Local Area Energy Plan (LAEP)

Vale of Glamorgan

Mae’r ddogfen hon ar gael yn Gymraeg
This document is also available in Welsh

Abbreviations

Sponsors: Vale of Glamorgan / Bro Morgannwg; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

Acronym	Definition or meaning
ABP	Associated British Ports
CAPEX	Capital Expenditure
CCGT	Combined Cycle Gas Turbine
CCR	Cardiff Capital Region
CCUS	Carbon Capture, Utilisation and Storage
DFES	Distribution Future Energy Scenarios
ECOFLEX	Flexible Eligibility Energy Company Obligation
EfW	Energy from Waste
EPC	Energy performance certificate
ESC	Energy Systems Catapult
EV	Electric Vehicle
GHG	Greenhouse Gas
HGV	Heavy Goods Vehicles
LAEP	Local area energy planning or Local area energy plan
LDP	Local Development Plan
LGV	Light Goods Vehicles
LSOA	Lower super output area, a small area classification in the UK designed to have a comparable population

Acronym	Definition or meaning
NAEI	National Atmospheric Emissions Inventory
NGED	National Grid Electricity Distribution
NHS	National Health Service
NZ	Net Zero
PPA	Power Purchase Agreement
PEDW	Planning and Environment Decisions Wales
PV	Photovoltaics
RIIO	Revenue = Incentives + Innovation + Outputs, a regulatory framework used by the UK energy regulator, Ofgem
RLDP	Replacement Local Development Plan
RTP	Regional Transport Plan
SEWBCC	Southeast Wales Business Climate Coalition
SDP	Strategic Development Plan
SMR	Steam Methane Reformation
ULEV	Ultra Low Emissions Vehicle
WWU	Wales and West Utilities
ZEV	Zero Emissions Vehicles

Contents

Sponsors: *Delivery partners:*

Navigating this report

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This Local Area Energy Plan was prepared by Arup, Carbon Trust and Afallen on behalf of Vale of Glamorgan and co-ordinated across the region by the Cardiff Capital Region. Energy Systems Catapult is the Technical Advisor for the LAEP Programme in Wales.

The Plan's development was funded by the Welsh Government.

Foreword

A note from Councillor Bronwen Brooks

As we find ourselves in this period of transition where we are facing unprecedented challenges and transformative opportunities, the imperative for a just energy transition has never been more urgent.

The Local Area Energy Plan (LAEP) for the Vale of Glamorgan represents a bold and visionary roadmap for realising this future. It is a testament to the collective commitment of the Council and local stakeholders to harnessing the power of innovation, collaboration, and forward-thinking leadership to address the pressing issues of achieving a net zero carbon energy system.

Local Area Energy Planning is a whole energy systems method of developing evidence-based and data-driven plans for decarbonising energy systems in local areas. Through completing this process, it is clear that by taking advantage of our strategic industry and logistics capability, embracing cutting-edge technologies, and fostering a culture of sustainability, we have the opportunity to decarbonise the Vale's energy system. This will ensure the well-being of current and future generations and unlock new pathways to growth and prosperity.

Crucially, the LAEP is not merely a document of aspirations; it is a blueprint for action. It is a call to arms for all stakeholders, from public sector at a national, regional and local level, industry, communities and individuals, to join forces in pursuit of a common vision. It is a call to invest in renewable energy infrastructure, to promote energy efficiency and conservation, to support innovation and entrepreneurship, and to cultivate a culture of environmental stewardship and responsibility.

As a Council, we have already committed to change through our Climate Challenge Plan 2021-2030 delivered through Project Zero. Project Zero is the Council's response to the Climate Change emergency and articulates the direction we want to take and how we want to change. It brings a great deal of work together, new ideas and ways of working as well as continuing with the good work already taking place, for example improving our school buildings, working with developers and the community, and encouraging behaviour change. The work to deliver the Local Area Energy Plan is another example of this commitment in action to reduce carbon emissions to net zero by 2030.

I extend my deepest gratitude to all those who have contributed to the development of this plan, the policymakers, experts, business leaders, and individuals whose insights, expertise, and passion have shaped its vision and goals. By working together we can create a more sustainable and prosperous future for the Vale of Glamorgan and beyond.

(*Councillor Bronwen Brooks, Deputy Leader and Cabinet Member for Sustainable Places)*

Figure 0.1: Councillor Bronwen Brooks

Local Area Energy Plan outline

This plan collates evidence to identify the most effective route for the Vale of Glamorgan to reach a net zero energy system in line with the Local Authority's wider ambitions

As part of this project, three separate documents have been produced. This will ensure the content is accessible to a variety of audiences whilst also making it easier to find information relevant for the reader. These three documents are the:

1. **Local Area Energy Plan** *(this document)* contains the overarching plan, focusing on the Vale of Glamorgan's area-wide local energy plan and actions.
2. **Technical Report** contains the graphs, charts, maps and supporting data for the results published in the Local Area Energy Plan. It also provides more detail about the approach to modelling and scenario analysis that we took. This report is available upon request from the Council.
3. **Renewable Investment Prospectus** highlights short-term, regional and local renewable energy opportunities that have the greatest potential for delivery across Cardiff Capital Region.

Achieving the transformation that is needed for the energy system to reach net zero will not be easy and will need a collaborative approach. In this plan, the term "we" has therefore been used to refer to the range of people and organisations in the Vale of Glamorgan who will support the ambition we set out and take action. The Council and Cardiff Capital Region have taken facilitating roles in developing this LAEP, but will not deliver the ambition it sets out alone. This Plan has been developed with input from a range of stakeholders, and we hope that you will be inspired by the actions that stakeholders have committed to, to take action to transform our energy system too.

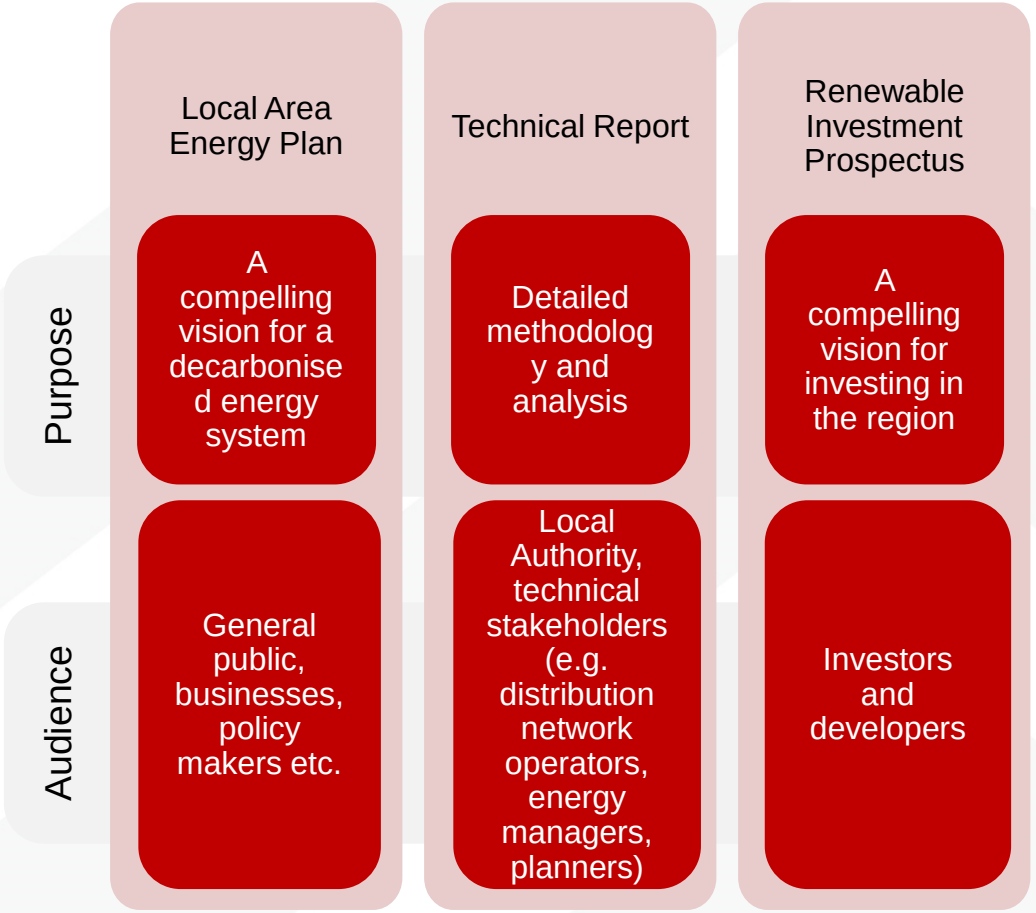


Figure 0.2: LAEP and support documents purpose and audience summary.

Executive summary

The Vale of Glamorgan has a vision to transition the local energy system to net zero

Sponsors: *Delivery partners:*

The vision for the Vale of Glamorgan's future local energy system is:

The Vale of Glamorgan Local Area Energy Plan (LAEP) represents our collective commitment to shaping a future where energy is clean, accessible, and equitable for all residents and businesses, and considerate of future generations.

The Vale of Glamorgan's **energy objectives** are collectively agreed and describe what needs to be done to create the enabling conditions needed to deliver this LAEP.

- Making homes low carbon
- Adopting onshore renewables
- Moving transport and logistics to Net Zero
- Supporting industrial energy transition
- Reinforce and transition the gas and electricity distribution networks

Executive summary

The Vale of Glamorgan has a vision to transition the local energy system to net zero

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; CARBON TRUST

Our **energy propositions** describe what needs to change between now and 2050 to decarbonise the Vale of Glamorgan's local energy system and achieve energy net zero by 2050.

1. Maximise reduction in carbon emissions across all activity
2. Improve efficiency to reduce energy demand
3. Strategically seek and leverage a diverse range of financial resources to support initiatives aimed at reducing carbon emissions
4. Support the Vale of Glamorgan Council's Project Zero aspirations to be net zero by 2030
5. Work towards new and existing buildings becoming low carbon prioritising inclusivity, equality, and fairness
6. Sensitively deploy renewable energy to the greatest extent possible
7. Exploit opportunities for green hydrogen implementation for transport and industry
8. Foster resilience in the energy supply chain through energy diversity including community energy projects
9. Improve and increase electrification of the transport system alongside modal shift
10. Nurture partnerships and collaboration between local government, businesses, educational institutions, community organisations, and energy stakeholders
11. Cultivate the supply chain to provide quality jobs and economic opportunities
12. Create the workforce to reach net zero 2050 targets

Executive summary

Vale of Glamorgan's energy propositions in more detail

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; CARBON TRUST

1. Making homes low carbon

Supporting constituents in accessing and adopting interventions which enable the reduction of energy use and the uptake of renewable energy.

Low-regret options:

- Retrofit
- Heat pumps

2. Adopting onshore renewables

Maxing out the deployment in areas within the Vale of Glamorgan than have been identified as suitable for onshore renewable technologies.

Low-regret options:

- Rooftop solar PV
- Onshore wind turbines
- Ground-mounted solar PV

3. Moving transport and logistics to net zero

Complete shift away from fossil fuels, reducing energy needs and promoting active travel in the Vale of Glamorgan.

Low-regret options:

- EV chargers

4. Supporting industrial energy transition

Creating a vision for industry to enable a coordinated transition and establishment of future fuels economy in the Vale of Glamorgan which supports existing transition and future green growth.

Low-regret options:

- H_2 Hydrogen

5. Reinforcing the networks

Supporting an intelligent, no-regrets upgrade and resilience programme of works through meaningful data and engagement.

Low-regret options:

- Flexibility, storage technologies

Figure 0.3: Summary of energy propositions

Executive summary

Vale of Glamorgan's local energy system will need to change significantly to achieve net zero by 2050

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; CARBON TRUST

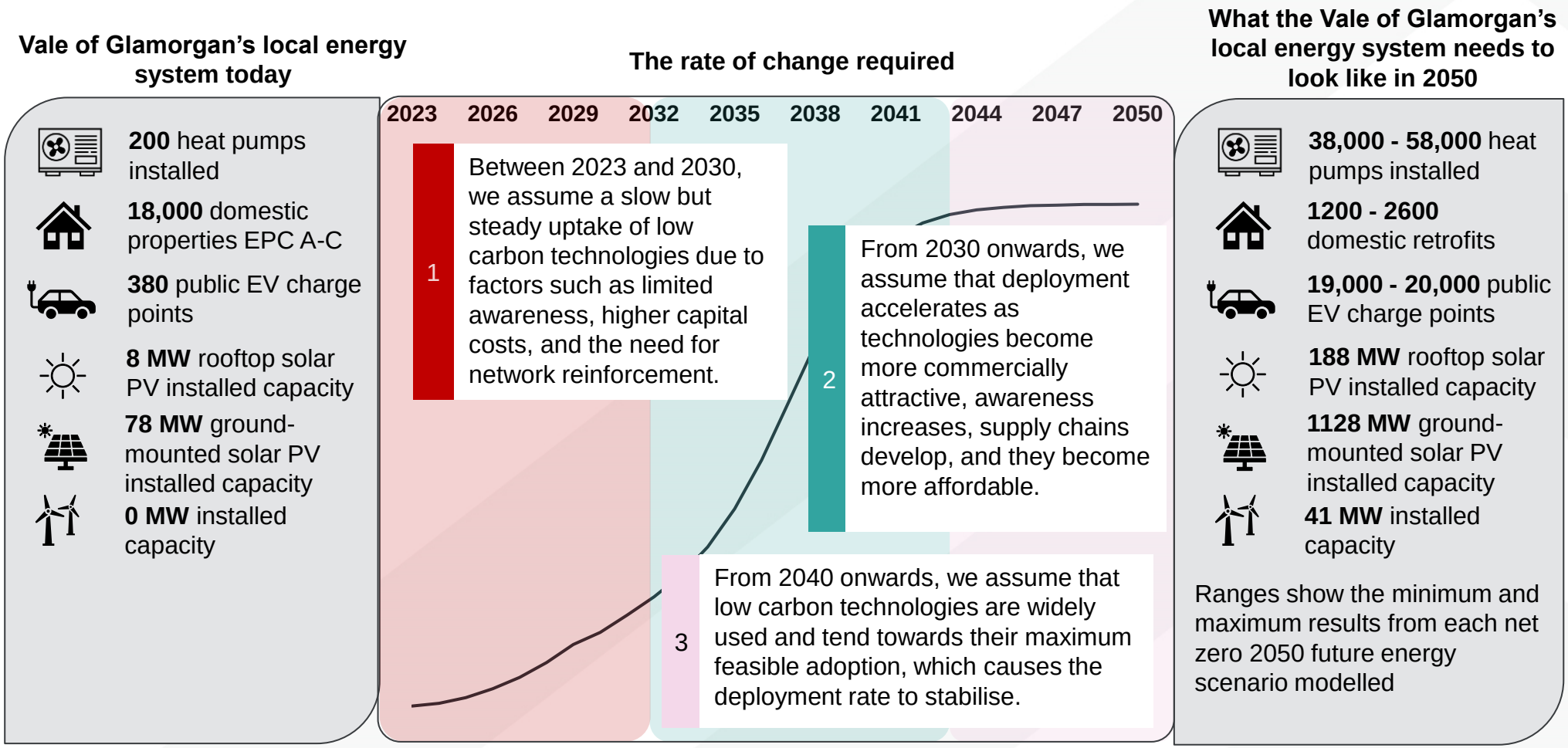


Figure 0.4: Deployment rate for low carbon technologies in the Vale of Glamorgan to 2050

Executive summary

Achieving a net zero local energy system in 2050 could lead to the following

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; CARBON TRUST

Direct impacts

Emissions reduction

20 times less greenhouse gas (GHG) emissions than in 2023

8-26% less energy to heat an average building than in 2023

Energy savings

2.5 times less energy used for transport than in 2023

Wider impacts

Energy security and reliability

Diversification of energy generation sources

Air quality improvements

Up to £607 million of cumulative savings by 2050

Up to £41 million in annual cost savings due to better air quality

Net job creation

5300 - 6300 jobs created through to 2050

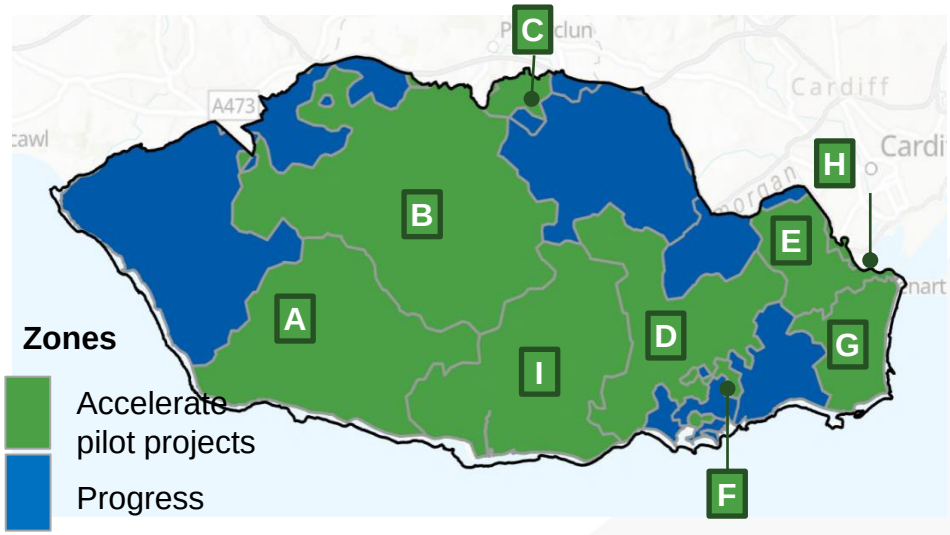
Affordability

Wales' Well-being of Future Generations (Wales) Act 2015, well-being goals

Executive summary

To support transformation of the energy system, pilot projects may be useful. The map below highlights areas that could provide a useful focus for these pilots.

Figure 0.2 identifies zones with particularly favourable conditions for specific energy components, making them ideal locations for pilot studies. The summary tables detail key figures for each zone by 2030: (i) pilot ambition, (ii) required investment for each pilot and (iii) total investment for all energy components and electricity network infrastructure interventions. Ranges show the minimum and maximum results from each future energy scenario modelled (see page 48 for more detail). Note: intervention should still be carried out in 'Progress' zones to transition the local area to net zero.



