Using energy data to drive energy system decarbonisation

GEODE Innovation & Development Working Group

Yiu-Shing Pang

UK Power Networks
Delivering your electricity

INVESTORS IN PEOPLE™ We invest in people Platinum

NES NATIONAL EQUALITY STANDARD

THE UK'S TOP 5 BEST BIG COMPANIES TO WORK FOR 2023

About UK Power Networks

8.3M homes and businesses

28% of UK Total

9.3GW+ Distributed Generation Connected

32% of UK Total

16GW+ Peak Demand

28% of UK Total

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UK Electricity System 2022

+5.6%

Total electricity generated in 2022 (326TWh)

-3.9%

Overall load reduction in 2022

41% (135TWh)

Renewable Generation +10% on 2021

+25% (80TWh)

Record levels of wind generation

56%

Of UK energy mix was from low carbon sources

5.3 TWh

UK net export- first time in 40y

By 2035 the UK needs 150GW of low carbon generation to run the system in Net Zero mode, serving 65GW. There is 340GW in the accepted que to connect, where we only require an additional 100GW

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Situation- Renewables at UKPN level

Decarbonising Electricity

9.4GW of distributed generation connected, **7.3GW** renewable

10GW DG accepted, not yet connected

410MW of storage connected, **3.3 GW** accepted and yet to connect

National ambition to run the system in Low carbon mode by 2035

Decarbonising Transport

440k Plug-in vehicles charging off our network today, volumes multiplying annually

Forecasting **2.6m** EVs by 2030

22,500 Public charge points, **36%** of the country

172MW of Hydrolyser applications

Decarbonising Heat

30,000 heat pumps connected to our networks today

2025 Future homes standard will drive volumes of heat pumps, by 2028 gov expect **800,000** a year nationally

By 2030 we expect **712k – 1.1m** to connect to our network

Demand of 15GW

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Challenges driven by DER uptake

Challenges
Limited capacity for DER connections (driven by Solar growth)
Lack of visibility at LV networks
Dynamic network
Rush for storage
Ambitious EV targets

UK Power Networks DSO Strategy

1. Facilitate cheaper and quicker connections using proven innovation

Continue rollout of Flexible DG that uses Active Network Management

2. Use customer flexibility as an alternative to network upgrades

Run market tenders for flexibility services such as Demand Side Response

3. Develop enhanced System Operator capabilities

Develop TSO – DSO Commercial Framework, DER Dispatch capability and readiness for smart meters

4. Collaborate with industry to enable GB wide benefits

Actively participate in industry forums to make this transition a reality

5. Prepare and facilitate the uptake of Electric Vehicles

Enable connections using smart solutions and ensure business readiness

We set out our strategy to transition to a Distribution System Operator in July 2017

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Open data

Deliverables

- Across the business in various areas – regulatory reporting, connections, environment,
- Regulatory incentive revenue
- Usership – monthly users: 4,400 vs 1,750 (2023 vs 2022)

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Data

58 records

Active filters Clear all

Portal Status 3 - Published, Open

Filters

Search records...

Triage Outcome

1 - Open	57
2 - Public with some restrictions	1

Portal Status

0 - Awaiting Data	4
1 - Awaiting Upload	1
2 - Published, Test Environment	8
3 - Published, Open	58
4 - Published, Restricted	3
6 - Not Published	17

