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Bringing energy to your door

Distribution Future Electricity Scenarios

Paving the way to a Net-Zero Future for the North West

January 2025

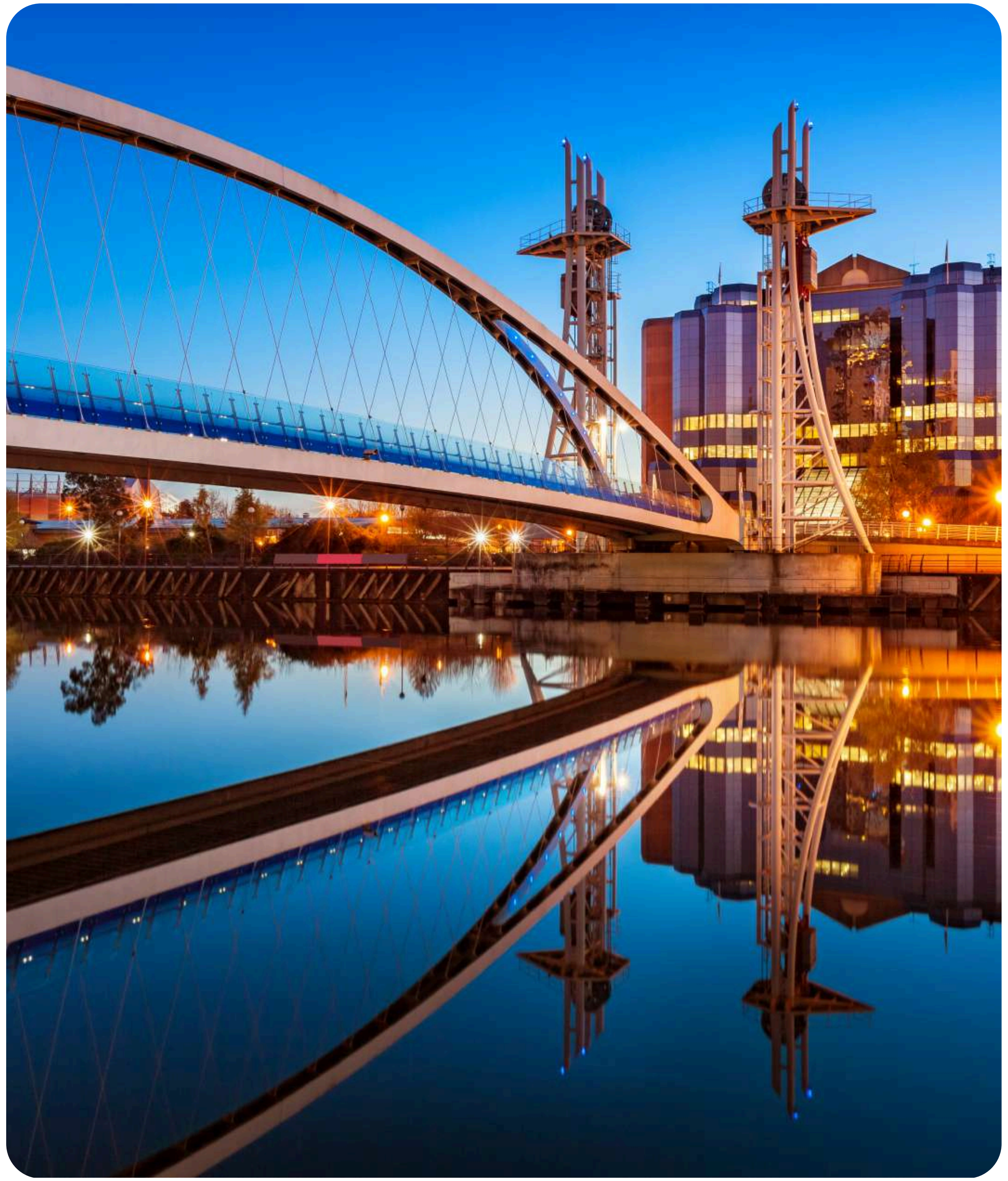
Executive Summary

Welcome to the seventh edition of our Distribution Future Electricity Scenarios (DFES). The DFES outlines the expected demand, distributed generation (DG) and battery storage uptake across the North West up to 2050.

The DFES forecasts are a key component of our Distribution System Operation (DSO) functions, which allow us to enhance transparency in our network capacity strategy to facilitate the plans for our regional stakeholders, as well as a timely and cost-efficient Net Zero transition for the North West. This publication marks our seventh consecutive year of conducting a comprehensive year-long cycle of extensive stakeholder engagement and advanced bottom-up forecasting.

The DFES outlines the expected demand, distributed generation (DG) and battery storage uptake across North West up to 2050. The DFES is a critical tool that will complement the Regional Energy Strategic Plans (RESPs) to assure that we secure supply and coordinate an economic network development. This publication highlights the importance of both DFES and the RESPs to deliver the UK Government's Clean Power 2030 plan.

Following the reduction in electricity demand in the recent years due to the energy and cost of living crisis, last year we observed a slight increase. Following Ofgem's, our regulator's, reforms in the customer charging rules that reduced the cost for our customers to connect to our network we also observed an unprecedented increase in connection acceptances by our customers and stakeholders.



Executive Summary

Having completed a full year of bespoke engagement with all of the local authorities and their partners in our region we have gathered insights and data for over 300 development areas and decarbonisation and economic growth plans. This increase in regional decarbonisaton and economic development combined with increased connections activity are the key drivers of demand and generation growth in the next 10 years.

Compared to last year's DFES, this year's forecast includes a slightly slower pace of electrification of transport and heating, in line with current market trends and reflecting Covid post-pandemic sales for electric vehicles (EVs) and heat pumps (HPs).

This year we have updated our EV profiles to reflect the latest insights and we have also enhanced our heavy duty vehicle modelling to consider new depots such as truck stop sites. On electrification of heating, as DESNZ heat networks zoning provides more clarity, we have modelled holistically for the first time the longer term extent and impact of district heating networks in our forecast.

On renewable generation and battery storage, the connection charging reform (Access SCR) has resulted in an increased number of acceptances, which are reflected in our forecast.

This is also the first time that we have published forecasts of electricity demand and low carbon technologies for our 30 thousand low voltage (LV) network substations. The forecasts are accessible via our new DFES LV workbook, and LV forecasting data will be also accessible via our Open Data Portal, which is our "one-stop shop" to access data, tools, and methodologies via tabular, mapping, and machine-readable (API) formats.

Ben Grunfeld
Strategy and Growth Director

Glossary

In accordance with industry standards, this report will utilize engineering abbreviations. For easier understanding, a glossary is provided below.

AD	Accelerated Decarbonisation scenario
ATLAS	Architecture of Tools for Load Scenarios
BV	Best View scenario
BSP	Bulk Supply Point
CT	Counterfactual scenario
DG	Distributed Generation
DFES	Distribution Future Electricity Scenarios
DNO	Distribution Network Operator
DNOA	Distribution Network Option Assessment
DSO	Distribution System Operator
EE	Electric Engagement scenario
EHV	Extra high voltage
ENW	Electricity North West
ESO	Electricity System Operator
EV	Electric vehicles
FES	Future Energy Scenarios
GSP	Grid Supply Point
HE	Hydrogen Evolution scenario
HP	Heat pumps
HT	Holistic transition scenario
HGV	Heavy good vehicles
HV	High voltage
I&C	Industrial and commercial
IDNO	Independent distribution network operator
LAEP	Local Area Energy Plans
LCT	Low carbon technologies
LRE	Load related expenditure
LV	Low voltage
NDP	Network development plan
NESO	National Energy System Operator
PV	Photovoltaic generation
RESP	Regional Energy Strategic Plan
RIIO-ED2	Revenue = Incentives+Innovation+Outputs Electricity Distribution - Price Control from 2023 to 2028
V2G	Vehicle to grid charging

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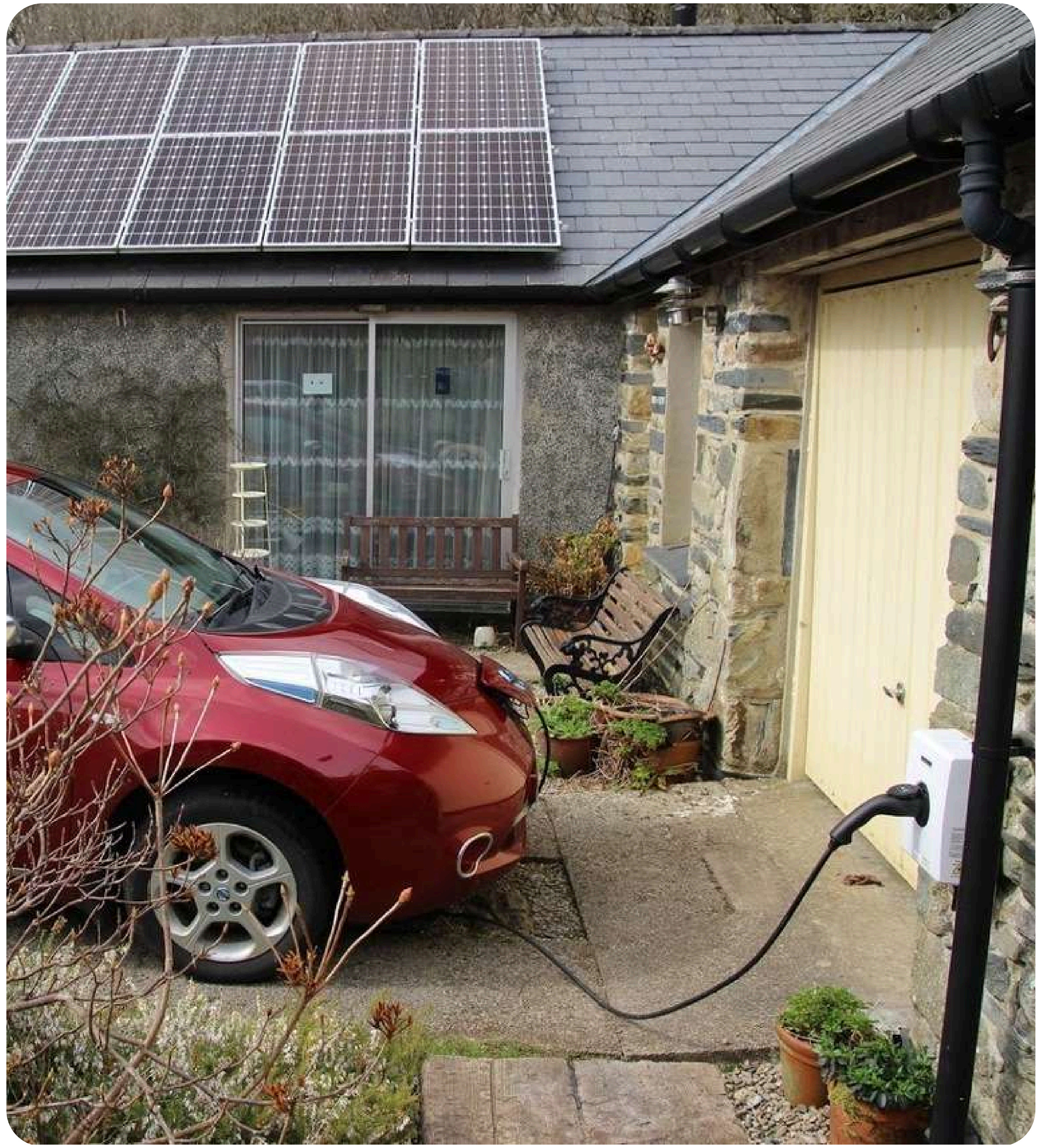

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Moving forward: RESP and DFES

Moving forward DFES become critical to both inform Regional Energy Strategic Plans (RESPs) and allow us to secure electricity supply and develop an economic network. The DFES will also ensure that even the more granular Local Area Energy Plans (LAEPs) driven by local government requirements will be facilitated.

To accelerate the transition to Net Zero the UK government has presented the Clean Power 2030 mission this autumn. Following the Department for Energy Security and Net Zero (DESNZ) decision the National Energy System Operator (NESO) was also established at the same time (both in October 2024). As part of the UK government's commitment to accelerate decarbonisation, the NESO is expected to act as a whole system energy planning coordinator and produce Regional Energy System Plans (RESP). The RESPs are expected to define the regional needs for the required strategic infrastructure that can facilitate a timely Net Zero transition.

Moving forward and towards the next regulatory period (RIIO-ED3 from 2028 to 2033) our network investment and DSO flexibility service provision will facilitate the RESP requirements. We expect that the RESPs will be whole system decarbonisation pathways that define a timely and cost-efficient path to Net Zero. Within this context this and particularly the forthcoming DFES publications will be critical to both inform the RESP and assure through granular forecasting that we can meet our license conditions for secure electricity supply and economy network development. The DFES will continue to be the main vehicle that will also ensure that even the more granular Local Area Energy Plans (LAEPs) coordinated by local government will be facilitated.

This year we publish a first interpretation of the newly introduced pathways in the national Future Energy Scenarios (FES). Our interpretation are scenarios that follow our ENWL ATLAS methodology and detailed granular modelling with alignment on high level assumptions with the national FES scenarios. Later this year following further guidance from Ofgem, our regulator, and engagement with the NESO and our regional stakeholders we will present how we will define the network investment requirements that deliver the RESPs. Importantly, we will explain how the forecasting scenarios in DFES complement the pathways in RESPs to facilitate a timely and cost-efficient Net Zero transition for the North West.

What is DFES

The Distribution Future Electricity Scenarios (DFES) are our long term forecasts of electricity demand, distributed generation, battery storage and low carbon technologies deployment across the North West.

This edition of the DFES includes six scenarios. The Best View scenario follows the same rationale with last year's publication and defines the highest certainty trends for a 10 years horizon followed by central assumptions in the longer term.

This year we model for the first time the four new scenarios that align with the newly introduced framework of the Electricity System Operator's (NESO's predecessor) Future Energy Scenarios (FES). These are Holistic Transition, Electric Engagement, Hydrogen Evolution and Counterfactual. This alignment supports whole system thinking, ensuring a cohesive approach for our stakeholders.

The newly introduced ESO's FES framework does not consider any equivalent to the Leading the Way scenario, which modelled an accelerated decarbonisation across GB. Thus, we have introduced a sixth Accelerated Decarbonisation scenario to reflect in network planning the short and long-term uncertainties in case our region decarbonises at high pace through electrification.

All six scenarios are produced following our enhanced ATLAS methodology, which is fit for system planning purposes bottom-up, time-series, machine learning enabled and granular forecasting methodology. For the first time we publish forecasts for over 30 thousand substations across our low voltage (LV) network in our new bespoke DFES LV workbook.

Why is DFES important

KEY USES OF DFES

- The DFES are the driver of our Network Development Plan, which details future distribution network reinforcement and flexibility service solutions to release solutions to release capacity that tackles network issues from the future levels of demand and generation growth.

- All DFES forecasting scenarios are used to produce the capacity headroom forecasts for demand, generation and battery storage in our Network Development Plan's (NDP) scenarios headroom report known as NDP workbook. The NDP workbook will be refreshed using these scenarios in May-June 2025.

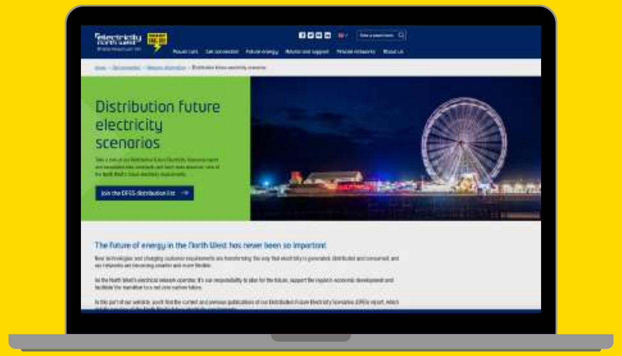
- The DFES have a main planning purpose, but allow us to publish and share granular data and insights with our stakeholders to support their decarbonisation and other plans.

WHAT YOU CAN FIND

- Our updated DFES workbook contains forecasts at primary substations and per local authority areas for electricity demand, renewable DG, battery storage and Low Carbon Technologies, including EVs and heat pumps.

DFES WORKBOOK

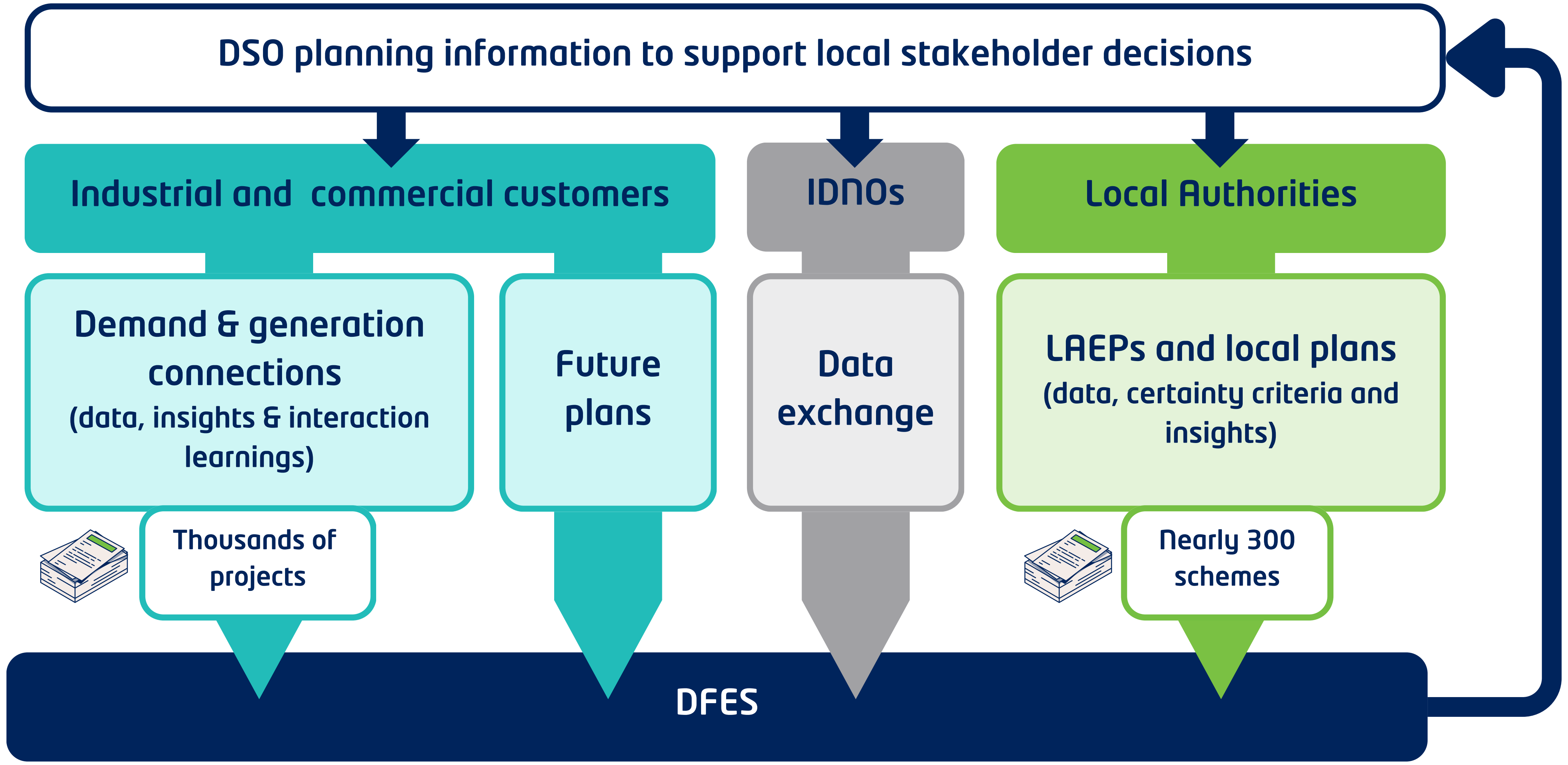
You can explore our DFES 2024 forecast in the DFES Workbook by clicking the laptop icon below or scanning the QR code on the right.