Suggested energy components to pilot in each zone

	Heat pumps		Ground-mounted PV		Rooftop PV
	EV charger		Onshore wind		Insulation measures

	(i)	(ii)	(iii)
A Boverton			**Zone A total £68-330m**
	87-280MW	£37-120m	
	12-39MW	£13-43m	
	470-2100 homes	£6-120m	
B Cowbridge			**Zone B total £46-260m**
	11.7MW (2050)	£13m (2050)	
C Pontyclun 132/11kV			**Zone C total £0.3-2.8m**
	100-710kW	£78-530k	
	6-33 homes	£0.09-1.3m	
D Barry Grid Primary			**Zone D total £47-290m**
	1.4-8.9MW	£1.1-7.3m	
E Llandough			**Zone E total £20-130m**
	1.2MW (2050)	£1.3m	
F Court Road Barry			**Zone F total £8.3-69m**
	1.5-14MW	£1.1-11m	
	700-1,200 homes	£3.6-51m	
	0.27-1.8MW	£0.22-1.5m	
G Penarth			**Zone G total £38-270m**
	5.6-19MW	£6.2-21m	
H Grangetown Grid Primary			**Zone H total £1.2-5.7m**
	3-35 homes	£70-1000k	
I East Aberthaw Primary			**Zone I total £74-220m**
	140-180MW	£59-77m	

Figure 0.5: Vale of Glamorgan's spatial representation of opportunities, including 2030 ambition and investment (million £). Zone boundaries are defined by primary substation service areas.

Note: Substations C and H cross the local authority boundary and the deployment values presented here cover land within the Vale of Glamorgan only.

Executive summary

GHG emissions trajectories for the Vale of Glamorgan

Sponsors: Delivery partners:

The Figure 0.6 illustrates the modelled rate of decrease in emissions over time by implementing three scenarios: National Net Zero 2050, Net Zero 2030 and Do Nothing. This indicates that there are different pathways to reduce GHG emissions depending on rate of deployment of low carbon technologies.

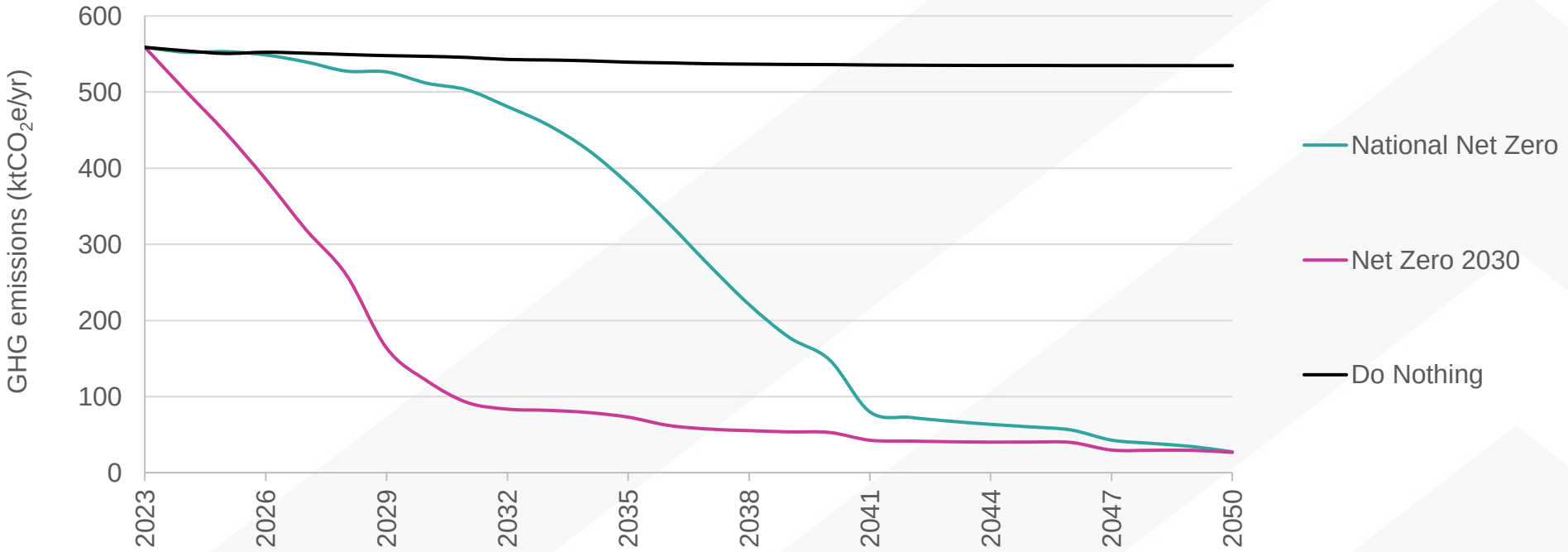


Figure 0.6: Vale of Glamorgan's GHG emissions trajectories

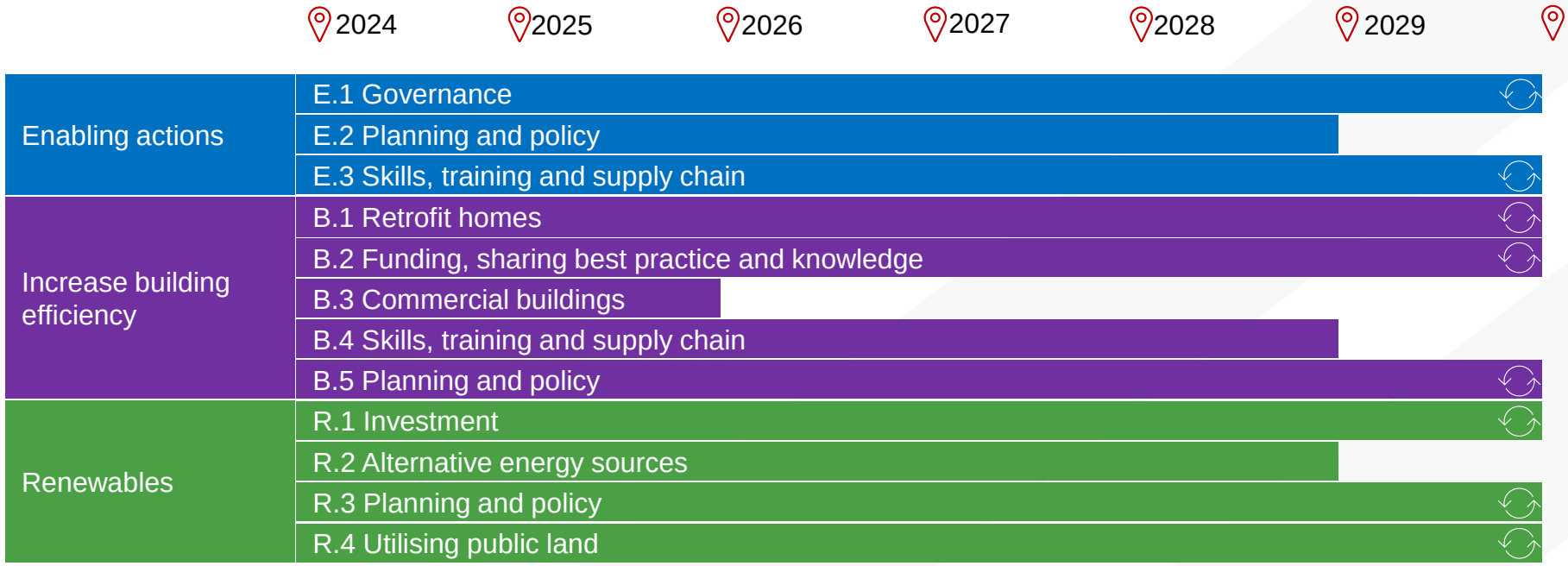
NB: in this report we use carbon dioxide equivalents to quantify GHGs. We express it as CO_2e

Executive summary

Routemap – short-term

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; CARBON TRUST



L — Action will be implemented at a local scale, across the Vale of Glamorgan

R — Action will be implemented at a regional scale, across CCR local authorities

N — Action will be implemented at a national scale, across all of Wales

Timescale for the action is ongoing

Executive summary

Routemap – short-term

Sponsors: *Delivery partners:*

	2024	2025	2026	2027	2028	2029	2030
Decarbonise transport	T.1 Regional planning and policy						
	T.2 Evs and EV charging						↻
	T.3 Hydrogen vehicles						
	T.4 Planning and policy						
	T.5 Modal shift						↻
Business and industry	C.1 Engagement with industry						↻
Innovation	I.1 Foster innovation						↻
Energy networks	N.1 Coordination between Vale of Glamorgan Council, NGED and WWU						↻
	N.2 Reinforce electricity distribution network						↻
	N.3 Transition the gas network						↻
	N.4 Hydrogen planning						↻

- (L) Action will be implemented at a local scale, across the Vale of Glamorgan
- (R) Action will be implemented at a regional scale, across CCR local authorities
- (N) Action will be implemented at a national scale, across all of Wales
- ↻ Timescale for the action is ongoing

Executive summary

To deliver the LAEP, we have developed a series of actions and next steps that we'll need to take

Sponsors: Vale of Glamorgan Bro Morgannwg; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

Action routemap

Although the exact form of the decarbonised energy system in 2050 is uncertain, there are actions we can take now with relative certainty that will help us maintain the ability to meet our 2050 net zero ambition and capitalise on the opportunities that this transition will bring.

Our action routemap takes each energy proposition and outlines critical, enabling actions that we will take collectively alongside our stakeholders in the coming decade, with a particular focus on what we can achieve in the next 5-7 years.

The sequencing of activities in the routemap is highly dependent on the political, regulatory and strategic context it has been created in. Therefore, we expect it to evolve over time and be regularly updated to make sure it stays relevant. Vale of Glamorgan's routemap can be found in Chapter 4: Action planning.

Next steps

Progressing energy propositions: For each prioritised proposition, we will undertake a series of development activities to progress towards delivery (such as feasibility studies, detailed technical and commercial development, business case, commercialisation and procurement).

Governance: Where possible, we will integrate oversight of LAEP delivery with existing governance structures. We will appoint a delivery programme manager, to lead the delivery of the actions in this plan.

Monitoring: We will work with regional and national partners to develop a monitoring framework which builds on existing processes and helps us understand the progress Vale of Glamorgan is making towards its committed actions and ambitions set out in this plan.

Engagement & collaboration:
Many stakeholders with an interest an influence over the local energy system have come together to help shape this LAEP, and it is important that this collaboration continues as we deliver this plan. We will The development of this LAEP has brought those with interest and influence together.

Vale of Glamorgan LAEP

Chapter 1: Introduction

1. Introduction

What is Local Area Energy Planning?

Overview

Definition of a LAEP

A Local Area Energy Plan (LAEP) sets out for all local stakeholders the changes required to transition an area's energy system to net zero carbon emissions against a specified timeframe. By exploring a range of technologies and scenarios through whole energy system modelling and analysis, the most cost-effective preferred pathway to net zero can be identified[M01]. The process follows standardised guidance defined by ESC.

Being data-driven and evidence-based, a LAEP uses a whole energy system approach that is led by local government and developed collaboratively with defined stakeholders. It sets out to identify the most effective route for the local area to meet its local net zero target, as well as contributing towards meeting the national net zero target[M01].

A LAEP results in an indicative costed spatial plan that identifies the change needed to the local energy system and built environment, detailing what changes are required, where, when and by whom. The level of detail for an area is equivalent to an outline design or master plan; additional detailed design work is intended to identify core areas that require focus over the next 25 years. Rather than a detailed schematic, a LAEP provides a proposed future sector-specific action plan that sets out how each part of the area will be designed and built. Additional detailed design work will be required for identified specific actions, projects and programmes to progress to implementation[a].

Vision of a LAEP

A LAEP defines a long-term vision for an area but should be updated approximately every 3–5 years (or when significant technological, policy or local changes occur) to ensure the long-term vision remains relevant.

1. Introduction

What is Local Area Energy Planning?

Scope of a LAEP

The UK government's 2021 Net Zero Strategy estimates that 82% of the UK's emissions are "within the scope of influence of local authorities", however the Vale has a large amount of industry which isn't under the direct control of the local authority. The scope of a LAEP covers the current energy consumption and associated greenhouse gas emissions, as well as the projected consumption in a defined area to 2050, primarily focussing on the area's built-environment (all categories of domestic, nondomestic, commercial, and industrial buildings), some aspects of energy used for transportation, as well as the local renewable generation and energy networks needed to support this consumption. Elements included in a LAEP are:

- Electricity, heat and gas networks
- The future potential for hydrogen
- The built environment (industrial, residential, and commercial), its fabric and systems,
- Flexibility (in terms of shifting when demand is placed on the grid), and the storage and generation of energy.
- Providing energy to decarbonised transport (i.e., the electricity required for electric vehicle charging infrastructure).

It identifies near-term actions and projects, providing stakeholders with a basis for taking forward activity and prioritising investments and action. Site-specific data is used where available, with remaining areas covered by nationally available dataset.

Benefits of a LAEP

A LAEP provides a long-term plan to deliver net zero. A key benefit of LAEP is the 'whole systems approach' aligned to the Wellbeing of Future Generations Act "way of working" on integration. This gives consideration to the most cost-effective solutions to the future energy system as a whole at the right time. For example, deploying different heat decarbonisation technologies to avoid a high-cost upgrades of the electricity network. By working closely with local stakeholders, incorporating their data, knowledge and future plans, a LAEP is built on a common evidence base. The agreed set of actions can then be used reliably by stakeholders from Council planners to network operators to community groups, knowing they are working towards a common goal built on strong foundations.

1. Introduction

The energy transition across Wales

Overview

The Welsh Government's "Net Zero Wales" plan[M03] establishes an increased level of ambition on decarbonisation, with a legally-binding target to reach net zero emissions by 2050. It is the first national government to fund the roll-out of LAEP to all its local authorities. The programme is being coordinated through a regional approach with Cardiff Capital Region and Ambition North Wales, where LAEPs are being developed for local authorities in Mid Wales, South West Wales, North Wales and the Cardiff Capital Region. The rationale for taking this approach was because there are efficiencies on data collection and management, as well as reinforcing the links between the regional and local plans to maximise opportunities across LA areas and between regions. Several suppliers have been selected to produce the LAEPs for each region, as detailed in the map.

To contribute to the Welsh Government's commitment of producing a "National Energy Plan" in 2024, upon completion of the LAEP programme Energy Systems Catapult[M04] will aggregate the LAEPs into a national view. To support this task, they are working with the Welsh Government to create and import standardised LAEP outputs for aggregation into the DataMapWales platform[M05]. The Catapult is also providing technical advisory support to the Welsh Government throughout the programme.

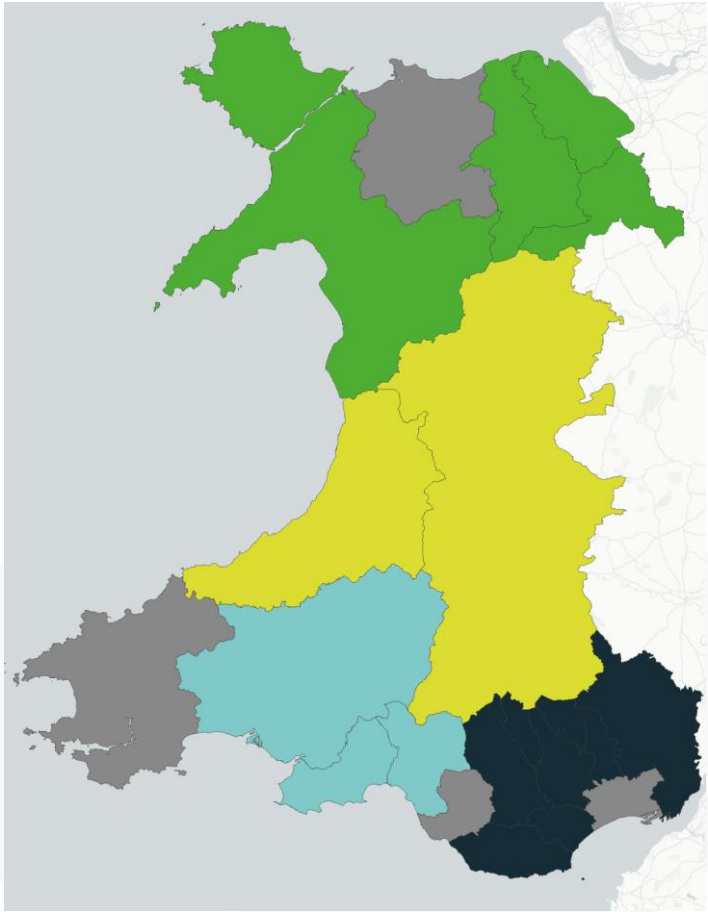


Figure 1.1: LAEP landscape across Wales

1. Introduction

Boundary and scope

Parts of the energy system analysed in a LAEP

A LAEP considers energy use, supply and generation within the Vale of Glamorgan boundary.

There are three core parts to the local energy system:

- **Infrastructure** – The physical assets associated with the energy system such as electricity substations.
- **Supply** – Generation (renewable and non-renewable), storage and distribution of energy to local consumers for use in homes, businesses, industry and transport.
- **Demand** – The use of energy driven by human activity e.g. petrol/diesel used in vehicles, gas burned for heat in homes, required for the energy system to operate.

The whole energy system across all sectors is considered in the planning process to ensure that the interactions and dependencies between generation and use of different energy sources are fully considered. This identifies where different systems can work together to improve the overall resilience and flexibility of the energy system.