Data Roadmap and Tracker

Edit

Information | Table | Analyze | Export | API

	ID	Dataset Title	Description	Triage Outcome	Portal Status	Estimated/Actual Date for Publi...	Refresh Rate	Raw/Processed	Link to Dataset	Link to Triage
1	OD001	Areas of Outstanding Natural Beaut...	Shapefile showing the areas within ...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
2	OD006	UK Power Networks primary substati...	A shapefile containing the approxim...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
3	OD007	Long Term Development Statement ...	Long Term Development Statement ...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
4	OD008	Long Term Development Statement ...	This is Table 2a from our current LTD...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
5	OD009	Long Term Development Statement ...	This is Table 2b from our current LT...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
6	OD010	Long Term Development Statement ...	This is Table 3a from our current LTD...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
7	OD011	Long Term Development Statement ...	This is Table 3b from our current LT...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
8	OD012	Long Term Development Statement ...	Long Term Development Statement ...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
9	OD013	Long Term Development Statement ...	This is Table 4b from our current LT...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
10	OD014	Long Term Development Statement ...	Long Term Development Statement ...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
11	OD015	Long Term Development Statement ...	Long Term Development Statement ...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
12	OD016	Long Term Development Statement ...	Long Term Development Statement ...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
13	OD017	Long Term Development Statement ...	Long Term Development Statement ...	1 - Open	3 - Published, Open	2022-11-30 00:00:00	Bi-annual (May and Nov)	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
14	OD018	Power Quality Data	This dataset contains data captured ...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Annual	Raw	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
15	OD019	Local authorities within UK Power N...	Shapefile showing local authority bo...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
16	OD021	Embedded Capacity Register	The Embedded Capacity Register (E...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Monthly	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
17	OD022	Low Carbon Technologies (LCT) con...	Volume of Low Carbon Technologies...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Monthly	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
18	OD024	Earthing EPR Data for Grid and Prim...	The EPR dataset includes the fault c...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Weekly	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
19	OD025	Earthing Soil Data for Grid and Prim...	The soil dataset includes multi-layer ...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Weekly	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
20	OD026	Earthing Fault Level Data for Grid an...	The earthing fault level dataset inclu...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Weekly	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
21	OD030	Key characteristics of active Grid an...	List of Active Grid and Primary Sites ...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
22	OD031	UK Power Networks Licence Area Fl...	Shapefile showing the areas within ...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	Daily	Raw	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
23	OD032	UK Power Networks Licence Area 33...	Shapefile showing the position of U...	1 - Open	3 - Published, Open	2021-12-13 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
24	OD033	UK Power Networks Licence Area 13...	Shapefile showing UK Power Networ...	1 - Open	3 - Published, Open	2021-12-13 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
25	OD034	London Power Networks (LPN) area ...	Shapefile showing operational boun...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	One-Off	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
26	OD035	South Eastern Power Networks (SPN...	Shapefile showing operational boun...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	One-Off	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
27	OD036	Eastern Power Networks (EPN) area ...	Shapefile showing operational boun...	1 - Open	3 - Published, Open	2021-10-06 00:00:00	One-Off	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
28	OD040	UK Power Networks Licence Area 33...	A dataset showing the location of U...	1 - Open	3 - Published, Open	2022-07-04 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
29	OD041	UK Power Networks Licence Area 13...	A dataset showing the location of U...	1 - Open	3 - Published, Open	2021-11-04 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
30	OD050	Secondary Sites	List of secondary substations and ke...	1 - Open	3 - Published, Open	2023-02-20 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
31	OD052	2030 projections for Blue Badge hol...	As part of our Enable project, we est...	1 - Open	3 - Published, Open	2022-04-04 00:00:00	One-Off	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
32	OD053	Rota Load Disconnection	Showing primary feeder areas and t...	1 - Open	3 - Published, Open	2022-12-09 00:00:00	One-Off	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
33	OD054	UK Power Networks Licence Area Gri...	National Grid sites (Transmission Sys...	1 - Open	3 - Published, Open	2022-07-04 00:00:00	Annual	Processed	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
34	OD056	Streetworks - open works	List of street works (including Privat...	1 - Open	3 - Published, Open	2022-12-06 00:00:00	Every Two Hours	Raw	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
35	OD061	PI data	PI data ranges through the voltages ...	1 - Open	3 - Published, Open	2023-11-17 00:00:00	Live	Raw	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...
36	OD068	Streetworks - proposed works	Live map of our proposed steet wor...	1 - Open	3 - Published, Open	2023-05-30 00:00:00	Daily	Raw	https://ukpowernetworks.opendatas...	https://ukpowernetworks.sharepoint...