DFES Workbook Content

- Useful Information
- Interactive Graph Tools
- BSP and Primary Substations Datasets
- Per local authority data
- Entire ENWL Network Datasets

Stakeholder engagement inputs



- Engagement with all local authorities,
- Engagement with nearly 400 local climate, planning and decarbonisation officers,
- Nearly 300 new and more granular planned development areas,
- 100 schemes identified as high certainty with local government support

We produce DFES by utilizing data and insights gathered from a diverse array of stakeholders. This process incorporates lessons learned from our engagements with them and employs fit for purpose granular bottom up forecasting modelling. These models capture all granular activity and local bespoke profiles to enhance accuracy and validity of the forecasts at local substation level.

Industrial and commercial customer plans reflected in forecasts for both quoted and accepted demand connections, as well as accepted demand and generation connections. Bespoke information including longer-term timeline of growth is considered for all EHV (132-33kV) connections. Confidence factors taking into account historical performance are considered for the more granular HV/LV (11-0.4kV) projects in the connections pipeline.

Our role is to facilitate the decarbonisation (eg, LAEPs) and economic growth plans of local authorities. To do that we not only use data and insights from the wide variety of their planned developments, but importantly there is a bidirectional flow of information and insights where we provide further data, transparency in our planning methodologies and insights that help local government and their partners better inform their plans.

By being informed by local planned developments supported by local government well in advance of a connection application allows us to proceed with coordinated network development with network reinforcement done in stages. This means that we increase cost efficiencies and impact on energy bill payers by avoiding a reactive piecemeal network expansion driven by connections activity that neglects the DFES forecasts. It also means that we will release only the required capacity for the identified high certainty developments, whilst we will also take considerations to not foreclose the longer-term more ambitious regional decarbonisation and economic growth plans that currently have lower certainty.

Stakeholder led DFES

Our DSO team interacts with a diverse range of stakeholders, as it is essential to build robust regional relationships. This engagement helps us reflect their plans and needs in DFES and ultimately support Net Zero initiatives and economic growth.

December 2023: DSO discussion forum on Flexibility
February 2024: DNOA Smart
March 2024: Optimisation Output
April 2024: Voice of the North West
June 2024: DSO Function Webinar
October 2024: DSO Conference
November 2024: DSO Functions Webinar
December 2024: LAEP - LAs focused event
December 2024: Data consultation forum

Events in collaboration with other stakeholders:

June 2024: Flexibility Summit North West
November 2024: Open Data Dive

Use this QR code to access more on the virtual events we host every year.

The six scenarios

Counterfactual

Misses Net Zero. Heavy reliance on gas across all sectors, particularly electricity supply and space heating. Electric vehicle and heat pump uptakes are the slowest.

Holistic Transition

Achieving Net Zero relies on electrification with a critical role for hydrogen at industrial clusters. Assumes highest consumer engagement in energy transition that is reflected in accelerated adoption of domestic heat pumps.

Electric Engagement

In this scenario Net Zero is met through electrification with high levels of electric vehicles and heat pumps. Consumers are highly engaged in the energy transition.

Hydrogen Evolution

Hydrogen used widely across industry and also used for domestic heating close to industrial clusters. Hydrogen also prevalent for heavy goods vehicles. However, electrification of transport and heating are still the main decarbonisation paths.

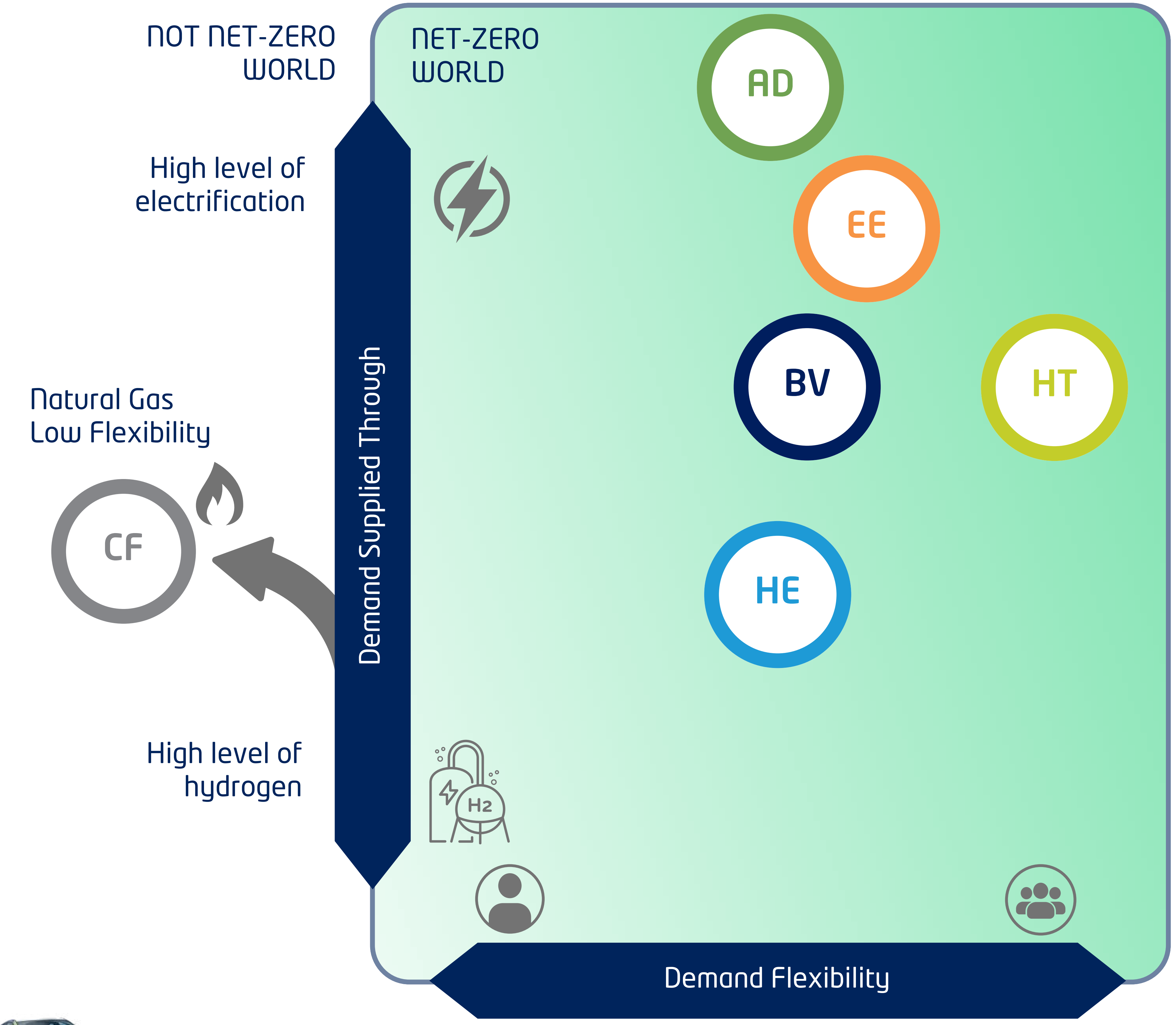
Best View

Highest certainty assumptions in demand and generation forecasts up to 2030. Electrification of transport and heating are the main paths, but conservative assumptions used for demand growth from new connections (access SCR impact) reflecting a slow economic growth expectation within the current global economic landscape.

Accelerated Decarbonisation

This scenario reflects accelerated decarbonisation through electrification across all energy sectors including transport, heating, electricity supply (generation).

The new scenario framework in DFES 2024



This year's DFES is transitional as National Grid ESO's Future Energy Scenarios (FES) are replaced by National Energy System Operator's (NESO's) Future Energy Scenarios (FES). This year we translated the four FES as part of the common scenario framework. However, moving forward we will further engage with NESO to translate the Regional Energy System Plan (RESP) into regional strategic network development requirements, whilst DFES will assure a regional stakeholder driven, holistic and granular economic network development that will allow us facilitate stakeholder plans whilst securing supply.

Best View considers high levels of electrification with hydrogen used for industrial process and heating close to industrial clusters. The scenario adopts central assumptions on smart EV charging, vehicle to grid (V2G), flexibility domestic demand side response participation.

Counterfactual (CF) does not achieve Net Zero. Electric Engagement (EE) drives the highest levels of electricity consumption beyond 2040, but Holistic Transition (HT) models increased impact on peak demand before 2040 as the higher consumer engagement is linked with accelerated use of domestic heat pumps. Hydrogen Evolution (HE) anticipates that up to 30% of heating demand will be met by hydrogen. Finally, Accelerated Decarbonisation (AD) scenario assumes the highest levels of electrification both in short and longer-term across all energy sectors.

Our Forecast Drivers

	CF	HE	BV	HT	EE	AD
Domestic Thermal Efficiency	L	H	H	H	H	M
Domestic Appliance Efficiency	L	M	M	H	M	H
Domestic Appliance Volumes	H	H	M	L	M	M
Non-domestic energy efficiency	L	M	M	H	H	H
Domestic Heat Pumps	L	M	H	EH	H	EH
Non-Domestic Heat Pumps	L	M	H	EH	H	EH
Electric Vehicles (Cars & Vans)	L	H	EH	M	EH	EH
Smart EV Charging & V2G	L	M	M	H	H	M
Electric Heavy Duty Vehicles	L	M	M	M	H	H
Air Conditioning	H	M	M	L	M	M
Demand Connections	L	Historical Confidence	M (access SCR impact)	M (access SCR impact)	H (access SCR impact)	EH (access SCR impact)
Local Stakeholders Plans	Lower Confidence	Confidence Based on Project Ranking	Confidence Based on Project Ranking	Confidence Based on Project Ranking	Confidence Based on Project Ranking	Confidence Based on Project Ranking
Electrification of Industrial Processes	L	L	L	M	EH	EH
District Heating	L	M	M	H	H	H

	CF	HE	BV	HT	EE	AD
Photovoltaics Small (<1MW)	L	M	M	H	H	H
Photovoltaics Large (>1MW)	L	M	M	H	M	H
Wind Generation	L	M	M	H	H	H
Combined Heat and Power	H	M	M	L	M	L
Other renewables (hydro, biogas, biomass)	L	M	M	L	H	L
Flexible generators (gas, diesel)	H	M	M	L	M	L
Domestic batteries	M	L	M	H	H	H
Non-domestic batteries	L	M	M	H	M	H
Generation and battery connections*	Only Accepted* (high certainty)	Only Accepted (high certainty)	Only Accepted (high certainty)	Only Accepted (high & low certainty)	Only Accepted (high & low certainty)	Only Accepted (high & low certainty)

Explanatory note on abbreviations:: L = Low - M = Medium - H = High - EH = Early High

*Accepted refers to generation and battery storage with a submitted connection request, a quote has been provided and connection accepted to proceed.

DFES utilising best data, insights and learnings

Best third party data & insights

- Demographics
- Heat pump consumer choice
- EV consumer choice
- Air conditioning
- Customer behaviour
- Macro-economic growth
- Non-domestic demand data
- building stock data

DSO Process

DSO Forecasting (ATLAS: bottom up, time-series & granular)

DFES

DSO data, insights & learnings

- PLANNING INSIGHTS
- CONNECTION PROGRESSION
- TIMELINE OF MATURE SCHEMES
- DEMAND CONNECTIONS (EHV TO LV)
- STAKEHOLDERS INTERACTION LEARNINGS
- BESPOKE LOCAL PROFILES
- HISTORICAL GENERATION TYPE, LOCATION, SIZE
- DG & BATTERY CONNECTIONS
- HISTORICAL HH DEMAND AND GENERATION

60 milllion historical data points

45000+ distributed generation units

2300+ new HV connections

Nearly 300 stakeholder planning insights

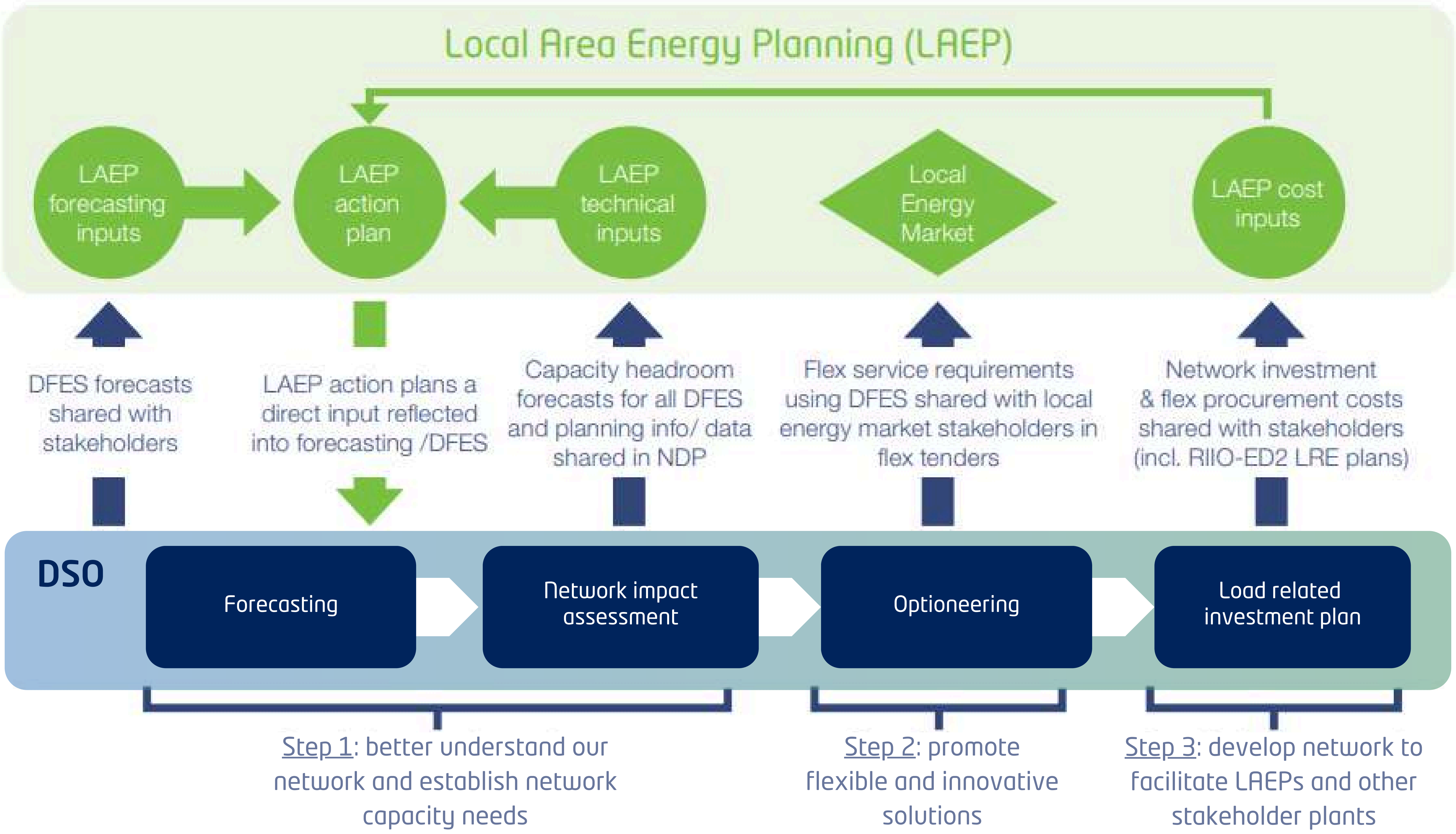
350+ stakeholders engaged

LAEP

HOUSING DEVELOPMENTS	EV CHARGERS	ECONOMIC GROWTH PLANS
ENERGY COMMUNITIES	RENEWABLES	HYDROGEN TECHNOLOGIES
COMMERCIAL AND INDUSTRIAL SCHEMES	HP AND DISTRICT HEATING	CERTAINTY INSIGHTS

Our forecasts combine data, insights and learnings from our continuous engagement and interactions with our regional stakeholders with third party data and insights importantly around longer term consumer choice aspects on low carbon technologies and uncertainties on efficiency measures.

DFES and Local Area Energy Planning



- Not one solution for decarbonisation across GB → LAEPs are the optimal local paths to meet Net Zero
- LAEPs coordinated by local government, DNOs are a neutral facilitator
- Whole energy system coordination by NESO (Regional Energy System Plan - RESP)
- NESO RESP driving strategic network investment requirements and can be informed by DFES
- DFES as part of the DSO process: critical to deliver DNO license obligations for security of supply and economic network development

What will the future look like?

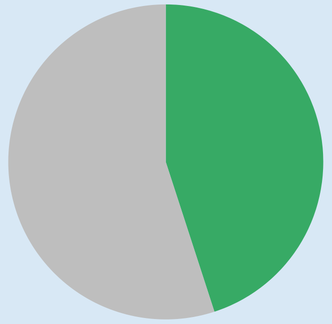
By 2040, we expect that energy demand in the North West will double according to our Best View scenario.

This rise is mainly driven by the adoption of approximately 3 million electric vehicles and more than 1.2 million heat pumps.

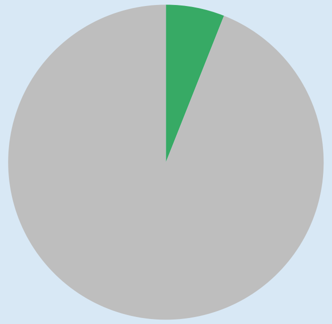
A day in 2040 in the North West

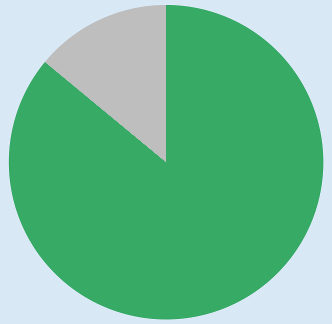
BV

Nearly one in every two dwellings is expected to have a heat pump.