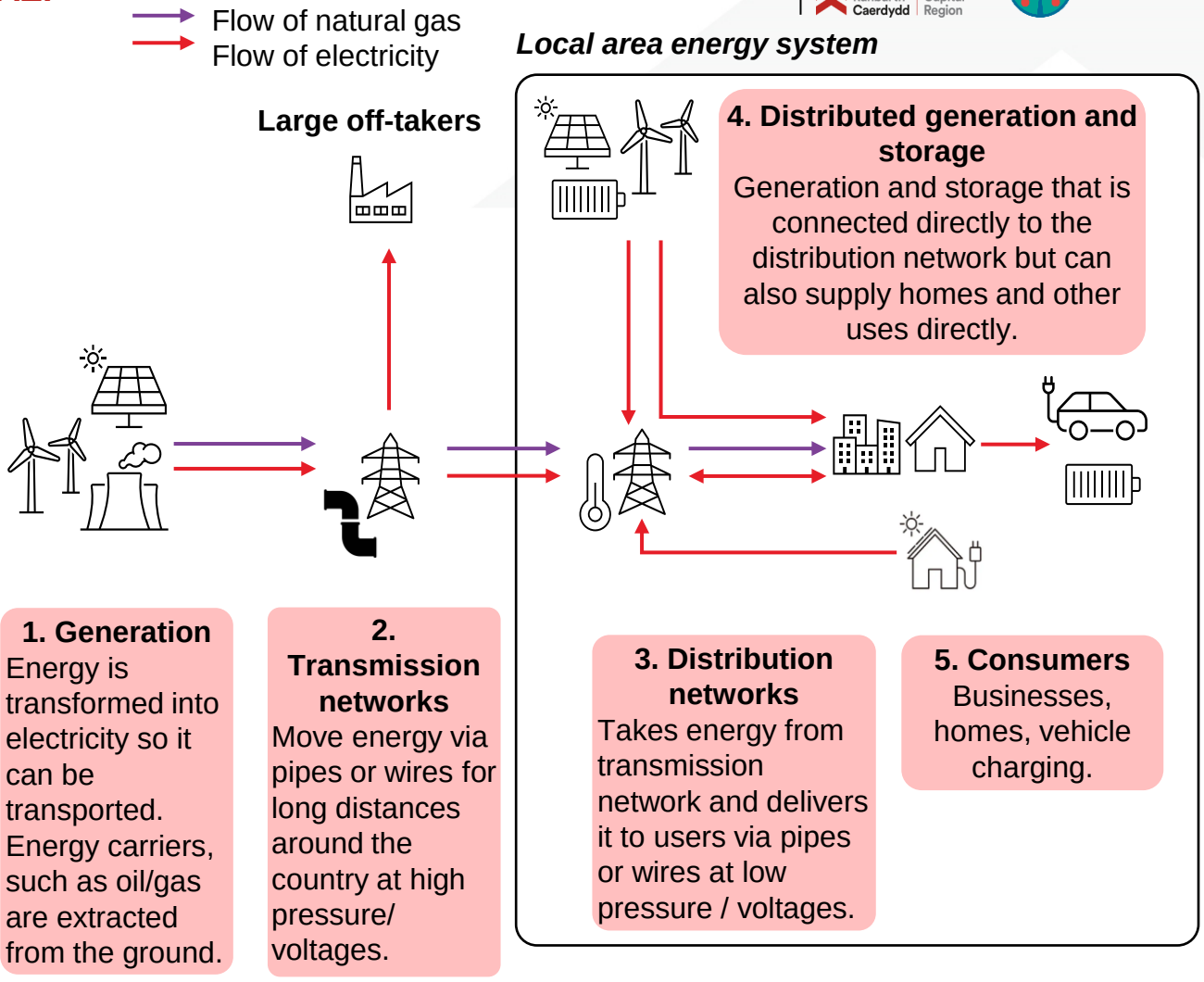


Figure 1.2: Schematic of electricity and gas transmission and distribution network and the system boundary for LAEP

1. Introduction

Boundary and scope

Definitions

Scope for the Welsh LAEPs

The diagram to the right indicate the parts of the local energy system which are in-scope for the LAEPs across Wales. This scope is defined by ESC's LAEP Guidance[M01].

Geographic boundary

We used the geographic boundary for Vale of Glamorgan County Borough to set the boundary for the LAEP, which meant that any energy generating assets, energy use and infrastructure in that boundary were considered for inclusion in the LAEP.

Exclusions from the LAEP

LAEP does not consider aspects of the energy system which are expected to be overseen by central government, or any non-energy sources of greenhouse gas (GHG) emissions occurring within the Local Authority's governing boundary (for example, emissions from industrial processes, agricultural land use and livestock are excluded. Energy used for shipping, aviation and rail are excluded on the basis that they are not local uses of energy. Large electricity generators connected to the transmission network (such as large wind farms and hydrogen SMR) are considered national assets and excluded from the modelling. However, these may still play an important role in Vale of Glamorgan's decarbonisation journey.

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region
Delivery partners: ARUP; CARBON TRUST

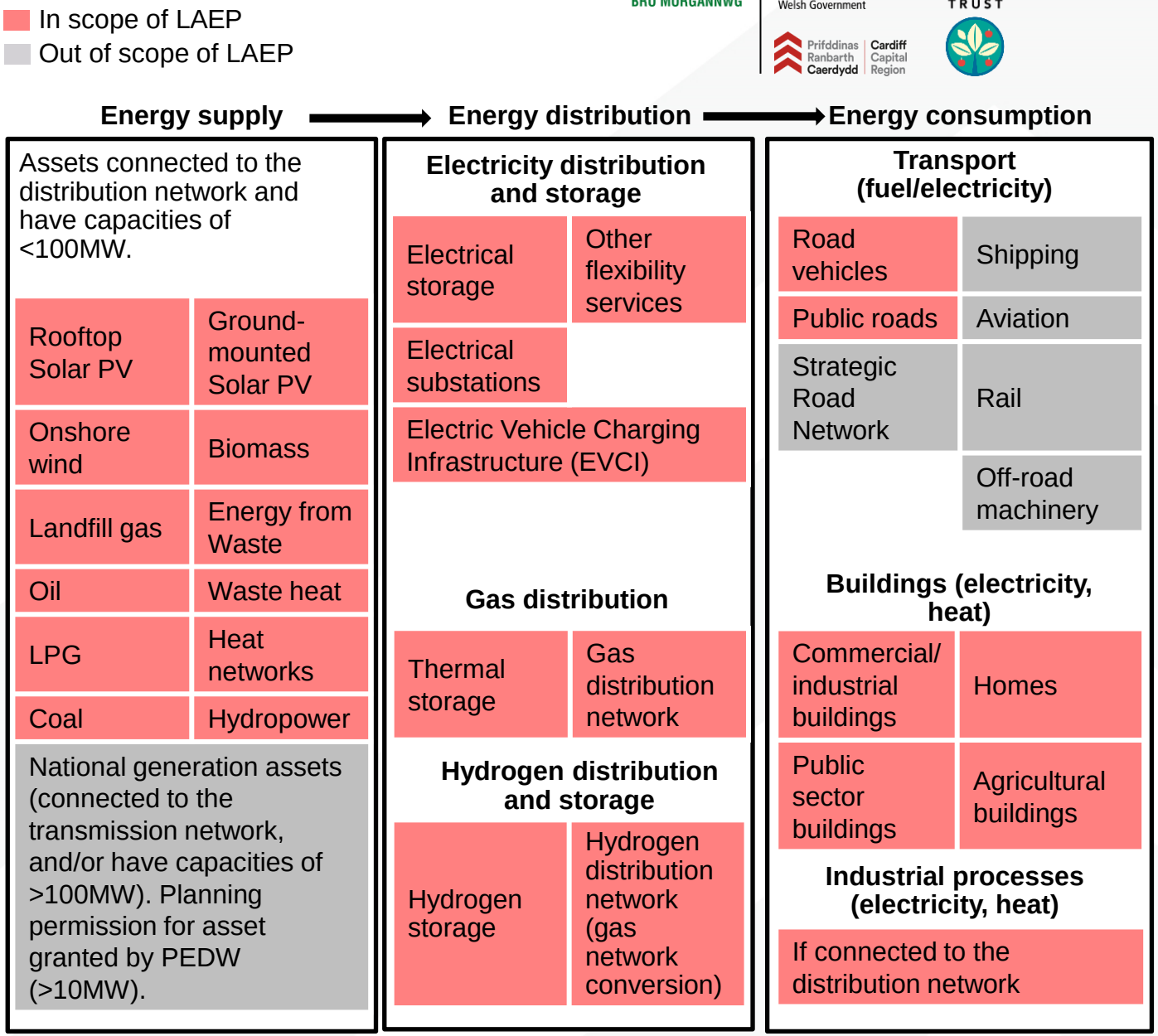


Figure 1.3: Schematic of the local system scope for LAEP

1. Introduction

Our vision for the Vale of Glamorgan's future local energy system

Future energy system vision and objectives

Vale of Glamorgan's vision

The following vision statement has been produced that underpins our ambition for the future net zero energy system in the Vale of Glamorgan:

Vale of Glamorgan's vision
The Vale of Glamorgan Local Area Energy Plan (LAEP) represents our collective commitment to shaping a future where energy is clean, accessible, and equitable for all residents and businesses, and considerate of future generations. Building upon existing successes it is a collaborative endeavour, uniting local government, businesses, residents, and regulatory partners in a shared vision for a more sustainable future. The plan will establish the Vale of Glamorgan's leadership role in transforming the energy landscape in a pivotal decade of action.

Energy objectives

In shaping the LAEP for the Vale of Glamorgan, energy objectives have been established. These objectives served as foundation elements that were considered when formulating recommended actions:

Energy objectives
1. Maximise reduction in carbon emissions across all activity. 2. Improve efficiency to reduce energy demand. 3. Strategically seek and leverage a diverse range of financial resources to support initiatives aimed at reducing carbon emissions. 4. Support the Vale of Glamorgan Council's Project Zero aspirations to be net zero by 2030. 5. Work towards new and existing buildings becoming low carbon prioritising inclusivity, equality, and fairness. 6. Sensitively deploy renewable energy to the greatest extent possible. 7. Exploit opportunities of green hydrogen implementation for transport and industry. 8. Foster resilience in the energy supply chain through energy diversity including community energy projects. 9. Improve and increase electrification of the transport system alongside modal shift. 10. Nurture partnerships and collaboration between local government, businesses, educational institutions, community organisations, and energy stakeholders. 11. Cultivate the supply chain to provide quality jobs and economic opportunities. 12. Create the workforce to reach net zero 2050 targets.

1. Introduction

Figure 1.4: Geographic boundary of the LAEP

LAEP contents

This LAEP presents a vision for a net zero local energy system for the whole Vale of Glamorgan area, with a route map to get there, including a set of recommended actions for the Vale of Glamorgan, whilst recognising the role of other key actors in government, the energy sector and across the community.

Plan structure

This plan is structured into four main topic areas:

1. The current energy system - description of the Vale of Glamorgan's existing energy system and relevant policies and objectives.
2. The future energy system - presentation of future scenarios for a net zero local energy system, including risks and "low regrets" measures, which are very likely to be part of the future energy system regardless of uncertainty around certain aspects of the future.
3. Action planning- a route map and action plan for us to use to drive the local energy system transition in the Vale of Glamorgan, including what needs to happen and what we will do.
4. Next steps – outlines immediate next steps and what is needed to create an enabling environment for the delivery of this plan, and a net zero local energy system.

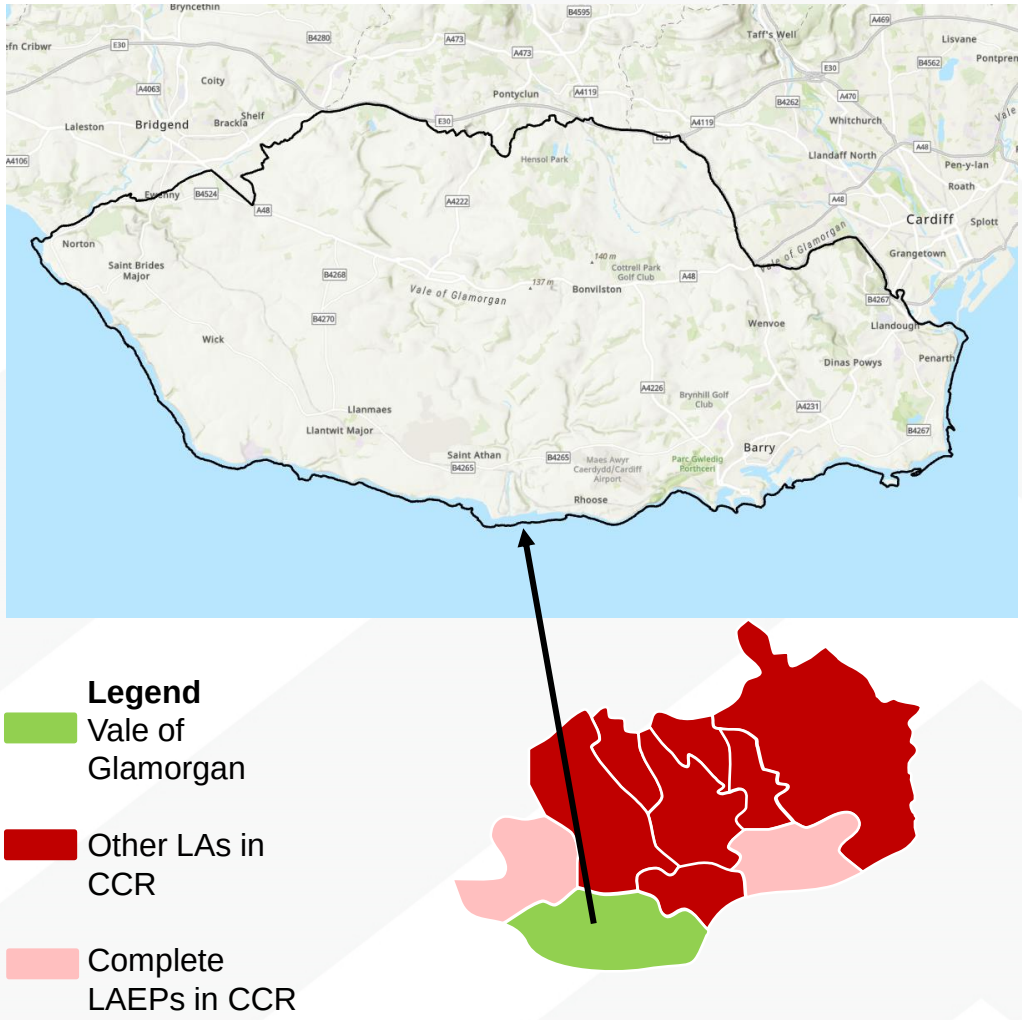


Figure 1.4: Geographic boundary of the LAEP

Vale of Glamorgan LAEP

Chapter 2: The current energy system

Vale of Glamorgan

2. The current energy system

Policy and funding context

Net Zero Wales is the Welsh Government's emissions reduction plan for the current carbon budget period between 2021-2025. This is a statutory document required by the Environment (Wales) Act, which sets out policies and proposals to help Wales meet its carbon budget and be on track to meet its legally binding net zero target for 2050. [M74] The Well-Being of Future Generations (Wales) Act is in place to ensure that this transition fosters greater equality and positive outcomes for all.

There are a range of strategies and policies at Welsh and UK level that will influence how Wales transitions to a net zero energy system in the next 25-30 years. Devolved powers vary across the different parts of the energy system.

Using our own statutory powers, we, as a Local Authority, have also established plans and policies relating to decarbonising energy use and other activities across its own operations, and have started to look further to how we influence changes in our local communities through our place-making role.

These include the Project Zero Climate Change Challenge Plan, which sets out our intention to become a zero-carbon council by 2030 [M54], the forthcoming Carbon Management Plan 2024 - 2030, and the Vale of Glamorgan Corporate Plan which includes ensuring new developments are sustainable and that developers mitigate their impacts

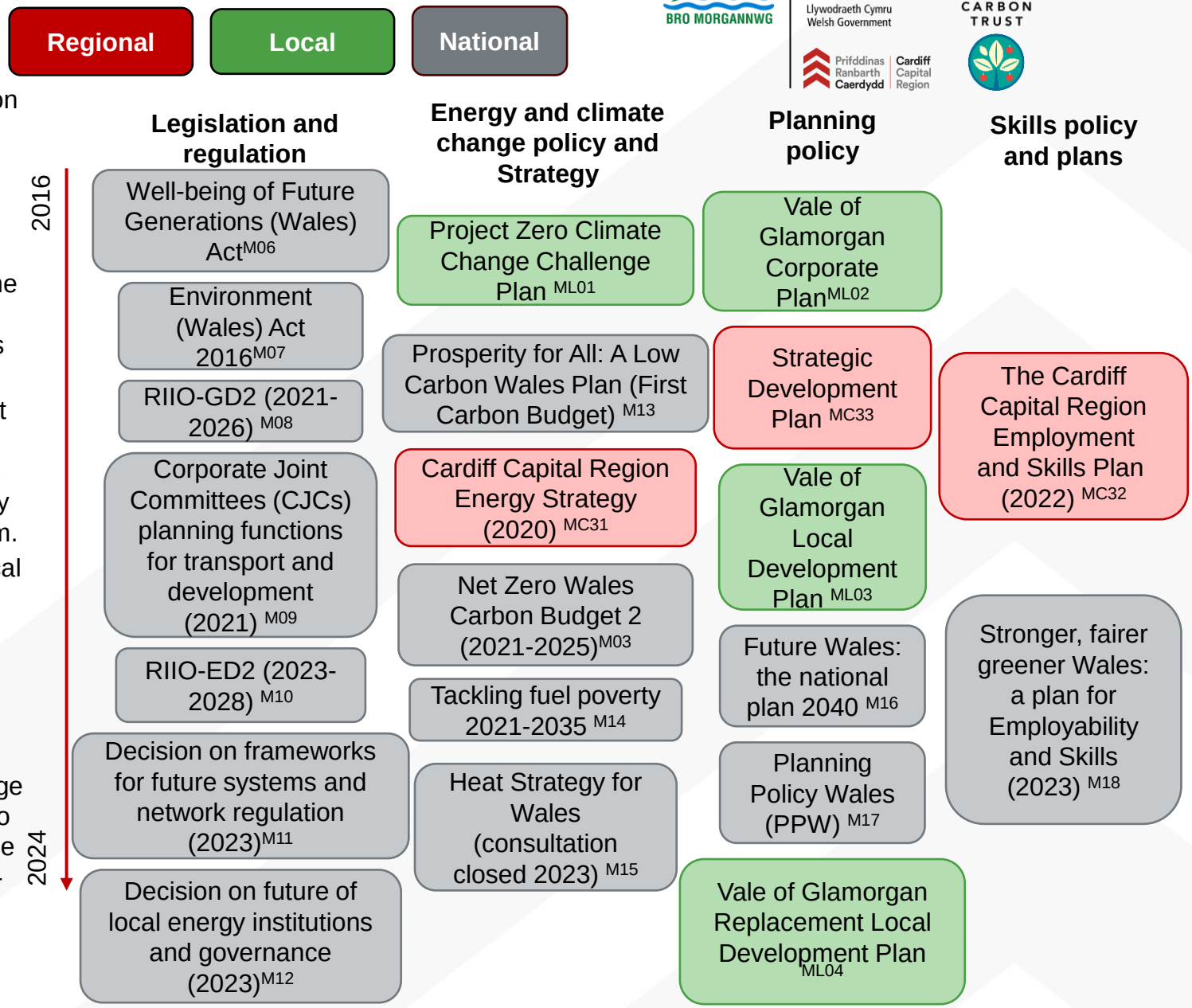


Figure 2.1: Summary of cross-cutting regulation / policies at local, regional and national level

2. The current energy system

Our collaborative approach to developing and delivering our LAEP

Stakeholder engagement approach

Delivering our LAEP calls for a collective effort from all types of organisations in and beyond the local authority boundary. The local energy system extends beyond the Vale of Glamorgan's influence which is why stakeholder engagement is the foundation for the development of our LAEP.

we prioritised stakeholders based on their level of local influence and / or knowledge of specific elements of the local energy system and their role in the development of the LAEP. The importance of recognising the involvement of regional stakeholders emerged early in the LAEP. They have a unique role, ensuring cohesion of action for specific element(s) of the energy system across neighbouring LAEPs in the same region and offering regional efficiencies where local objectives are aligned.