Suggest a new record

Delivering your electricity

Data products

Electricity network data

Other data

Property developers

Agriculture

Local government /authorities

Emergency services

Private individuals

Other utilities

Transport

Generation developers

Flexibility

Academia

Everyone else…

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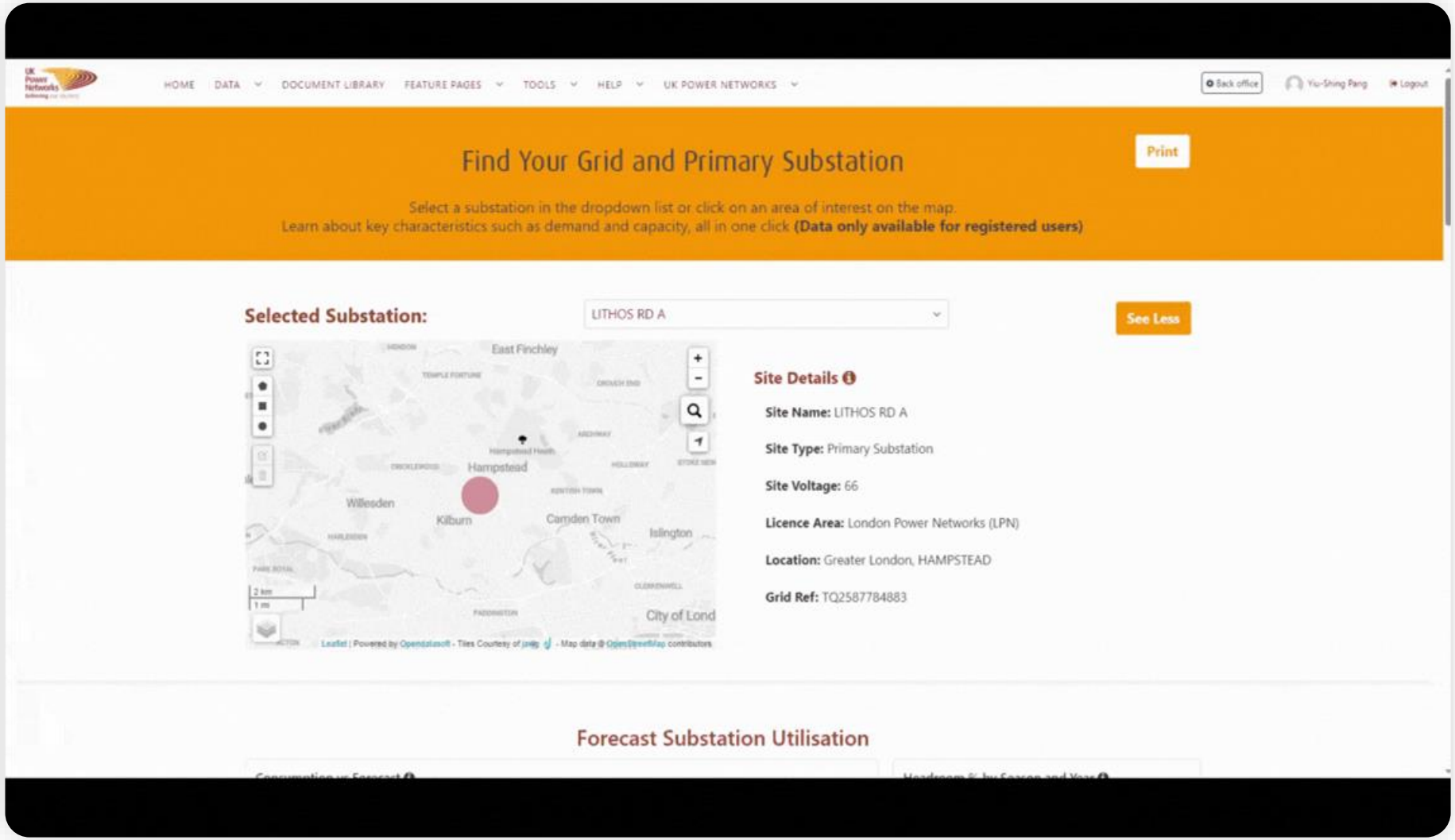
Grid and Primary Dashboard



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Local Area Energy Plan

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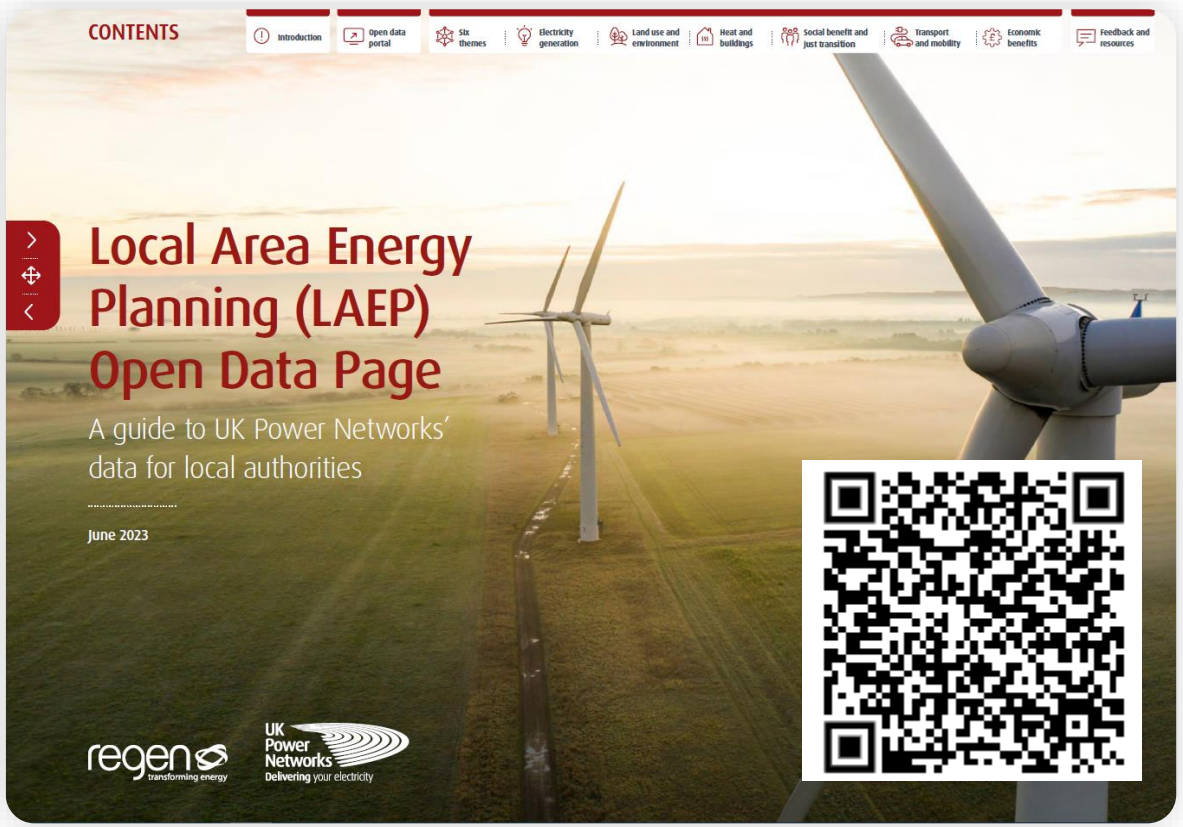
Local Area Energy Plan

