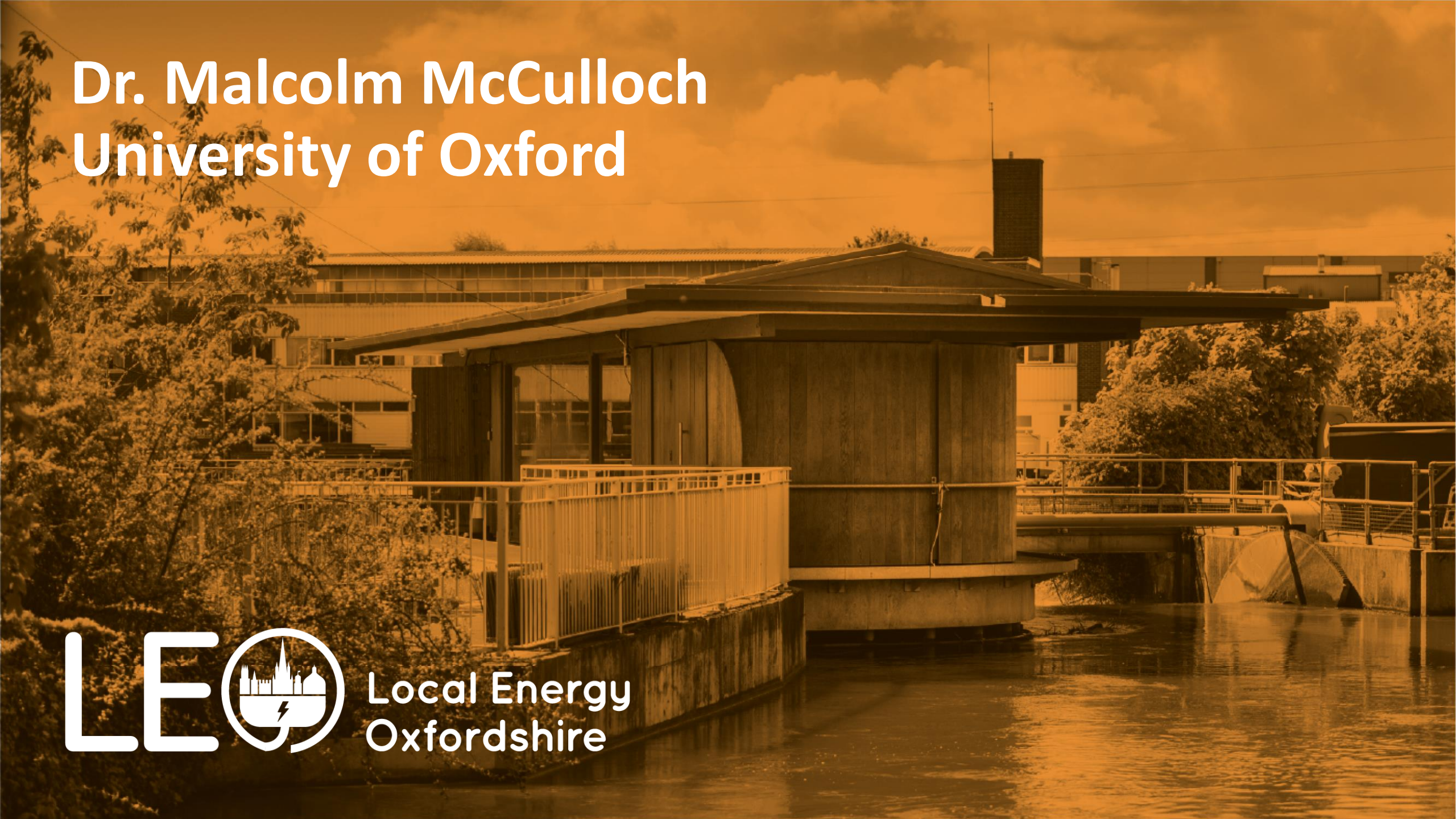
ENA Innovation Visit

19th September 2023

Local Energy Oxfordshire



Dr. Malcolm McCulloch
University of Oxford

LEO Local Energy Oxfordshire

The Achievements of LEO

- DSO market development
- Investable business models
- Skilled community of people
- Trialling flexibility
- Mapping for Local Area Energy Plans

Local Energy Oxfordshire

Local Area Energy Plans are Vital to achieve Net Zero

- Why?
- Local Area Energy Plans (LAEPs) should be mandated, convened by well-resourced local authorities
- LAEPs must take a 'whole systems' approach informed by local communities

Aggregators in the broadest sense are key to enabling flexibility at the Grid Edge

- Aggregation comes in many forms (technical, commercial, community lead).
- Only through aggregation can a DSO “see” grid-edge activity on its network

Investment in data and digital is key to enabling more efficient and smarter local area networks

- Availability **and access** to data is a key enabler
- This applies to both in front of and behind the meter
- Moving to time series data for secondary substations is key to enabling the transition

Local Energy Oxfordshire

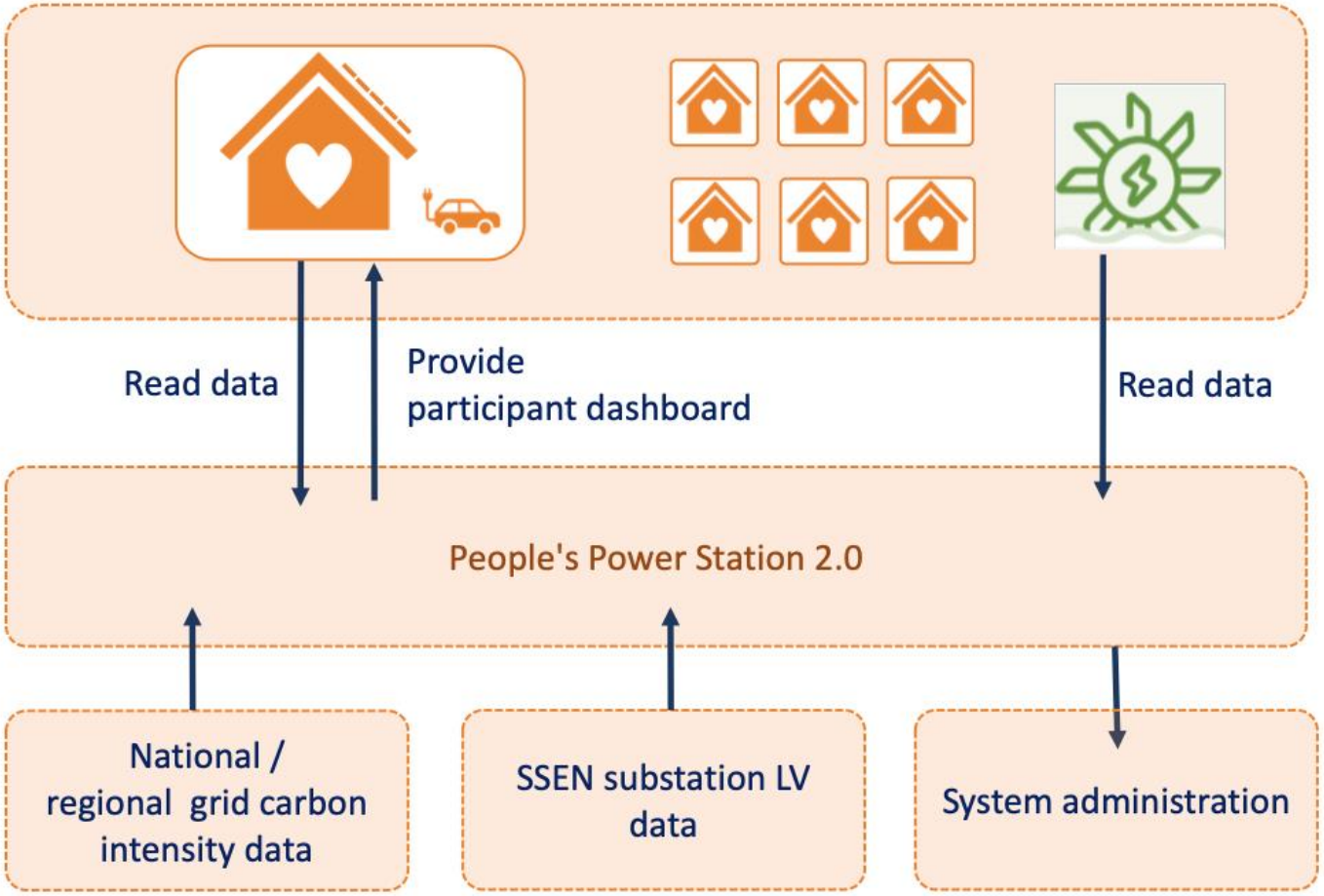
Optimisation behind the secondary substation brings a wide range of benefits.

- Strategic investments can be delivered based on accurate data from LAEPs
- Digital infrastructure supports local flexibility and customer services

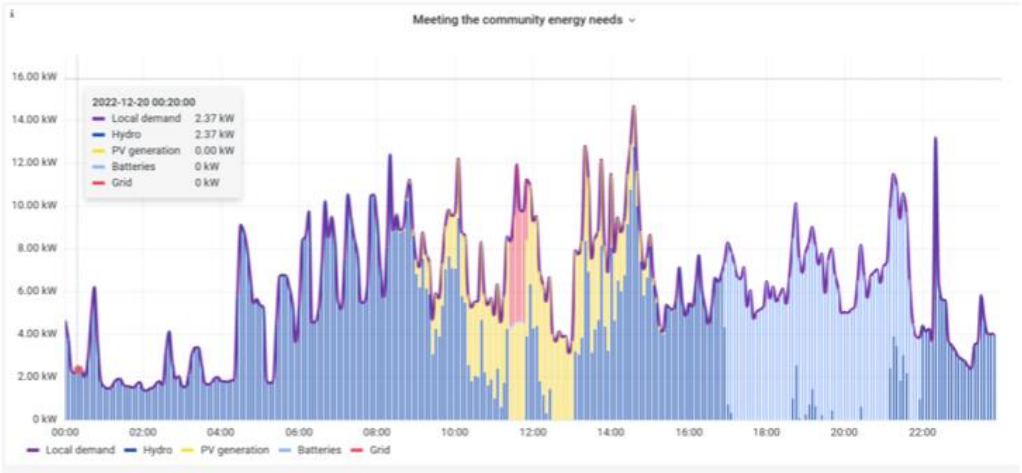
Barbara Hammond
Low Carbon Hub

Local Energy Oxfordshire

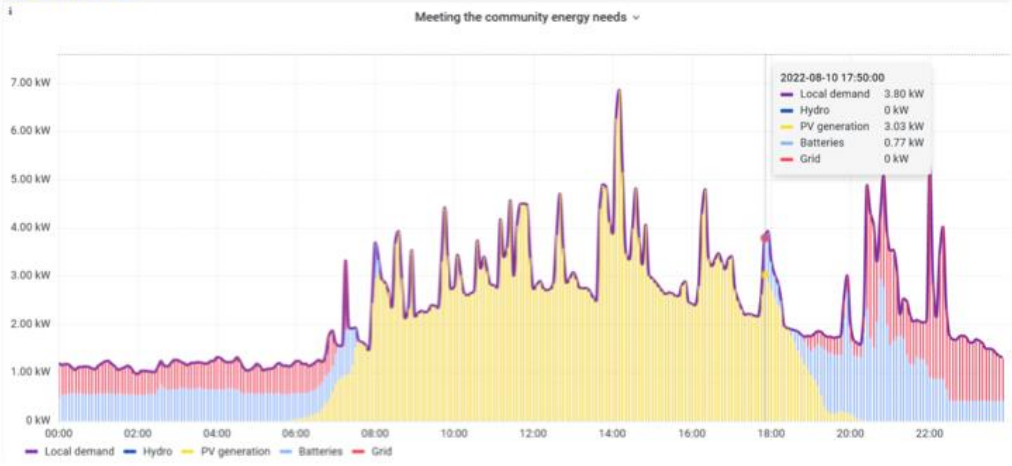
Enabling Societal Shift: Smart Communities