We engaged stakeholders at different stages of the development process to make sure they could help shape the plan and key development milestones. We held regional steering groups for the Cardiff Capital Region, attended by the regional and local authority leads, as well as bi-weekly meetings with the local authority leads. Three workshops were held regionally and involved primary stakeholders from across each local authority in the Cardiff Capital Region.

These workshops were used at stages where it was important to agree a way forwards that was appropriate for the region, as well as each local authority.

As part of the overarching programme, a national forum brought together all suppliers, local authority leads, the regional leads, Welsh Government and the Technical Advisor to share learnings and maintain a consistent approach across Wales. The suppliers and regional leads also had regular catch ups to share assumptions and challenges.

*This report is accompanied by a **Technical Report** which includes more detailed information on the analysis methodology and engagement of stakeholders throughout the plan's development.*

Sector	Examples of stakeholders engaged
Buildings	Housing developers
Transport	Transport providers
Renewable energy generation	Energy project developers Community energy groups, landowners
Industry and private sector	Local businesses, larger industrial players
Networks	Distribution Network Operators, gas distribution networks
Public sector	Public service providers, Welsh Government, educational institutions

Table 2.1: Summary of stakeholders

2. The current energy system

Vale of Glamorgan's energy baseline

How to read a Sankey diagram

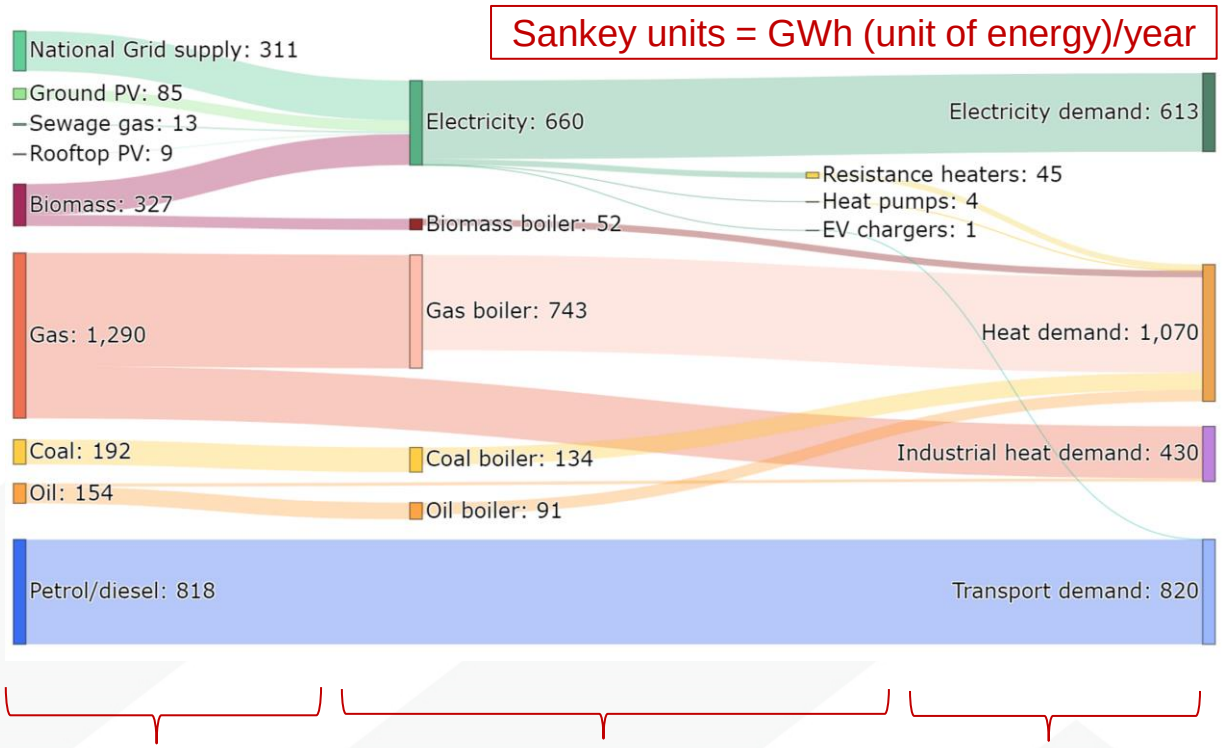
This section provides a detailed overview of the local energy system baseline, and describes the methodology and assumptions used to understand current energy infrastructure, what types of energy are used, what technologies are used to convert it from one form to another (e.g. heat) and how much is consumed.

Results presented reflect the energy baseline in the Vale of Glamorgan in 2023, apart from the transport (2015) and industry data (2019), generation from fossil fuels was taken from 2019 and therefore this contains Aberthaw Power Station. Transport and industry datasets are the least likely to have changed in terms of electrification over the years 2019 to 2023, and transport is the most likely dataset to have changed due to COVID-19.

Sankey diagrams are a way of visualising energy transfer from energy sources to energy demands via energy vectors or conversion technologies.

They are read from left to right and show a snapshot of a scenario in time e.g., 2050. Energy transfers are drawn to scale and so are helpful to identify the size of each transfer and compare different scenarios.

The average Welsh home uses 3.325MWh/year of electricity, which is 0.003GWh for comparison with the scale on the Sankey. In terms of gas, a typical home uses 12MWh/year, which is 0.012GWh for comparison with scale on the Sankey.[M40]



1. Where the energy comes from

This side represents the different **energy sources**, including generation technologies and imports from the national grid

2. How the energy is being converted

3. Where the energy is being used

This side represents the **final demands** for each energy vector: heat demand, electricity, demand, transport demand.

Figure 2.2: How to read a Sankey diagram (units are GWh/year)

2. The current energy system

Vale of Glamorgan's energy baseline

Energy demand

Most of the **electricity** within the system is supplied by the National Grid, accounting for 47% of total electricity consumed.
Biomass, ground PV and sewage gas generate 37%, 13% and 2.0% respectively.
Almost all electricity is used for electricity demand (i.e. not

Heating comprises the largest component of energy demand, accounting for 36% of total energy across the Vale of Glamorgan. Due to the high penetration of the gas network in the Vale of Glamorgan, a significant percentage of heating (69%) is delivered by gas, providing a total gas demand of 743 GWh. The remaining heat demand is provided by other fuels such as oil, biomass and coal.

Almost all **vehicles** in the Vale of Glamorgan utilise internal combustion engines (ICEs), with relatively low uptake of electric vehicles (EVs).

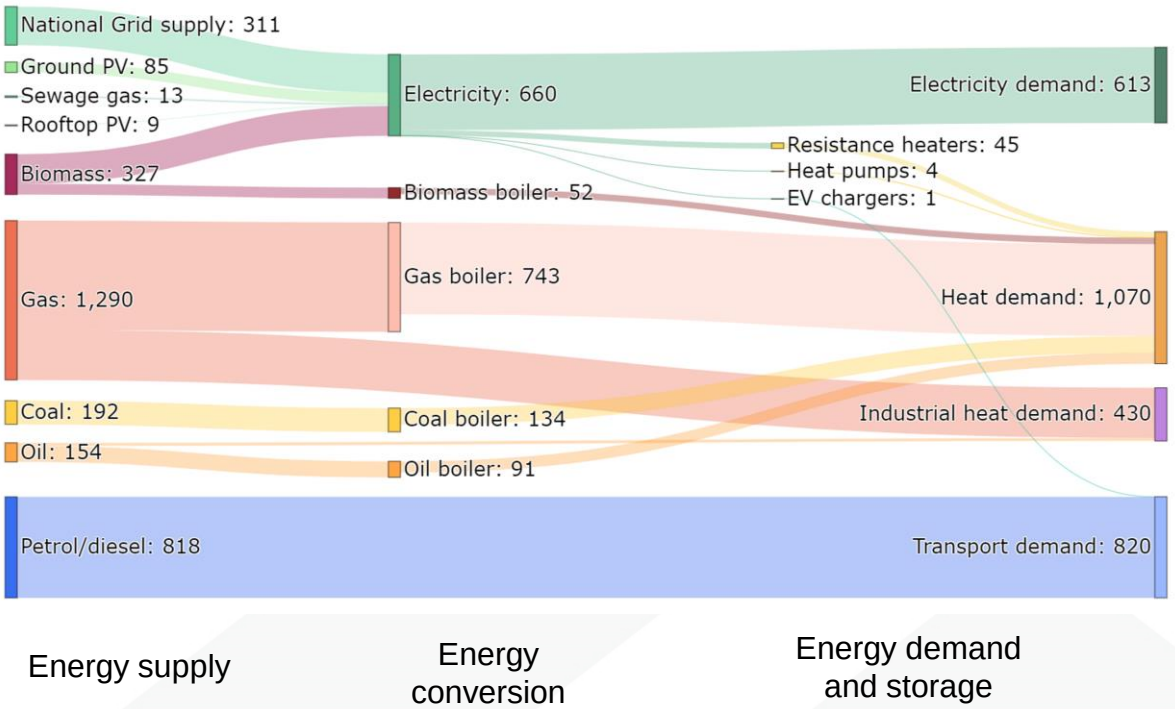


Figure 2.3: Baseline Sankey, representing energy flows in the Vale of Glamorgan in GWh/year (2019)

2. The current energy system

Vale of Glamorgan's energy baseline

Energy demand

Sponsors: *Delivery partners:*

Industry

15% total energy demand

Main industries are chemical industries and minor power producers

94% industrial heat derived from gas

6% industrial heat derived from oil

Transport

28% total energy demand

Road transport accounts for 30% of total emissions

80% car ownership in the Vale of Glamorgan M65

0.42% of cars are EV or hybrid M43

Electricity

21% total energy demand

47% derived from National Grid (imported from outside the Vale of Glamorgan)

13% derived from Ground PV

2% derived from sewage gas

Heat

36% total energy demand

69% heat produced by gas boilers

5% heat produced by biomass boilers

47% properties achieve EPC A-C

2. The current energy system

Vale of Glamorgan's energy baseline

Energy usage demand by sector

Buildings and industry

Major industrial loads in the Vale of Glamorgan are concentrated in the area provided electricity by the Sully Grid Primary substation.

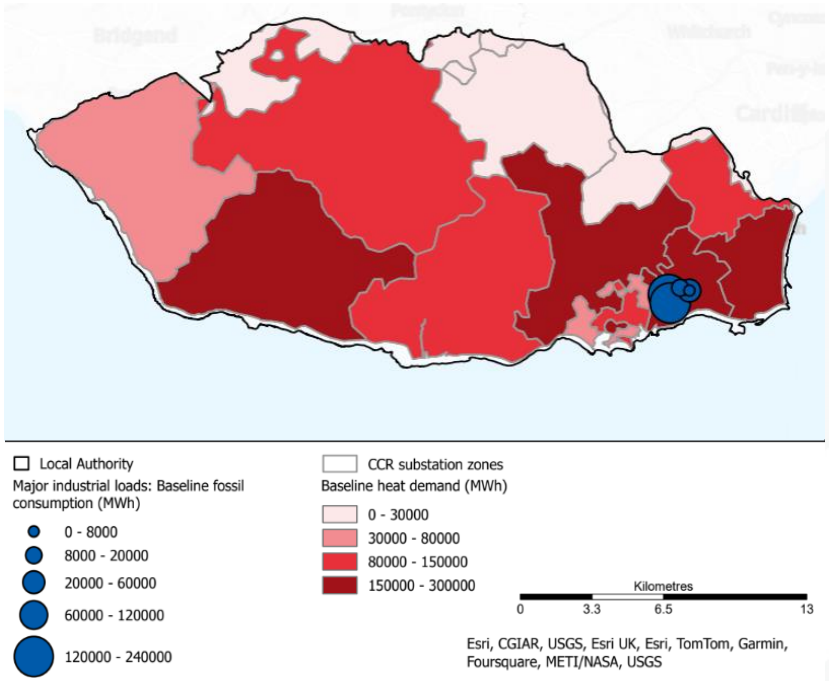


Figure 2.4: Major industrial loads (2019) and heat demand (2023) by substation zone across Vale of Glamorgan

Electricity usage demand

The highest electricity consumption is found in the southern substation zones, with reduced consumption in the more rural parts of the Vale of Glamorgan.

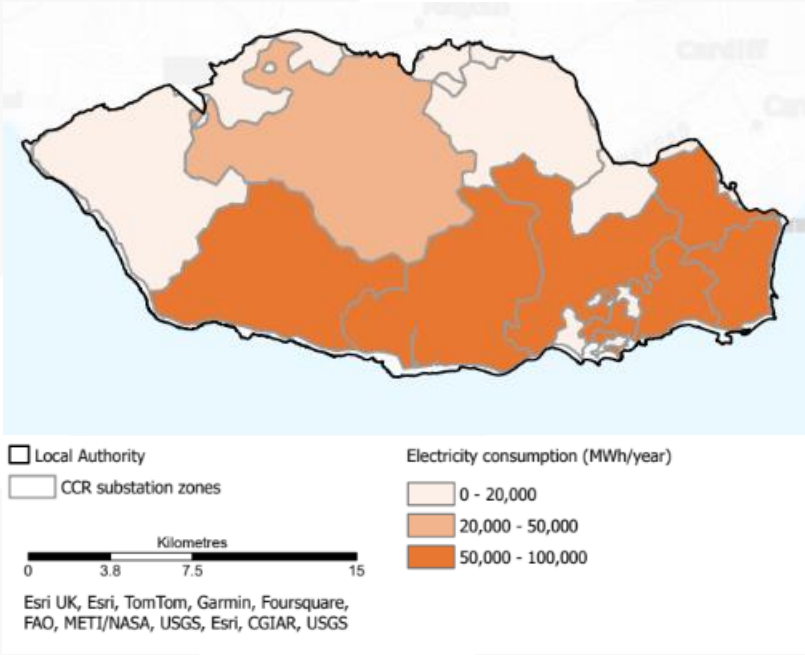


Figure 2.5: Electricity consumption (MWh/year) (domestic and non-domestic properties) by substation zone across Vale of Glamorgan (2023). Data is based on meter level electricity consumption data

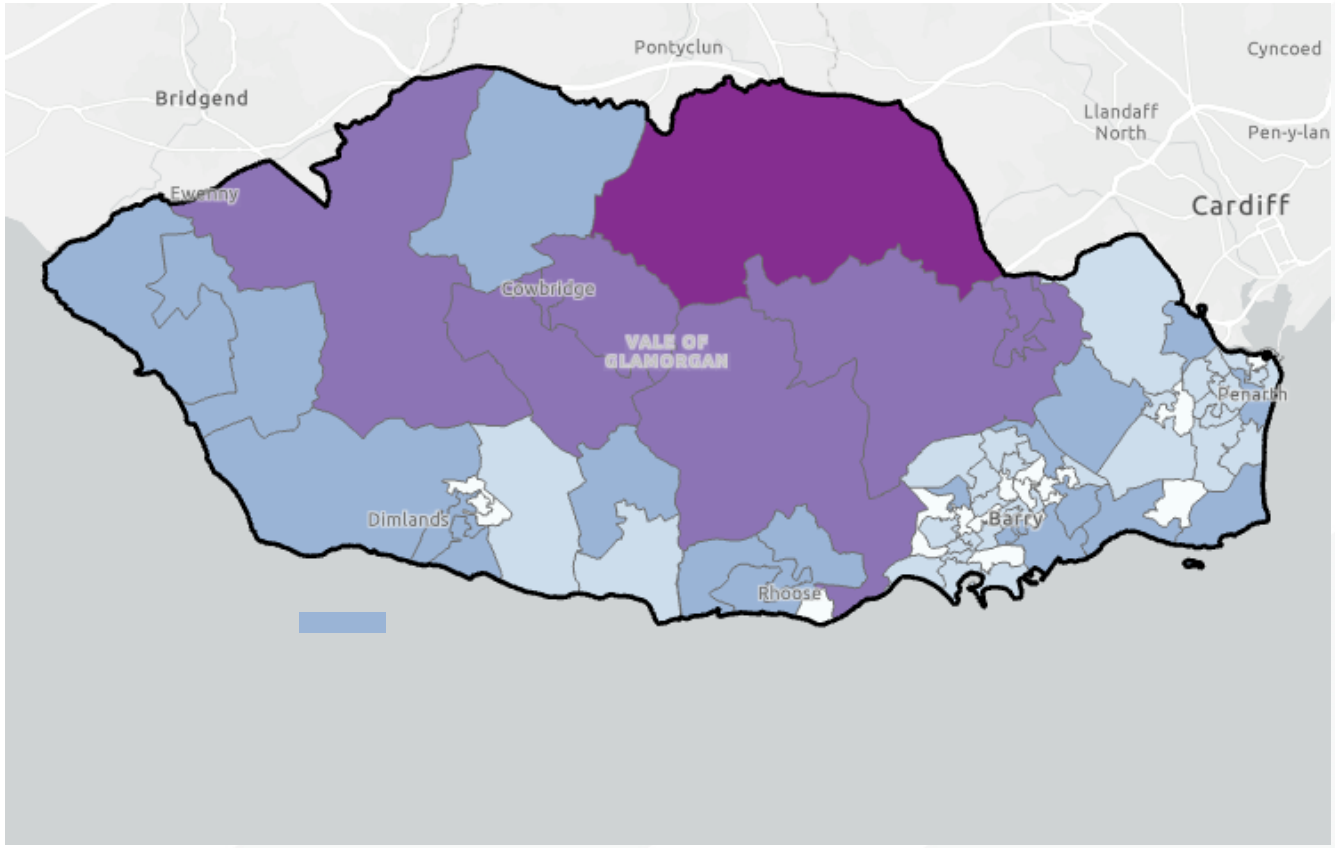
2. The current energy system

Vale of Glamorgan's energy baseline

Energy usage demand by sector

Sponsors: *Delivery partners:*

Transport



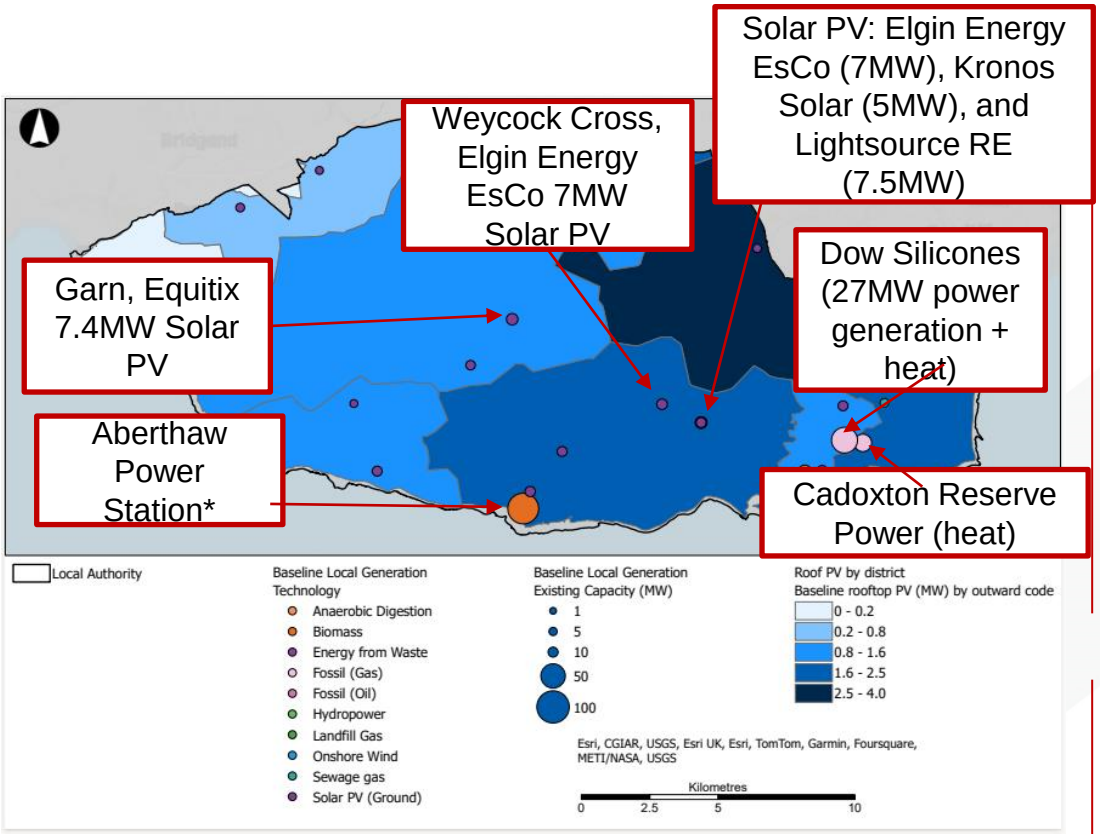
The highest transport energy consumption is focused in the northeast LSOA, this has the M4 running along the northern border of the Vale of Glamorgan. It is also one of the larger LSOAs in the Vale of Glamorgan, and contains campsites, golf courses and a National Trust site which may get a high number of visitors. The A48, which crosses the centre of the Vale of Glamorgan, passes through the LSOAs with the next highest kWh of consumption which means that these are more likely have higher demand for each LSOA.