Our most prioritised use case for Open Data

- Surveyed the 200+ people at our launch event
- Focus group event to drill down on details
- In depth engagement with two local authorities over 2022
- Arrived at 30 top use cases and the 150+ underlying datasets
- New Net Zero team (DSO) to “hand hold” local authorities



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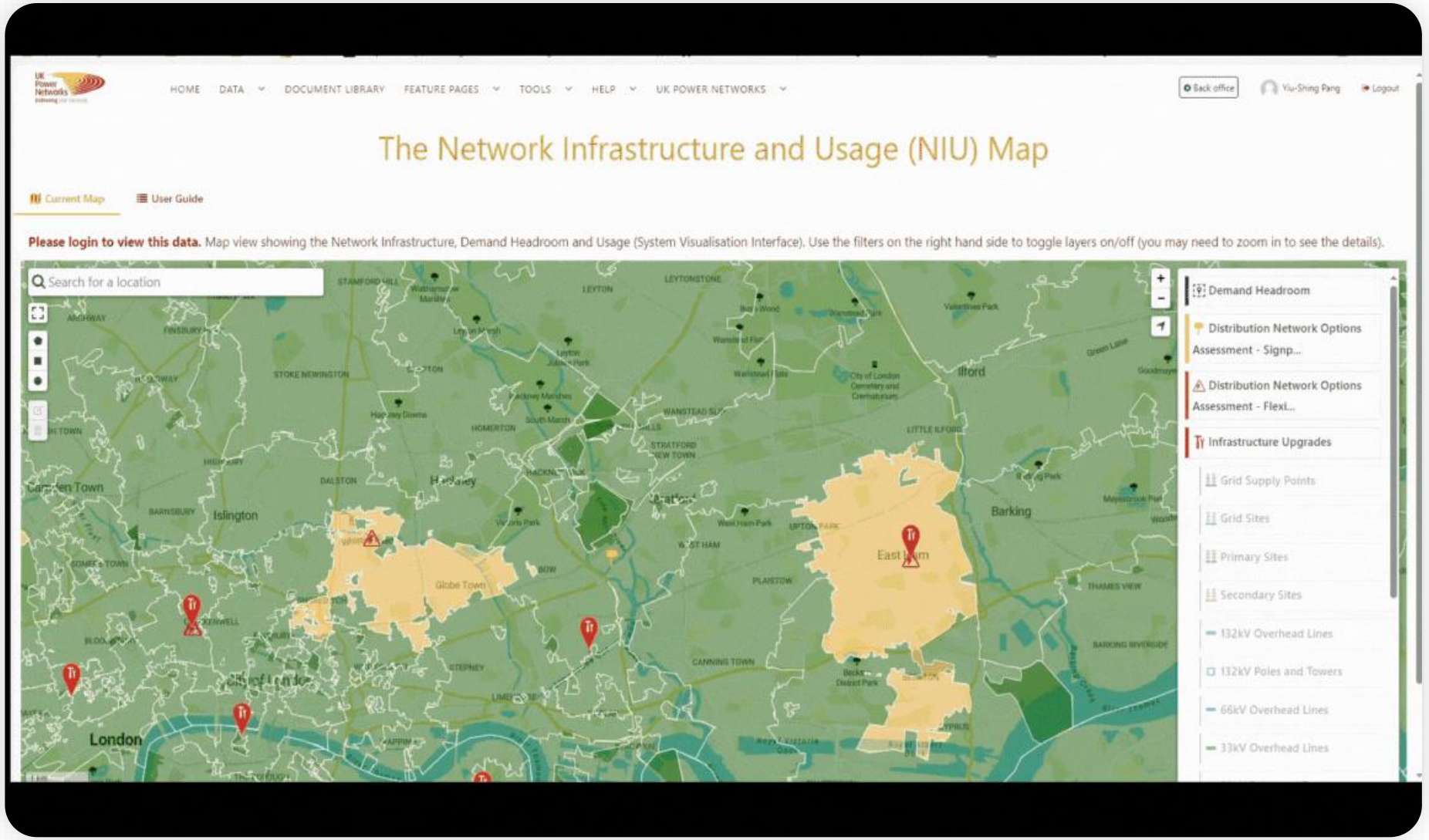
Network Infrastructure and Usage Map