One out of every 16 homes will feature rooftop photovoltaic panels.





Nearly 9 out of 10 individuals currently behind the wheel are anticipated to be driving electric vehicles.

A day in our region in 2040 BV

	TODAY	2040
Annual Electricity	21 TWh	44 TWh
Number of EVs	170k	3 millions
Number of HPs	25k+	1.2 millions
DG Capacity	1.6 GW	2.9 GW
Battery Storage	400 MW	2.8 GW

DFES 2024 at a glance

Volumes relative to historical*

	BV	EE AD	EE AD
	2030	2040	2050
	8x	18x	20x
	9x	44-69x	80x
	4.9x	6.6-15x	8-17x
	1.4x	2-2.4x	2.5x
	1.4x	2.5-3.1x	3-4x

*In this table, for instance, the notation "10x" that the volume/number of units of the specified variable/technology forecasted in 2040 is ten times the volume/number of units recorded in financial year 2023/24.

KEY POINTS

By 2030 there could be 1.3 million EVs in the North West (8x the 2024 volumes) with location and charging speed being critical factors to determine network impact. Our forecast considers also the figures for electric vans, buses, coaches and heavy duty vehicles.

While the exact timing is still relatively uncertain we anticipate a significant increase in heat pump adoption between 2030 and 2040, up to 2.3 millions in our service territory. We expect the uptake of heat pumps to be driven by government incentive such as the Boiler Upgrade Scheme. However, there is increasing certainty that longer term heat pump volumes will be reduced as district heat networks will be developed in some areas

Five fold increase of battery storage expected by 2030, up to 15 times in 2040 and up to 17 times by 2050. While the majority of regional volumes are primarily driven by large grid-scale batteries, we foresee a rise in the adoption of domestic batteries.

We are expecting electricity consumption to increase by roughly 40% in 2030 (Best View) and more than double by 2040. Heat pumps and electric vehicles are the main drivers. This is expected in all scenario except Counterfactual and Hydrogen Evolution.

Renewable generation is expected to increase up to 40% by 2030 and up to quadruple by 2050. Even higher levels are required if regions need to accelerate decarbonisation of transmission connected renewable projects are delayed.

Scenarios in numbers

2024
21.2 TWh Annual Electricity
171,852 EVs
25,162 Heat Pumps
1.6 GW of Renewable Generation
423 MW of Battery Storage

Scenario	2030	2040	2050
Counterfactual (CF)	26 TWh 0.92 million 0.09 million 1.8 GW 0.9 GW	34 TWh 2.49 million 0.30 million 2.2 GW 1.0 GW	39 TWh 3.05 million 0.52 million 2.8 GW 1.1 GW
Hydrogen Evolution (HE)	28 TWh 1.07 million 0.17 million 2.2 GW 2.0 GW	39 TWh 2.86 million 0.51 million 2.9 GW 2.8 GW	42 TWh 3.43 million 0.68 million 3.7 GW 3.3 GW
Best View (BV)	30 TWh 1.31 million 0.23 million 2.2 GW 2.1 GW	44 TWh 3.06 million 1.20 million 2.9 GW 2.8 GW	50 TWh 3.44 million 2.27 million 3.7 GW 3.4 GW
Electric Engagement (EE)	32 TWh 1.3 million 0.2 million 2.7 GW 2.1 GW	47 TWh 3.1 million 1.1 million 3.9 GW 2.8 GW	52 TWh 3.4 million 2.0 million 5.2 GW 3.4 GW
Holistic Transition (HT)	32 TWh 1.0 million 0.4 million 3.3 GW 3.7 GW	47 TWh 2.6 million 1.7 million 4.9 GW 6.3 GW	49 TWh 3.1 million 2.0 million 6.1 GW 7.1 GW
Accelerated Decarbonisation (AD)	34 TWh 1.3 million 0.4 million 3.3 GW 3.7 GW	50 TWh 3.1 million 1.7 million 4.9 GW 6.3 GW	52 TWh 3.4 million 2.0 million 6.1 GW 7.1 GW

Six Scenarios

Through 2030, the Best View scenario outlines our high-certainty assumptions.

Beyond that year, the other four scenarios—Best View, Holistic Transition, Electric Engagement, and Accelerated Decarbonization create a framework that indicates where the future is likely headed, given the elevated levels of electrification they represent compared to the other two scenarios.

Our electrified scenario shows a strong push for batteries and distributed generation with more than 7GW and 6GW respectively in 2050.

Data visualization

The DFES workbook offers comprehensive numerical data of all forecasting components associated with electricity demand and distributed generation. It includes various scenarios and annual projections extending to 2050, as well as multiple geographic levels, including BSP and primary substation feeding areas, as well as county and individual councils. This diverse granularity allows stakeholders to utilize the data flexibly, in conjunction with geographical datasets provided by ENWL (such as Voronoi Polygons and Local Authority Boundaries available on the ENWL data portal) to meet their bespoke needs. More granular datasets down to over 30,000 secondary substation feeding areas in our new LV workbook provides higher resolution of domestic and small commercial forecasts on electricity demand and low carbon technologies.

DFES data for Bulk Supply Point substations

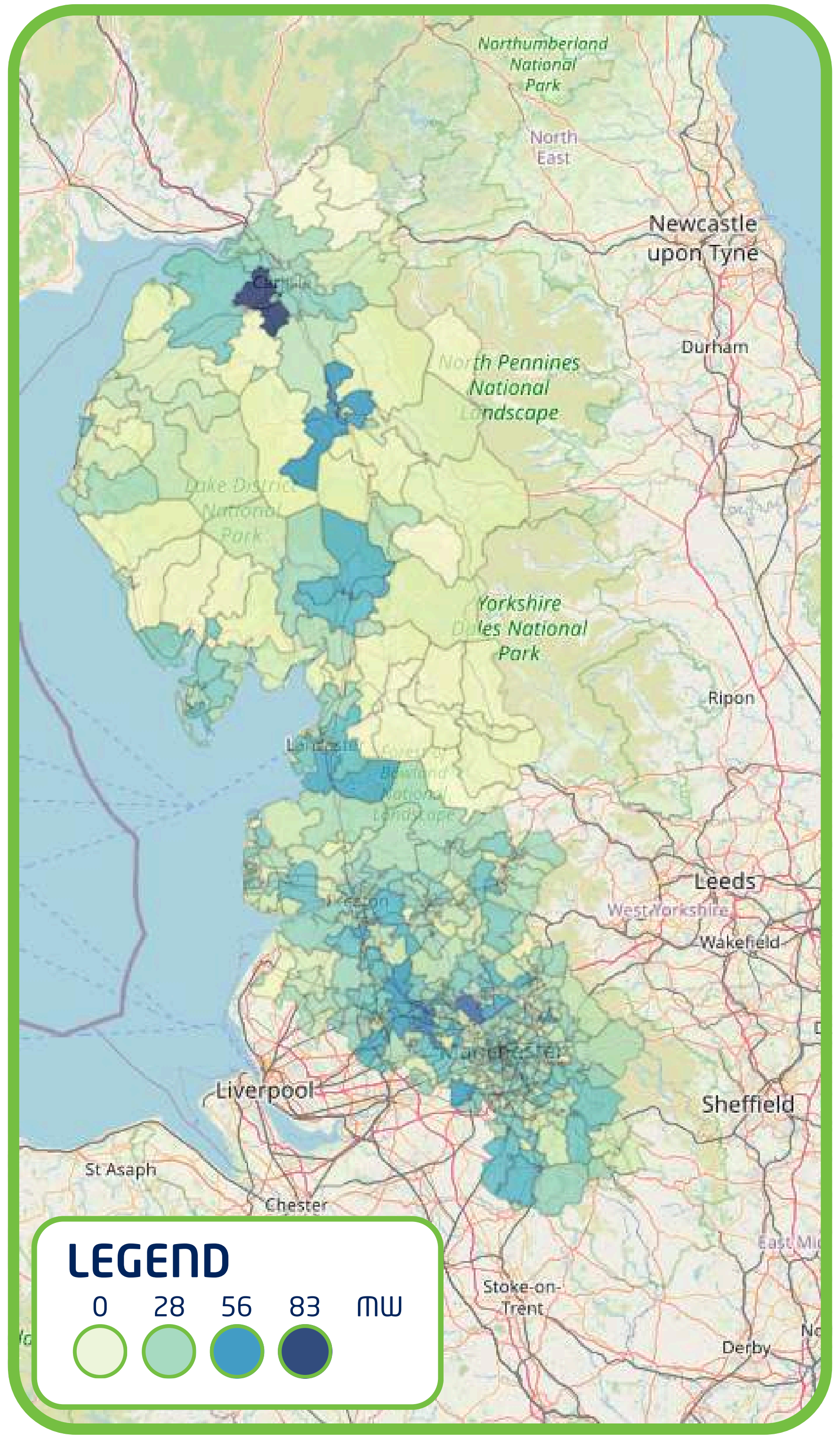
DFES data for primary substations

DFES data for Local Authorities

Voronoi polygons (available on the ENWL Open Data Portal)

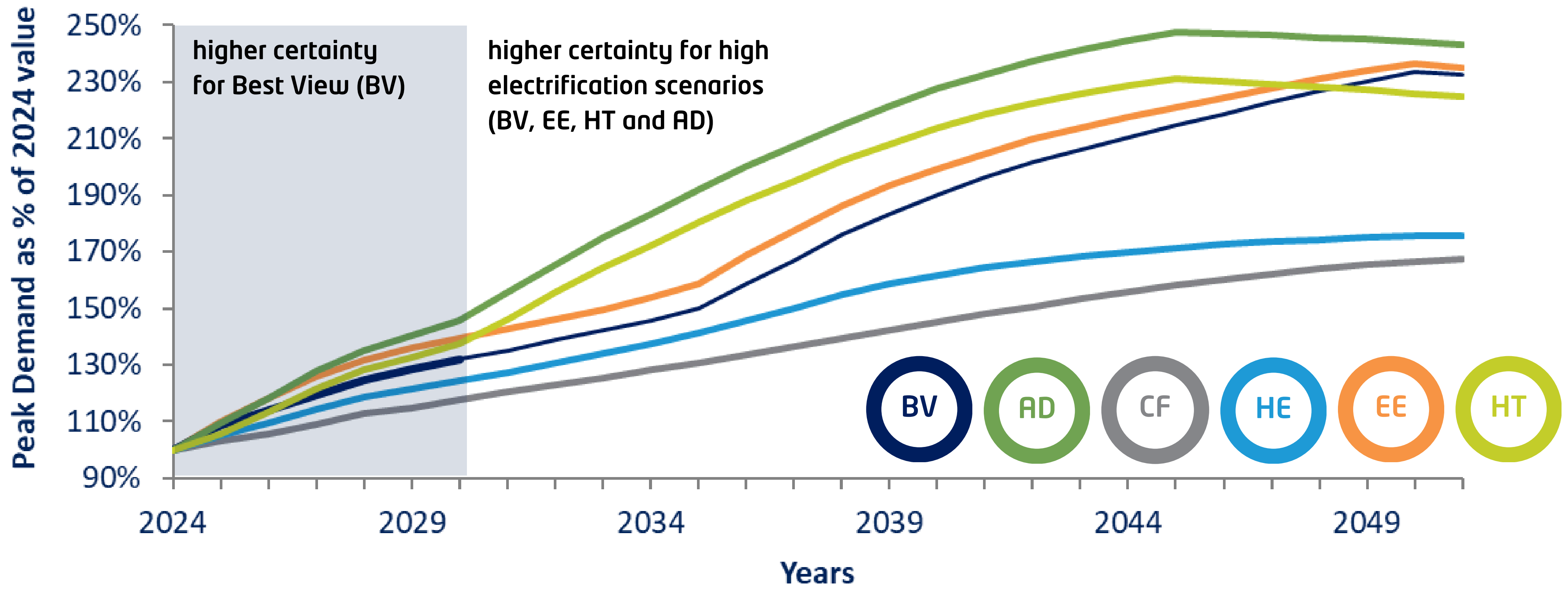
Boundaries (available on the ENWL Open Data Portal)

Example:
2050 peak demand across primary substations
(Best View scenario)



Peak electric demand

Annual peak demand forecast



Our highest certainty trend in Best View is that peak electricity demand will be predominantly driven by 2030 by local planned developments and the electrification of transport. Beyond 2030 there is higher certainty in the range of peak demand growth defined by the scenarios considering higher levels of electrification of transport and heating (Best View, Electric Engagement, Holistic Transition and Accelerated Decarbonisation).

2x in 2050

This year, we observed a slight increase in the peak electricity demand in our region (i.e., aggregated across substations). We also recorded an over 200% rise in connection acceptances compared to ED1 as the Access and Forward-Looking Charges Significant Code Review (Access SCR) arrangements resulting in lower connection fees for our customers have unblocked their plans and incentives more customers to connect to our networks to facilitate their plans. Looking ahead, the expected growth in electric vehicle (EV) adoption and heat pumps will be the main driver in the peak demand in our region.

In the next couple of years, we expect a slower uptake of EVs, reflecting a lower than anticipated sales. Our Best View scenario predicts a faster adoption rate towards 2030 and beyond, as it considers the ban on internal combustion engine vehicles being moved up from 2035 to 2030 in line with government current's plans. Similar to last year, the increased adoption of heat pumps – coupled with enhanced energy efficiency measures leads to a notable demand growth extending into the mid-2030s.

However, local government led LAEPs and the NESO's RESP need to consider whole system costs to guide the cost optimal heating solutions across North West, e.g. the construction and long-term operating costs of district heat networks need to be considered as opposed to counterfactual impact of heat pumps on LV networks.

Our higher certainty scenarios in the longer term are the ones that consider higher levels of electrification of transport and heating (BV, EE, HT and AD scenarios). These scenarios drive by 2050 the peak electricity demand to over double than its current levels. The Accelerated Decarbonisation defines the upper end of the peak demand growth range in short and longer-term growth assuming accelerated decarbonisation of heating, higher levels of electrification of transport and materialisation of the more ambitious LAEP action plans supported by local government.