Figure 2.6: Transport energy consumption (combined total across cars, light goods vehicles (LGV) and heavy goods vehicles (HGV) by LSOA (2015)

2. The current energy system

Vale of Glamorgan's energy baseline

Energy generation



This map shows baseline local energy generators and their existing capacity (MW). It is also showing rooftop PV (MW) across the Vale of Glamorgan by outward code (the first half of the postcode, i.e. CF63).
*Aberthaw Power Station has since been decommissioned and purchased by CCR

Figure 2.7: Local energy generators and their respective capacities (MW) and domestic and non-domestic rooftop solar PV (MW) by outward code (2023)

Electricity generation

Potential generation of 178MW

86MW generation capacity from solar PV

45MW generation capacity from biomass

44MW generated from gas-fired generators

Heat generation

Main heat source (including industry) is gas at 86%

13% of heat (including industry) is generated by coal

10% of heat (including industry) is generated by oil

Vale of Glamorgan has no active district heating networks.

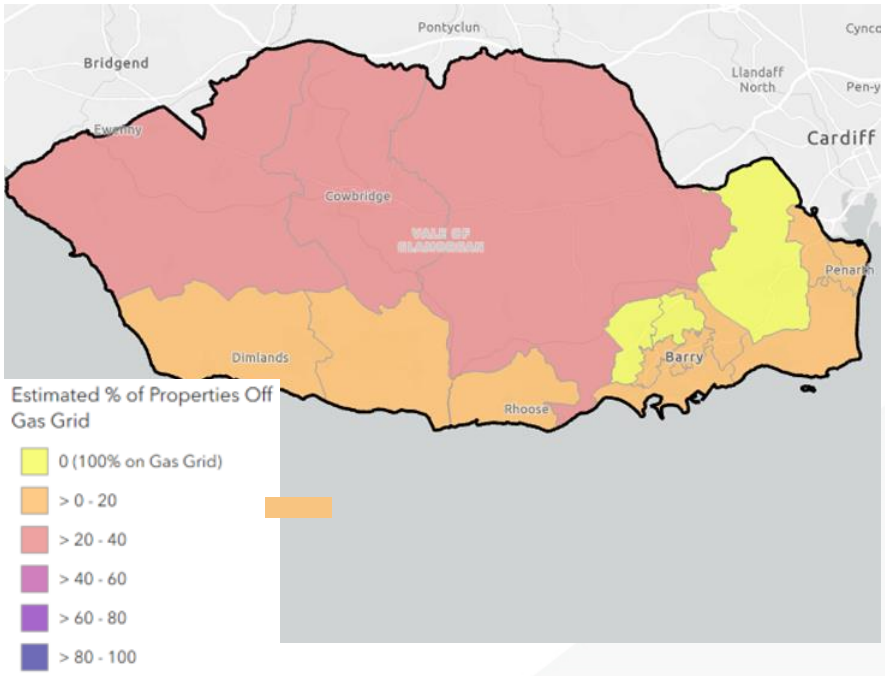
2. The current energy system

Vale of Glamorgan's energy baseline

Networks and infrastructure

Sponsors: *Delivery partners:*

Non gas connected buildings



Higher numbers of properties off the gas grid are located in the rural areas in the north and west of the Vale of Glamorgan with generally higher numbers in more urban areas.

Figure 2.8: % of properties that are not connected to the gas distribution network (2023)

2. The current energy system

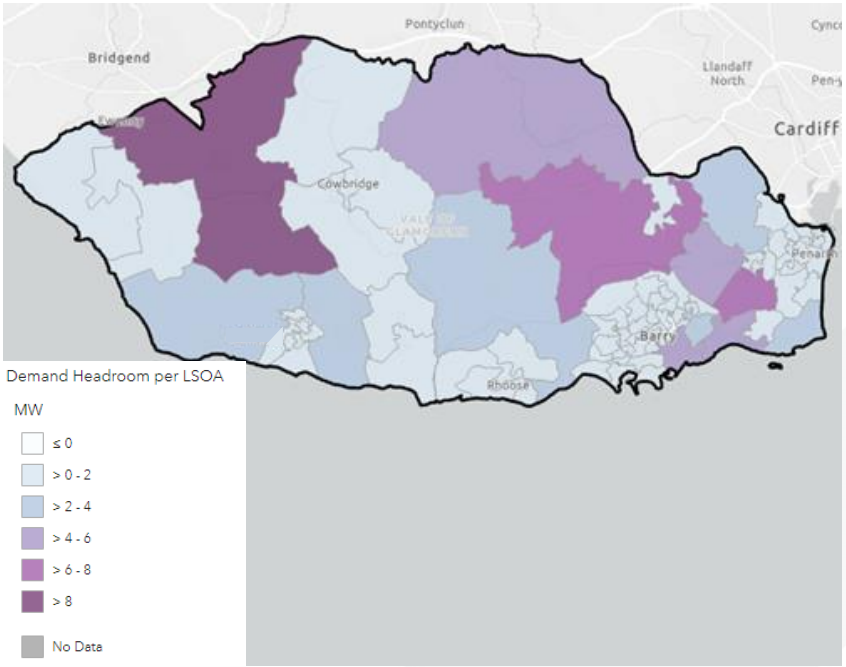
Vale of Glamorgan's energy baseline

Networks and infrastructure

Sponsors: Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; CARBON TRUST

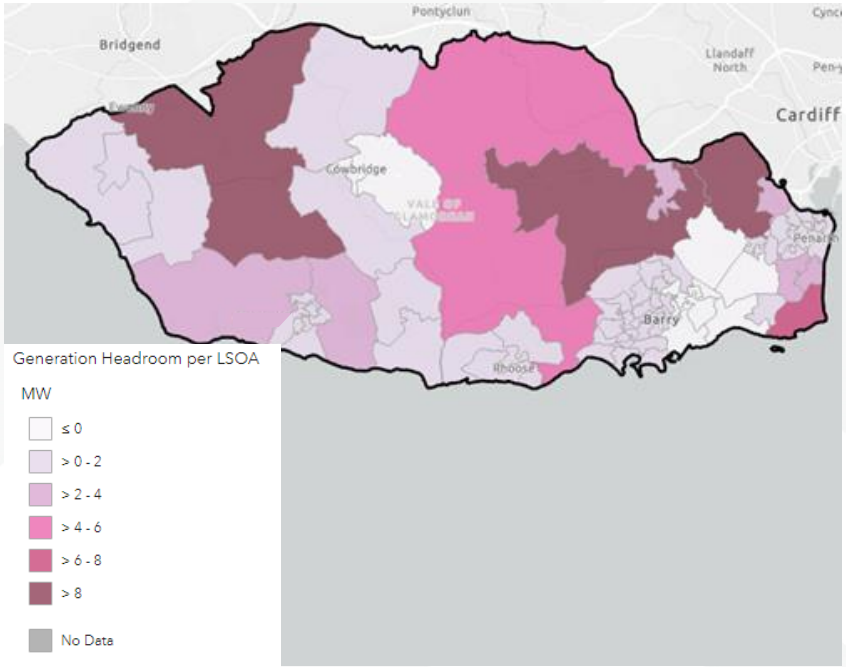
Demand headroom



Demand headroom varies across the Vale of Glamorgan with greater demand headroom in the northeast and northwest and less elsewhere.

Figure 2.9: Electricity demand headroom (2023)

Generation headroom



Generation headroom in LSOAs across the Vale of Glamorgan is variable with more than 8MW of headroom in the northeast and northwest but 0MW of headroom in the centre and southeast where the industrial areas are located.

Figure 2.10: Electricity generation headroom (2023)

2. The current energy system

Vale of Glamorgan's energy baseline

Local environmental, social and economic factors that influence energy (2019 figures)

Sponsors: *Delivery partners:*

Land

Total land area: 329km^2 (1.6% of Wales)[ML13]

Designated Enterprise Zones: Gateway Development Zone, Cardiff Airport, St Athan Aerospace Business Park[ML14]

The Vale has 8 designated bathing waters including Penarth Beach and Jackson's Bay[ML15]

Designated landscapes include the Glamorgan Heritage Coast and Monknash Coast Site of Special Scientific Interest[ML03]

Demographics

Number of inhabitants: 130,000[ML05]

Population growth in last 10 years: 5.4%[ML05]

Median age of 44 years[ML09]

8.6% of people identify as disabled and limited a lot to carry out day-to-day activities (21.1% across Wales)[ML09]

Socio-economics

8% of households in fuel poverty (as of 2018)[ML06]

5,800 people commute in and 19,000 people commute out of the Vale of Glamorgan[ML08]

Largest employment sectors include Human Health and Social Work, Retail and Manufacturing[ML16]

Tourist attractions in the Vale include Barry Island beaches and Cosmeston Lakes Country Park

Emissions

GHG emissions per capita: 4.2tCO$_2$e[ML07]
Welsh average is 7tCO$_2$e[M68]

Buildings are the largest source of energy emissions followed by road vehicles

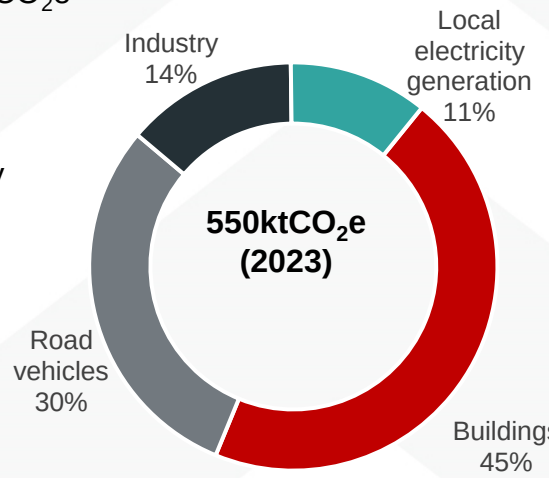


Figure 2.11: Energy related emissions in the Vale of Glamorgan (2023)

2. The current energy system

Vale of Glamorgan's energy baseline

Progress to date

Since declaring a climate emergency in 2019, the Vale of Glamorgan Council has worked to reduce its organisational GHG emissions, and to provide the means for the wider community to do the same, as it transition to a net zero energy system.

The Council's Project Zero initiative has had considerable success, notable through the construction of Wales' first zero carbon school in March 2022 at a cost of £5 million and smaller initiatives such as the installation of EV chargers at several Council owned locations.

A timeline of other successes across the Vale of Glamorgan, led by various organisations, is shown in Figure 2.13.

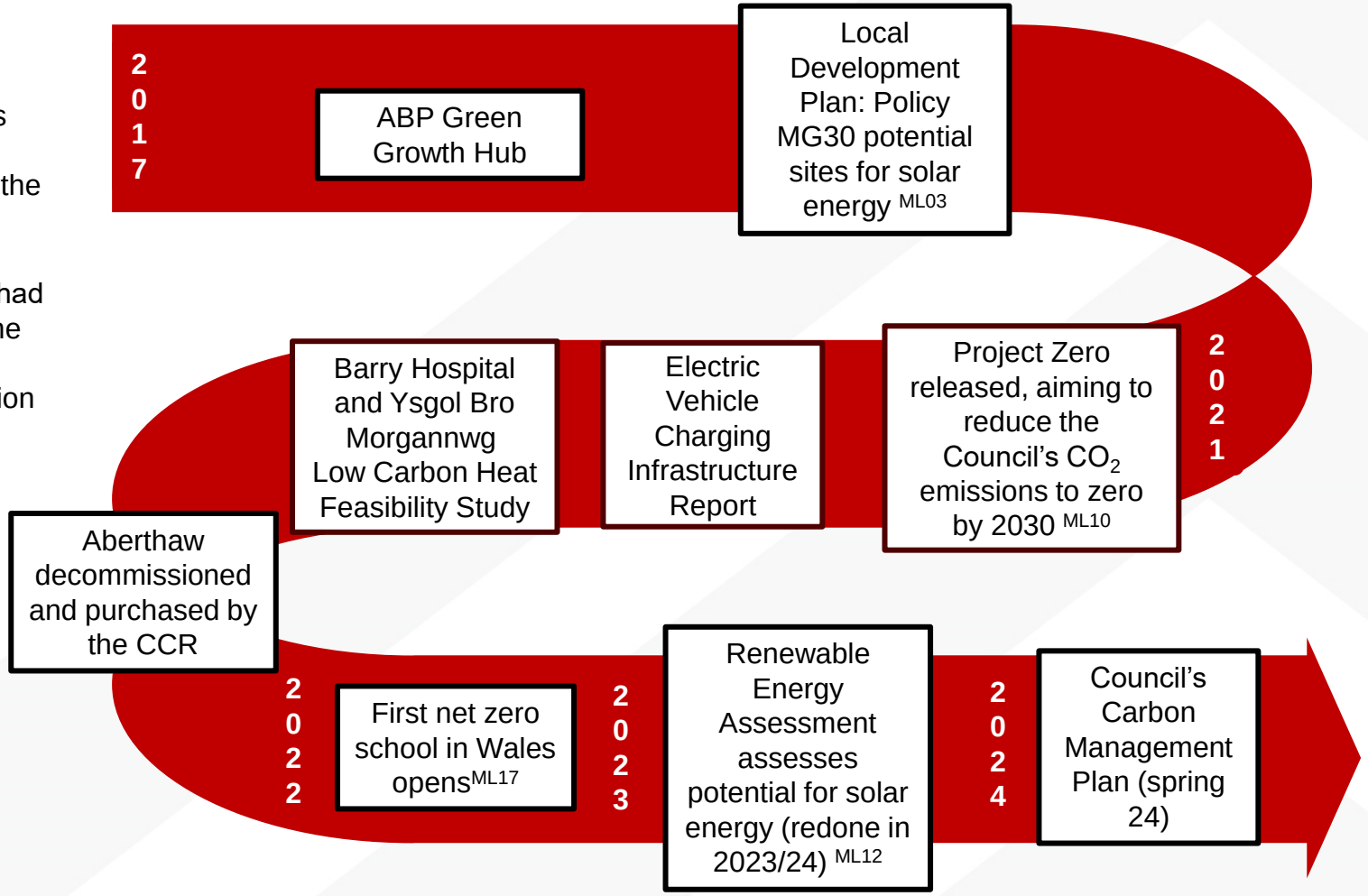


Figure 2.12: Summary of activities to date that have contributed to decarbonising the local energy system

2. The current energy system

Vale of Glamorgan's energy baseline

Plans for the future

Reducing energy demand

The local area heavily relies on fossil fuels, leading to substantial carbon emissions, and faces challenges in building energy efficiency and transportation.

Looking ahead, the Vale of Glamorgan Council aims to become carbon neutral as an organisation by 2030. They have the Project Zero Challenge Plan[ML10] which commits to demonstrating strong leadership, fulfilling their responsibility to current and future generations (which includes creating more energy efficient buildings, reviewing their Supplementary Planning Guidance, supporting a modal shift away from cars to more sustainable forms of transport and reducing energy used) and making a difference (including ensuring contract management and procurement policies reduce waste and carbon emissions, invest in their existing housing stock to make it more energy efficiency (using the optimised retrofit programme for 500 homes over the next 4 years[ML11]) and deliver near zero carbon, or at a minimum A rated new Council homes, invest in and implement a programme of energy saving projects to reduce energy across Council owned buildings).

By building on past successes and implementing ambitious plans, the Vale of Glamorgan is poised to make significant strides in achieving carbon emission reduction goals and creating a sustainable future for the area.

Renewable generation

A number of renewable energy generation sites have been developed across the Vale of Glamorgan. The renewable energy assessment identifies 20 feasible sites for wind and 20 feasible sites for solar development[ML12].

The Council purchases 100% of electricity from renewable sources, they also wish to maximise the potential of Council owned land assets in the production of renewable energy, and explore ways in which this would benefit the local community. They currently have operational PV panels at 24 Council owned loactions, and are developing a masterplan for further sites.

A major site for clean energy is the Aberthaw redevelopment site which is planned to be repurposed from a coal power plant to a green energy hub to support renewable energy generation and storage; CCR has purchased this site and is working on the redevelopment plans for it.