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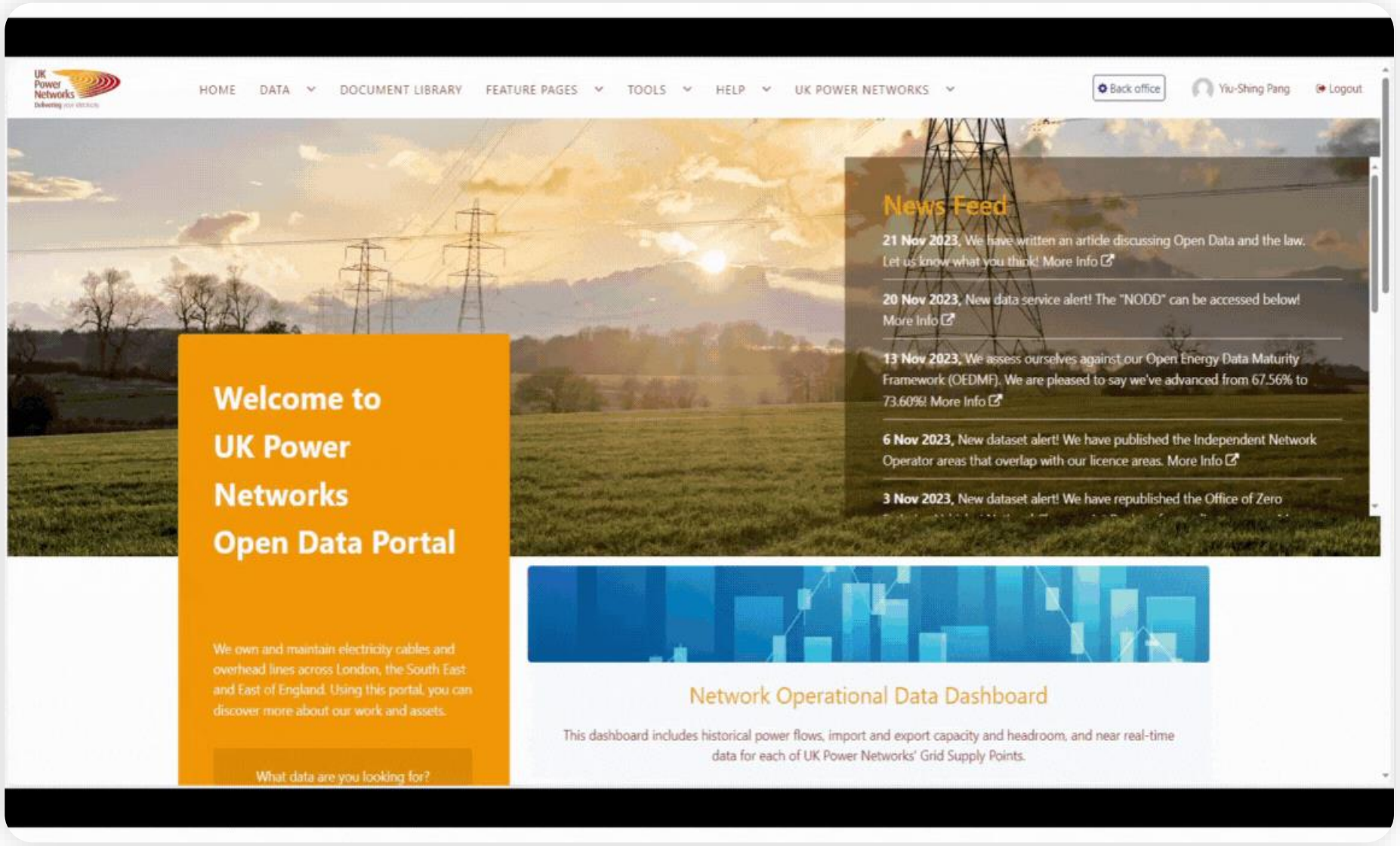
Network Operational Data Dashboard



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Use cases

Overhead lines for safety

From dataset: UK Power Networks Licence Area HV Overhead Lines shapefile

Heathpatch

We used this dataset to copy the overhead power lines onto the 'The Land App' software, overlaying it with our farm fields. This could then be printed and added to 'Harvest Packs' for contractors to refer to when working on the farm for Health and Safety awareness, to show where power lines and poles are.

Real-time power cut alerts to EV drivers

From dataset: Live faults

ev.

We're bringing peace of mind to our drivers in the UK with real-time alerts via the UK Power Networks power cut API.

After a successful trial with hundreds of EV drivers in this region, we're delighted to launch this groundbreaking new feature to all drivers in the UK Power Networks region - covering London, the South East, and East of England.

Through Powercast, we're minimising the disruption caused in the rare event of a power cut, empowering drivers to make the switch to an electric vehicle with confidence.

Rachel Jessup 1 December 2023 09:00

Assessing the network for connection opportunities

From dataset: Embedded Capacity Register 2 - 1MW and above

AURA POWER

I work for a large scale solar and battery developer and part of my role is to identify new grid opportunities by assessing the network. I have used the ECR for identifying substations which have a lot of sites already connected which may therefore look constrained and would be better avoided, and substations with accepted connections so we can watch these and see if they fall away and allow capacity to become available. This also enables us to see parts of the network which have few connected and accepted sites.