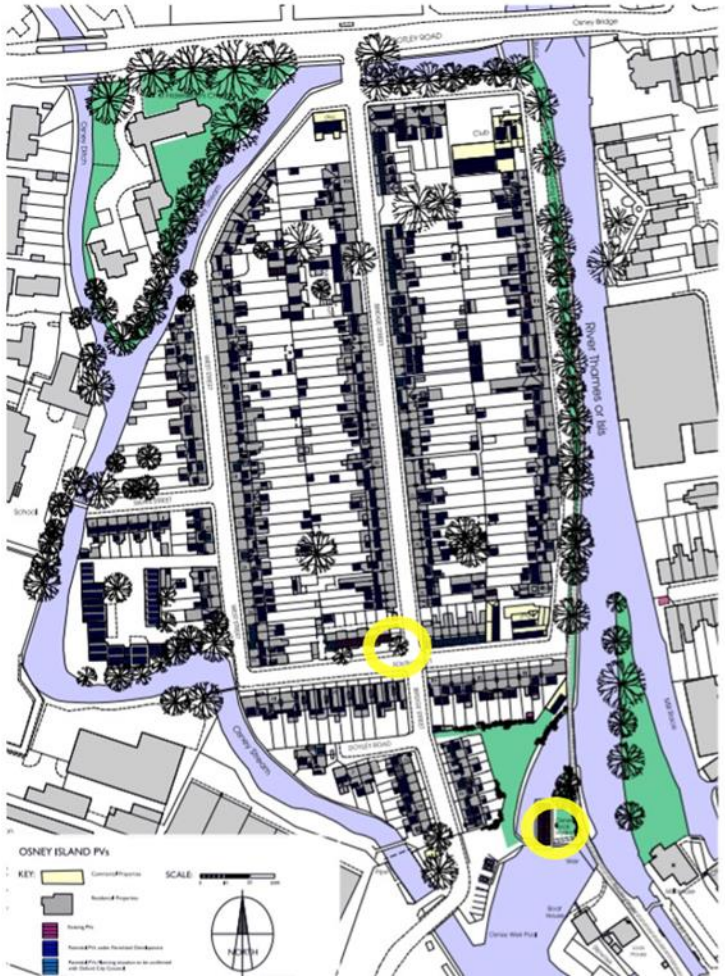
Winter



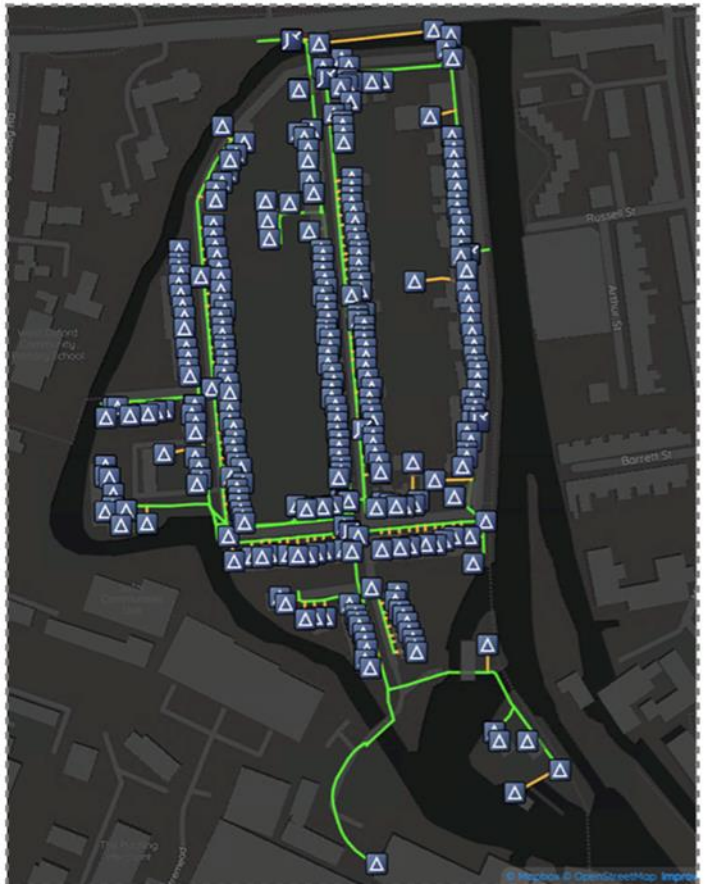
Summer



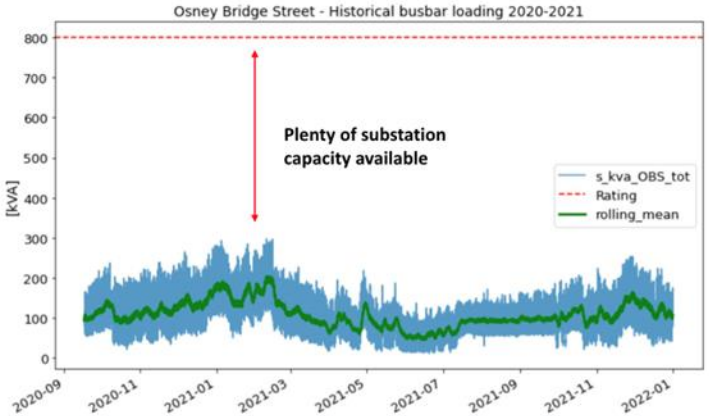
Enabling every customer of every DSO



EO CIM model with UPRNs as supply points and service cables



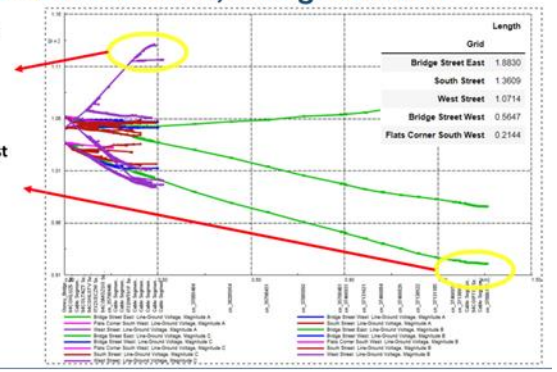
Total demand at LV substation over a year (2020-2021)



Osney Bridge Street – Low demand, max generation

Voltage profile for all feeders

- Significant voltage rise in **West Street** (above 1.1pu)
- Voltage drop in **Bridge Street East** of 0.91pu (longest feeder)



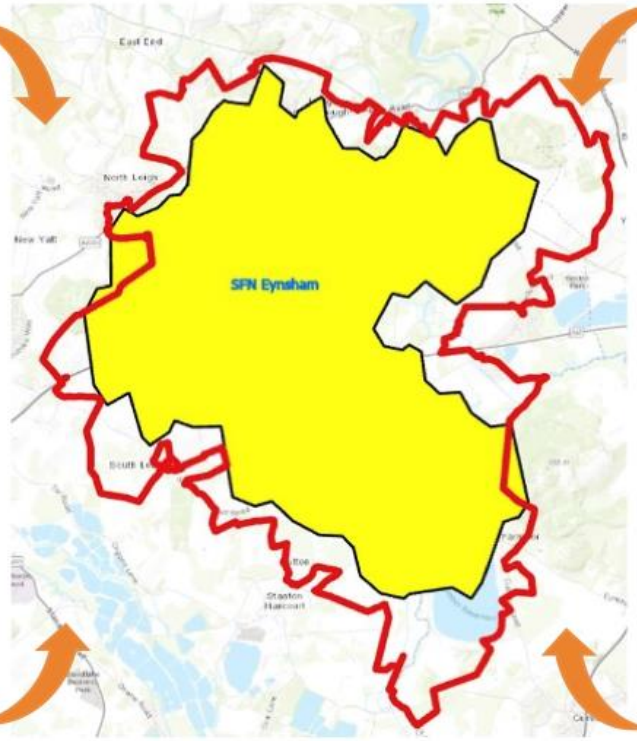
Osney Secondary Substation network modelling study: all SSEN network modelling effort and results

The Local Area: Plans with a purpose

c. 7,400 secondary substations	63 Primary substations	c. 300,000 MPANs

Deddington Smart heat pumps

Osney Supercharge:
smart PV, batteries and hydro



Eynsham Primary Substation
Local Area Energy Plan

Rose Hill:
'time of use tariff'