Peak demand - geospatial view

Peak electricity demand in the Best View scenario per primary feeding area

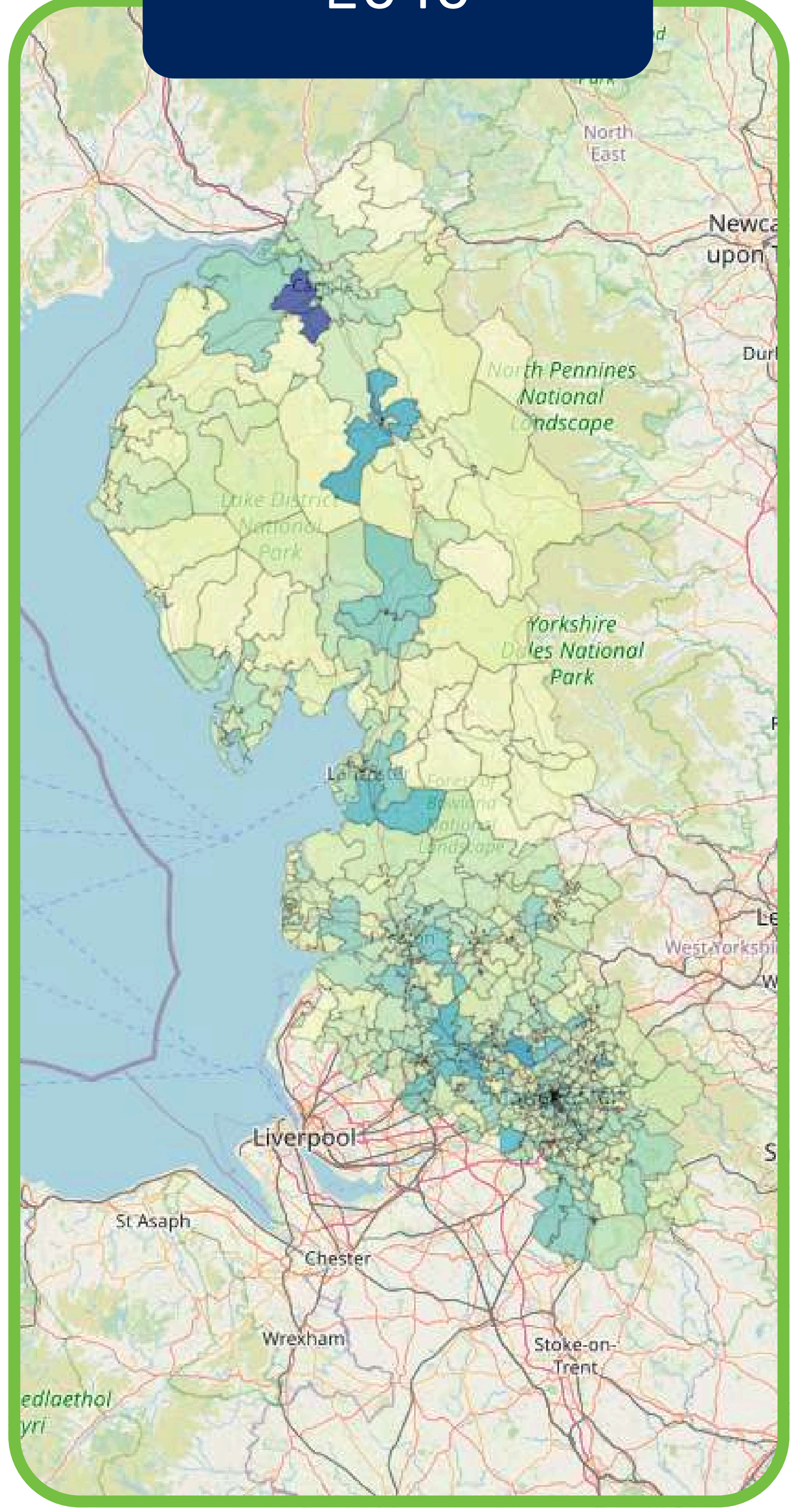
LEGEND

0 28 56 83 MW

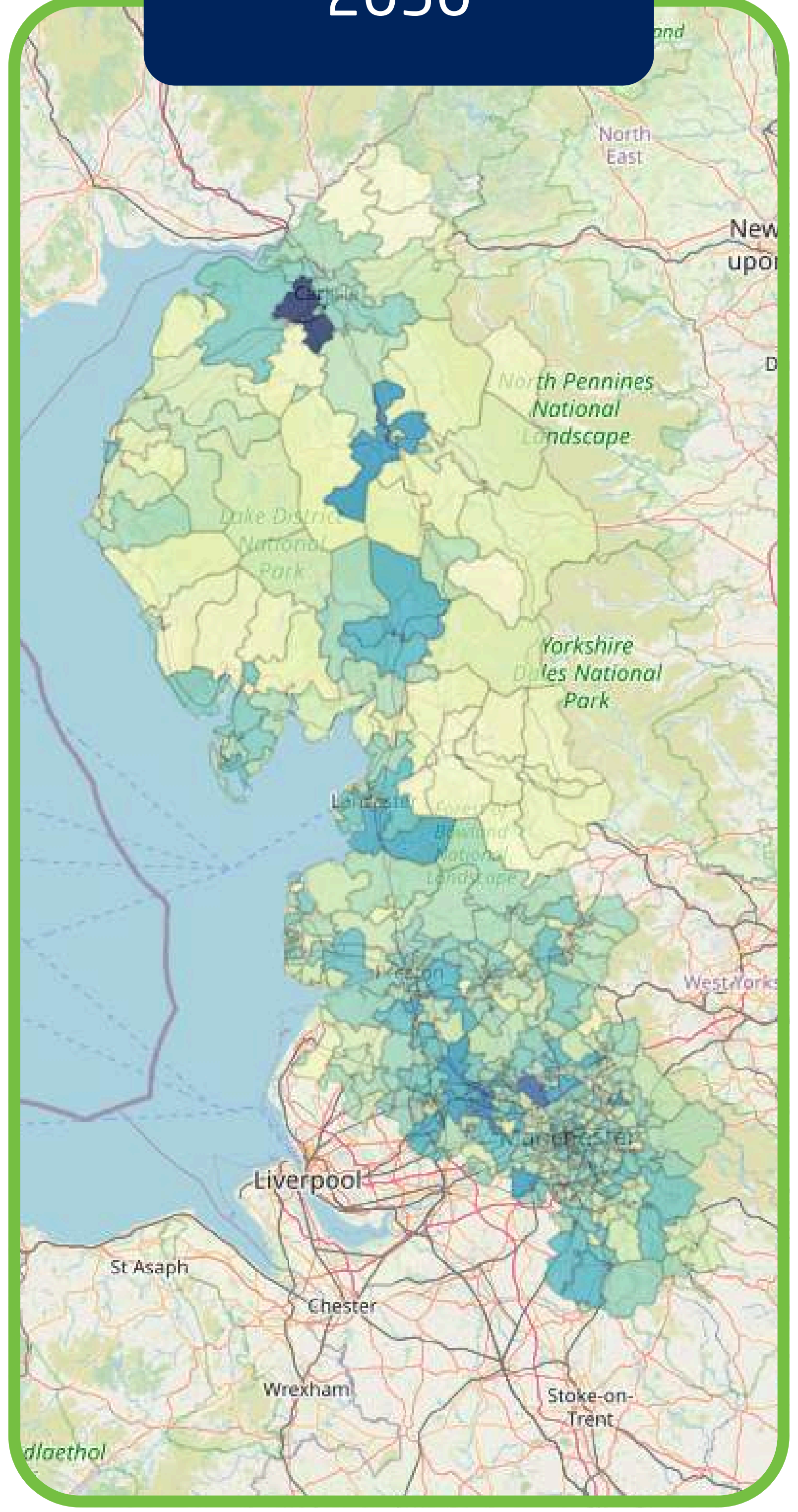
2024

2030

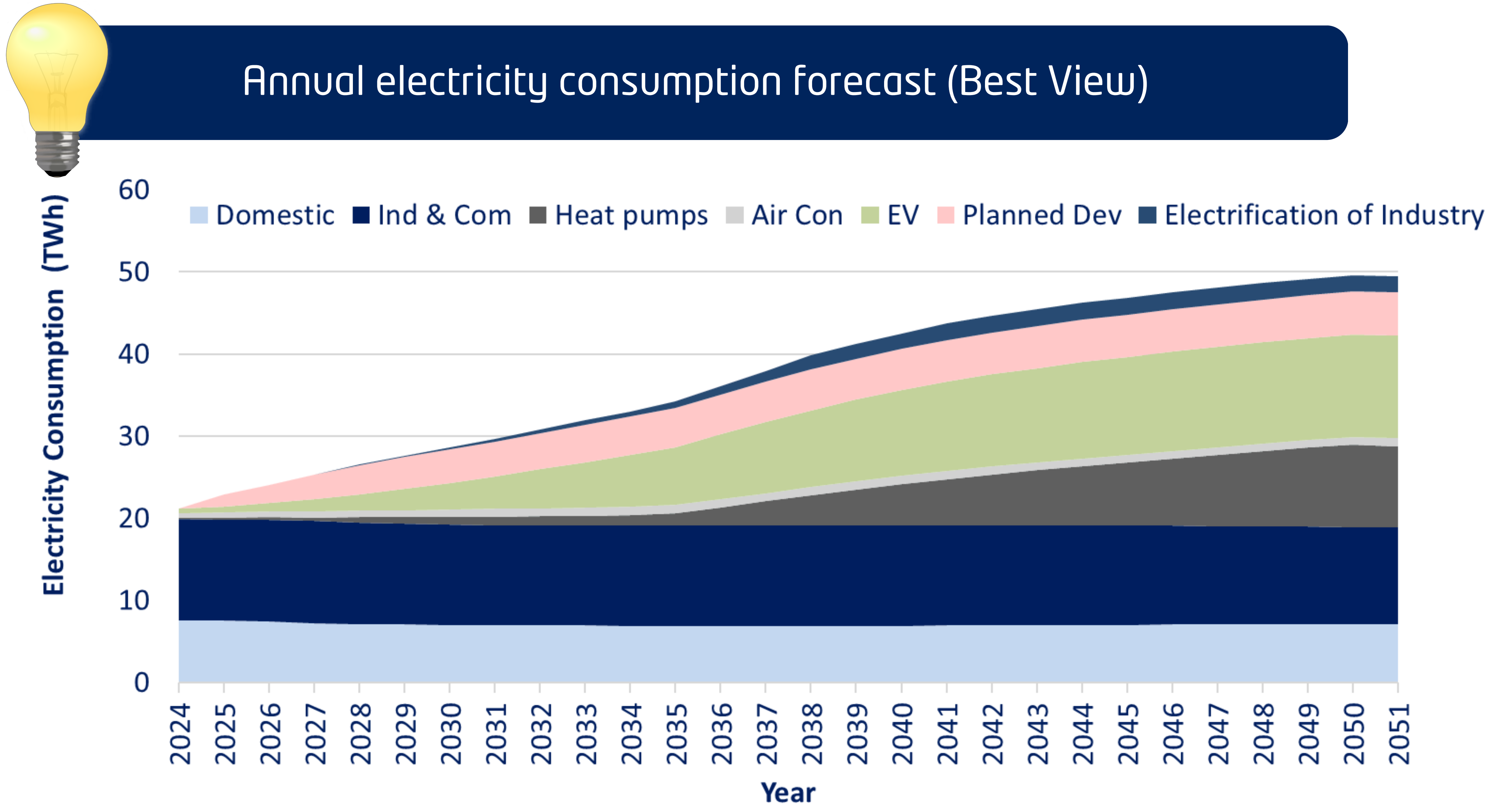
2040



2050



Electricity energy consumption



In the Best View scenario, EVs and planned developments are expected to be the primary contributors to the increase in energy consumption in the short term. However, starting in the mid-2030s, we anticipate a surge in heat pump adoption, making it the second largest low-carbon technology in terms of demand consumption, following EVs.

2x in 2040

The annual electricity (energy) consumption is expected to increase at faster pace than peak demand. The main factor behind this is that EV charging is a more flexible activity as customers are expected to be successfully incentivised to charge their vehicles at times of lower electricity demand. On the contrary, heat pumps even with the use of hot water storage are a more inelastic activity as customers require heating at specific time windows during the day and there are limitations in how much heating can be generated at times of low electricity demand and stored for use at other times.

The industrial and commercial sector is expected to see increased demand due to switching from fossil fuel fired processes to use of electricity. This is likely more common for 'low temperature heat' (e.g. electric boilers and heat pumps). However some 'high temperature' process might be electrified with development and research in progress (e.g. electric glass furnaces).

Heat pumps are expected to have a more pronounced effect on peak demand than in overall energy consumption when compared to EVs. This is because HPs must operate during peak hours even with hot water storage tanks in place and so affecting the peak demand. On the other hand, EVs are expected to utilize smart charging and recharge overnight avoiding to increase the peak demand in our networks.

Energy consumption - geospatial view

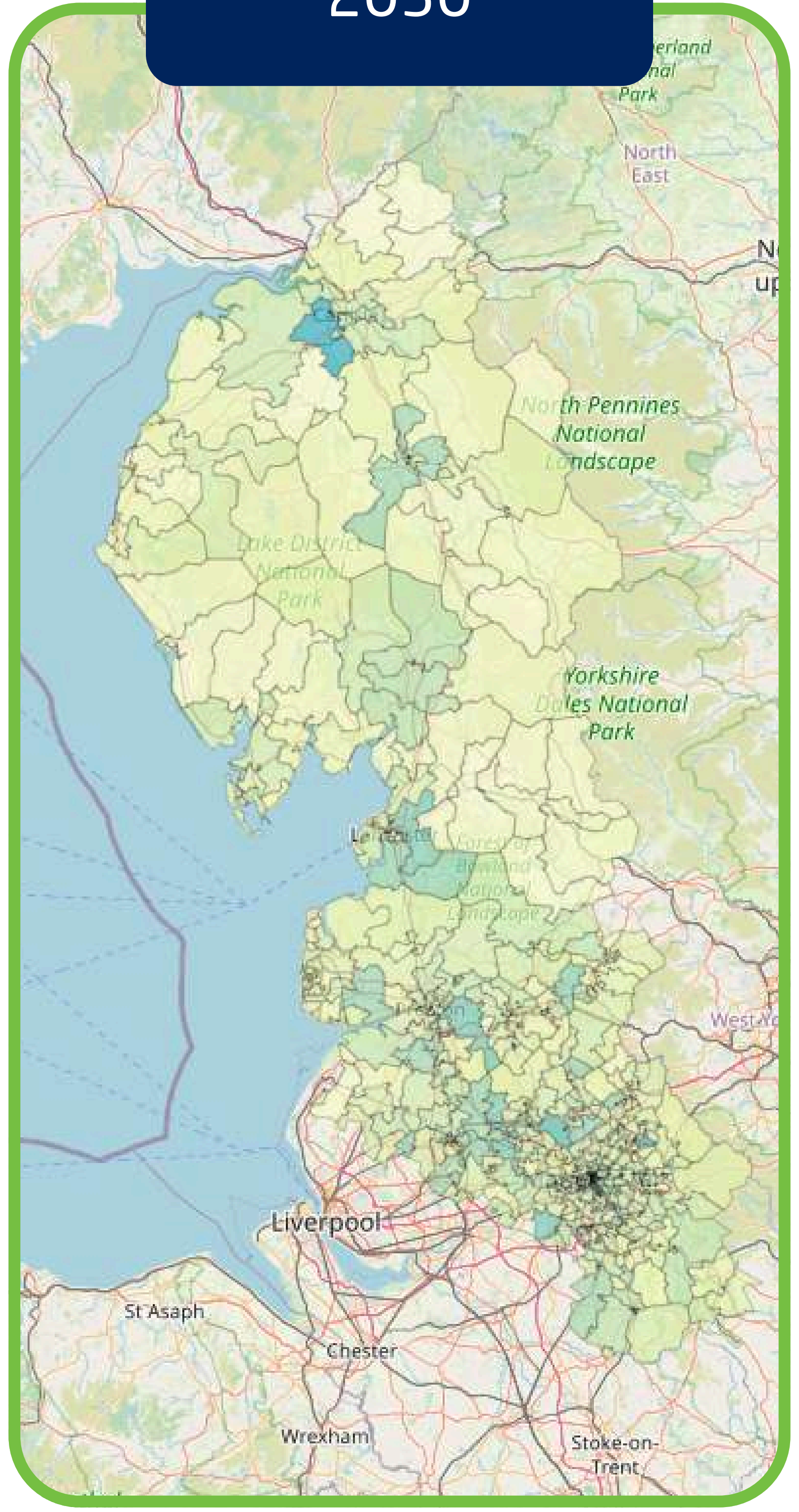
Energy consumption in the Best View scenario per primary feeding area