Greater London Authority's London Heat Map

From dataset: Key characteristics of active Grid and Primary sites

The London Heat Map is a tool designed to help users identify areas of high heat demand and to construct heat network models and assess their feasibility. The waste heat layer will be a new feature on the London Heat Map. The UKPN Key characteristics of active Grid and Primary sites will be used to show the waste heat potential from transformers across London. Electricity substations on both the transmission and distribution networks contain transformers to convert power from one voltage to another. Transformer coils are usually cooled and insulated by being immersed in insulating oil. A heat recovery data tool, using assumptions from previous Buro Happold project experience, has been used to calculate the transformer waste heat potential.

Pippa Corbett 25 July 2023 09:42

UK Power Networks • Following
Utilities

⚡ Our #OpenData has helped inspire the next generation of global engineers.

Victor Mukora, a recent Virginia Tech graduate, used predictive models to analyse our datasets about how environmental variables can affect solar panels. With the help of his advisors, Victor's research was published in the Virginia Journal of Business, Technology, and Science!

Victor, who moved to the US from Kenya at a young age, said one of the words he was most proud of spelling as a first-grader was 'electricity.'

He watched videos of power stations and electrical transformers, doodled substations on his papers, and stood outside the fence of a local facility with his uncle "just so I could see what a substation looked like in close up."

"My whole research project has been building on understanding different aspects of how environmental conditions affect the panel, and how we can go from that to optimising the design of a panel. UK Power Networks was really a jackpot for my research."

Amazing work, Victor — we love to see it! 🤩

4 months ago • Edited

51 4 6

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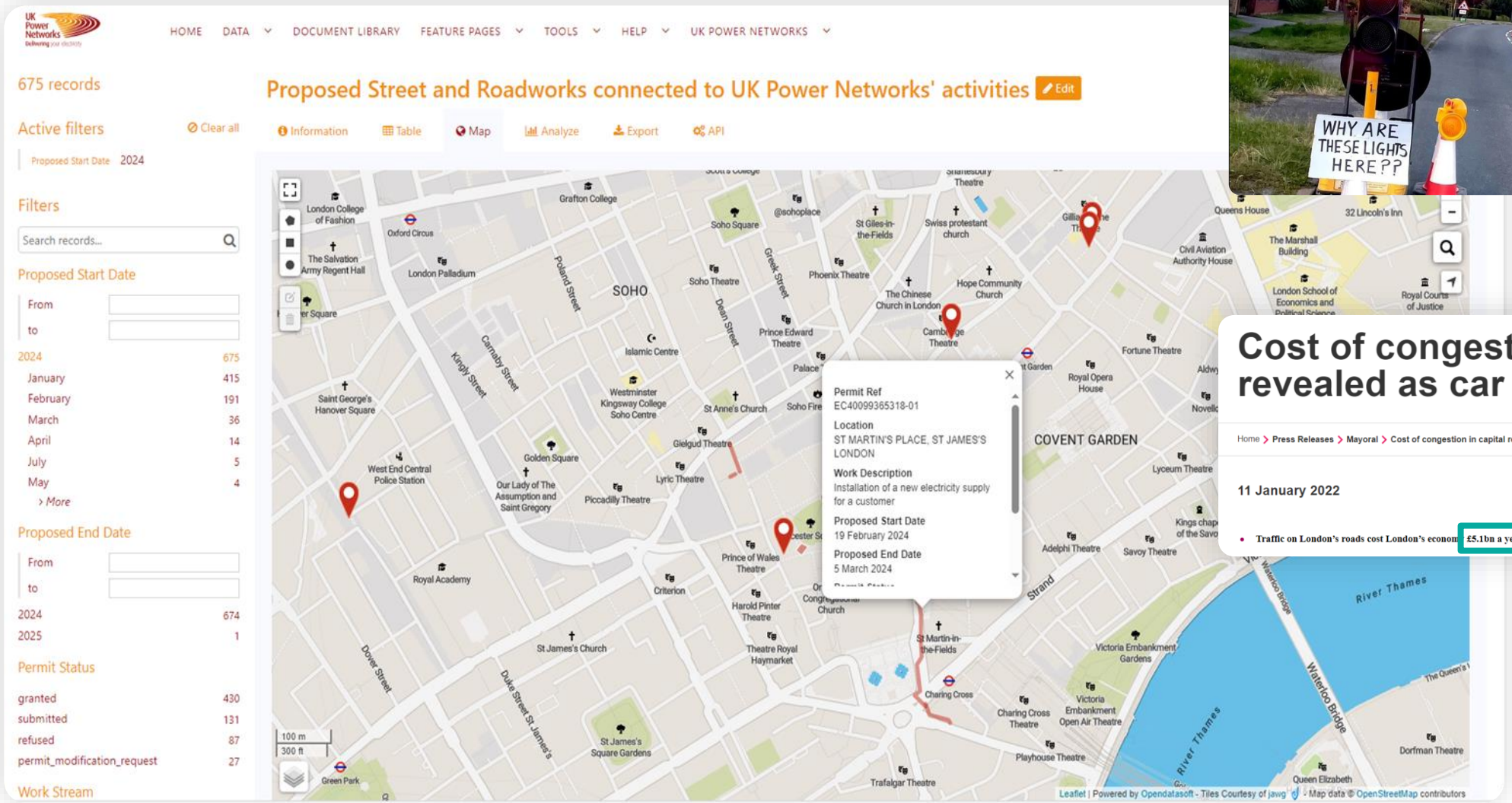
Not all energy related…