Springfield Meadows climate positive community

5 District Councils	1 County Council	300 Parishes; c. 520,000 voters

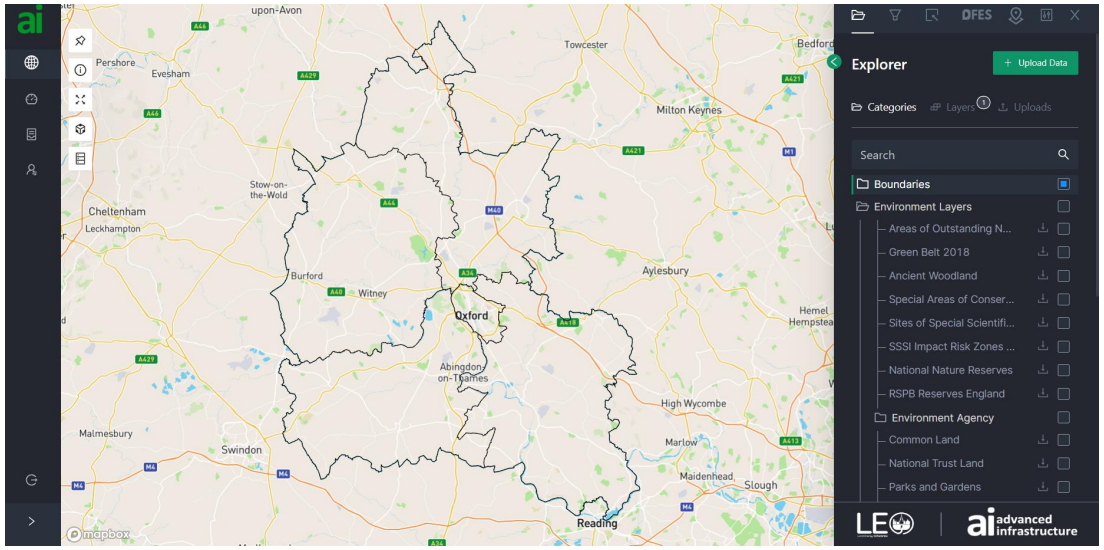
Inga Doherty
Oxfordshire County Council

Local Energy Oxfordshire

Energy mapping for local area energy plans

LEO Strategic Energy Mapping – LAEP+

Supporting strategic scale energy planning



LEMAP - Local Area Energy Mapping

Participatory mapping for community groups

Local Area Energy Plans are vital to achieve Net Zero

Local Energy Oxfordshire

project-leo.co.uk

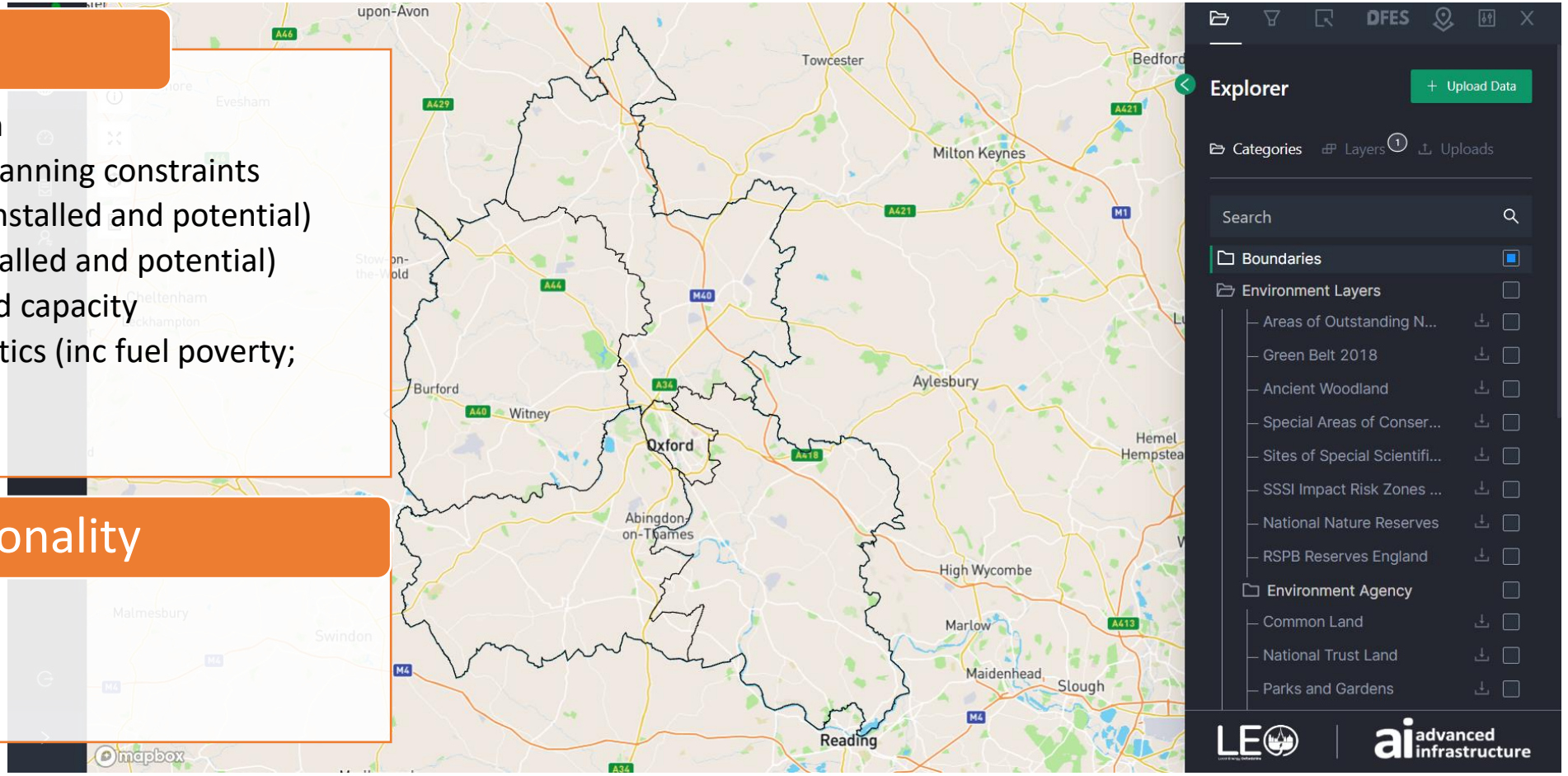
LEO energy mapping - understanding place

Data

- Energy demand; generation
- Planned housing growth; planning constraints
- Low carbon technologies (installed and potential)
- Renewable generation (installed and potential)
- Network data, including grid capacity
- Socio-economic characteristics (inc fuel poverty; deprivation)
- DFES

Features and functionality

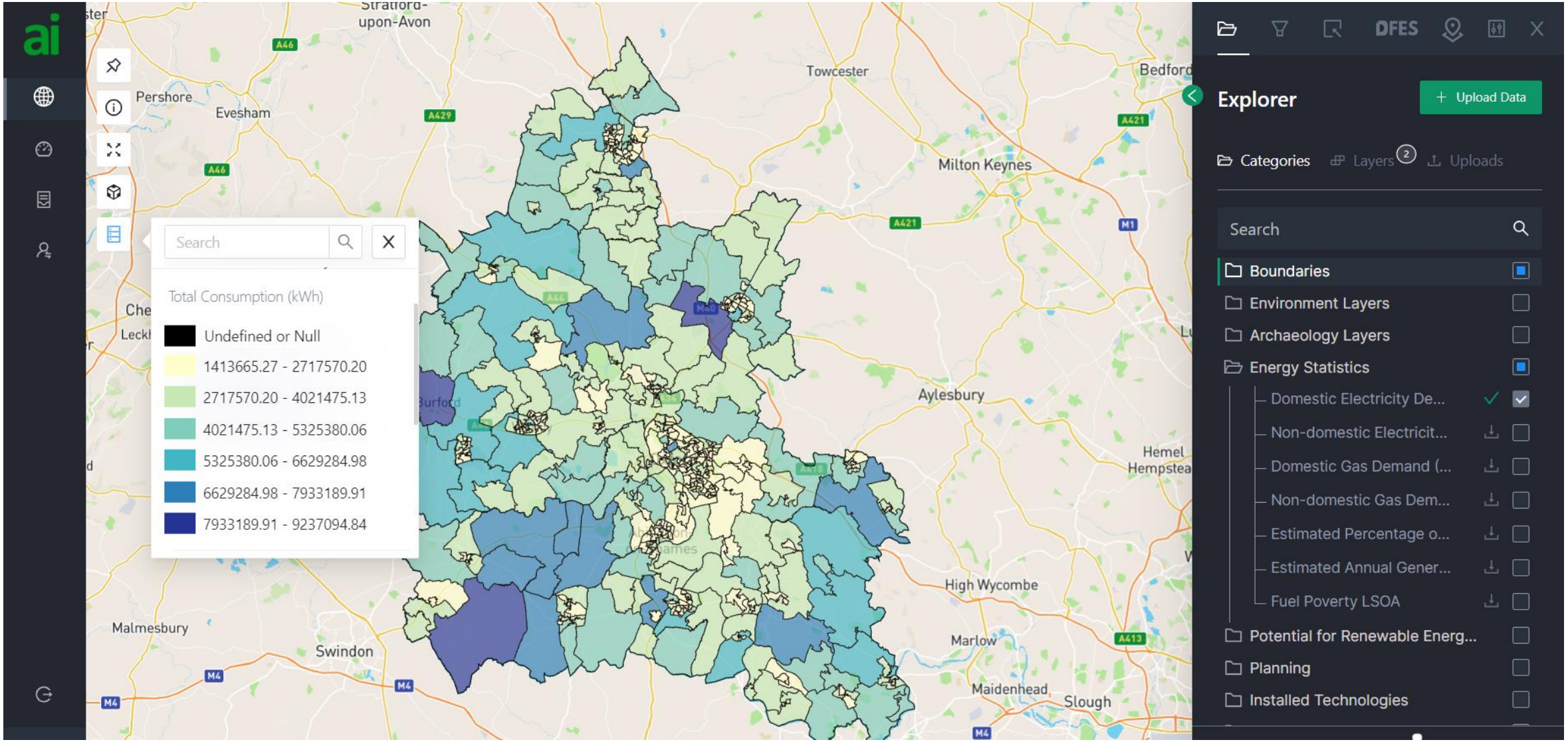
- Data filters
- Dashboards
- Data stories



Local Energy Oxfordshire

project-leo.co.uk

Setting the baseline – current energy use



Local Energy Oxfordshire

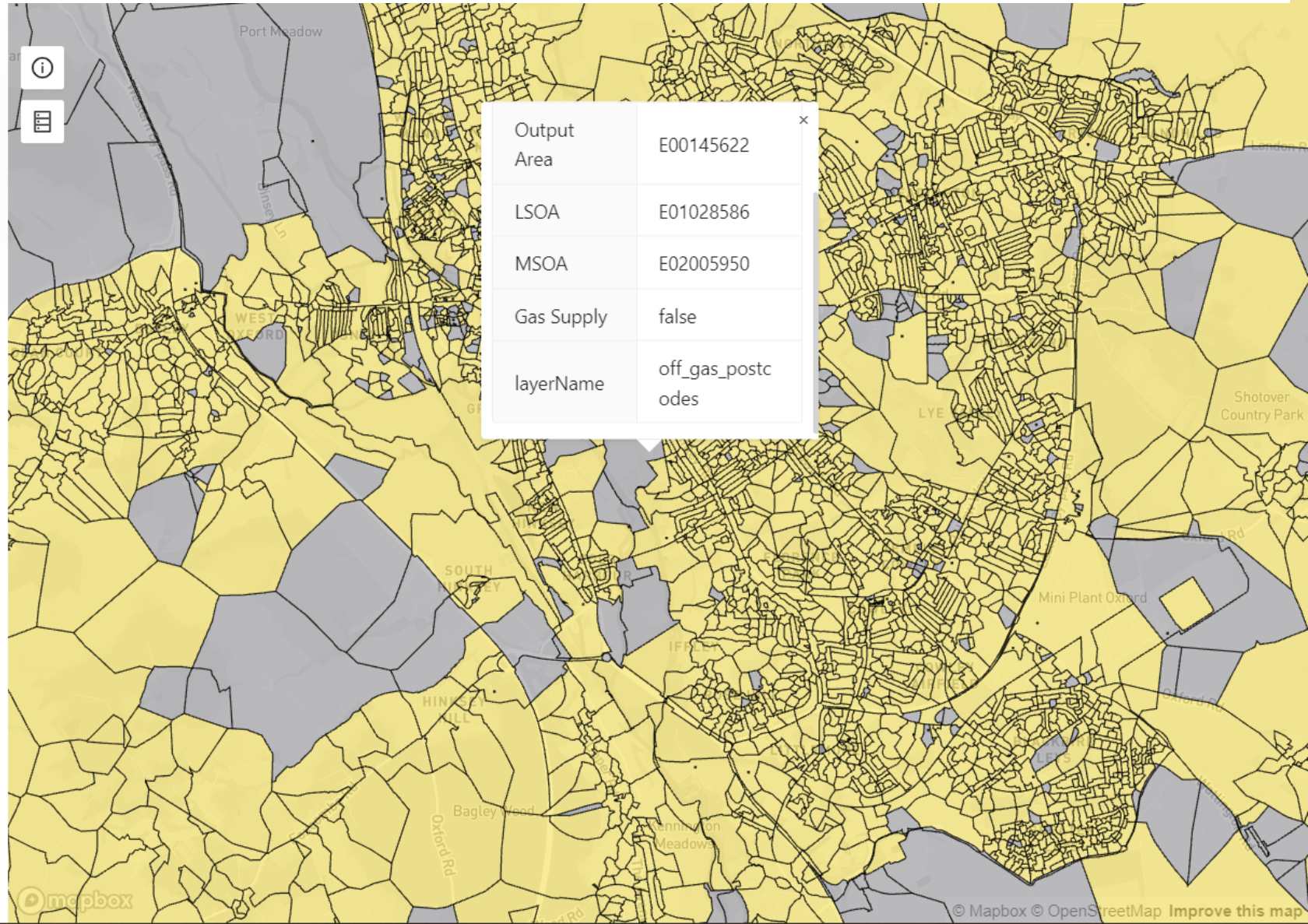
project-leo.co.uk

Setting the baseline – on- or off-gas

Energy Networks

Off Gas Postcodes

For 339 postcodes in Oxford City, Xoserve holds no record of a gas connection. Any buildings within these postcodes are likely served by alternative heating sources such as oil, wood or electric heating. These areas represent good locations to deploy electric heating sources.