LEGEND

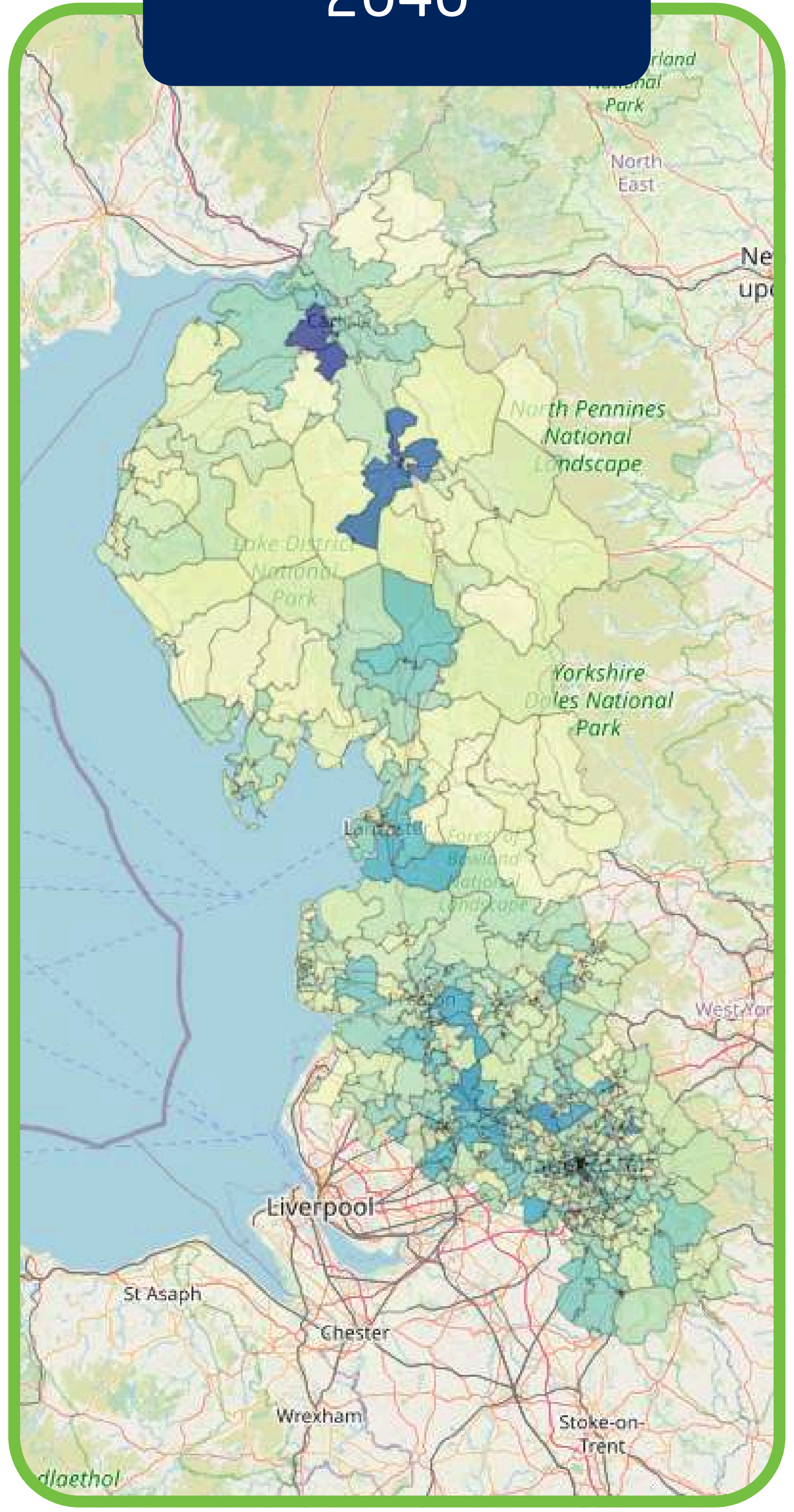
0 133 266 400 GWh

2024

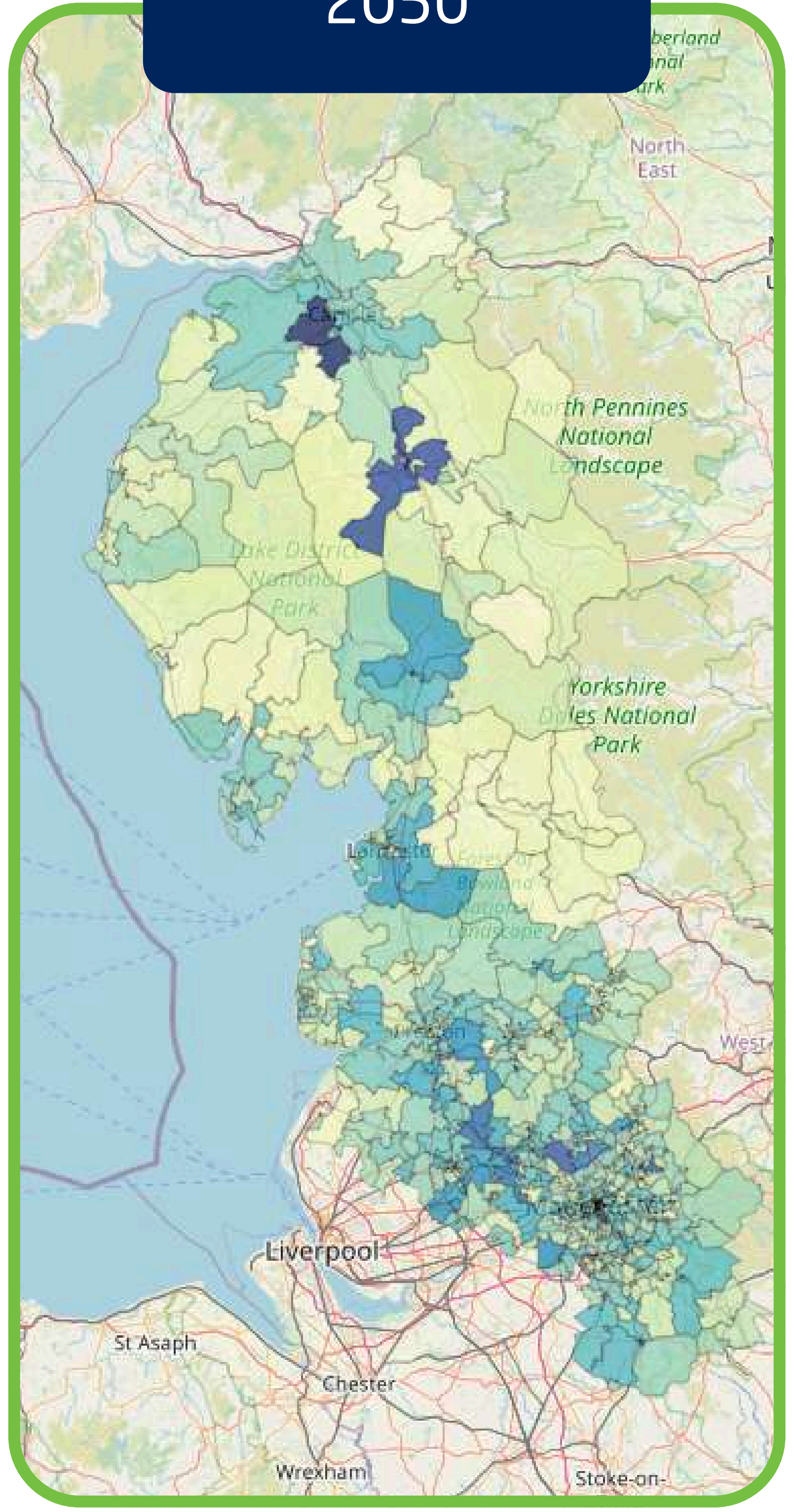
2030



2040

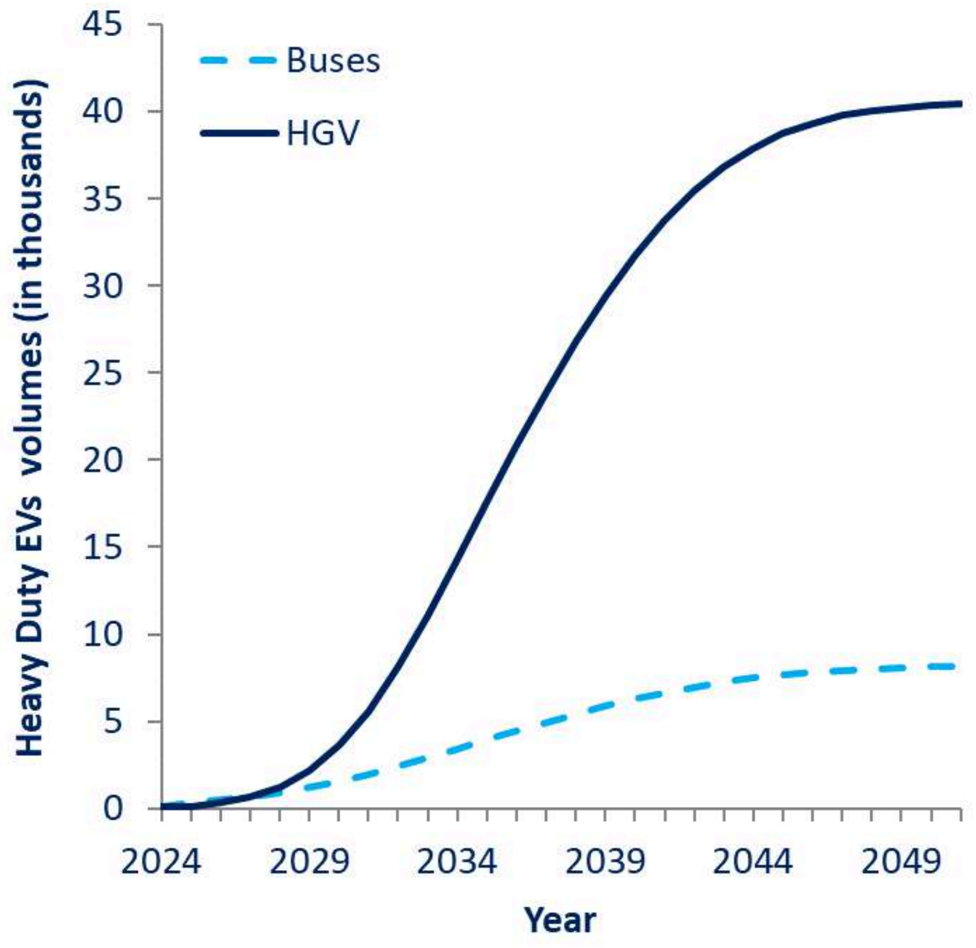


2050

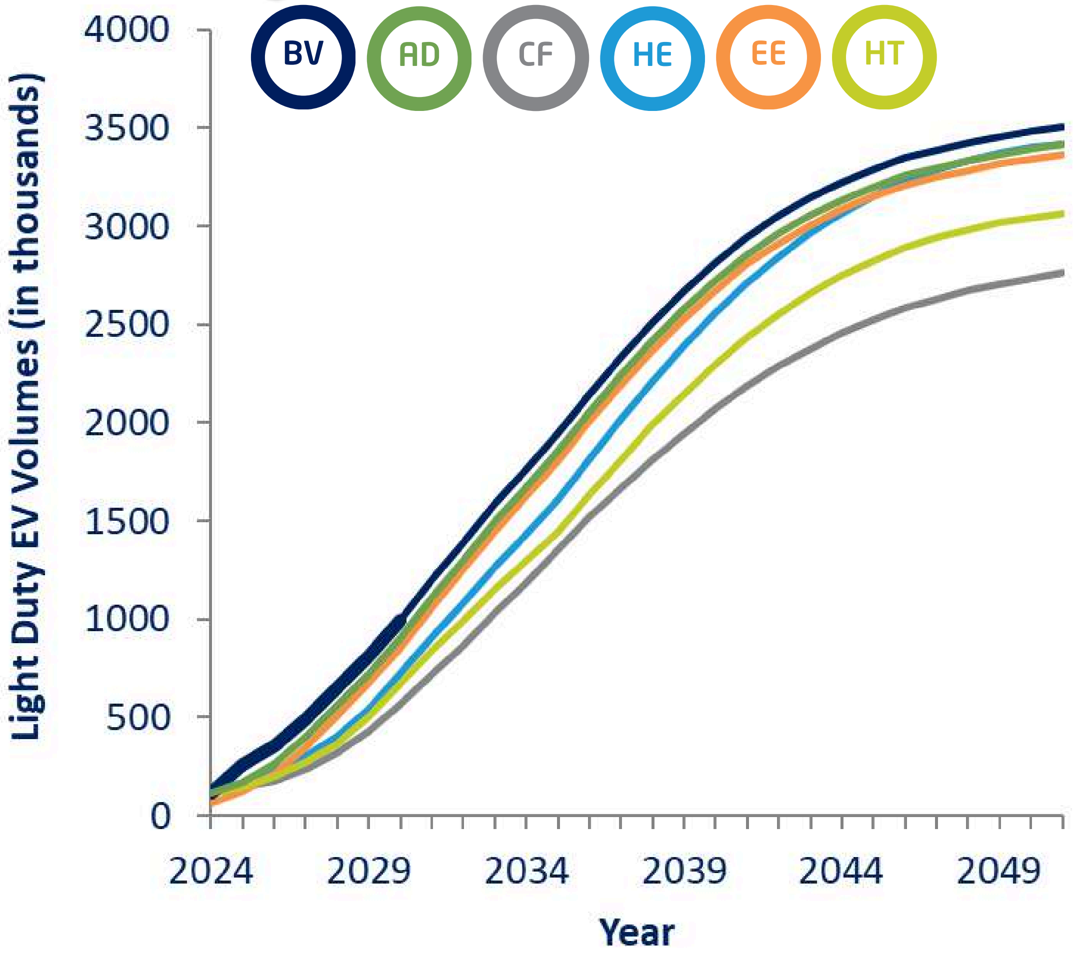


Electrification of transport

Heavy duty vehicles (Best View)



Light duty vehicles (all scenarios)



Our projections for electric vehicles consider a range of both local and regional/national factors, including battery prices, perceived accessibility to charging stations, zero-emission vehicle (ZEV) mandates, short-term and long-term sales trends, and battery electric vehicle (BEV) supply as well as customer behaviour.

3.5 million by 2050

This year's projections show a slightly slower uptake of EVs in the next few years, but reach a higher number in late 2030s and 2040s. The early lower volumes arise from the lower EV sales seen in 2023 and slower recovery of total sales post-COVID, consistent with current market trends.

This year, we are seeing a higher uptake of electric heavy goods vehicles (EV HGVs) compared to last year's DFES thanks to a model update. According to recent findings* rigid HGVs, especially those ranging from 7.5t to 26t, are already proving to be cost-effective to convert to battery electric for some of the most prevalent applications. Additionally, more than half of rigid HGVs can be electrified now without heavily relying on a public charging network, thanks to their ability to charge overnight. In addition, very recently the first 42t fully electric HGVs have started their operating in the UK.

In the short term, the number of electric buses is projected to increase at a faster rate than that of HGV due to governmental support (e.g., ZEBRA scheme). However, in the long run, more of the current HGV fleet will move to fully electric to outnumber the electric bus volumes.

Our forecast also accounts for the increasing participation of electric vehicles (EVs) in smart charging and vehicle-to-grid (V2G) charging/discharging patterns. This trend is evident in the representative EV profiles published in the DFES workbook, which show how an average (diversified) EV profile tends to shift, with reduced charging during peak hours and increased charging in the early mornings.

* https://www.erm.com/globalassets/documents/insights/2023/why-electrification-of-great-britains-truck-fleet-can-happen-faster-than-many-expect.pdf

Electric vehicles - geospatial view

Number of electric vehicles (cars and vans only) in the Best View scenario per primary feeding area