Streetworks - collaboration



Cost of congestion in capital revealed as car use remains high

Home > Press Releases > Mayoral > Cost of congestion in capital revealed as car use remains high

11 January 2022

- Traffic on London's roads cost London's econom **£5.1bn a year, or £1,211 per driver**

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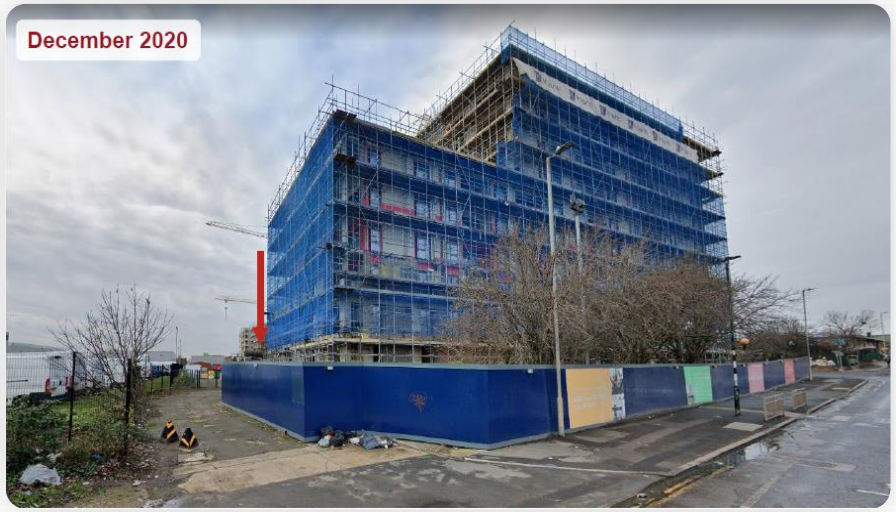
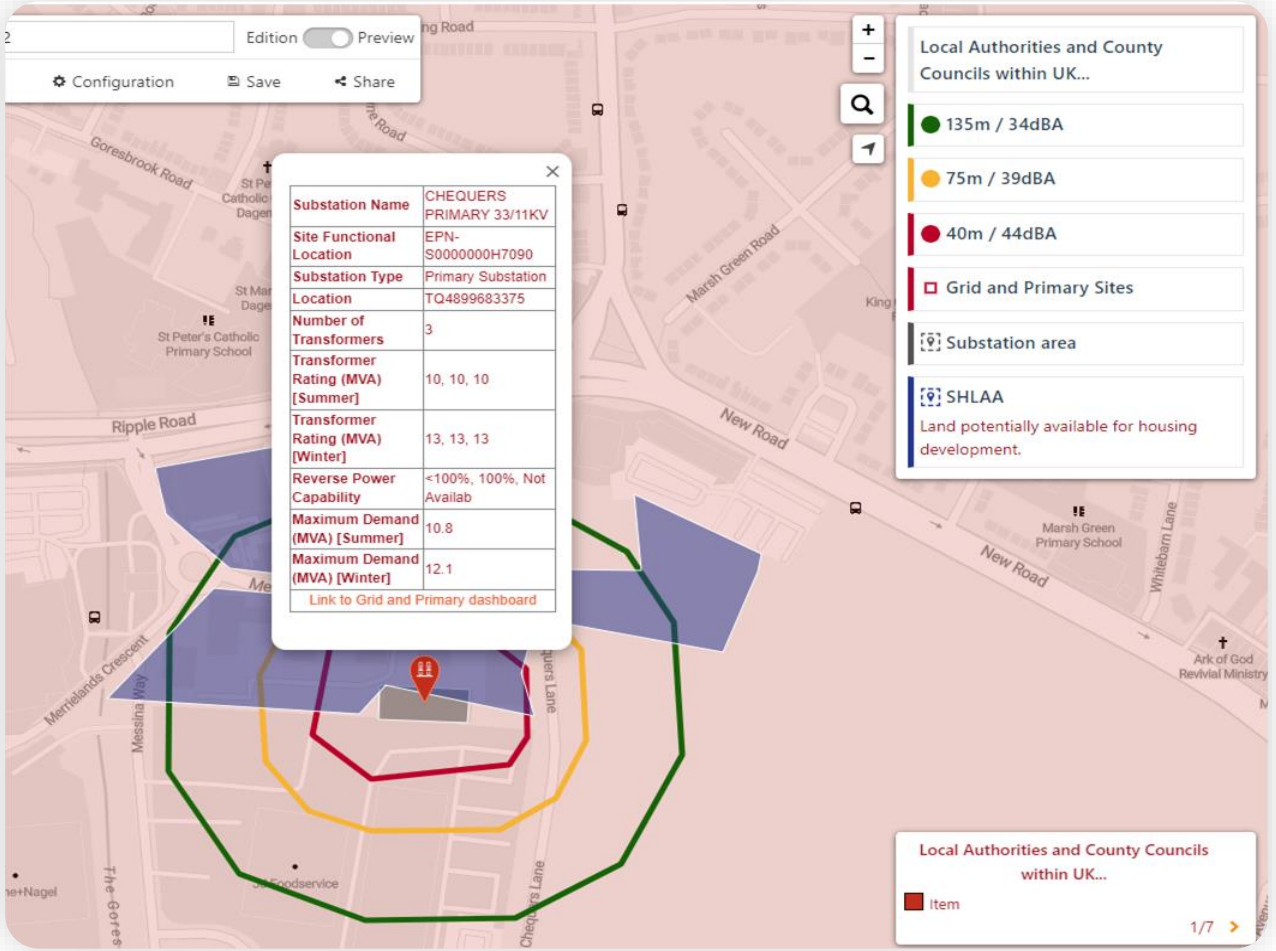
Noise