Setting the baseline – understanding communities

Fuel Poverty

In 2020, there were an estimated 13.2% of households (3.16 million) in fuel poverty in England under the Low Income Low Energy Efficiency (LILEE) metric, down from 13.4% in 2019 (3.18 million).

According to the same BEIS 2020 fuel poverty statistics (published April 2022), 11% of households in Oxford City are in fuel poverty. Oxford has a higher rate of fuel poverty than the other districts in Oxfordshire where the overall proportion of households in fuel poverty is 8.1%

Number of households	Number of households in fuel poverty	Proportion of households fuel poor (%)
60,19	6,651	11.0

Across 80 LSOAs in Oxford, 8 had fuel poverty rates of over 20%. 75% of LSOA have fuel poverty rates between 3% and 13%. LSOA Oxford 016E (LSOA code: E01028576) has the highest proportion of fuel poor households at 22.9%

The charity National Energy Action has estimated that price rises in 2021 and April 2022 will lead to an increase in the number of households in fuel poverty (under a different definition to the LILEE metric) of more than 50%.

Setting the baseline – understanding communities

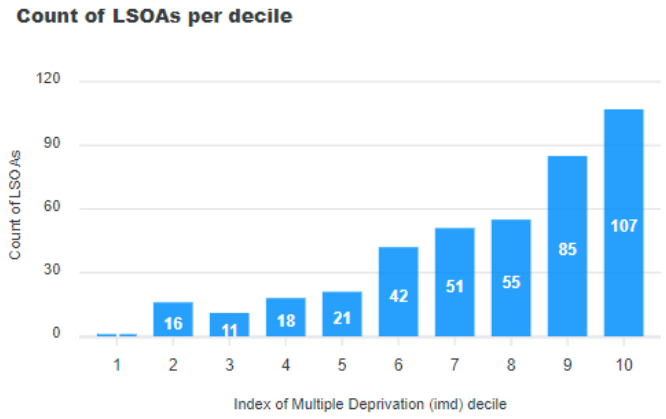
Indices of Deprivation

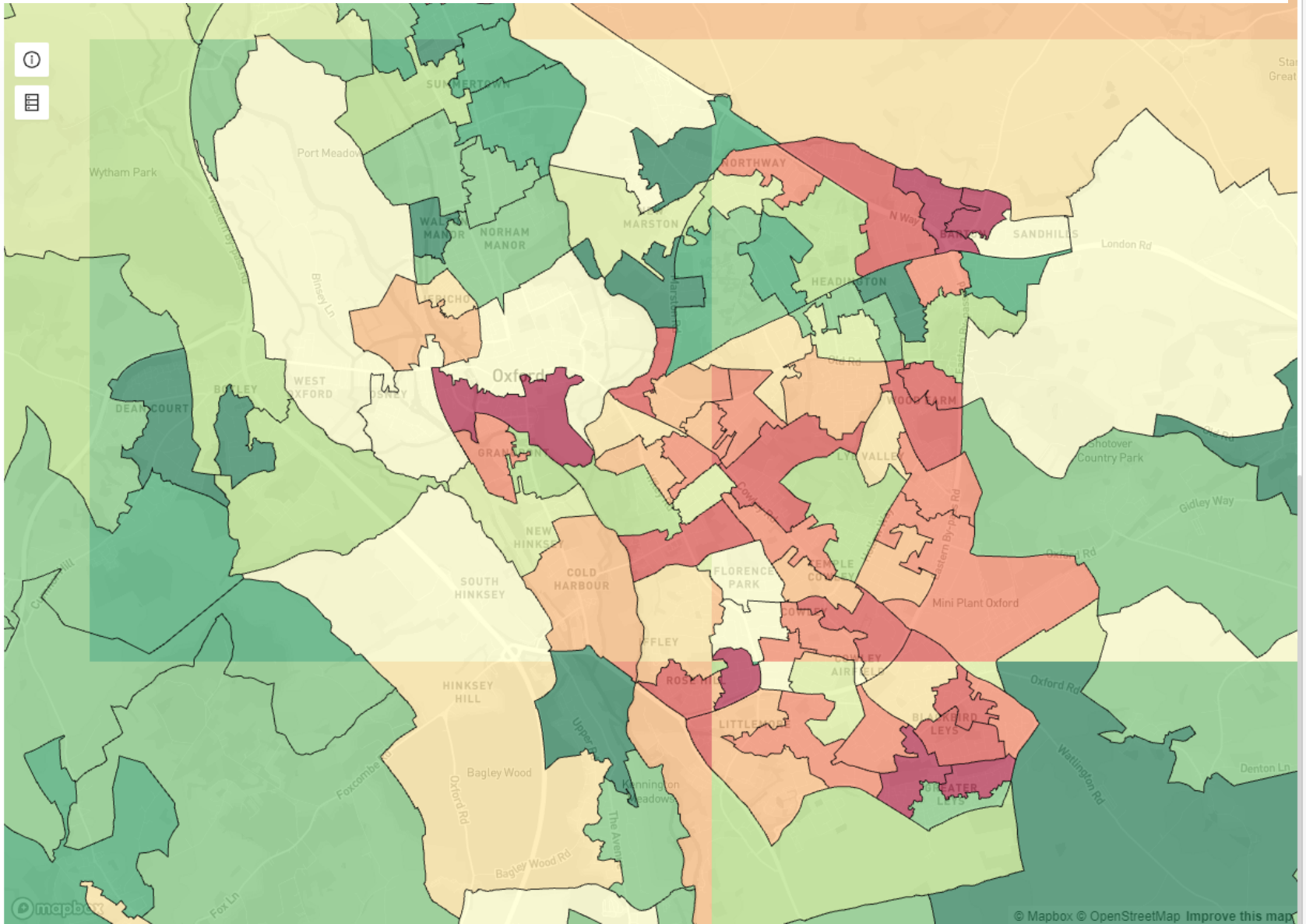
The English Indices of Deprivation measure relative deprivation across 32,844 small areas in England called lower-layer super output areas (LSOAs). The index of multiple deprivation is the most widely used of these indices

The population weighted average of the combined ranks of LSOAs in Oxford is 13634.79. This population weighted average ranks Oxford at 189 out of 317 district authorities. The nature of this measure – using all areas, and using ranks rather than scores – means that a highly polarised larger area would not tend to score highly, because extremely deprived and less deprived LSOAs will 'average out'. Conversely, a larger area that is more uniformly deprived will tend to score highly on the measure.

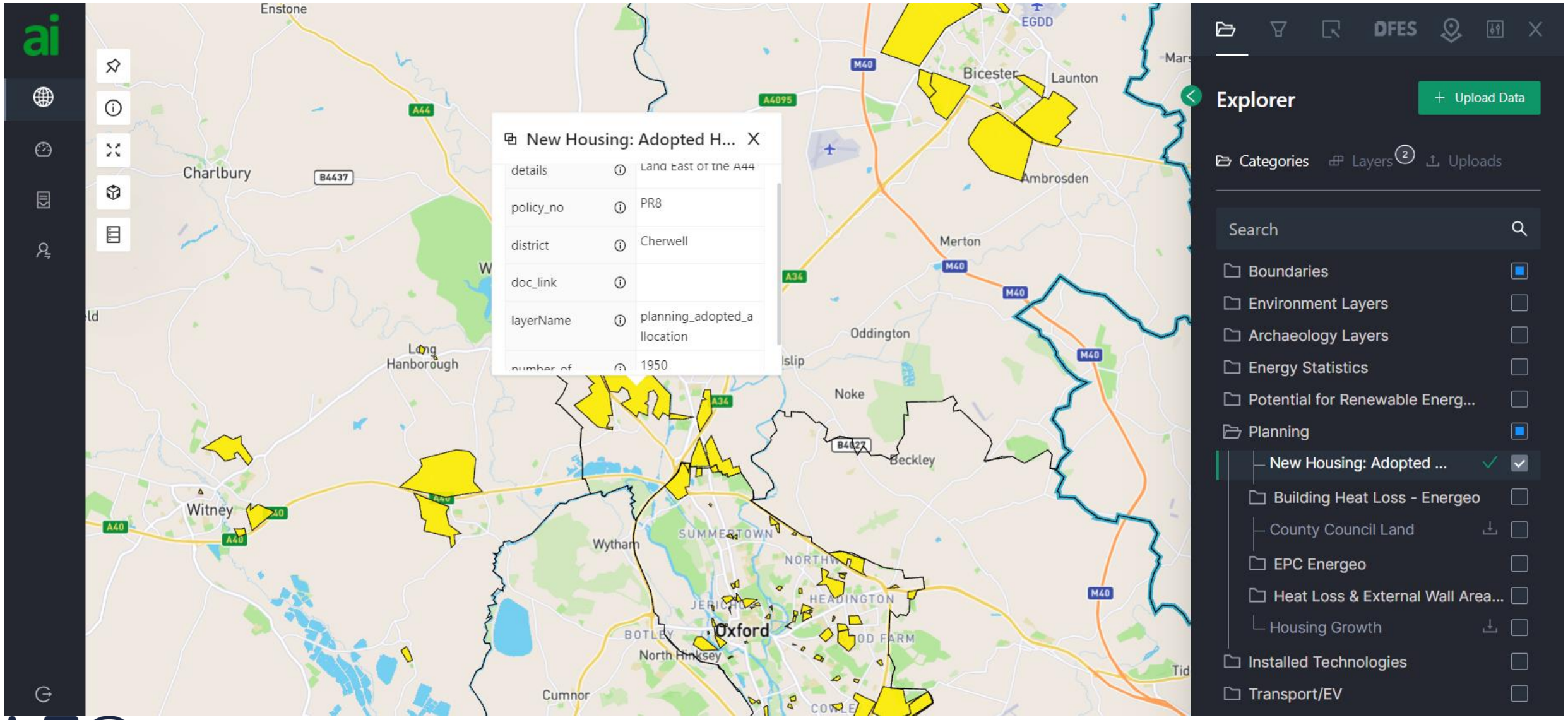
In addition to overall rank, the English Indices of Deprivation divides English LSOAs into 'Deciles'. All 32,844 LSOAs are grouped into 10 bands (deciles), each containing 10% of the LSOAs. Decile 1 contains the 10% most deprived LSOAs in England.