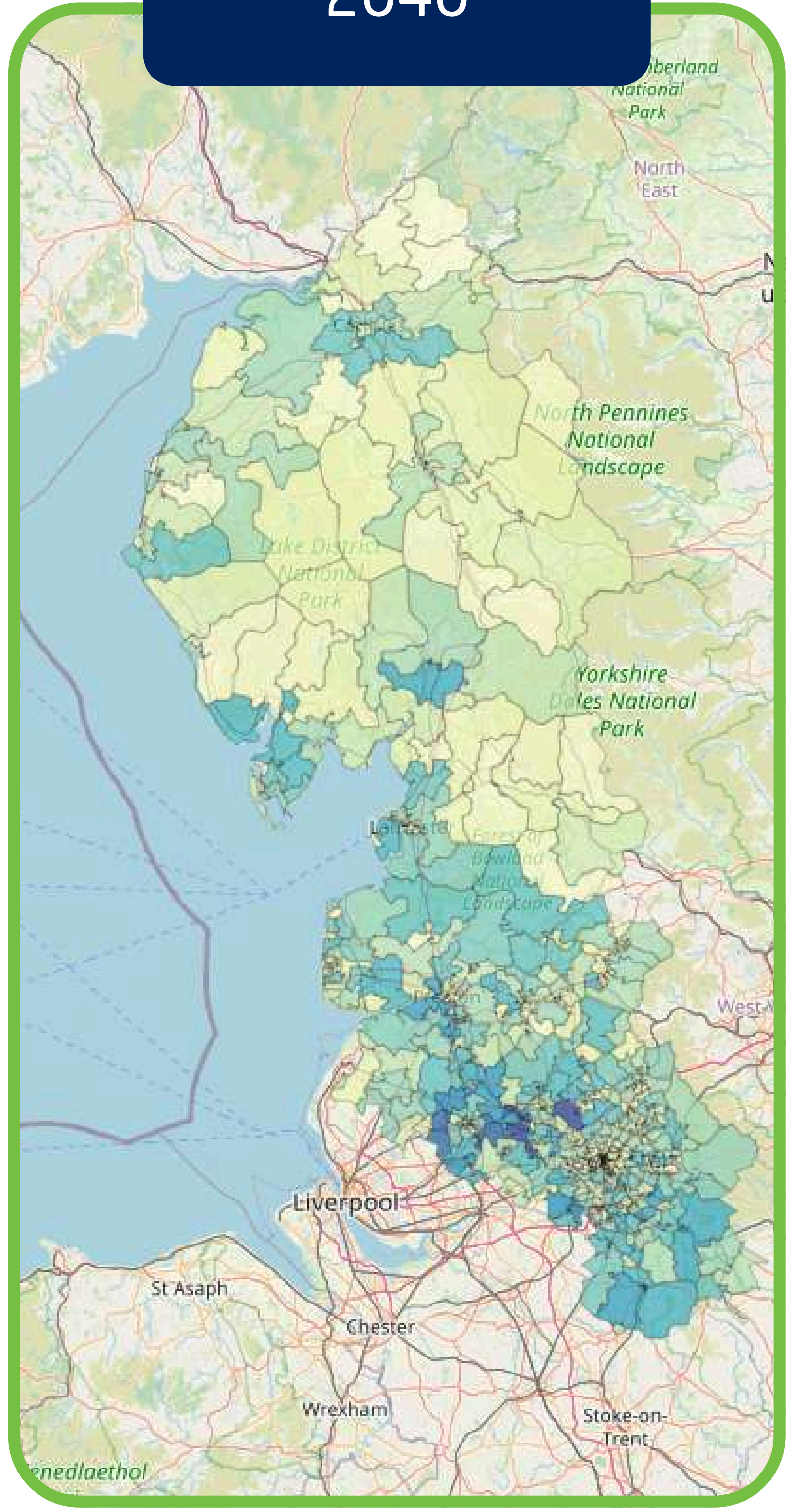
LEGEND

0 10k 20k 30k No

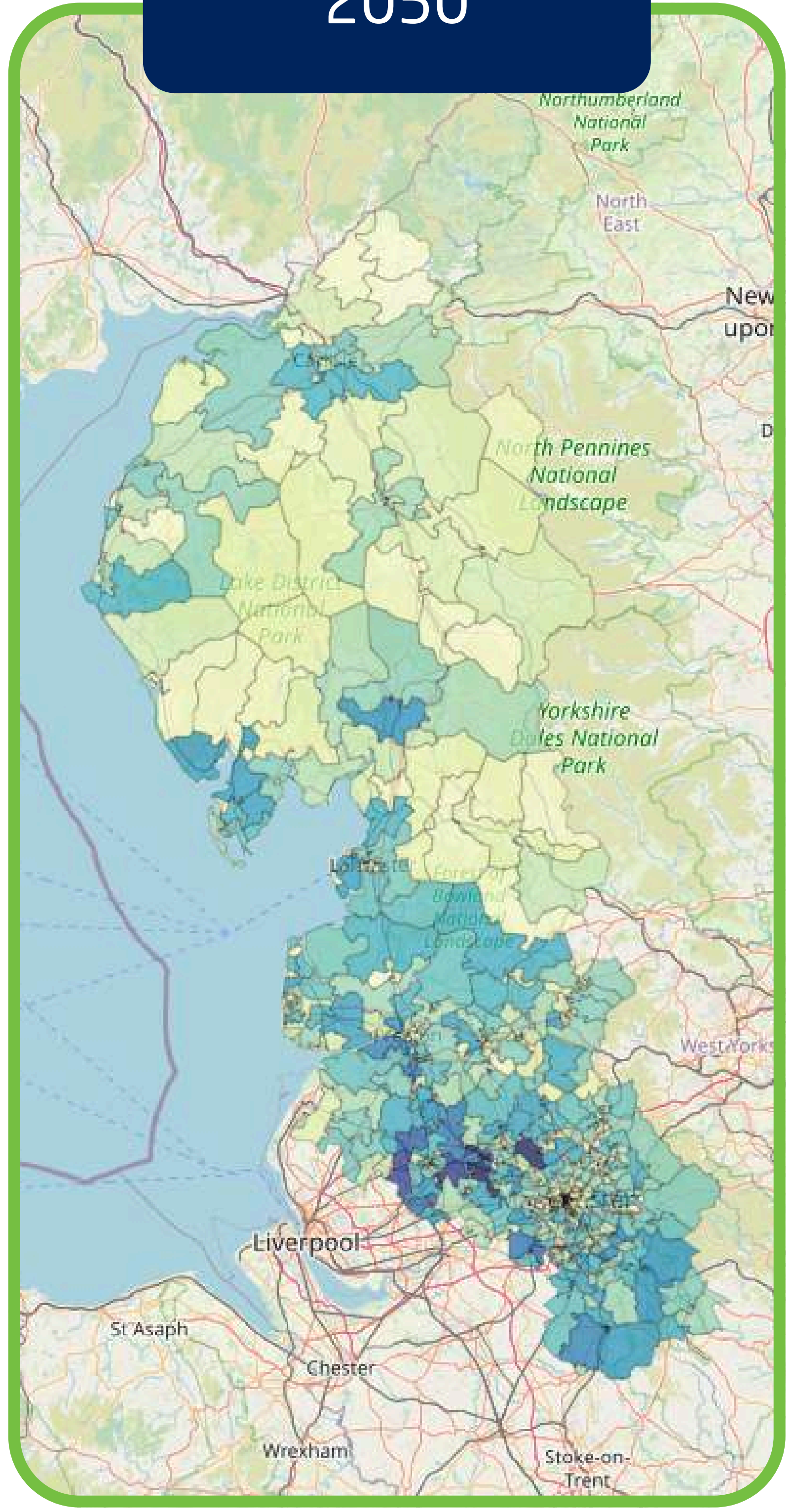
2024

2030

2040

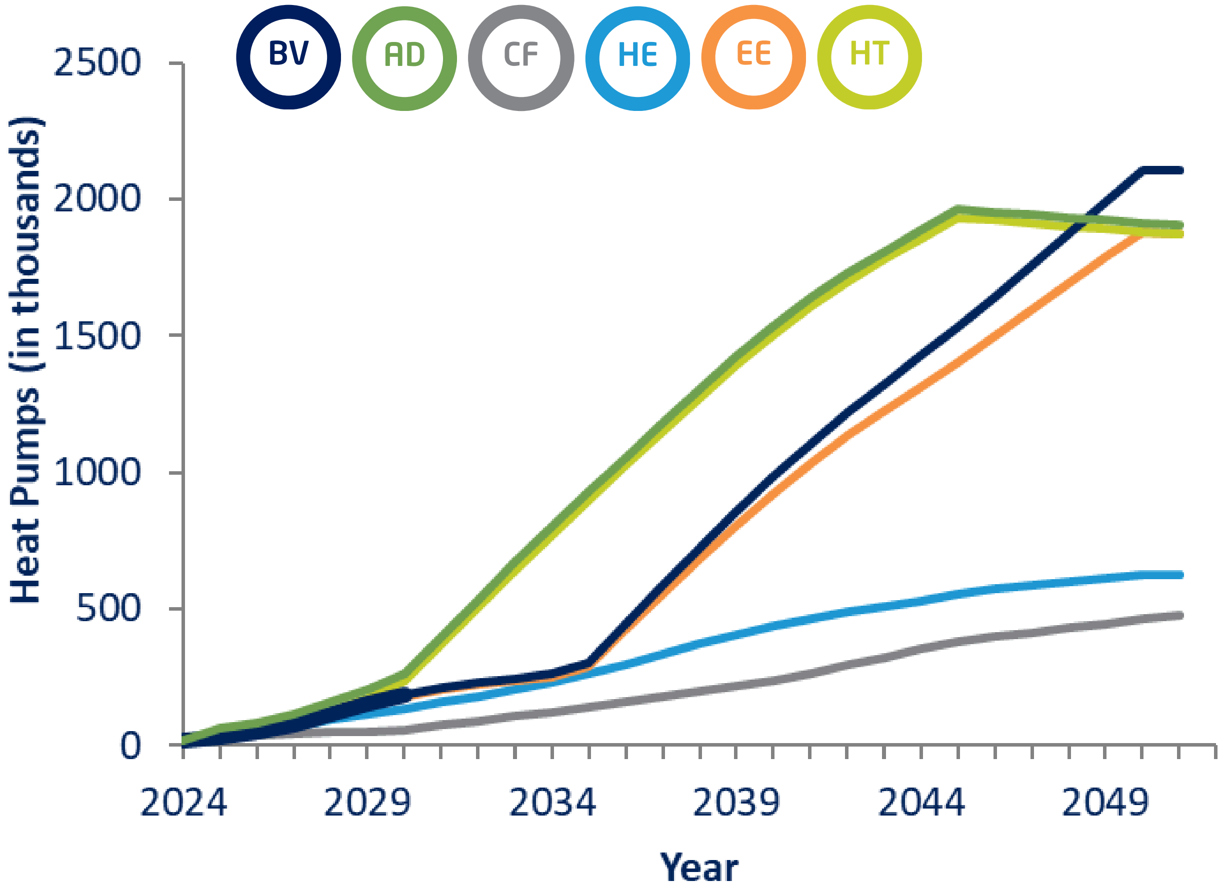


2050

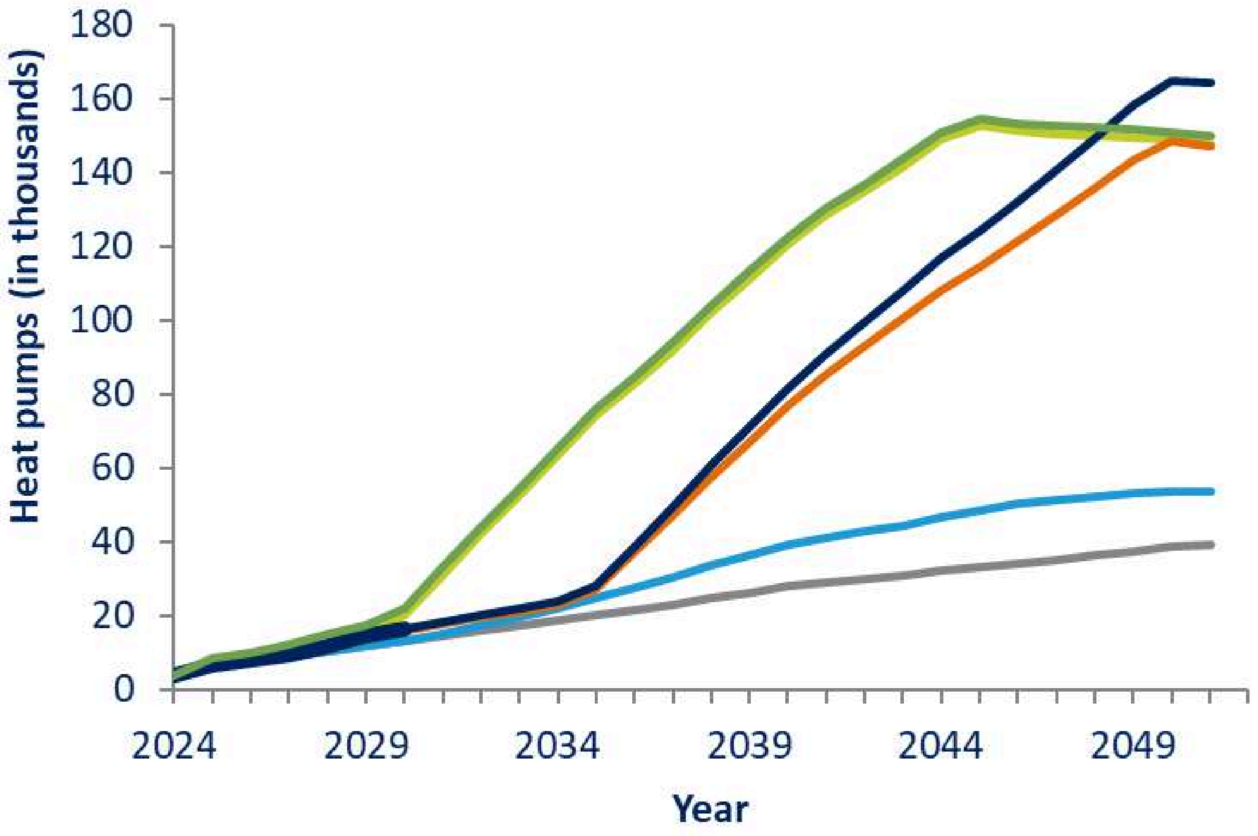


Electrification of heating

Domestic heat pumps



Non-Domestic heat pumps



By 2040 we anticipate in Best View that approximately 45% of domestic customers will have heat pumps. While electrifying heating is a low-regret solution, to maximise whole system benefits it is essential to proceed with enhancements in building fabric to increase energy efficiencies.

2 million by 2050

In the Counterfactual and Hydrogen Evolution scenarios, the adoption of heat pumps (HPs) is significantly slower due to a lower commitment to achieving Net Zero in the former and a stronger adoption of hydrogen in the latter. Nonetheless, even in the scenarios with the highest use of hydrogen for domestic heating we anticipated 500,000 heat pumps by 2050.

In our Best View scenario and Electric Engagement scenarios, we expect volumes to align closely with last year's projections. However, in the Accelerated Decarbonisation and Holistic Transition scenarios, the rate of adoption is faster. This is based on the assumption that existing buildings will not have the option to choose their heating fuel by 2030, unlike the 2035 timeline set in the other scenarios.

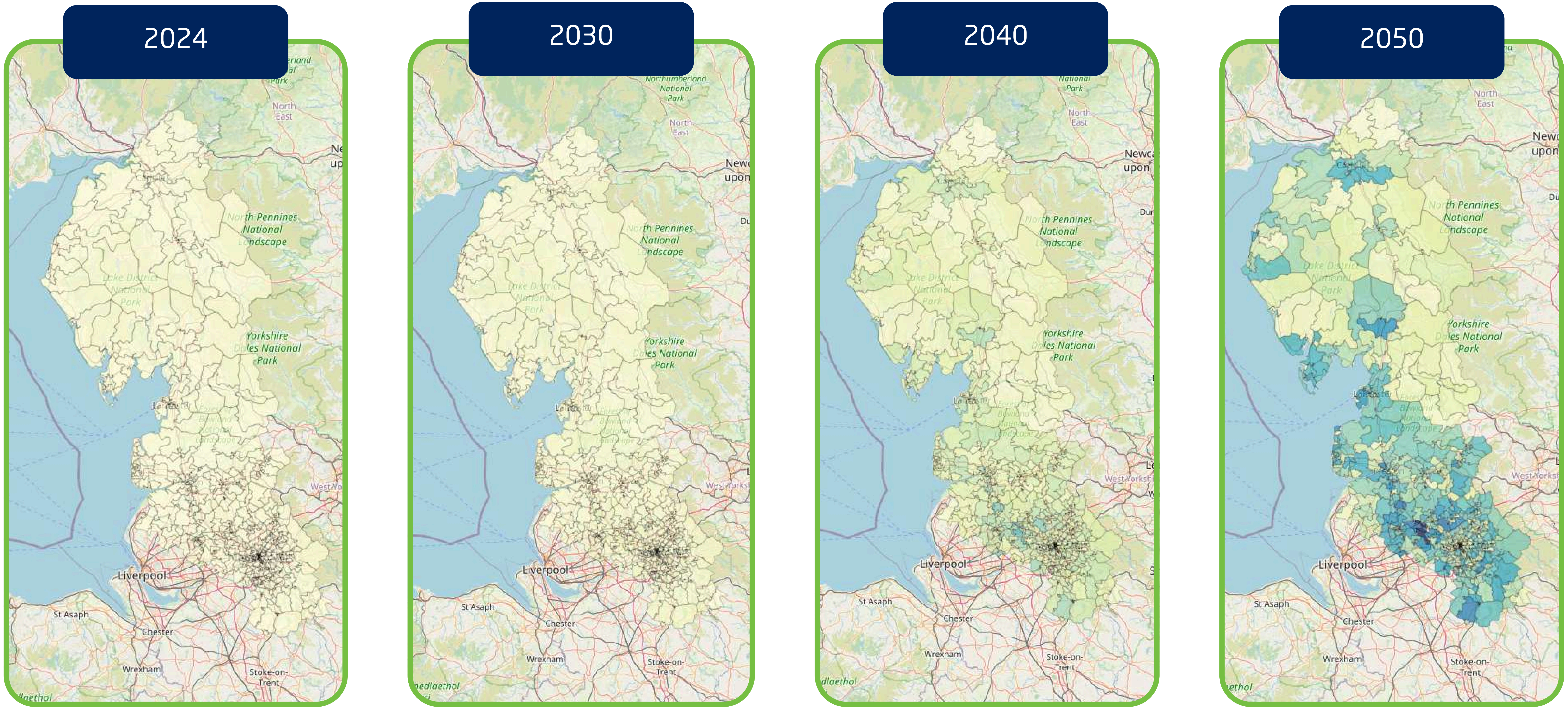
For non-domestic HPs we have removed in alignment with NESO FES (Future Energy Scenarios) a modelling cap that assumed that parts the non-domestic stock (e.g., small industrial customers) cannot adopt heat pumps. This has resulted in slightly higher uptake of non-domestic HPs in the long term, where across scenarios up to around 2/3 of the non-domestic building stock could adopt an HP.

Heat pumps - geospatial view

Heat pump uptake (domestic and non-domestic) in the Best View scenario per primary feeding area

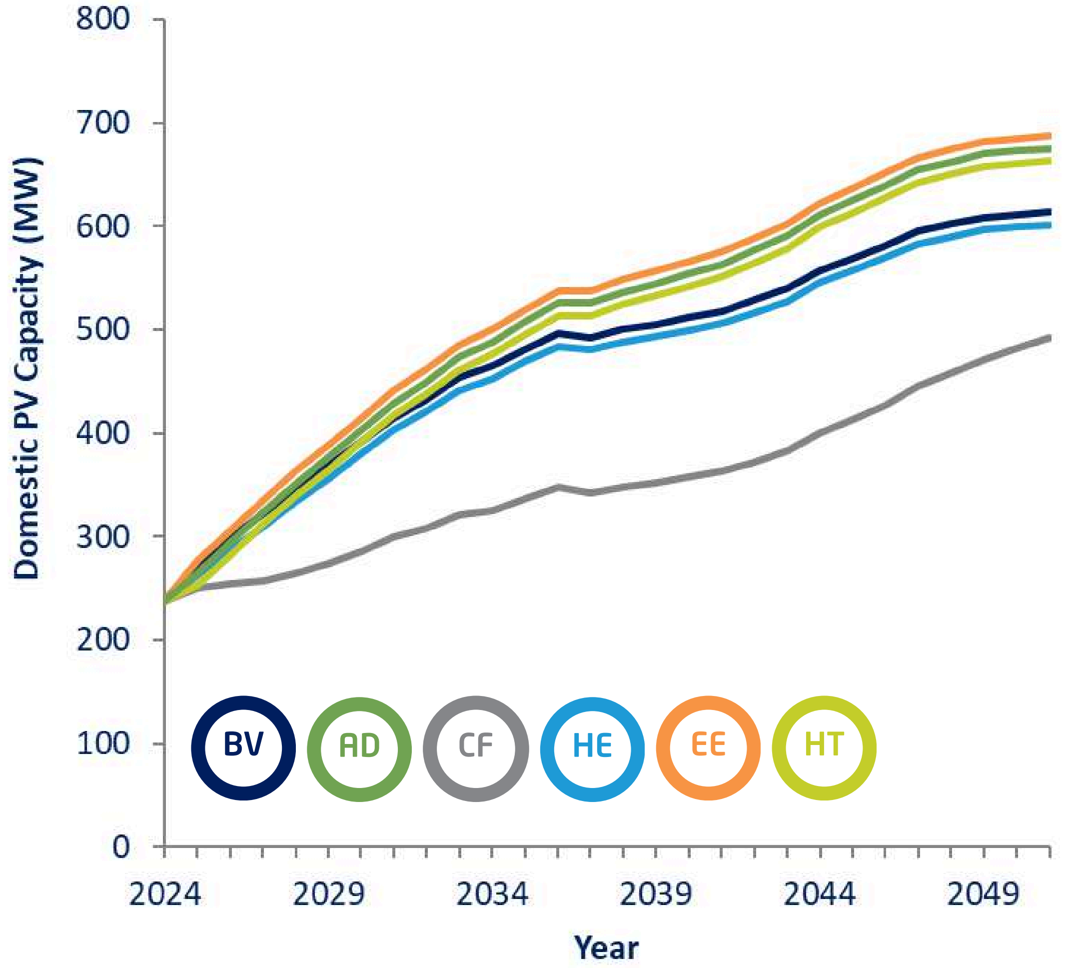
LEGEND

0 8k 17k 25k No

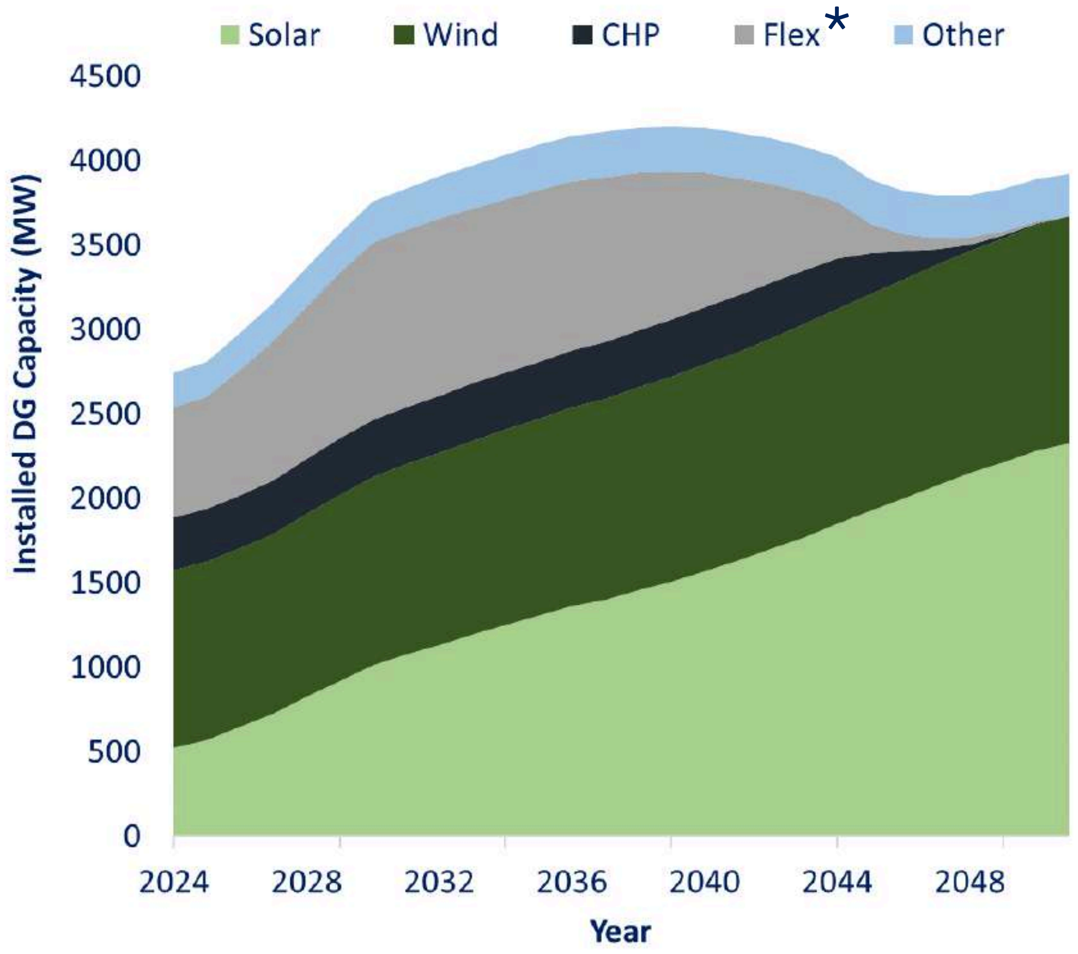


Distributed generation

Domestic PV - installed capacity



Generation by type installed capacity (Best View)



Distributed solar (PV) and wind generation will play a pitoval role in the decarbonisation of electricity supply in the North West to both accelerate the decarbonisation of the region and meet the increased electricity demand especially if the more ambitious assumptions of efficiency measures used to plan transmission connected renewables are not materialised.

*flex = this refers to generators fueled by natural gas or diesel that are mainly providing frequency balancing services to the NESO.

PV and Wind

When it comes to installed capacity, photovoltaic technology is anticipated to grow rapidly reaching four times its nowadays level by 2050 under the Accelerated Decarbonisation scenario.

In the short term, all scenarios, except for the Counterfactual, show a similar increase in domestic PV installations. However, in the long run, the Electric Engagement, Holistic Transition, and Best View scenarios indicate a more significant rise, driven by decreasing costs of PV panels and the implementation of more favorable solar export tariffs.

In terms of onshore wind generation forecast, we have modelled the UK government commitments to enhance its deployment in our Accelerated Decarbonisation plan. By 2050, we project that wind generation capacity will nearly double compared to current levels, with the potential for further increases in our next year forecast based on the effectiveness of these policies.

In all scenarios, with the exception of the Counterfactual, the installation of Combined Heat and Power (CHP) systems is expected to experience a temporary increase due to the current pipeline. However, it is anticipated to gradually decline and approach zero by the late 2040s, as these technologies are not Net Zero compatible in large volumes and are expected to be actively disincentivized once they have completed their operational life.