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Governance

Summary Toolbar Data Triage Assessment Form: Underground Cables dataset (24/0 Openness Rating: Can we publish this data? WITH SOME RESTRICTIONS Status: Approved

ID	Standard Enterprise Risk	Category	Inherent Likelihood	Inherent Impact	Inherent Risk Score	Can this be mitigated?	Mitigation Approach *(see guidance)*	Residual Likelihood	Residual Impact	Residual Risk Score	Comment
1	Published data conflicts with existing regulatory submissions resulting in reputational damage and regulatory action	Regulatory Requirements	Low	High	8	No	[redacted]	[redacted]	[redacted]	8	We report the length/volume of cable data to Ofgem as part of RIGs. It is not directly comparable to this dataset.
2	Published data is inaccurate or misleading, resulting in a serious loss of reputation for UK Power Networks	Quality	Low	Medium	6	No	[redacted]	[redacted]	[redacted]	6	The dataset should be caveated that it is to improve safety, but suitable methods to detect cable location on-site should be used
3	Published data enables someone with hostile intentions to compromise the security of UK Power Networks	Security	Medium	High	12	No	[redacted]	[redacted]	[redacted]	12	Data on underground cable "pinch points" is considered a safety risk to share openly, and should only be shared with known trusted parties. Additionally, identification of urban tunnels may also be used by "urban explorers" which can be dangerous.
4	Personally identifiable information is published without a legal basis, resulting in reputational damage and regulatory	Privacy	N/A	High	0	N/A	[redacted]	[redacted]	[redacted]	0	No personal data
5	Published data breaches a license or other intellectual property agreement resulting in legal action against UK Power	Legal	N/A	Medium	0	N/A	[redacted]	[redacted]	[redacted]	0	No licencing required
6	Commercial stakeholders are able to gain a commercial advantage by abusing our published data to overcharge us	Commercial	Medium	Low	6	N/A	[redacted]	[redacted]	[redacted]	6	For competitions in connections, we need to be able to share this information with trusted parties. There is a risk the data could also be used by agents to gain insight about our network to secure commercial benefit through seeking property payments.
7	Published data enables discrimination against individuals or a given community resulting in inequality	Ethics	Very Low	Medium	3	N/A	[redacted]	[redacted]	[redacted]	3	N/A
8	Published data has a negative impact on electricity markets resulting in a less favourable situation for consumers	Consumer	N/A	Medium	0	N/A	[redacted]	[redacted]	[redacted]	0	N/A

Open Data... and the law

Yiu-Shing Pang
Open Data Manager at UK Power Networks

3 articles

November 9, 2023

Open Immersive Reader

- Regulated utilities have to adhere with numerous legislation and licence conditions
- Open Data in the energy sector is emerging, and has offered exciting new products and services, and realised efficiencies for its users
- However, despite the best intentions of legislation and Open Data, the conflict between the two are increasingly prevalent as we publish more granular data

Introduction

At UK Power Networks, we deliver value to our customers by maintaining a secure, reliable and resilient electricity network to 8.5 million homes and businesses, equating to over 20 million people across London, the South East and East of England.

In 2021, we launched our 'open data' programme following the Energy Data

Like Comment Share 93 · 24 comments

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Governance continued…

K	L	M	N
Substation Type	Substation Name	Substation Number	Grid Reference
Pole Mtd	Police Vhf		

Another DNO

- Tasty search terms:
  - RAF, HMP, Government, Hosp, Pol, Army, telecoms, radio, mast
- Water specific terms: P/S, SPS, WPS, P/STN, booster…
- Would the other utilities be comfortable with this data out there?

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Using energy data to drive energy system decarbonisation

DSO

Data is crucial to efficient system operation and delivers

Ease of access

Open data means ease of access for all stakeholders

Clear licence – CC BY 4.0

API

Security

Be careful what you are revealing

Critical National Infrastructure and pinch points

GDPR/Privacy – Risk assessment

Other use cases

Environment – noise

Streetworks

Opendata@ukpowernetworks.co.uk