Oxford City has one of the top 10% most deprived LSOAs in England and eleven of the 10% least deprived LSOAs in the country.

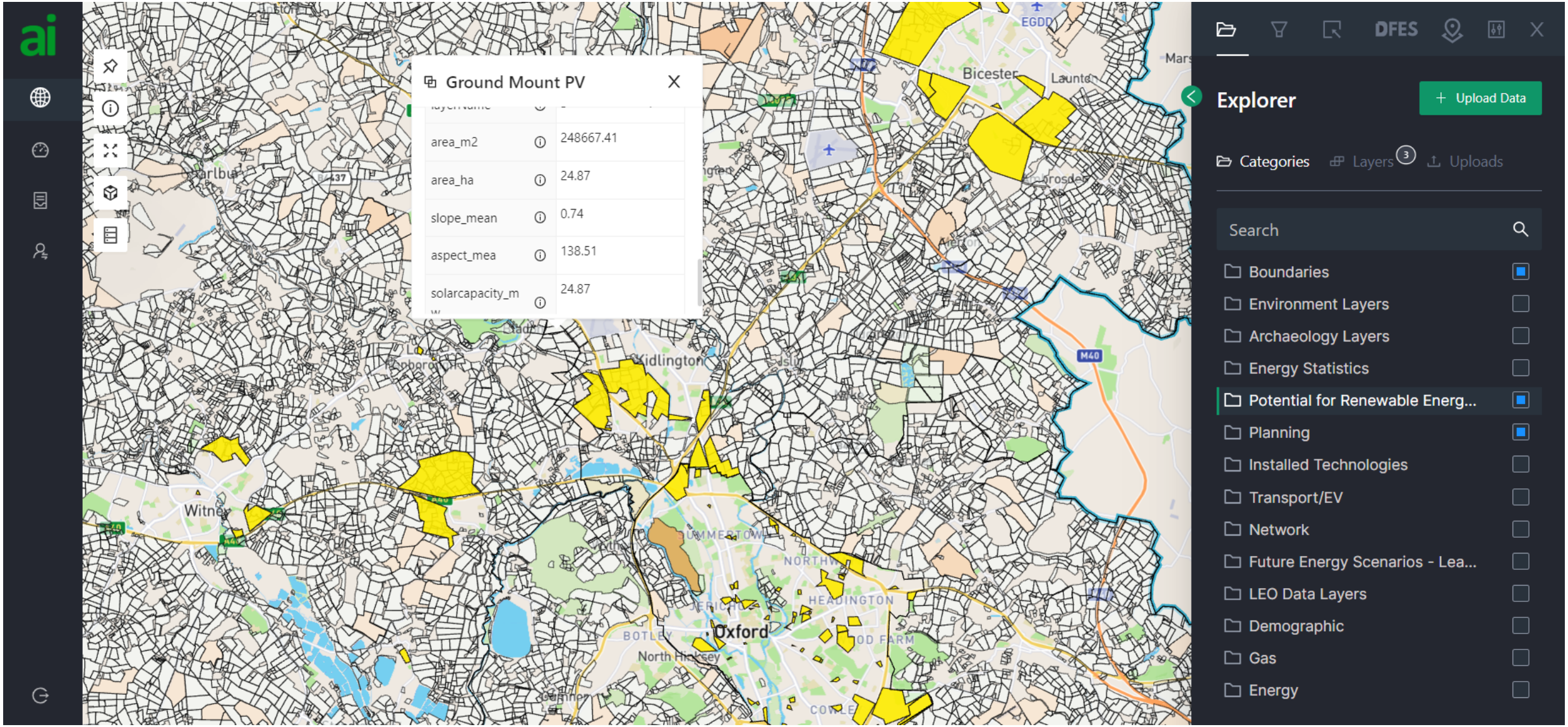




Planning for change - growth



Planning for change – increasing renewables



Local Energy Oxfordshire

project-leo.co.uk

Planning for change – increasing renewables

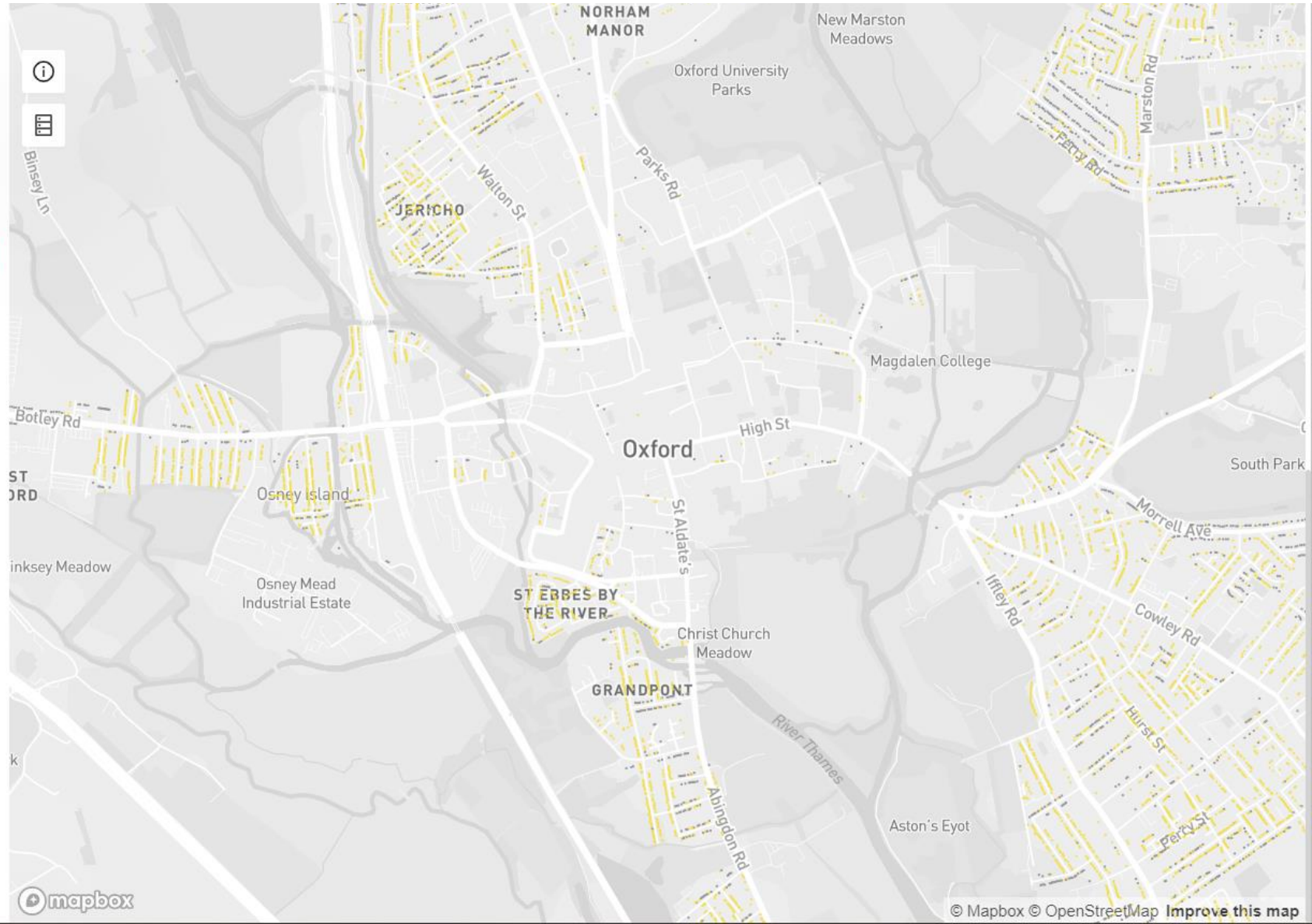
Retrofit Potential

Rooftop PV Potential

As part of Project LEO, both Energeo and Energy Systems Catapult produced desktop studies of rooftop PV potential across Oxfordshire. The Energy Systems Catapult dataset is shown on the map opposite.

In Oxford City, an estimated 11,907 domestic buildings are deemed suitable for PV installations across 43,851 assessed domestic properties. This equates to a total PV capacity of 29MW across domestic properties in Oxford City. Suitability and potential yield was assessed based on rooftop size and orientation. Only roofs able to support a system of at least 1.5 kWp were included.

Installation of rooftop PVs can have a significant positive impact towards reducing carbon emissions. A peak electricity capacity of 2.4kWp and an annual generation of 2040kW can be produced from just a small rooftop area of 20m2 that has an orientation towards the South.



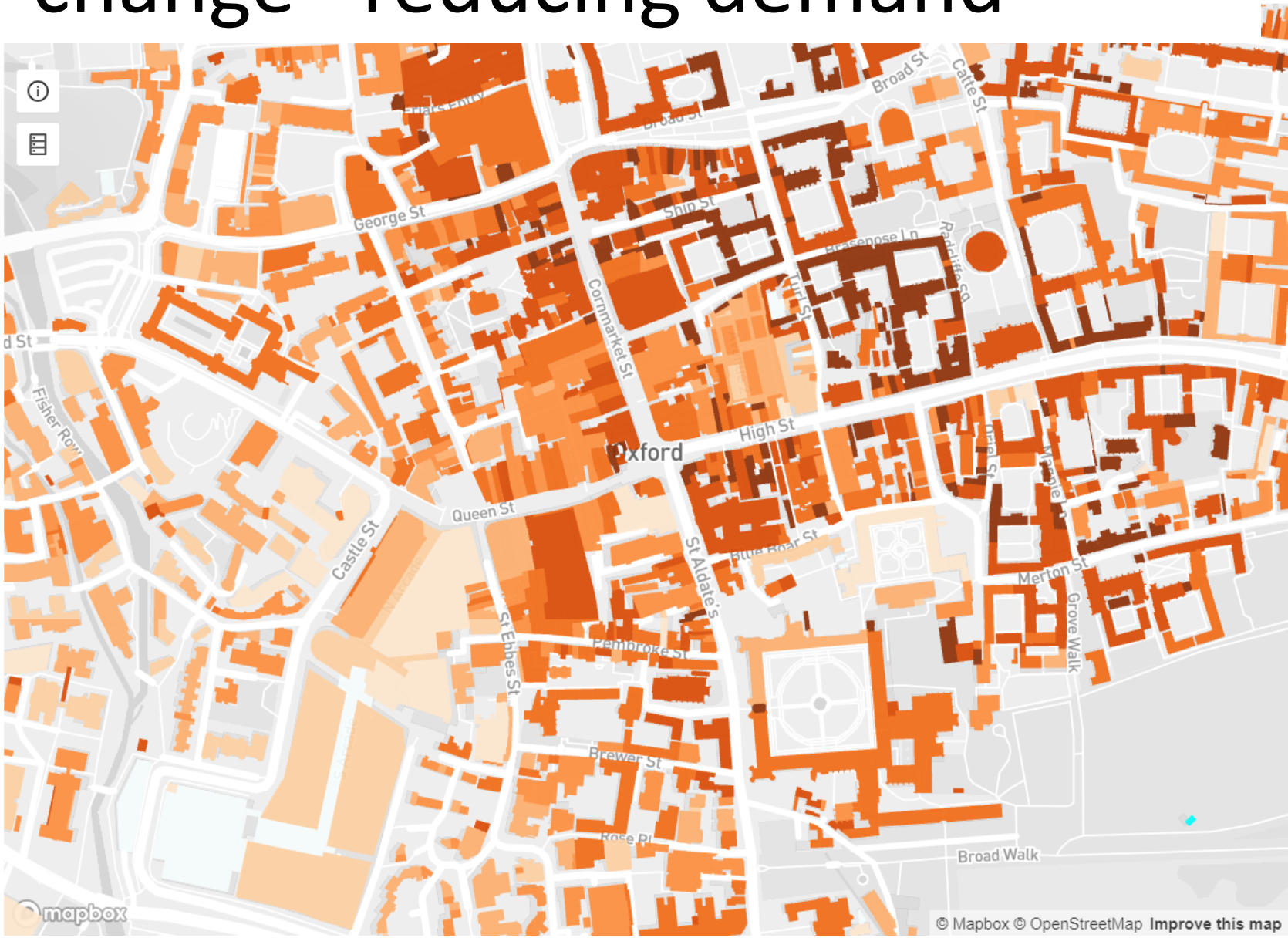
Planning for change –reducing demand

Buildings

Heat Loss

Detailed surveys of building heat loss can help identify opportunities to improve energy efficiency by highlighting particularly inefficient buildings.