Distributed generation - geospatial view

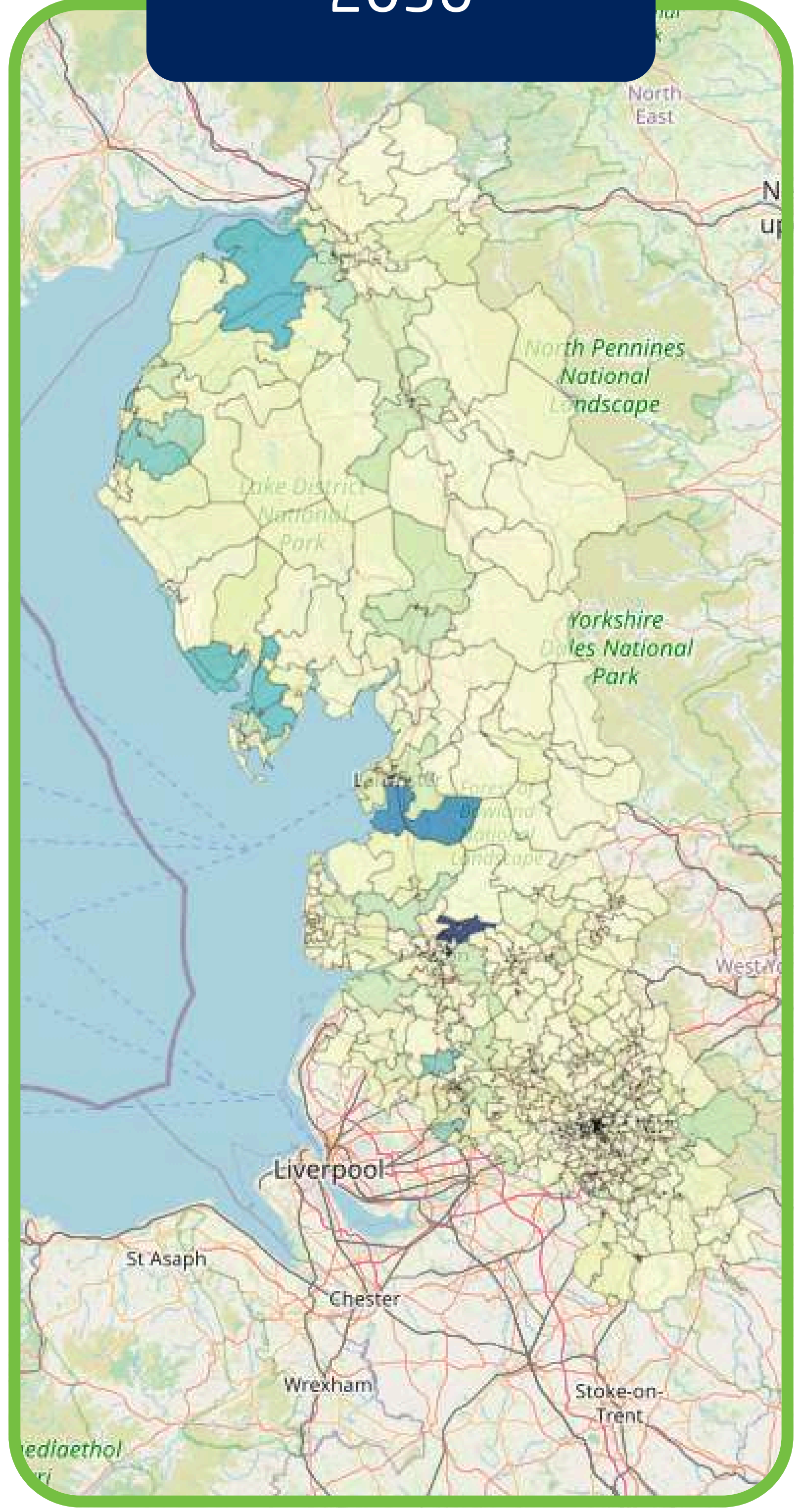
Distributed generation installed capacity (domestic, non-domestic, all generation type) in the Best View scenario per primary feeding area

LEGEND

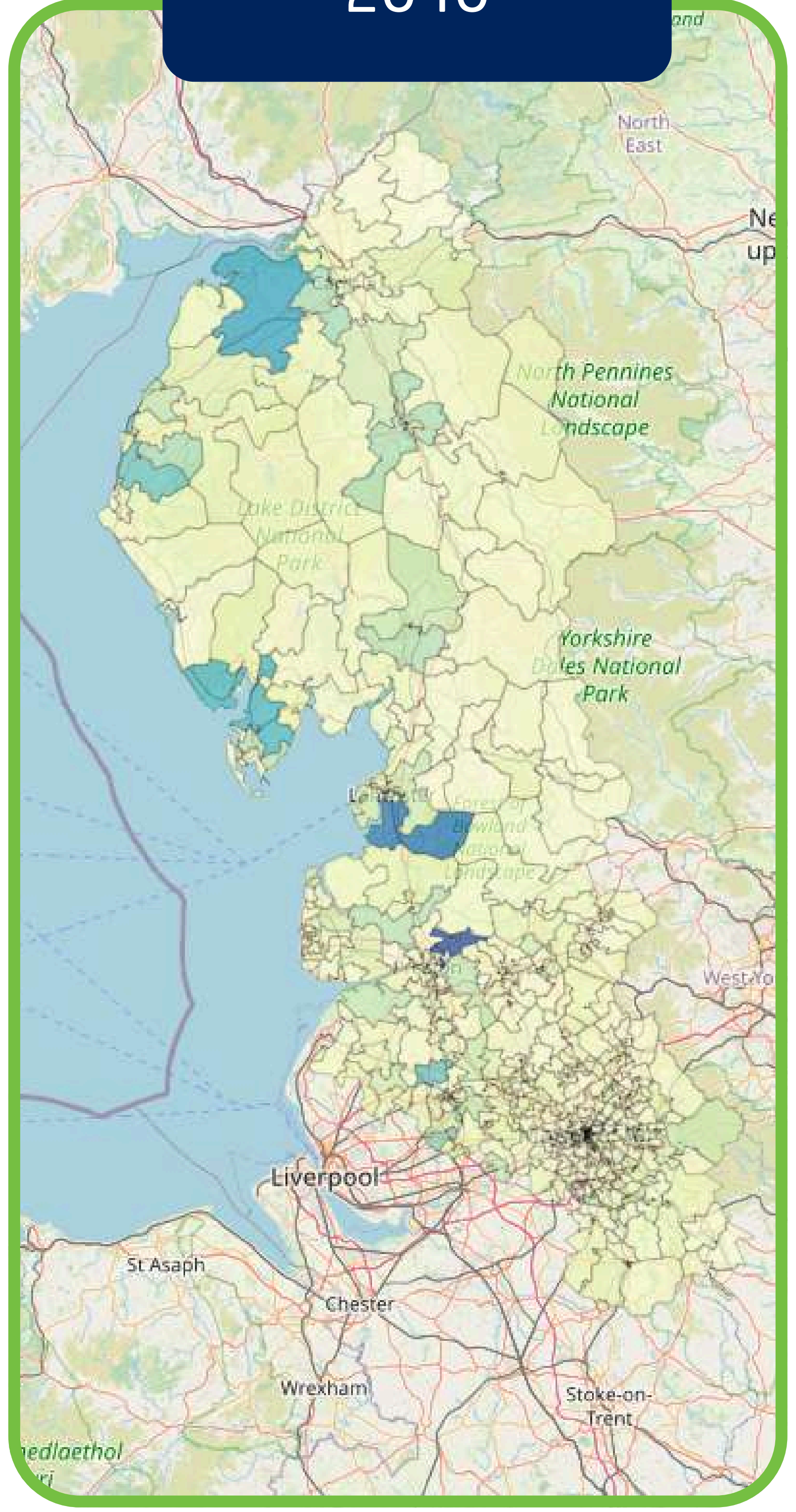
0 20 40 60 MW

2024

2030



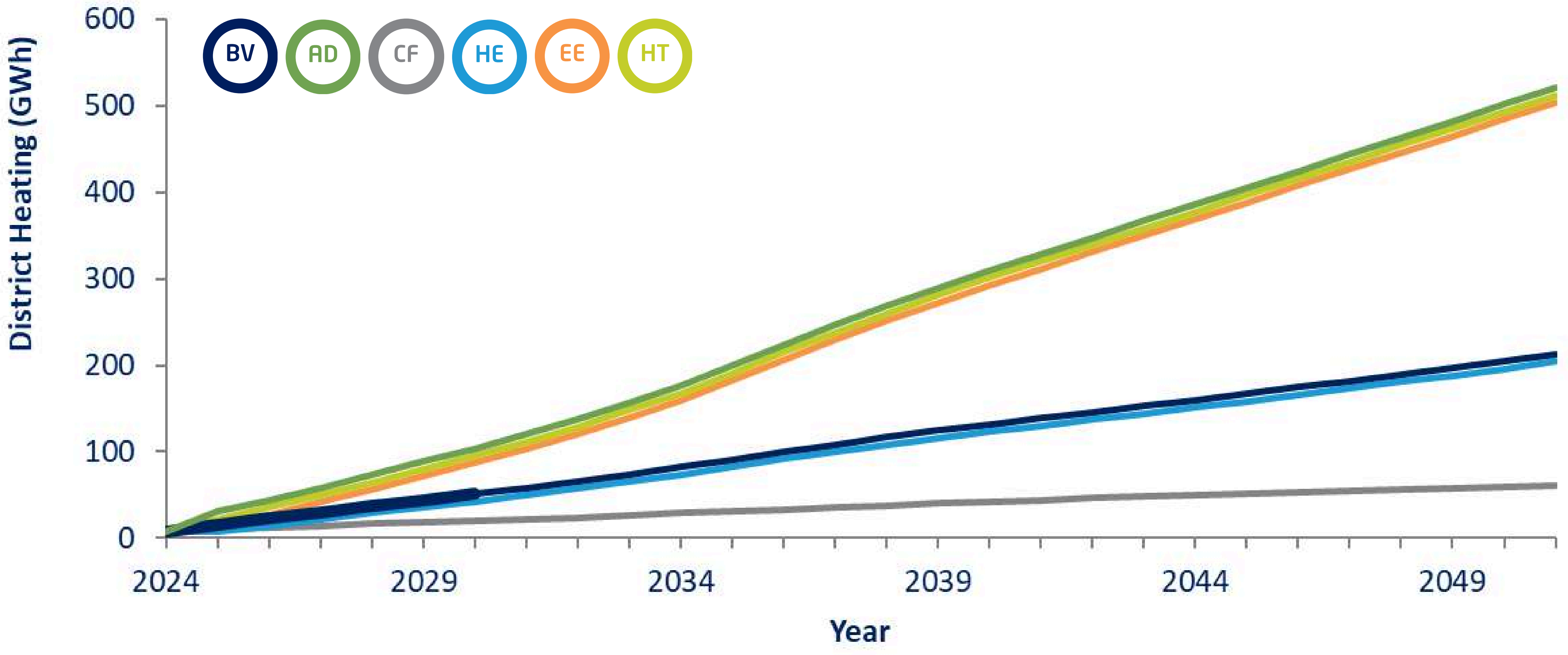
2040



2050

District heating

Electricity demand for district heating



Accelerated Decarbonisation, Electric Engagement and Holistic Transition scenarios show a consistent rise in district heating, which is sufficient to meet the 20% of heat that DESNZ expects is achievable to be supplied by heat networks by 2050. Best View scenario considers a central assumption between the upper range of these scenarios and the foreseeable 2.5 thousand connections in DESNZ's Heat Network Planning Database.

Up to 440k by 2050

This year marks the first time we model district heating in a holistic way considering the longer-term impacts rather than modelling only bespoke projects.

Approximately 10 thousand households in our license area are currently connected to a district or communal heat network. Additionally, DESNZ's databases indicate that there are around 2.5 thousand planned connections in our area. Natural gas fuelled heat networks are expected only in the short term. Projects are expected to quickly utilise large centralized heat pumps that act as energy multipliers (from 1 unit of electricity they produce multiple units of heating). Also waste heat from industrial processes and data centres are considered in the longer term to be accompanied with a heat pump to raise the temperature to a usable level for domestic heating.

Since district heat networks serve both residential and commercial users and typically include a storage component, we view this heating source as having a demand profile similar to that of heat pumps.

In areas served by district heating there will not be heat pump uptakes, which is the main factor behind the reduced longer term volumes of heat pumps in this year's DFES.

District heating - geospatial view

Yearly electric energy consumption from district heating systems in the Best View scenario per primary feeding area