Figure 2.13: Example of a Solar PV Farm – the Vale of Glamorgan currently has 78MW of ground mounted solar PV installed

Vale of Glamorgan LAEP

Chapter 3: The future energy system

Vale of Glamorgan

3. The future energy system

Vision and objectives

The Vale of Glamorgan Local Area Energy Plan (LAEP) represents the collective commitment of the Council and local stakeholders to shaping a future where energy is clean, accessible, and equitable for all residents and businesses, and considerate of future generations. Building upon existing successes it is a collaborative endeavour, uniting local government, businesses, residents, and regulatory partners in a shared vision for a more sustainable future. The plan will establish the Vale of Glamorgan's leadership role in transforming the energy landscape in a pivotal decade of action.

Objectives of the plan

We have worked with stakeholders to define the following objectives for our plan:

1. Maximise reduction in carbon emissions across all activity.
2. Improve efficiency to reduce energy demand.
3. Strategically seek and leverage a diverse range of financial resources to support initiatives aimed at reducing carbon emissions.
4. Support the Vale of Glamorgan Council's Project Zero aspirations to be net zero by 2030.
5. Work towards new and existing buildings becoming low carbon prioritising inclusivity, equality, and fairness.
6. Sensitively deploy renewable energy to the greatest extent possible.
7. Exploit opportunities of green hydrogen implementation for transport and industry.
8. Foster resilience in the energy supply chain through energy diversity including community energy projects.
9. Improve and increase electrification of the transport system alongside modal shift.
10. Nurture partnerships and collaboration between local government, businesses, educational institutions, community organisations, and energy stakeholders.
11. Cultivate the supply chain to provide quality jobs and economic opportunities.
12. Create the workforce to reach net zero 2050 targets.

3. The future energy system

Vision and objectives

Sponsors: *Delivery partners:*

Understanding the future energy system

We know that we need to transition our energy system in the Vale of Glamorgan to net zero by 2050.

We also know that there are multiple plausible and attractive future energy systems for the Vale of Glamorgan, depending on a range of factors. This includes how innovation might impact on the cost of technologies over time, as well as wider policy decisions that will be made by Welsh and UK Governments. These factors will influence the uptake of hydrogen, for example.

Scenario analysis

To inform our plan, we used scenario analysis to explore what a net zero future energy system could look like under different future outcomes, including considering the potential for reduction measures and potential energy sources. We modelled four future energy scenarios and modelled the most cost- and carbon-effective way to meet demand in each one. Through doing this, we were able to identify technologies that played a significant role in all the future scenarios modelled. These technologies represent low- and no-regrets options (meaning that they are likely to be most cost-effective and provide relatively large benefits) which are very likely to be important parts of the future energy system, regardless of the uncertainty of the future.

Deployment modelling

We looked at how aspects of each energy proposition might be deployed between now and 2050, creating **deployment pathways**.

Deployment pathways indicate:

- the scale of change required over time,
- the sequencing of activity that needs to happen to achieve a net zero energy system.

Deployment pathways for different components were informed by broader plan objectives, local and regional strategic priorities, policies and national targets and using this context, helped us to define a suitable level of ambition, and bring all this evidence together into an action plan.

3. The future energy system

Overview

Summary of steps taken

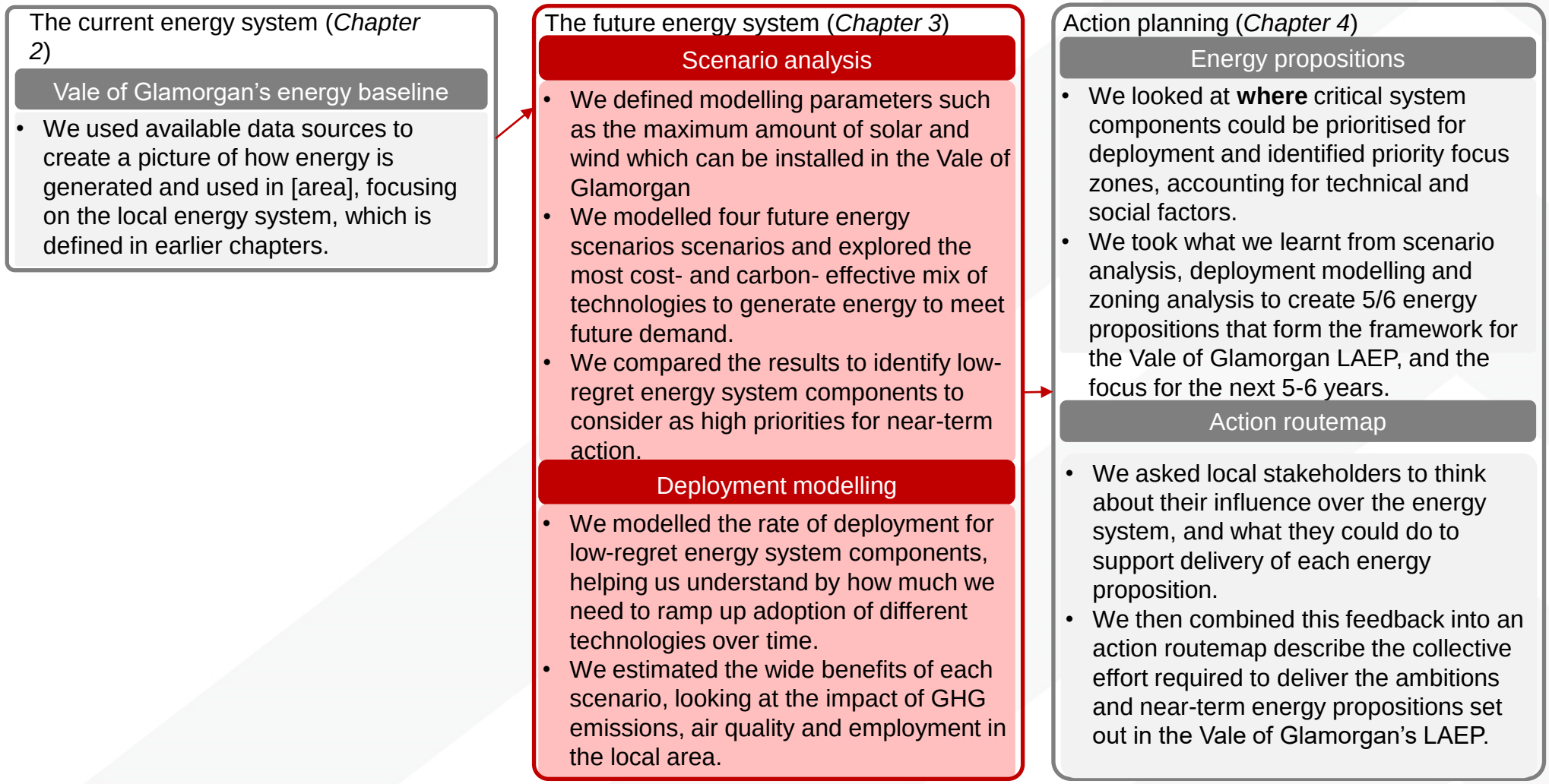


Figure 3.1: Summary of steps taken to produce the LAEP

3. The future energy system

Scenario analysis

Summary of future energy scenarios

Do nothing	• A scenario for comparison which considers committed activities, and assumes that current and consulted upon policy goes forward and remains consistent. • This scenario provides a cost counterfactual. • There is no decarbonisation target for this scenario, and we do no use it in optimisation modelling.
National Net Zero	• Uses the lowest cost and carbon combination of technologies to meet Wales' 2050 net zero target. • Assumes a moderate level of energy demand reduction across the system. • Model is allowed to import and export to the electricity grid, this assumes that the electricity grid is decarbonised and reinforced to allow for the demands, likely to be a combination of offshore wind, hydrogen CCGT, grid level battery storage, nuclear (these are considered as national assets and outside the scope of the LAEP).
Low Demand	• Considers the lowest future energy demand across different sectors. • Explores the impact of energy-reducing initiatives (home fabric improvements) and uptake of active travel and public transport use. • Model finds the lowest cost and carbon combination of technologies to meet predicted future energy demand. • Import and export of electricity as National Net Zero
High Demand	• Considers the highest future energy demand across sectors. • Model finds the lowest cost and carbon combination of technologies to meet predicted future energy demand. • Import and export of electricity as National Net Zero
Net Zero 2030	• The Vale of Glamorgan would like to achieve net zero by 2030 and would like to consider what measures could be undertaken to accelerate the transition to net zero. This is considered within the deployment modelling, rather than optimisation modelling as the quantum are taken from the National Net Zero scenario and we have this scenario.

Figure 3.2: Summary of future energy scenarios

3. The future energy system

Scenario analysis

National Net Zero scenario

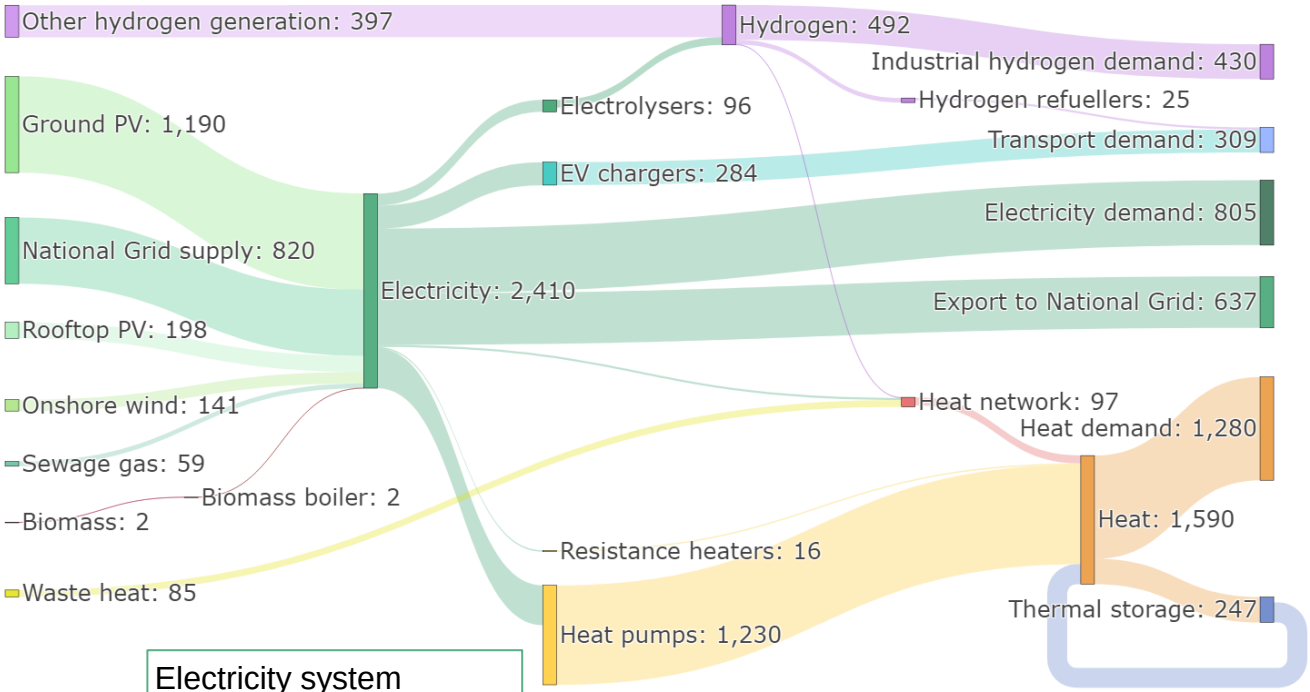
Figure 3.3 shows a potential future energy system for the Vale of Glamorgan, resulting from modelling used to optimise the cost and carbon emissions. We have run a number of scenarios to support us in making decisions. The optimisation modelling informs the deployment modelling and the actions that go into the plans but is not the "final plan" for the local authority area.

Hydrogen imports and hydrogen to be generated from electrolysis serves transport and industrial demand

Significant increase in renewable energy generation, especially ground-mount PV (14x higher than baseline).

Electricity to be supplied by the National Grid increased by 2.6x compared to the baseline.

Smaller contribution from biomass, which could serve electricity demand.



Electricity system expected to be 3.7x larger than the baseline.

Majority of transport demand to be met through EV chargers. Hydrogen refuellers could meet 8% of demand.

Significant portion, (26%) of generated electricity is surplus, produced at times when not needed and so is exported.

Heat supply to be predominately met by heat pumps (92%) , with smaller contributions from heat networks (7%) , resistance heaters (1%)

Figure 3.3: A Sankey diagram for a potential future 2050 energy system (energy flows in GWh)

3. The future energy system

Scenario analysis

Physical energy system components

Table 3.1 provides an overview of the variations in energy components observed in the optimisation modelling results across future energy scenarios, benchmarked against the baseline results.

- Ground-mounted, rooftop solar and onshore wind generation consistently increases across all scenarios; meeting both the Vale of Glamorgan's energy demand and exporting in times of surplus generation to the National Grid.
- Biomass generation sees a decline across all scenarios, due to a reduced dependency resulting from the enhanced output of solar and wind farms.
- Hydrogen is incorporated into the energy mix in all scenarios, sustaining the Vale of Glamorgan's industrial and transport demands.
- Transport demand decarbonises due utilising electricity through EV charge points and hydrogen.
- Heat demand is predominantly catered for by heat pumps, a trend that is consistent across all scenarios. While heat networks and other technologies contribute to this demand, their usage is comparatively less.

	Energy system components	Baseline	National Net Zero	High Demand	Low Demand
Generation	Ground-mounted PV	85 GWh	↑ to 1,190 GWh		
	Rooftop PV	9 GWh	↑ to 198 GWh		
	Onshore wind	0 GWh	↑ to 141 GWh		
	Sewage gas	13 GWh	↑ to 59 GWh		
	Biomass	327 GWh	↓ to 2 GWh		↓ to 1 GWh
	Hydrogen import	0 GWh	↑ to 397 GWh	↑ to 395 GWh	↑ to 380 GWh
	Electrolyser	0 GWh	↑ to 96 GWh	↑ to 93 GWh	↑ to 112 GWh
	Import from Grid	311 GWh	↑ to 820 GWh	↑ to 830 GWh	↑ to 585 GWh
Conversion	EV chargers	1 GWh	↑ to 284 GWh	↑ to 303 GWh	↑ to 284 GWh
	Hydrogen refuellers	0 GWh	↑ to 25 GWh	↑ to 24 GWh	↑ to 25 GWh
	Heat pumps	4 GWh	↑ to 1,230 GWh		↑ to 773 GWh
	Heat networks	0 GWh	↑ to 97 GWh		
	Resistance heaters	45 GWh	↓ to 16 GWh		↓ to 9 GWh
	Biomass boilers	52 GWh	↓ to 2 GWh		↓ to 1 GWh

Table 3.1: Change in energy generation and use by different technologies, compared across the scenarios

3. The future energy system

Deployment modelling

Impact on energy demand

Deployment modelling sets out how quickly each energy component could be deployed in each optimisation scenario and the Do Nothing scenario. The rate of change in the Do Nothing scenario is based on current deployment rates and policy levers, whereas the other scenarios show trajectories that meet the optimisation models, taking into account the need for growth in the supply chain.

Figure 3.4 shows how the energy demand could change over time in the different sectors for the baseline, 2030 and 2050.

The largest contributor to energy demand in 2050 in each scenario is heating buildings (1000-1500 GWh across scenarios), followed by electricity demand (640-800 GWh), industrial heat demand (430GWh) and road vehicles (310-330GWh) respectively. The lowest 2050 energy demand is seen in the Low Demand scenario, where a focus is put on reducing buildings heating demand through insulation retrofits.

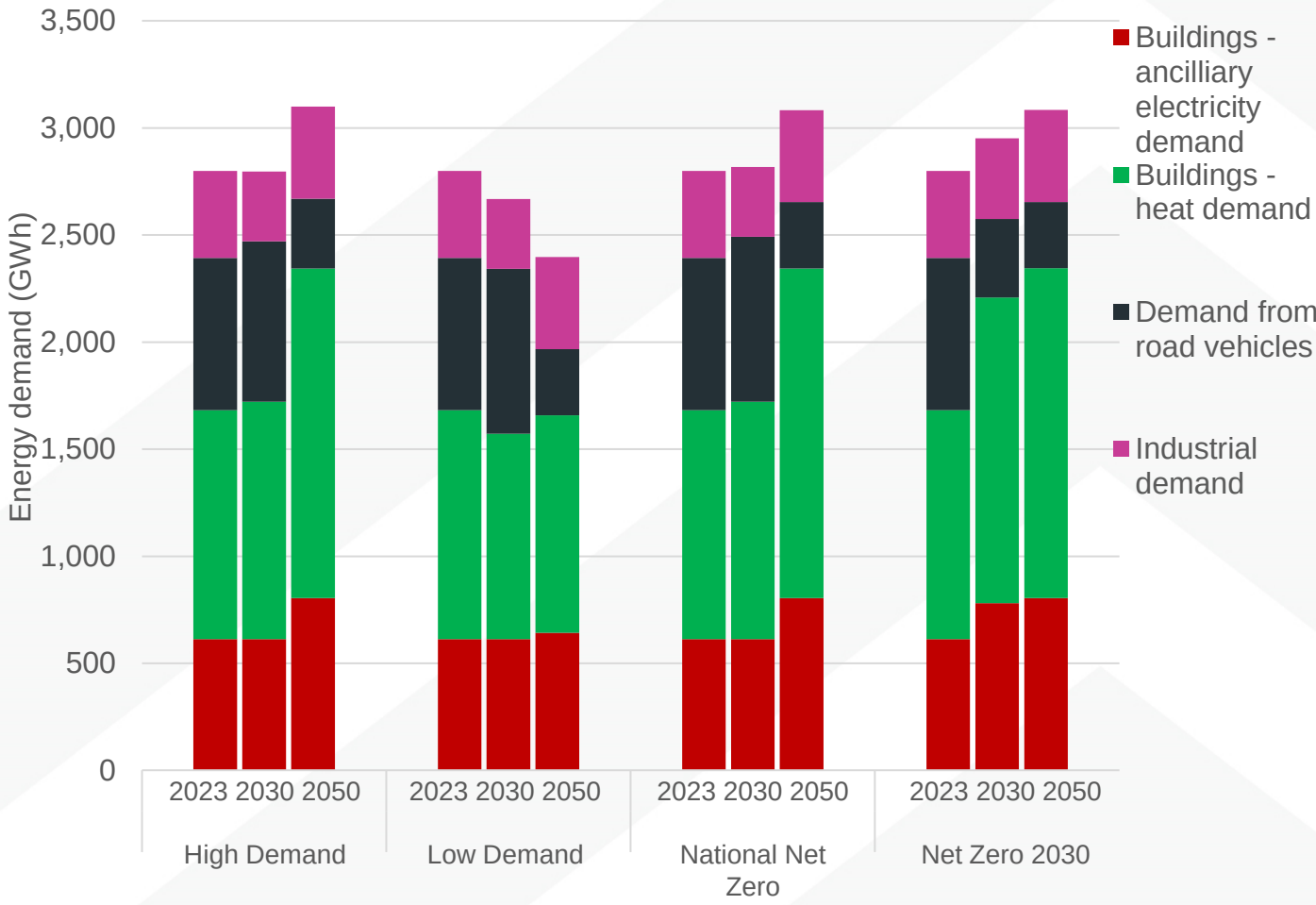


Figure 3.4: Energy demand over time for each scenario

3. The future energy system

Deployment modelling

Impact on GHG emissions

Figure 3.5 shows the gap in the GHG emissions between the Do Nothing scenario and the optimised scenarios. Our deployment modelling provides additional evidence on the realism of delivering the changes suggested by the optimisation modelling. It helps us to determine the actions needed in the next five years to set us on the pathway to net zero in 2050. There are also bigger systemic changes that will be needed to achieve the scale of change set out in this plan.