This Energeo dataset, shown on the map opposite, uses aerial thermal imaging taken in 2020 to provide an overview of heat loss across Oxfordshire's market towns, including Oxford City.



Planning for change –reducing demand

Retrofit Potential

Low Carbon Heating Potential

Low carbon heating sources like heat pumps, district heating and hydrogen will be required to hit net zero targets.

The LEO-LAEP+ platform includes data on the existing gas network, including the gas pipe topology and material, as well as off gas home records. There are 339 postcodes with no gas connection in Oxford

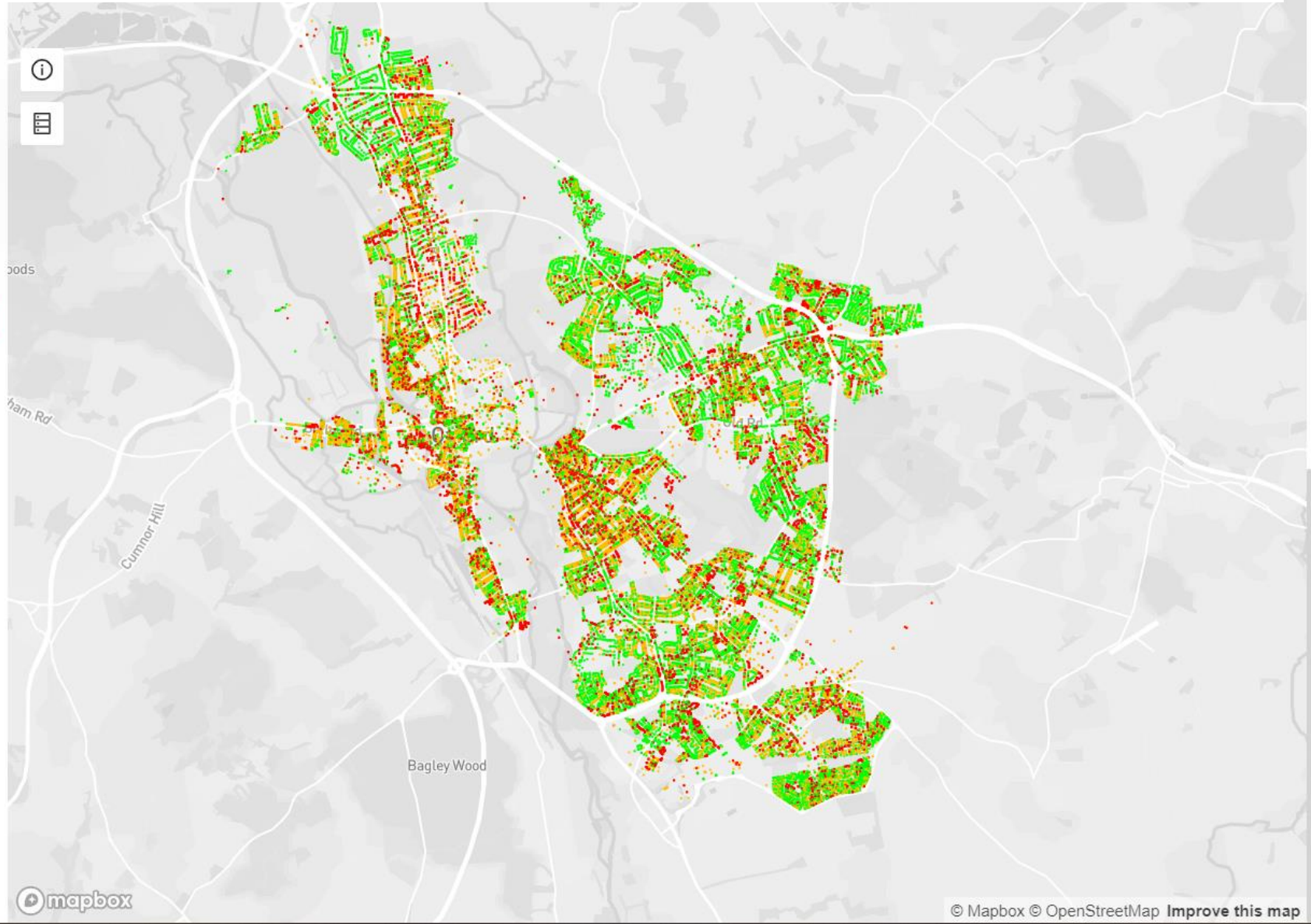
Desktop studies of low carbon heating potential for domestic properties across Oxfordshire have been provided by Energeo and the Energy Systems Catapult (ESC) for project LEO. These include:

1. ESC, Potential for air source heat pumps
2. ESC, Potential for ground source heat pumps
3. Energeo, Potential for ground source heat pumps

The map opposite shows the potential for air source heat pumps within Oxford City.

Across Oxford, ESC categorised 80,639 buildings according to likely suitability for an air source heat pump based on garden size, distance from neighbours and potential noise disruption

Likely suitable (green)	Uncertain (amber)	Likely unsuitable (red)
30848	22220	27571



Planning for change – electric vehicles

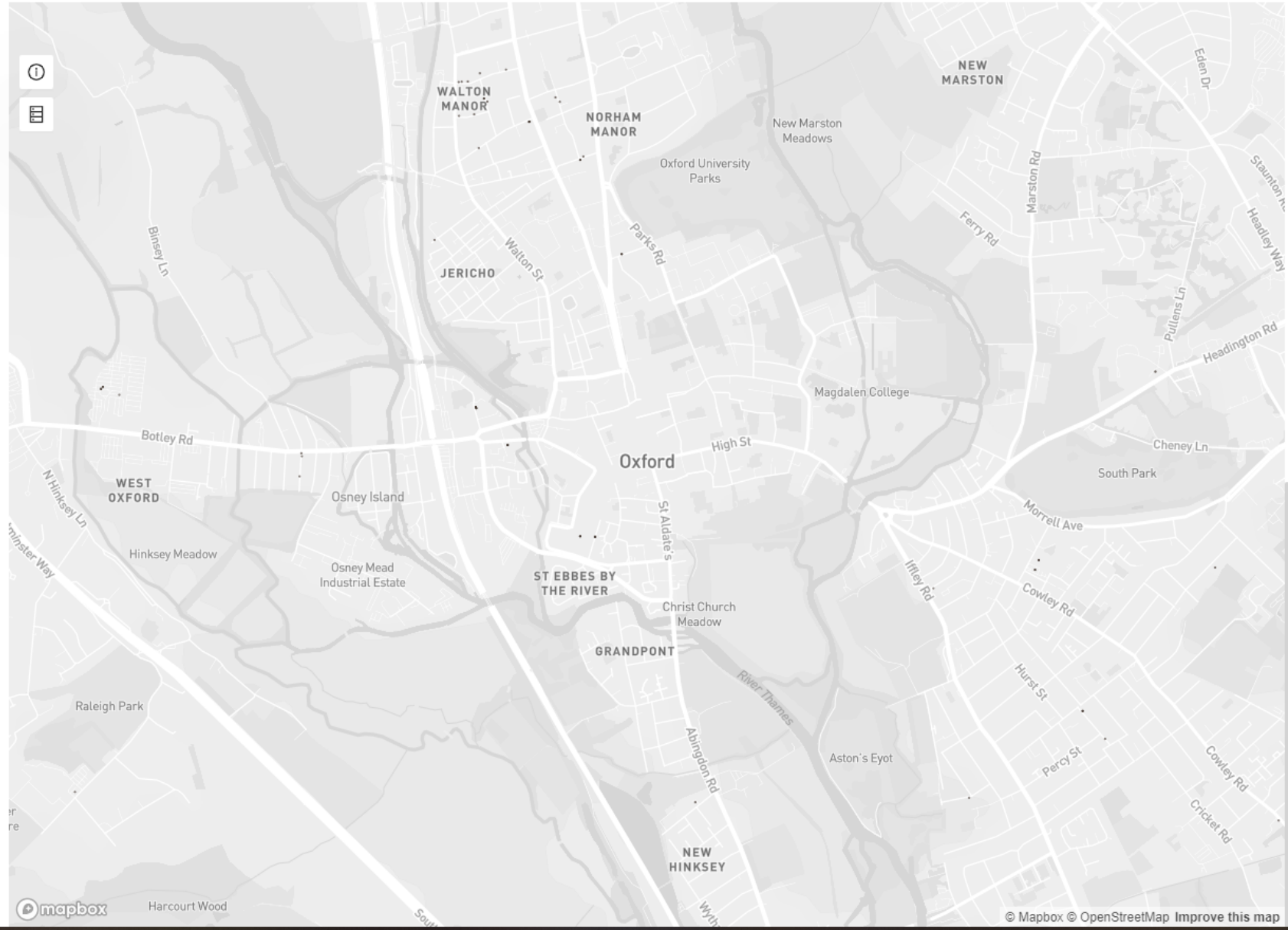
Transport

Existing EV Charge Points

As of 1 October 2022, Oxford City has 141 charging devices.* This is equivalent to 93 devices per 100,000 people. 31 of those devices are rapid chargers or higher. This puts Oxford in the top 20% of local authorities for charging infrastructure in the UK. These statistics are provided by DfT, using data on charging infrastructure from ZapMap and population statistics from the ONS.

As of Q3 2022, there are a total of 794 plug-in cars registered in Oxford City and 468 hybrid plug-in cars. Across Oxfordshire, there were 8,550 plug-in cars and 4,461 hybrid plug-in cars (24 May 2022, DfT and DVLA).

Note: A charging device may have more than one charging connector and be able to charge more than one vehicle at a time, therefore these figures do not reflect overall charging capability.