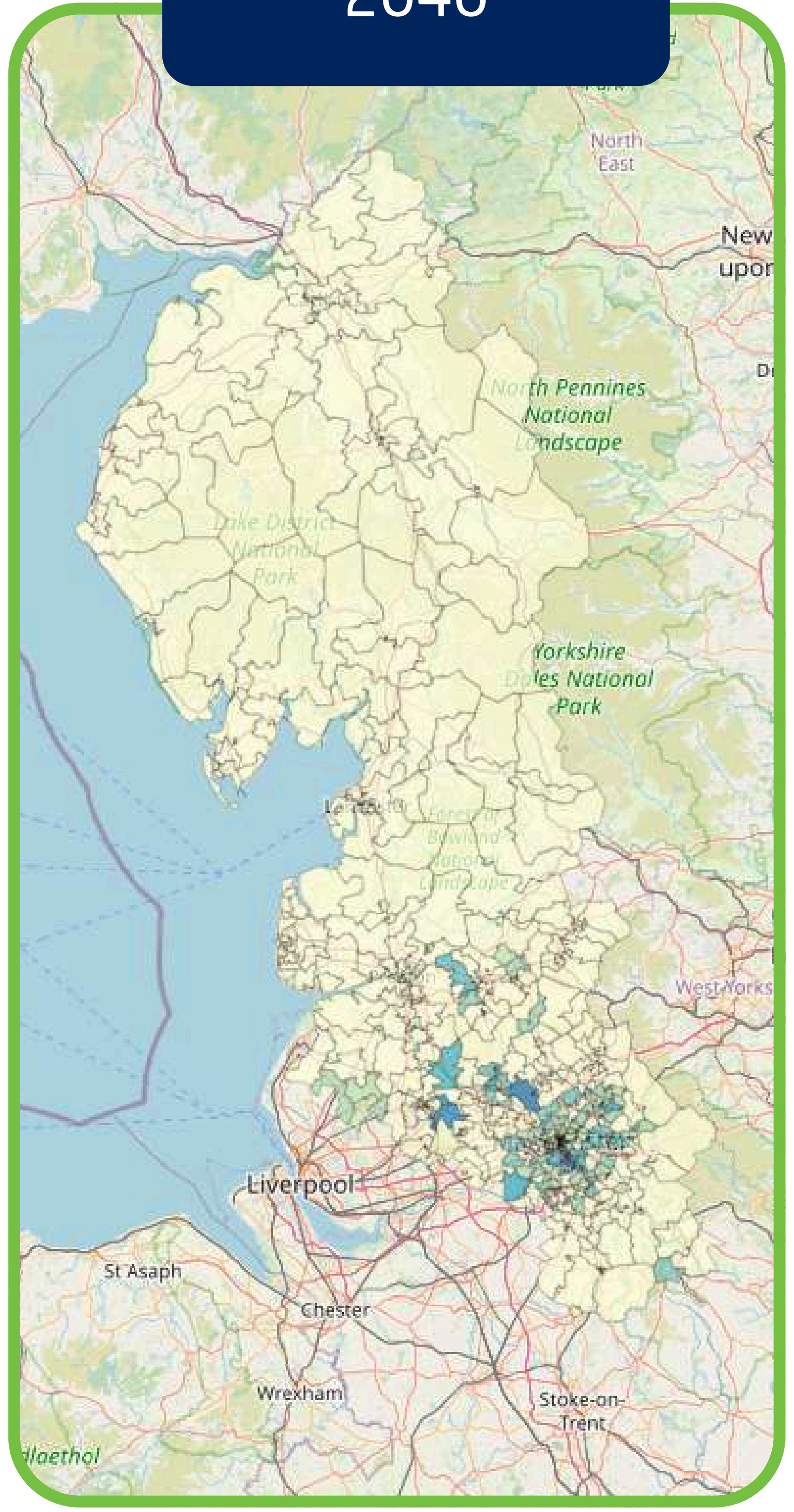
LEGEND

0 | 7 | 14 | 21 GWh

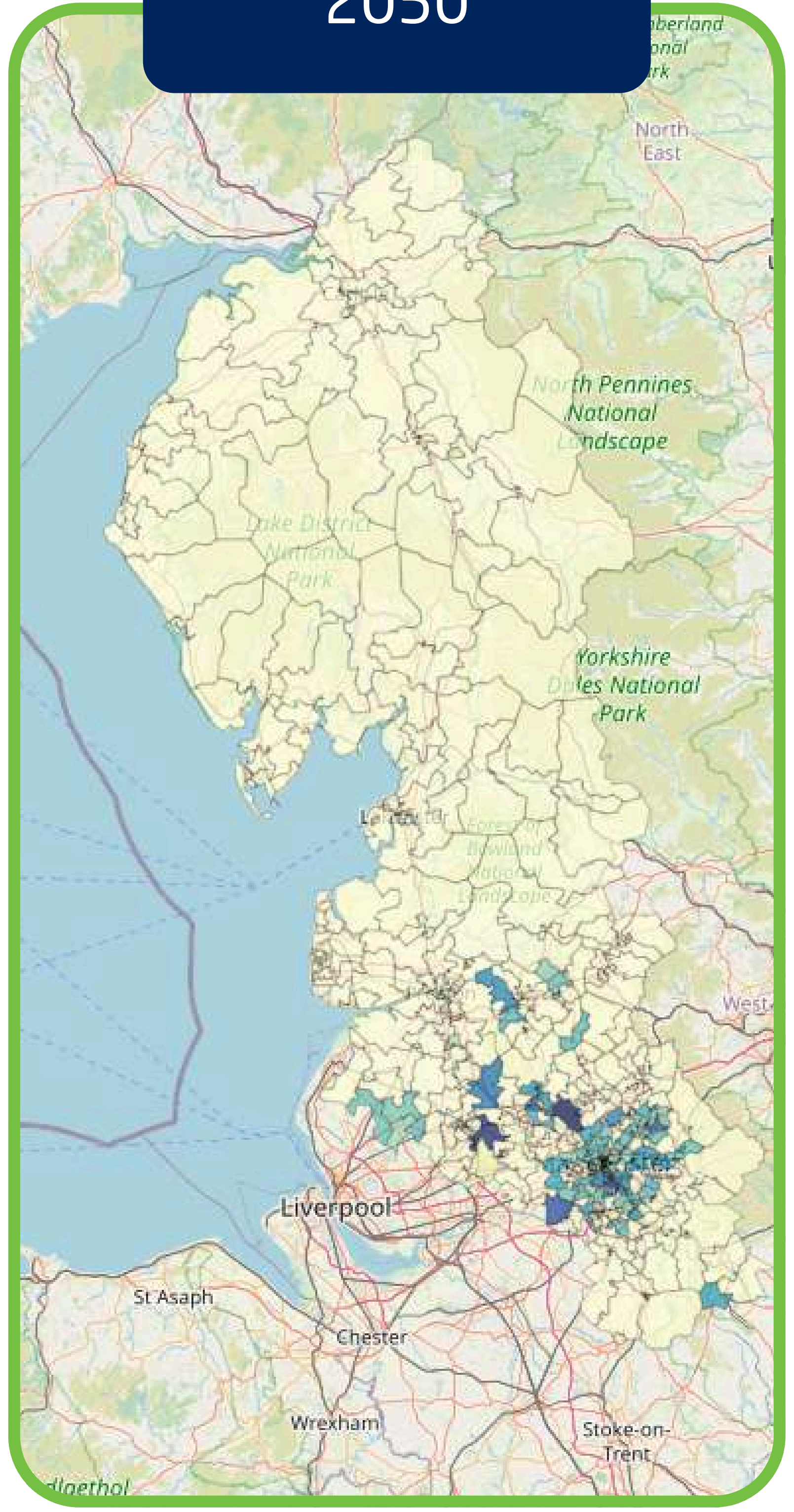
2024

2030

2040

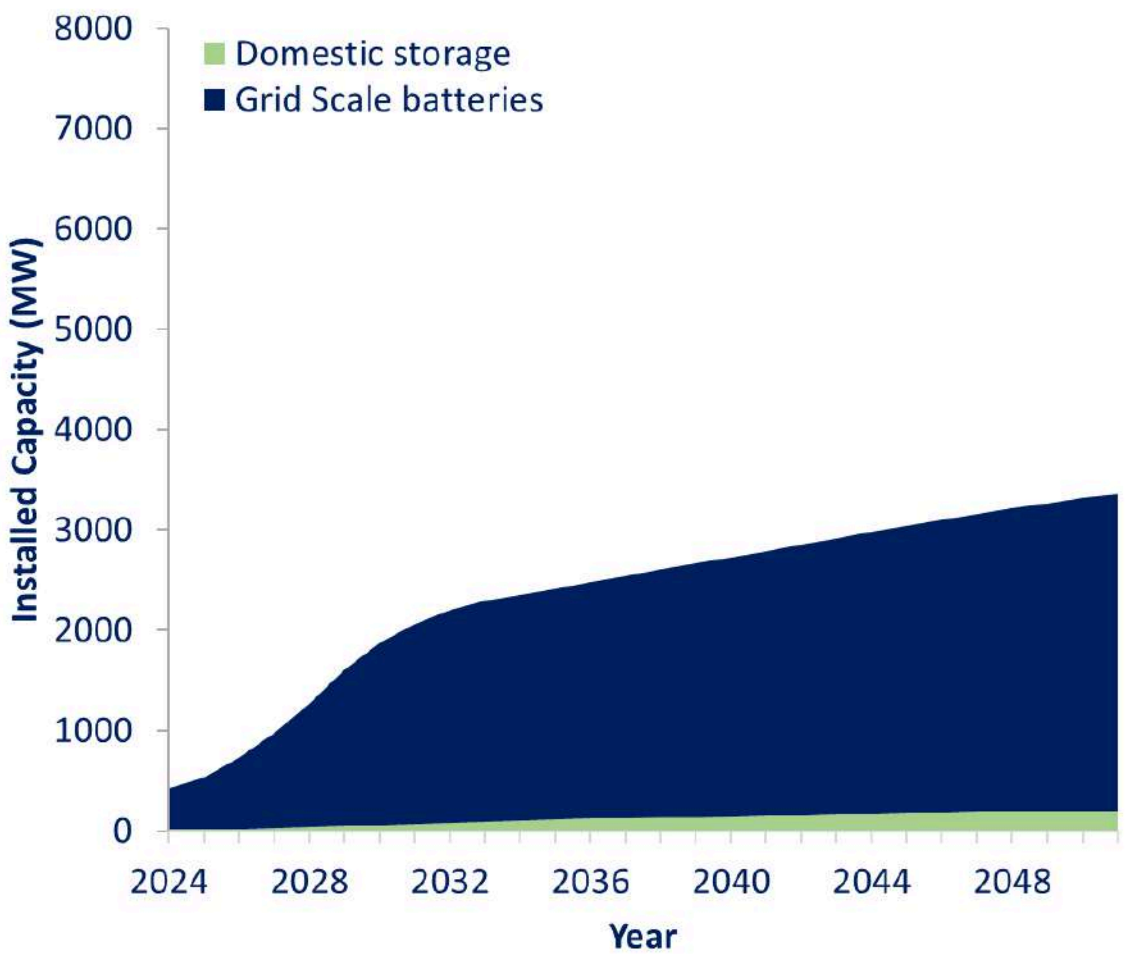


2050

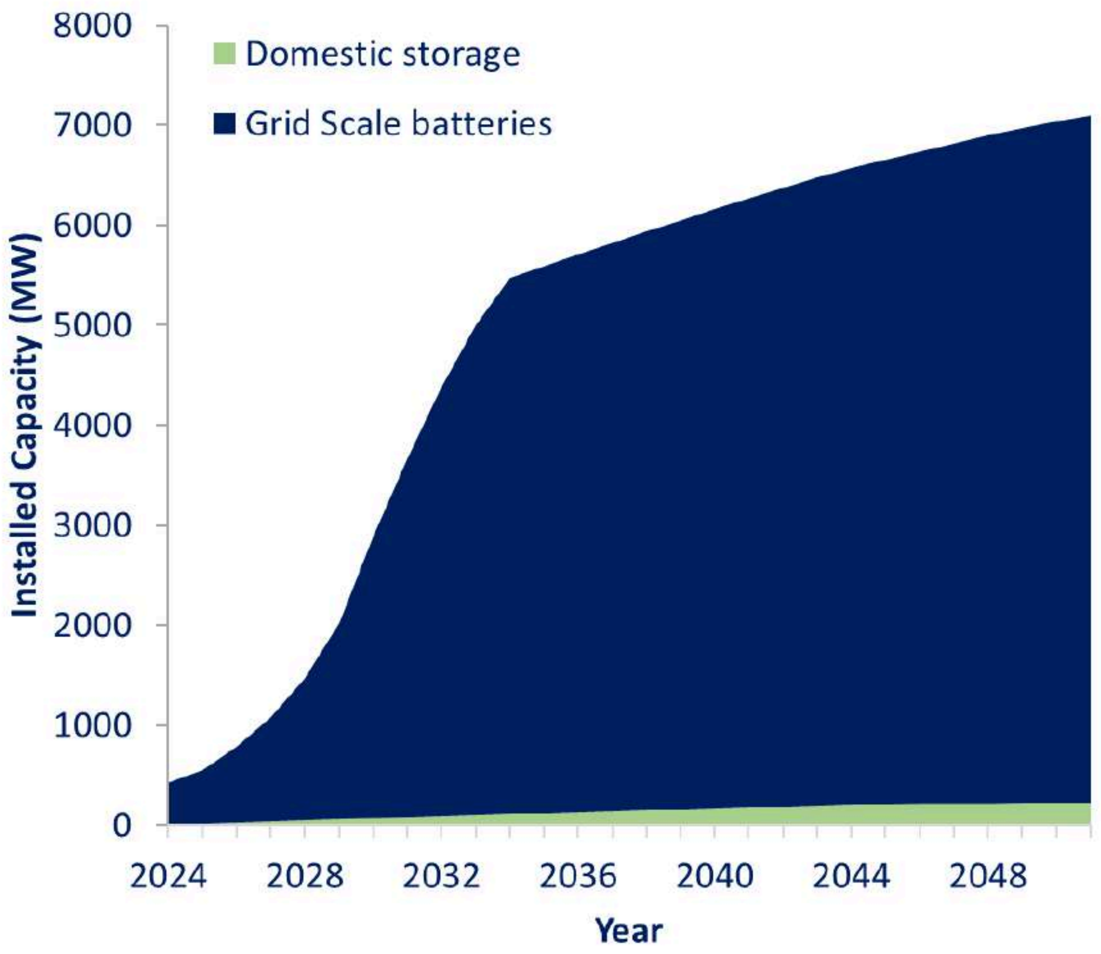


Battery storage

Battery storage in Best View



Battery storage in Accelerated Decarbonisation



As per last year's forecast, grid-scale batteries are expected to be the most dominant storage type. This is supported by the existing connections pipeline, where more than 5GW of grid scale battery quotations have been accepted by our customers.

1.8 GW by 2050

Large batteries are currently used to mainly offer demand balancing services to the National Energy System Operator (NESO) or behind-the-meter services for our industrial and commercial customers. Moving forward, batteries are anticipated to increasingly benefit from electricity price arbitrage and participate in new markets such as existing and new distribution system operation (DSO) flexible services.

Beyond 2030 we predict that battery adoption in our Best View scenario will surpass last year's projections, reaching just over 1.8 GW by 2050. This marks a fourfold increase compared to present levels, it is driven by the increased connections pipeline and it also aligns with the trajectory outlined in the recently published Clean Power 2030 NESO report.

Comprehensive battery forecasts across all scenarios can be found in our DFES workbook, indicating that battery capacity by 2050 can be up to over 7 GW in the Accelerated Decarbonisation scenario.

Battery storage - geospatial view

Battery storage uptake (domestic and grid-scale) in the Best View scenario

LEGEND

0 7 14 21 MW

2024

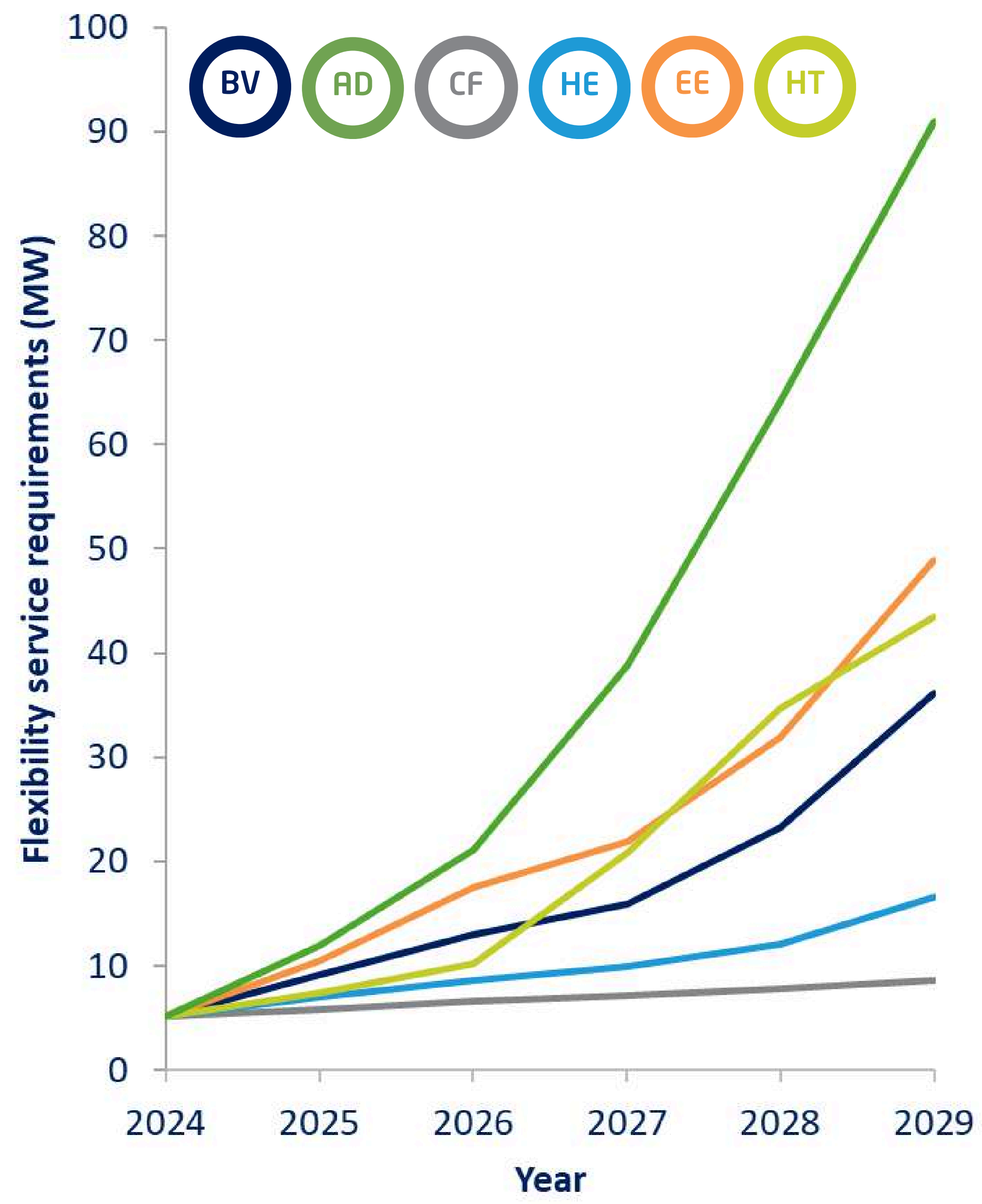
2030

2040

2050

Flexibility services

Forecast of flexibility service requirements



Flexibility service requirements map

Long-term forecasts of our flexibility service requirements are presented in our DFES workbook for all scenarios. These forecasts are a direct input to our Autumn and Spring flexibility tenders.

Flexibility First

In Electricity North West we follow a "flexibility first" approach. This means that we are committed to use flexibility services in all cases where it is technically feasible and more cost efficient to use flexibility instead of conventional network reinforcement to release capacity

The forecasts of flexibility service requirements are included in our DFES workbook. These forecasts have been also used in our Autumn 2024 flexibility tender as an input to the Common Evaluation Model (CEM) tool together with costs of counterfactual network reinforcement to define the ceiling prices for flexibility services.

DSO flexibility services can be used to release capacity in order to defer reinforcement and/or accelerate connections. However, it needs to be highlighted that the capacity released via flexibility services can only tackle specific network constraints (e.g., thermal instead of fault level issues).

Autumn 2024 tender in numbers

- **243 flexibility service requirements**
- **£12m+** of revenue available
- **44 locations** across the North West
- **870 MW** of flexibility capacity
- **4 years** of flexibility required

Data in our DFES

Each year, we publish our main DFES Workbook with 30+ datasets in an Excel tool detailing electricity demand, generation and low-carbon technology forecasts with different granularities down to granular local authority and primary substation feeding areas.

NEW! This year we also present our first DFES LV workbook with forecasts across over 30 thousand substations.

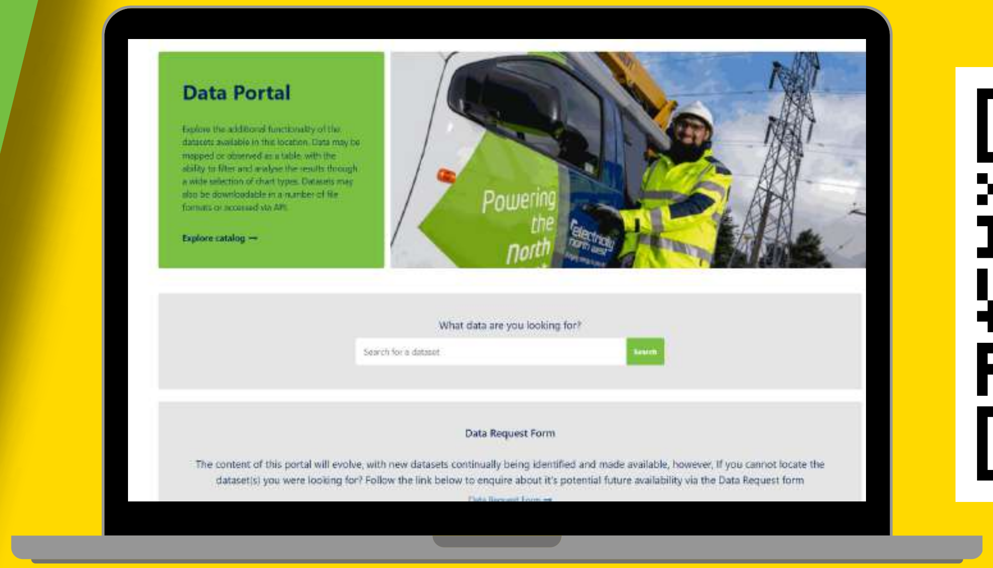
Our DFES data is accessible through our OpenData Portal in different formats:

- API
- Maps
- Personalized Views*
- Tabular (CSV, Excel...)
- Graphs

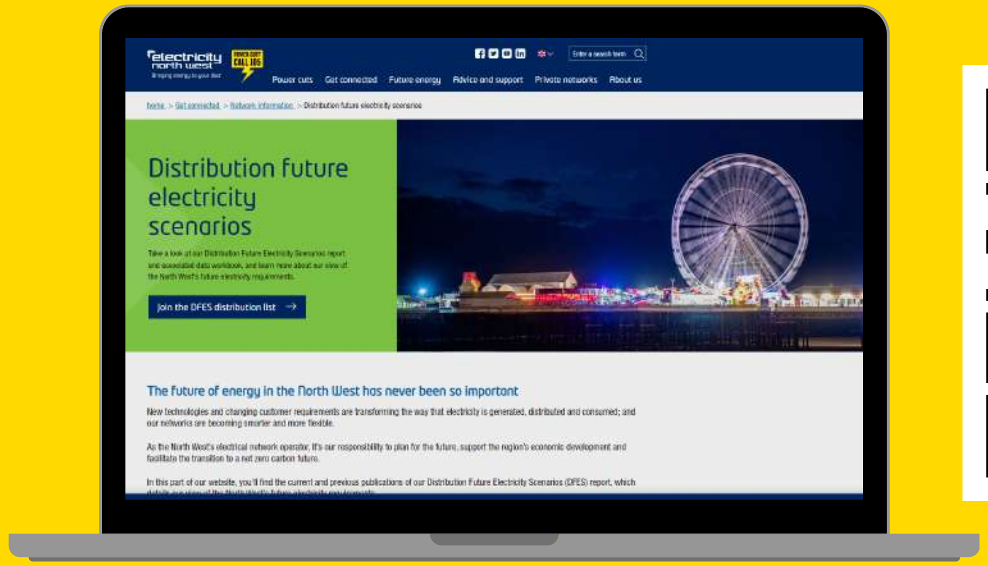
DATA

You can explore the detailed DFES datasets (over 40 across both DFES workbooks) by clicking the laptops below or scanning the QR code at the bottom.

ENWL Data Portal



DFES Workbooks



*In the data portal, you have the ability to layer various maps and datasets, allowing you to create intricate and on-the-fly visualizations.

Millions of data points in our DFES workbooks

TYPE

Generation

Generation data with breakdown per technology (including battery storage).

Demand

Peak, minimum, LCT uptake, residential, industrial and commercial component as well as district heating.

Flexibility

The amount of DSO flexibility services required to defer network reinforcement whenever economic to do so.

DFES

RESOLUTION

Time

Forecast up to 2050.

Scenarios

Best View, Accelerated Decarbonisation and the four scenarios that follow national pathways (from NESO's Future Energy Scenarios)

Asset Level

From BSPs to secondary substations and even down to granular local authorities.

EHV AND HV WORKBOOK

- 430+ NETWORK ASSETS
- 750,000+ DATA POINTS
- 36 DATASETS
- FROM 132KV TO LA

LV WORKBOOK NEW!

- 30,000+ NETWORK ASSETS
- 20+ MILLION DATA POINTS
- 6 DATASETS
- LOW VOLTAGE

Do you have any questions?

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If you have any questions or suggestions about our forecast, please contact us. We're always here to help!

DFES Workbook and Reports
www.enwl.co.uk/dfes

DSO Page
https://www.enwl.co.uk/dso

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ENWL Data Portal