The deployment modelling shows how these pathways contribute to the Welsh Government emissions reduction targets.

For the Vale of Glamorgan, the 2023 baseline is already a 43% reduction on the 1990 levels, with the pathways slightly missing the targets to 2050 apart from in the Net Zero 2030 scenario which accelerates the deployment.

The plan shows that the system doesn't entirely meet net zero in 2050 due to some residual emissions from electricity in the network, however the average reduction is 97% against the 1990 levels. Offsetting would be needed to reach net zero, which is not in the scope of the LAEP.

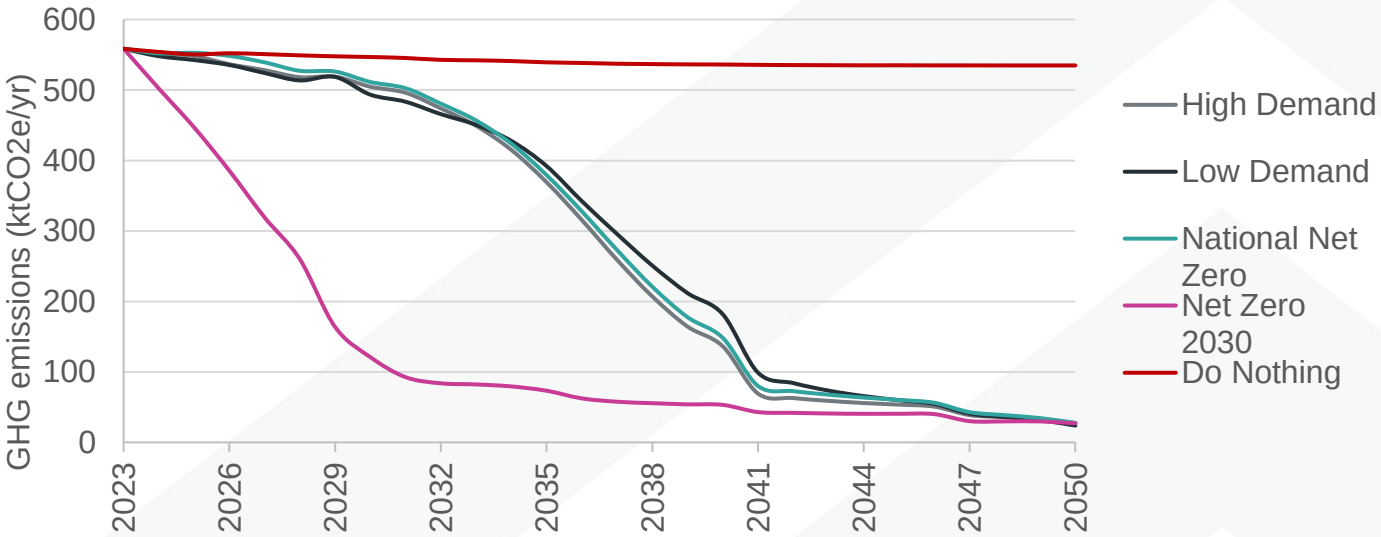


Figure 3.5: GHG emissions ($ktCO_2e$) to 2050 for each modelled scenario compared to the Do Nothing scenario

Scenario	2030	2040	2050
Welsh Gov targets	-63%	-89%	-100%
High Demand	-49%	-86%	-97%
Low Demand	-50%	-82%	-98%
National Net Zero	-48%	-85%	-97%
Net Zero 2030	-83%	-95%	-97%
Do Nothing	-45%	-46%	-46%

Table 3.2: Decrease in GHG emissions ($ktCO_2e$) to 2050 for each scenario compared to the 1990 GHG emissions value and the Welsh Government emissions reduction targets

3. The future energy system

Deployment modelling

Socio-economic impacts

Reducing the amount of energy we use and using renewable energy sources for power generation can have wider environmental, social and economic benefits, so it is important that they are fully understood to support decisions that impact the future of the energy system. For example, for every £1 invested in energy efficiency measures, the NHS can save £0.42 (amounting to annual savings of £1.4 billion in England alone)[M41].

Employment impacts

Investments in local energy systems can be expected to provide employment benefits by providing local, skilled jobs. These will include direct jobs from construction and operational phases of the development as well as associated supply chain and multiplier effects[M42].

Impact on air quality

It can also impact the quality of the air which in turn impacts: human health, productivity, wellbeing and the environment, which is why it is so important to understand when planning future policy or programmes of work. Activity costs presented in Table 3.3 show estimates for the impact of air pollution per unit of fuel consumed in each future energy scenario and estimates for the employment impacts associated with each future energy scenario, compared to the Do Nothing scenario

Metric	Do Nothing	National Net Zero	High Demand	Low Demand	Net Zero by 2030
Cumulative air quality activity costs between 2023-2050 (£'million) (2022 prices)	£1,200m	£600m	£580m	£590m	£300m
Additional gross local jobs between 2023-2030 (FTE)	No change	840	840	1,500	4,500
Additional gross local jobs between 2023-2050 (FTE)	No change	5,300	5,300	6,300	5,000

Table 3.3: Summary of economic impacts for each scenario: employment impacts and air quality activity costs. Figures shown relate to the period 2023 – 2050. Air quality activity costs are presented using 2022 prices and are not discounted

3. The future energy system

Deployment modelling

Summary of deployment

Our deployment model helps us to think about where we are now and where we need to get to, providing a starting point to frame the challenge and for more detailed analysis. We have included the minimum and maximum values from across the National Net Zero, Low and High Demand scenarios, which have a high degree of uncertainty as there are many variable factors and unknowns. The deployment modelling can't account for every factor, some of the things that will impact deployment include:

1) Technological advance and innovation
2) Supply chains and how they develop
3) Large scale activity to decarbonise infrastructure at other levels: regional, UK and beyond.

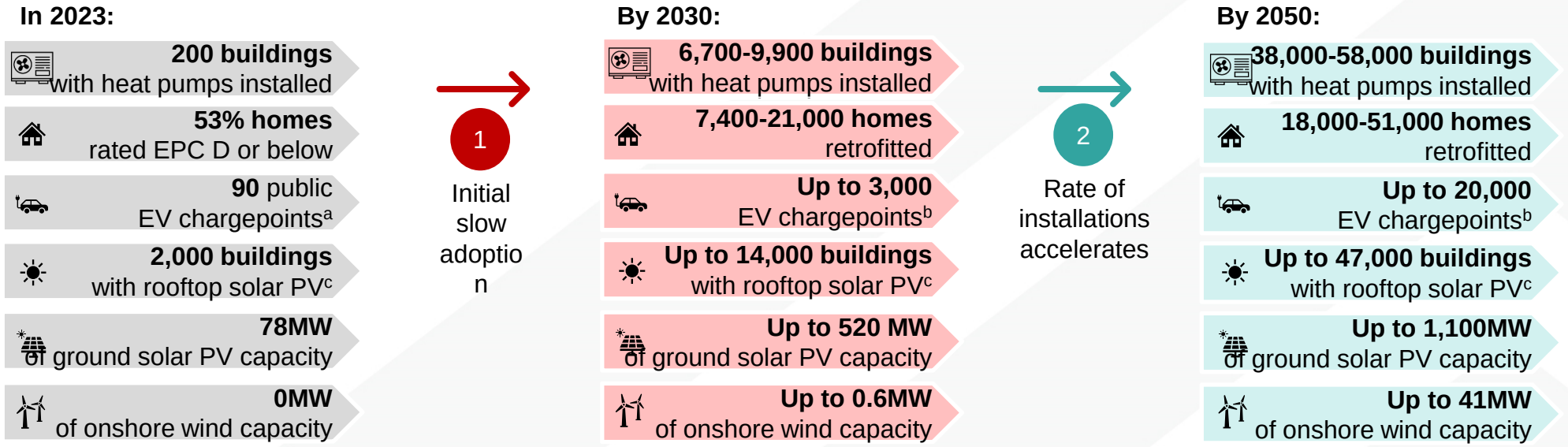


Figure 3.6: Summary of key deployment metrics from optimisation modelling

A) According to the National Charge Point Registry as of May 2023[M43]. Refers to individual charge points
B) Assuming 4.5kWp per charge point
C) Assuming 4kWp per roof
D) Renewable generation capacity is shown for technologies where current installed capacity is >5MW

Vale of Glamorgan LAEP

Chapter 4: Action planning

Vale of Glamorgan

4. Action planning

Energy propositions

We shared what we learnt from exploring different energy futures and deployment pathways with our stakeholders and discussed with them what key drivers will be critical for the transition to net zero.

We then considered their feedback, our strategic vision and objectives and agreed *energy propositions* to act as the framework for Vale of Glamorgan's LAEP.

There are numerous interdependencies and interactions between these propositions, as shown here, and this highlights the importance of a whole system approach with a co-ordinated programme of delivery to meet the net zero target by 2050.

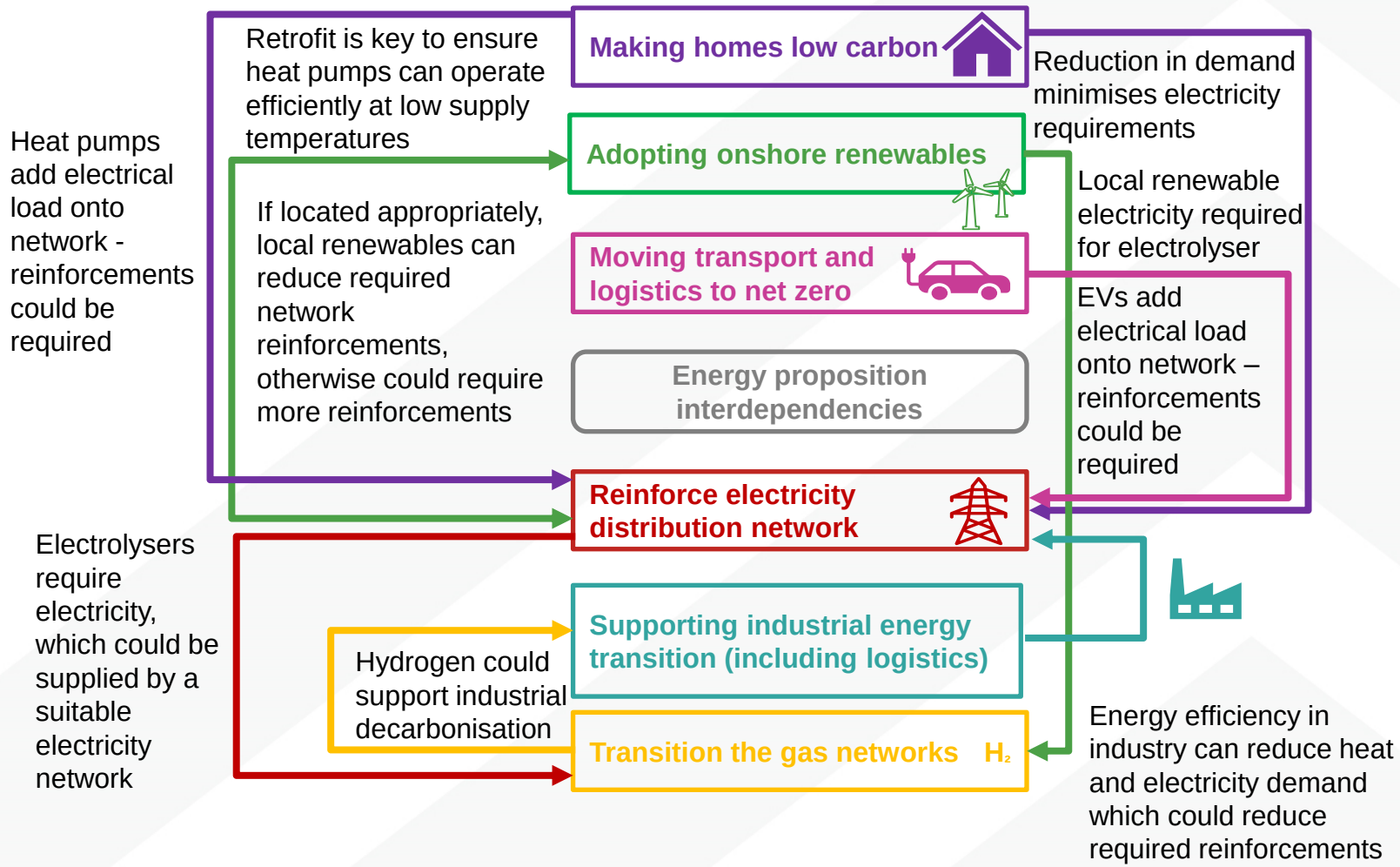


Figure 4.0: Summary of priority intervention areas and their inter-dependencies

4. Action planning

Energy propositions

Sponsors: Vale of Glamorgan Bro Morgannwg; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

Proposition 1: Making homes low carbon

Supporting constituents in accessing and adopting interventions which enable the reduction of energy use and the uptake of renewable energy. Review energy efficiency of Council owned stock and support building new homes net zero.

CAPEX to 2050: £260m - £3,300m for all measures

Proposition 2: Adopting onshore renewables

Increasing deployment of onshore renewables in areas within the Vale of Glamorgan that have been identified as suitable.

CAPEX to 2050: Up to £690m

Proposition 3: Moving transport and logistics to net zero

Complete shift away from fossil fuels, reducing energy needs and promoting modal shift, active travel and sustainable transport in the Vale of Glamorgan.

CAPEX to 2050: £8m - £70m

Proposition 4: Supporting industrial energy transition

Creating a vision for industry to enable a coordinated transition and establishment of future fuels economy in the Vale of Glamorgan which supports existing transition and future green growth.

Proposition 5: Reinforcing the electricity distribution network

Supporting an intelligent, no-regrets upgrade and resilience programme of works through meaningful data and engagement.

Proposition 6: Transitioning the gas network

Supporting an intelligent, no-regrets upgrade and transition programme of works through meaningful data and engagement.

H_2

4. Action planning

Plan on a page and action routemaps

Although the exact form of the decarbonised energy system in 2050 is uncertain, there are actions we can take now with relative certainty that will help us maintain the ability to meet our 2050 net zero ambition and capitalise on the opportunities that this transition will bring.

Plan on a page

As a starting point, our “plan on a page,” shown in Figure 4.1 on the next page, indicates the location and scale of recommended near-term changes required across Vale of Glamorgan. The map highlights eight modelling zones identified as priority focus zones for the low-regret energy system components included in Vale of Glamorgan’s energy propositions: heat pumps, EV chargers, rooftop PV, ground-mounted PV, onshore wind, and insulation retrofits. To prioritise where each low-regret energy system component should be deployed, each modelling zone was ranked using various technical and social factors such as the available capacity at each substation, Welsh Index of Multiple Deprivation, etc. For onshore wind, we used the 2050 deployment values over the 2030 values because wind development would need to be of a big enough scale to be commercially viable.

For more details on the methodology behind the “plan on a page”, please see our Technical Report.

Action routemap

Our energy propositions describe where our priorities lie based on the evidence presented thus far. Our **action routemap** takes each energy proposition and outlines critical, enabling actions that we will take collectively alongside our stakeholders in the coming decade, with a particular focus on what we can achieve in the next 5-7 years. Our action routemap has been developed as a dynamic plan that recognises the influence that wider contextual changes at national and local level will have on the way we choose to transition to a net zero energy system, such as national regulation, policy and strategic plans. As a result, we expect to regularly review and update our routemap based on these dependencies.

Each action will require four key elements to be successful:

- Mobilising finance
- Strong and consistent policy frameworks
- Identifying delivery owners
- Community engagement

4. Action planning

Plan on a page and action routemaps

Sponsors:

Delivery partners:

As set out in the introduction, many actors are need to play roles in each energy proposition to drive forward the change that is needed. The Vale of Glamorgan Council understands that their role in delivering each energy proposition will vary. Some actions call for Council action in the material delivery of programmes, whilst others need the Council to act as the facilitator for market-driven change.

Through the LAEP process, we also identified actions that would be best delivered collaboratively through the regional partnership. This is because there are economies of scale, and it would be more efficient to have joined up and focused public resources. The regional actions will require detailed design work, to create projects and programmes, to progress them to implementation stage - with an initial focus on the tried and tested. The Council will take an active role in supporting the Cardiff Capital Region going forward.

Local ownership is a key focus throughout this plan, and where possible the action taken should leverage the progress made through the Welsh Government's recent Co-operation Agreement[M63] with Plaid Cymru, which includes key goals on tackling climate change in a way that maximises local benefits.

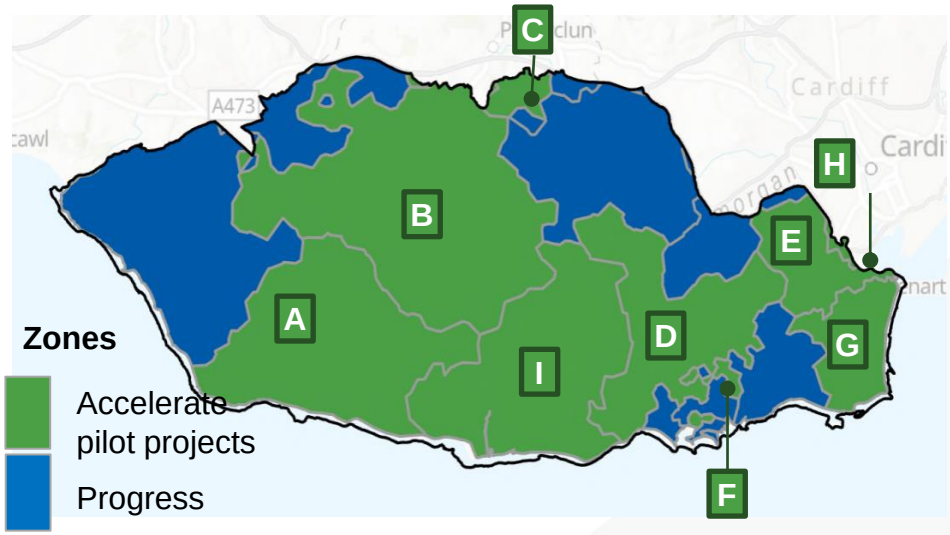
The following section provides further detail on each of the actions that we will undertake under each energy proposition, as well as our key asks of others. Due to the relative uncertainty of longer-term actions, we have chosen not to focus on detailed scoping of these in this report and instead, focus on actions we intend to deliver in the short-term, subject to appropriate support.