Planning for change – electric vehicles

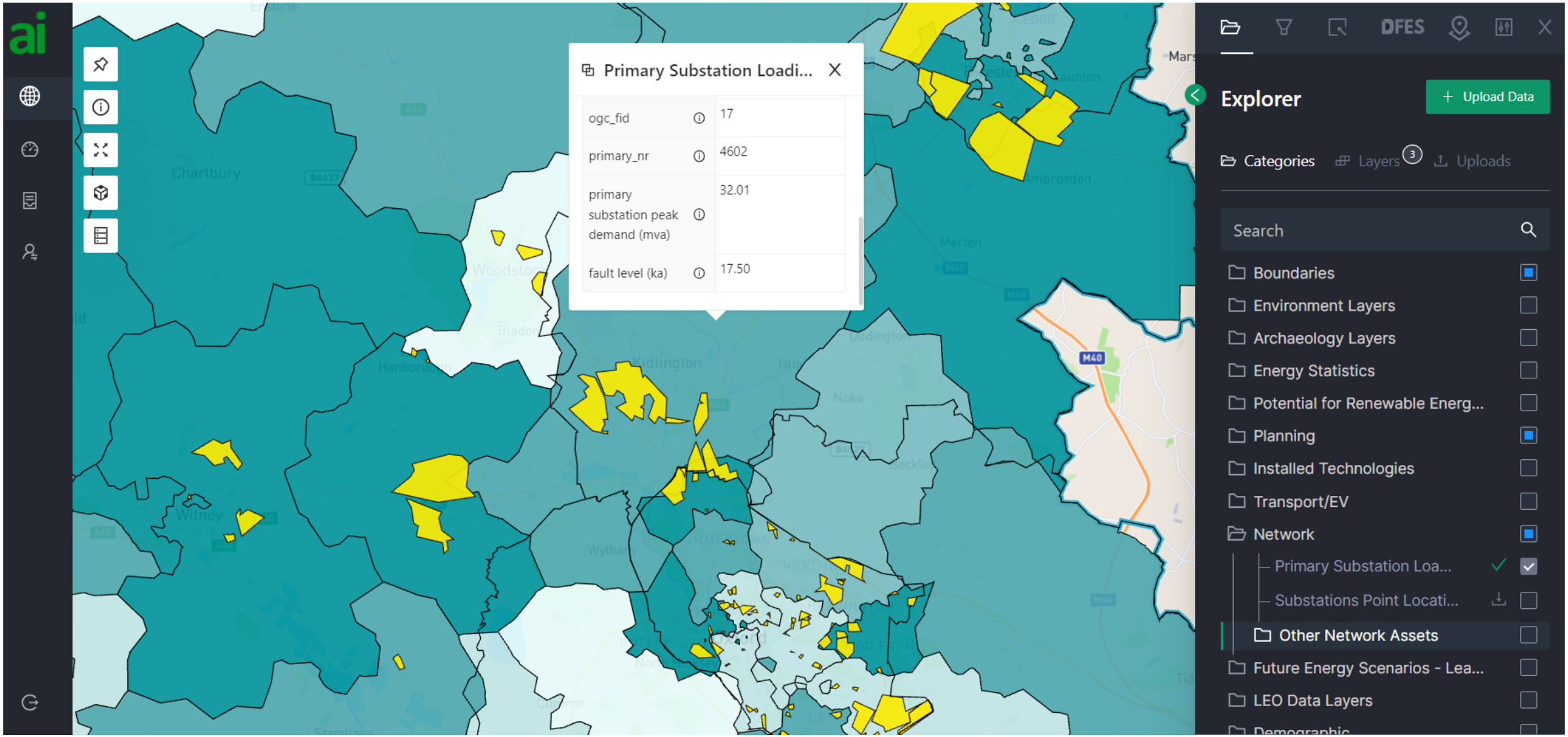
Transport

Space for Off Street Parking

Energy Systems Catapult provided Project LEO with a desktop study assessing the probability that domestic properties have space to park an average size vehicle within the property boundaries

Based on an assessment of available space at 31,553 domestic properties: 26,977 domestic properties were deemed to have space the park at least one car off-street. 4,576 domestic properties were ruled as unsuitable for off-street parking due to lack of available space. These homes likely use on-street parking or local car parks and will require access to some form of public or on-street EV charging infrastructure in future.

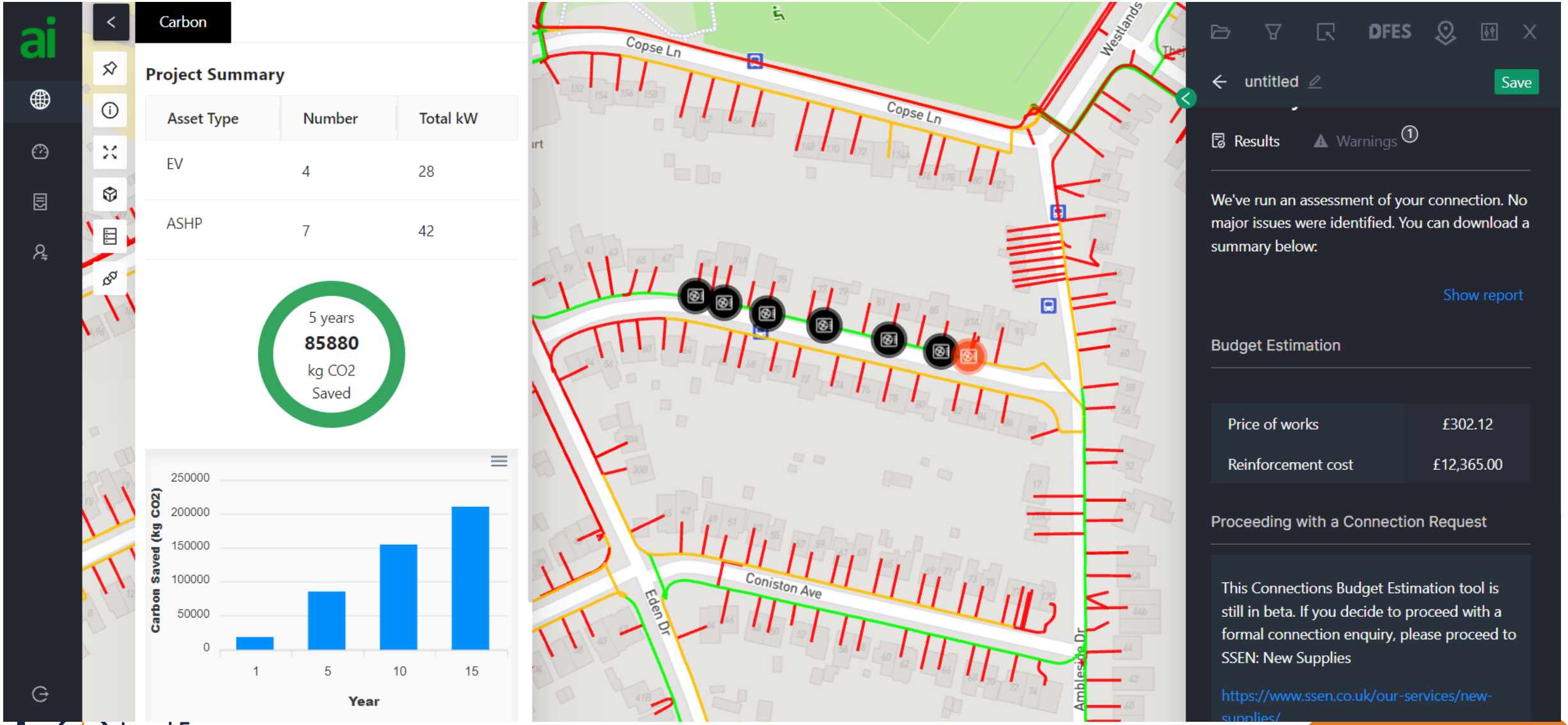
Network capacity (primary)



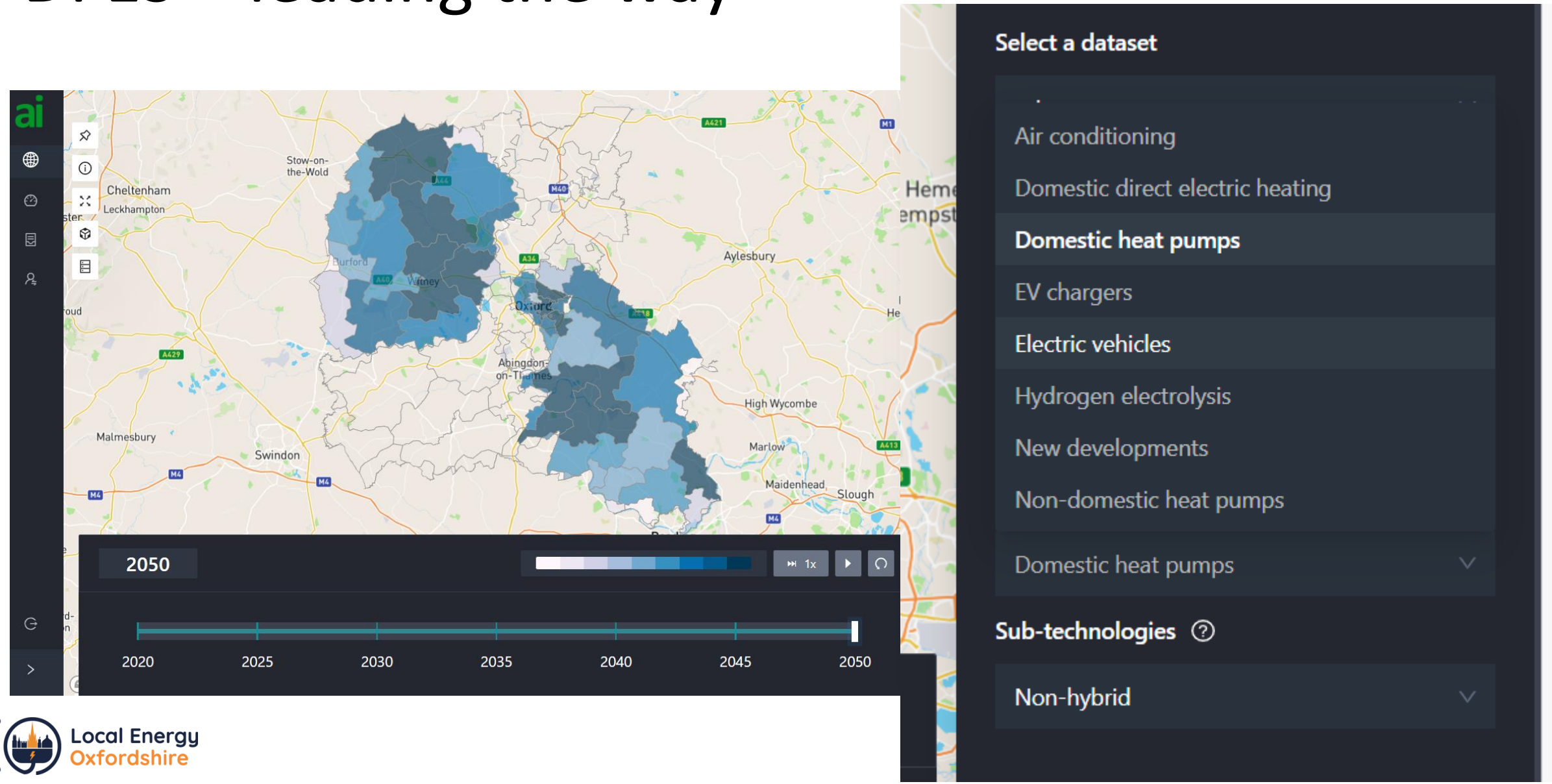
Local Energy Oxfordshire

project-leo.co.uk

Identifying projects and network capacity



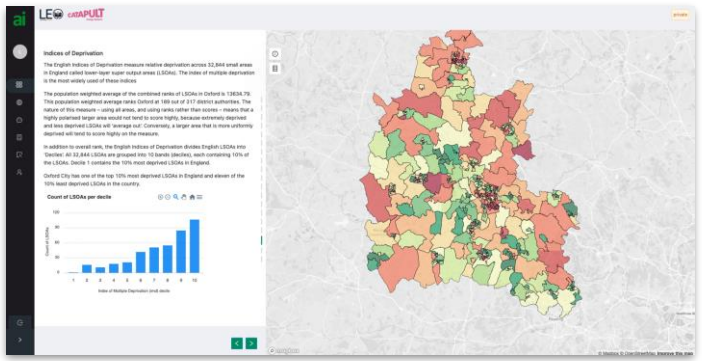
DFES – leading the way

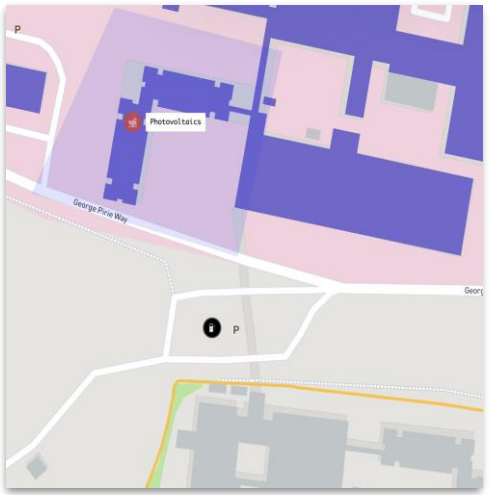


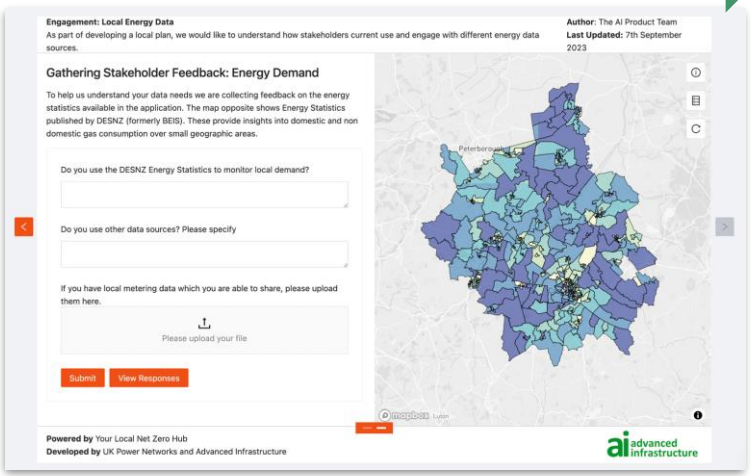
Local Energy Oxfordshire

Ongoing development – LAEP+

- Advanced Infrastructure also working directly with SSEN (RESOP) UKPN (Project CLEO) and NGED
- Progressive development has enhanced functionality across optioneering, carbon & cost estimation, scenario analysis and connection assessments.



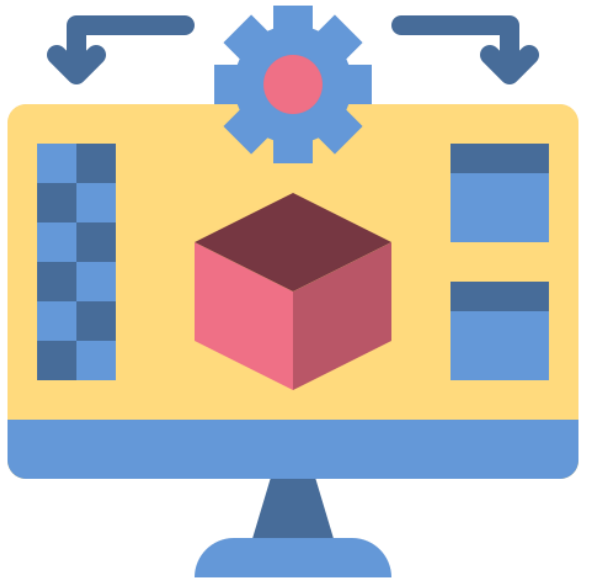




project-leo.co.uk

Ongoing development – 2023/24

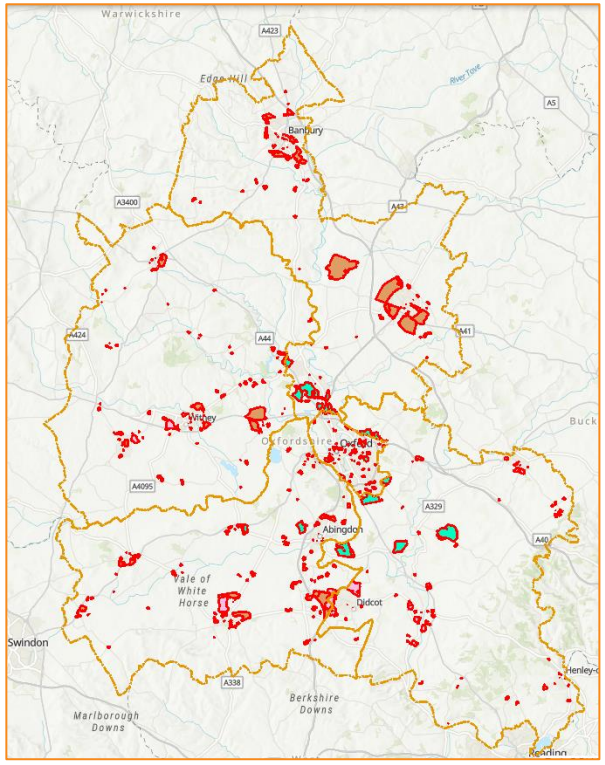
- Stakeholder Engagement Tools
- Data Stories with integrated survey features and options to publish to a public URL
- Cost and carbon assessment of projects
- Improved Network Capacity and connection assessments
- DNO Council communication tools
- Live Chat help Desk



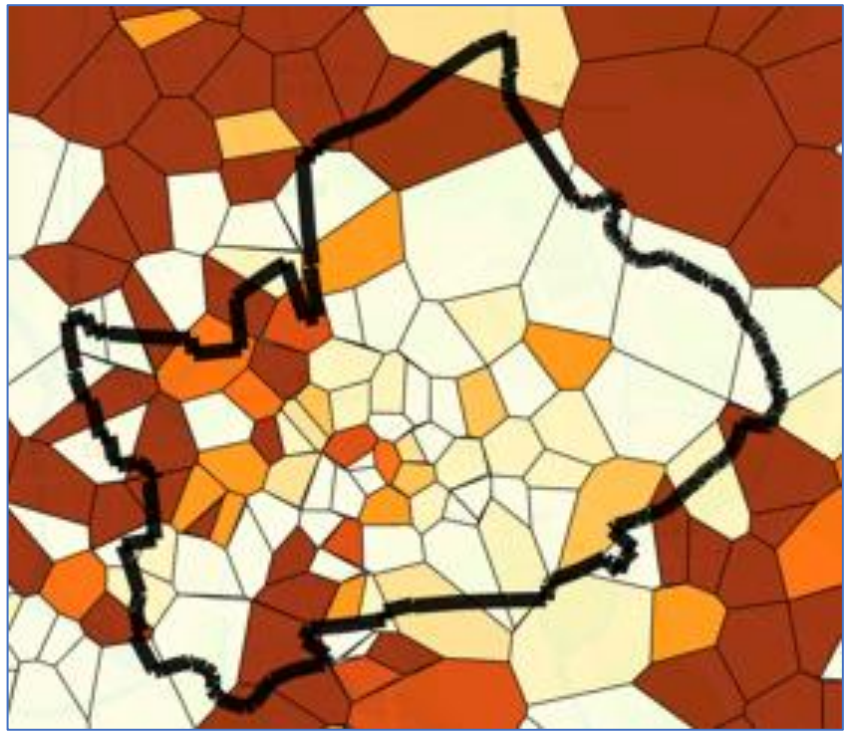
Supporting local area energy planning

- Baselining
- Planning for growth
- Planning for electrification of transport & heat
- Increasing renewable generation

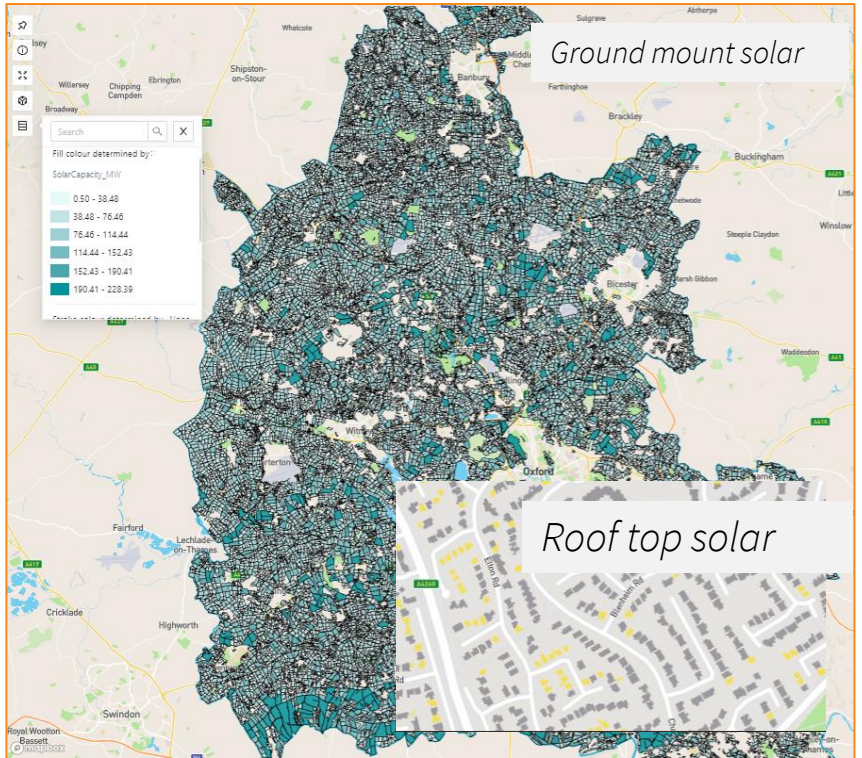
Planned housing growth locations



Network requirements



Solar generation potential



Thank You

Read the final report by visiting our website

www.project-leo.co.uk

Local Energy Oxfordshire

Oxfordshire

EDF ENERGY

equiwatt

NUVVE

OXFORD BROOKES UNIVERSITY

OXFORD CITY COUNCIL

Scottish & Southern Electricity Networks

UNIVERSITY OF OXFORD

piclo®

OXFORDSHIRE COUNTY COUNCIL

low carbon hub

project-leo.co.uk