4. Action Planning

Sponsors: Delivery partners:

To support transformation of the energy system, pilot projects may be useful. The map below highlights areas that could provide a useful focus for these pilots.

Figure 4.1 identifies zones with particularly favourable conditions for specific energy components, making them ideal locations for pilot studies. The summary tables detail key figures for each zone by 2030: (i) pilot ambition, (ii) required investment for each pilot and (iii) total investment for all energy components and electricity network infrastructure interventions. Ranges show the minimum and maximum results from each future energy scenario modelled (see page 48 for more detail). Note: intervention should still be carried out in 'Progress' zones to transition the local area to net zero.



Suggested energy components to pilot in each zone

	Heat pumps		Ground-mounted PV	☼	Rooftop PV
	EV charger		Onshore wind		Insulation measures

	(i)	(ii)	(iii)
A Boverton			**Zone A total £68-330m**
	87-280MW	£37-120m	
☼	12-39MW	£13-43m	
	470-2100 homes	£6-120m	
B Cowbridge			**Zone B total £46-260m**
	11.7MW (2050)	£13m (2050)	
C Pontyclun 132/11kV			**Zone C total £0.3-2.8m**
	100-710kW	£78-530k	
	6-33 homes	£0.09-1.3m	
D Barry Grid Primary			**Zone D total £47-290m**
	1.4-8.9MW	£1.1-7.3m	
E Llandough			**Zone E total £20-130m**
	1.2MW (2050)	£1.3m	
F Court Road Barry			**Zone F total £8.3-69m**
	1.5-14MW	£1.1-11m	
	700-1,200 homes	£3.6-51m	
	0.27-1.8MW	£0.22-1.5m	
G Penarth			**Zone G total £38-270m**
☼	5.6-19MW	£6.2-21m	
H Grangetown Grid Primary			**Zone H total £1.2-5.7m**
	3-35 homes	£70-1000k	
I East Aberthaw Primary			**Zone I total £74-220m**
	140-180MW	£59-77m	

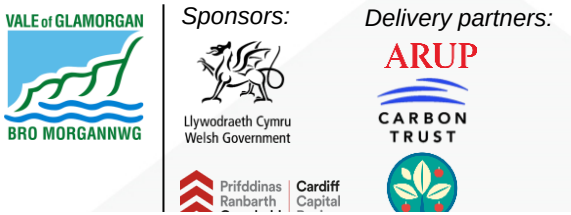
Figure 4.1: Vale of Glamorgan's spatial representation of opportunities, including 2030 ambition and investment (million £). Zone boundaries are defined by primary substation service areas.

Note: Substations C and H cross the local authority boundary and the deployment values presented here cover land within the Vale of Glamorgan only.

4. Action planning

Action routemap

National policies and targets

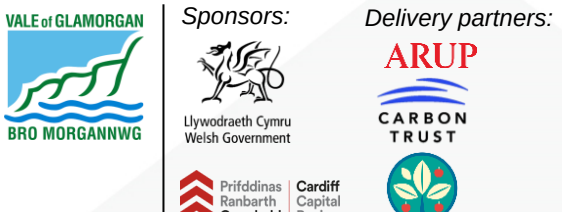


	Action	2024	2025	2026	2027	2028	2029	2030
National targets	Up to 1GW of electrolytic hydrogen secured (2025) [UK][M44]							
	Decision on hydrogen to heat buildings (2026) [UK][M45]							
	Up to 10GW hydrogen capacity (50% electrolytic) [UK][M44]	Progressing towards 2030						
	Up to 50GW of offshore wind capacity including up to 5GW of innovative floating wind (2030) [UK][M44]	Progressing towards 2030						
	Future Homes Standard consultation suggests all space heating and hot water demand be met through low carbon sources in new builds (2025) [M46]							
	All new social homes built to Welsh Development Quality Requirements 2021 without fossil fuel heating (from 2025)[M47]							
	All existing social homes to have a plan for minimising environmental impact and improving energy performance (2027) [Wales][M48]							
	-37% GHG emissions by 2025 (rel. to 1990) [Wales][M49]							
	-63% GHG emissions by 2030 (rel. to 1990) [Wales] [M49]	Progressing towards 2030						
	Meet the equivalent of 100% of electricity needs from renewable sources by 2035 [Wales][M26]	Progressing towards 2035						

4. Action planning

Action routemap

National policies and targets



	Action	2024	2025	2026	2027	2028	2029	2030
National targets	1.5GW of renewable capacity to be locally owned (exc. Heat pumps) (2035) [Wales] M26	Progressing towards 2035						
	580,000 heat pumps to be installed in Wales by 2035, contingent on scaled up support from the UK Government and reductions in the cost of technology[x] (2035) [Wales] M26	Progressing towards 2035						
	Minimum EPC E to rent out any property (from 2020 onwards) and EPC C from 2030 [UK] M51							
	1 public charge point for every 7 to 11 electric vehicles (2025) [Wales] M23							
	Rapid charging available every 20 miles on the strategic trunk road (2025) [Wales] M23							
	-10% car miles travelled/person (2030) [Wales] M03	Progressing towards 2030						
	80% new cars and 70% new vans sold to be 0 emissions (2030) (ZEV mandate) [UK] M53	Progressing towards 2030						
	100% new cars and vans sold to be 0 emissions (2035) (ZEV mandate) [UK] M53	Progressing towards 2035						
	Net zero public sector by 2030 [Wales] M23	Progressing towards 2030						

4. Action planning

Sponsors: Delivery partners:

Action routemap

Enabling actions

(N) Action will be implemented at a national scale, across all of Wales

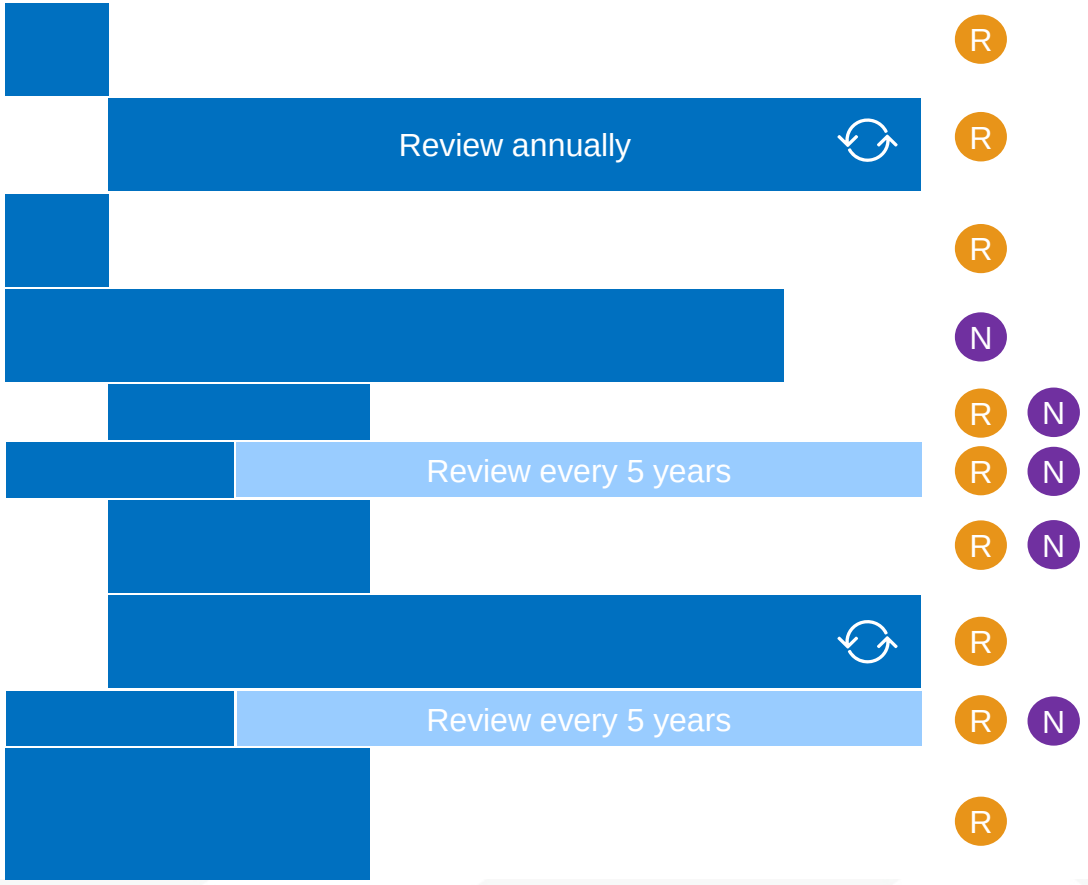
(R) Action will be implemented at a regional scale, across CCR local authorities

(L) Action will be implemented at a local scale, across Vale of Glamorgan

Timescale for the action is ongoing

Enabling actions

Action	Proposed leads
E.1.1: Develop a governance structure and performance management framework	R
E.1.2: Facilitate monitoring of the LAEP across the Region	R
E.1.3: Develop a business plan for delivery of the LAEPs across the region	R
E.2.1: Develop a regional Strategic Development Plan (SDP)	N
E.2.2: Develop a national energy plan	R N
E.3.1: Map and identify skills and labour needs	R N
E.3.2: Review and develop educational programmes to meet skills needed	R N
E.3.3: Develop a communication strategy to promote jobs	R
E.3.4: Identify supply chain needs	R N
E.4.1: Investigate possible procurement and investment frameworks that could be considered for larger projects of scale	R



4. Action planning

Sponsors: Delivery partners:

Action routemap

Enabling actions

- (N) Action will be implemented at a national scale, across all of Wales
- (R) Action will be implemented at a regional scale, across CCR local authorities
- (L) Action will be implemented at a local scale, across Vale of Glamorgan
- Timescale for the action is ongoing

Enabling actions

Action	2024	2025	2026	2027	2028	2029	2030	Proposed leads
E.4.2: Share best practice for energy decarbonisation							↻	R
E.4.3: Access funding for energy decarbonisation							↻	R
E.4.4: Update the Replacement Local Development Plan (RLDP)								L

4. Action planning

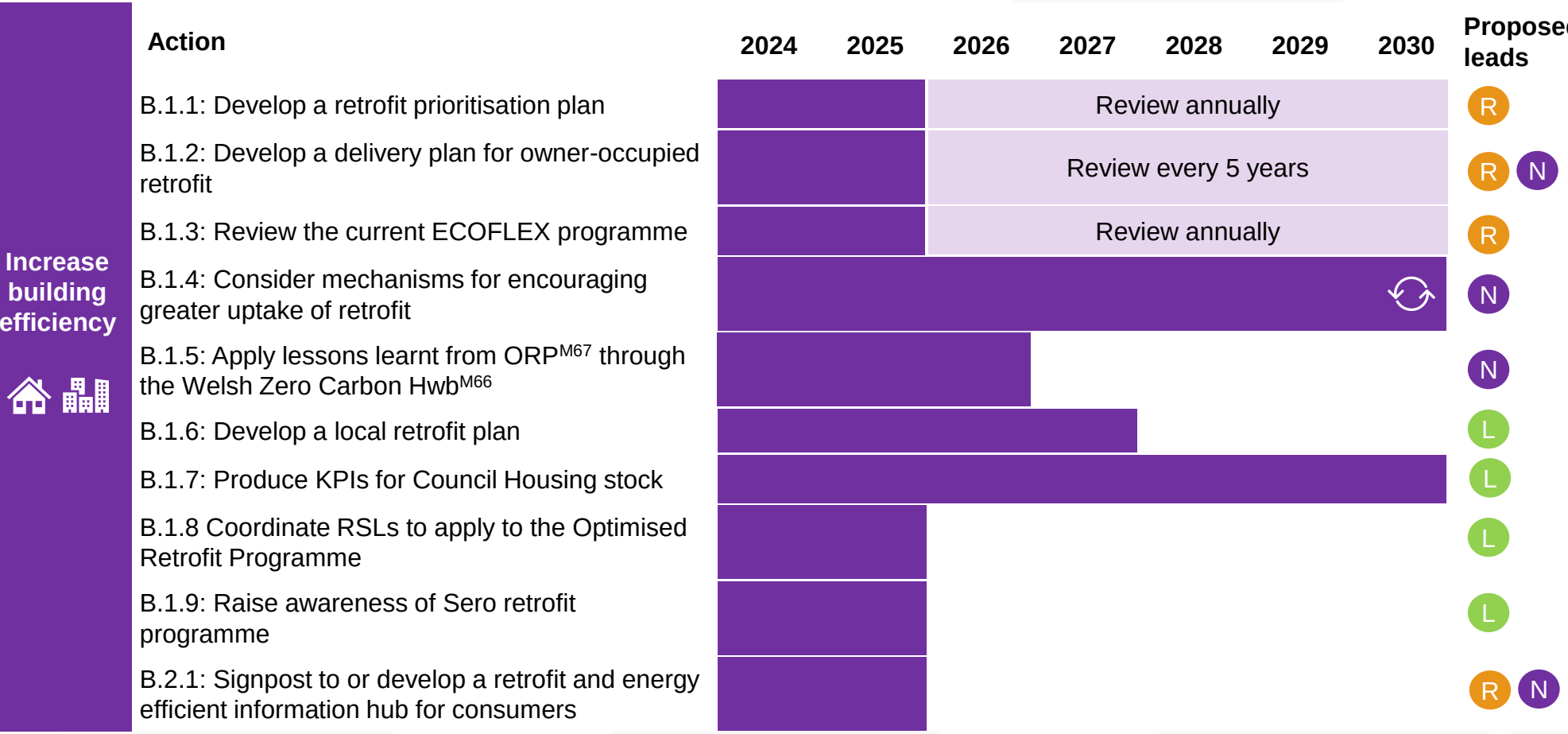
Sponsors: *Delivery partners:*

Action routemap

Increase building efficiency

- (N) Action will be implemented at a national scale, across all of Wales
- (R) Action will be implemented at a regional scale, across CCR local authorities
- (L) Action will be implemented at a local scale, across Vale of Glamorgan
- Timescale for the action is ongoing

Increase building efficiency



4. Action planning

Sponsors: Delivery partners:

Action routemap

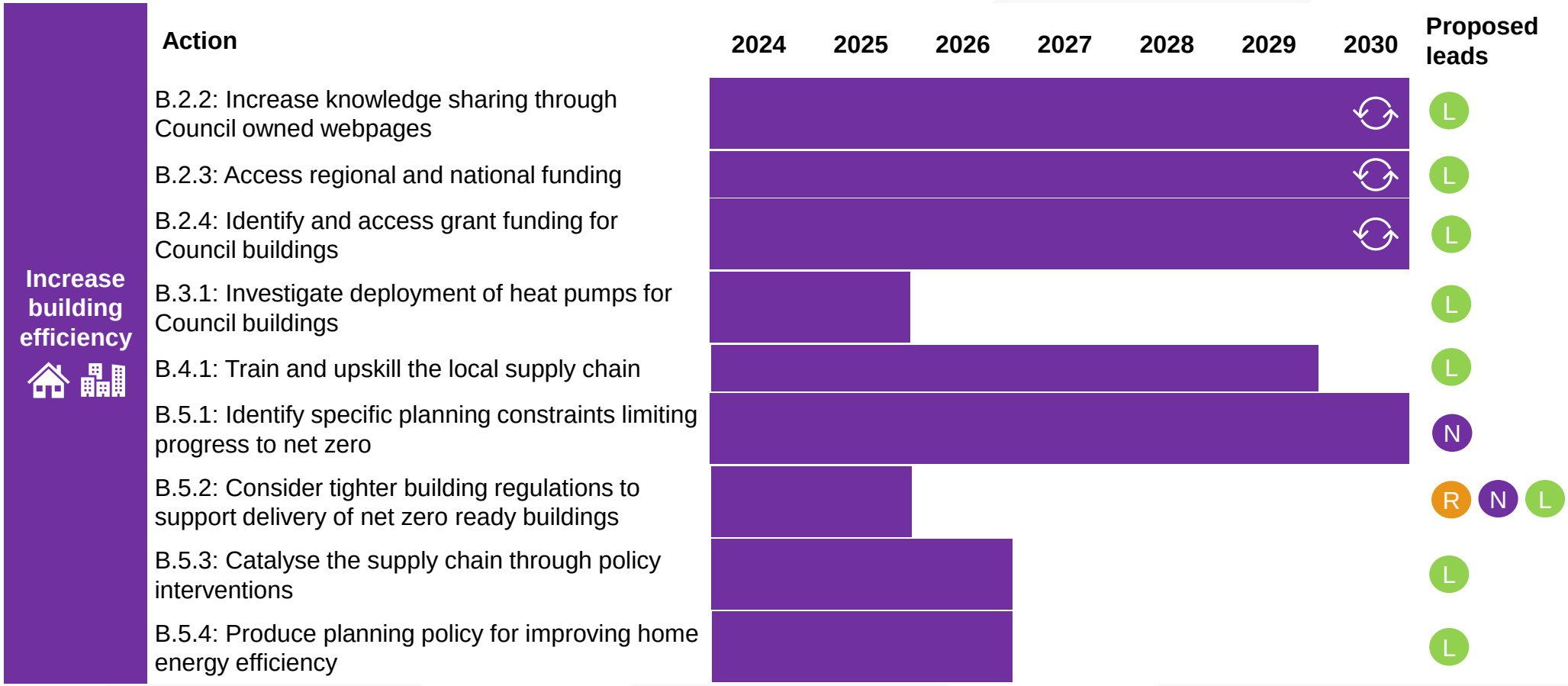
Increase building efficiency

N Action will be implemented at a national scale, across all of Wales

R Action will be implemented at a regional scale, across CCR local authorities

L Action will be implemented at a local scale, across Vale of Glamorgan

Timescale for the action is ongoing



4. Action planning

Sponsors: Delivery partners:

Action routemap

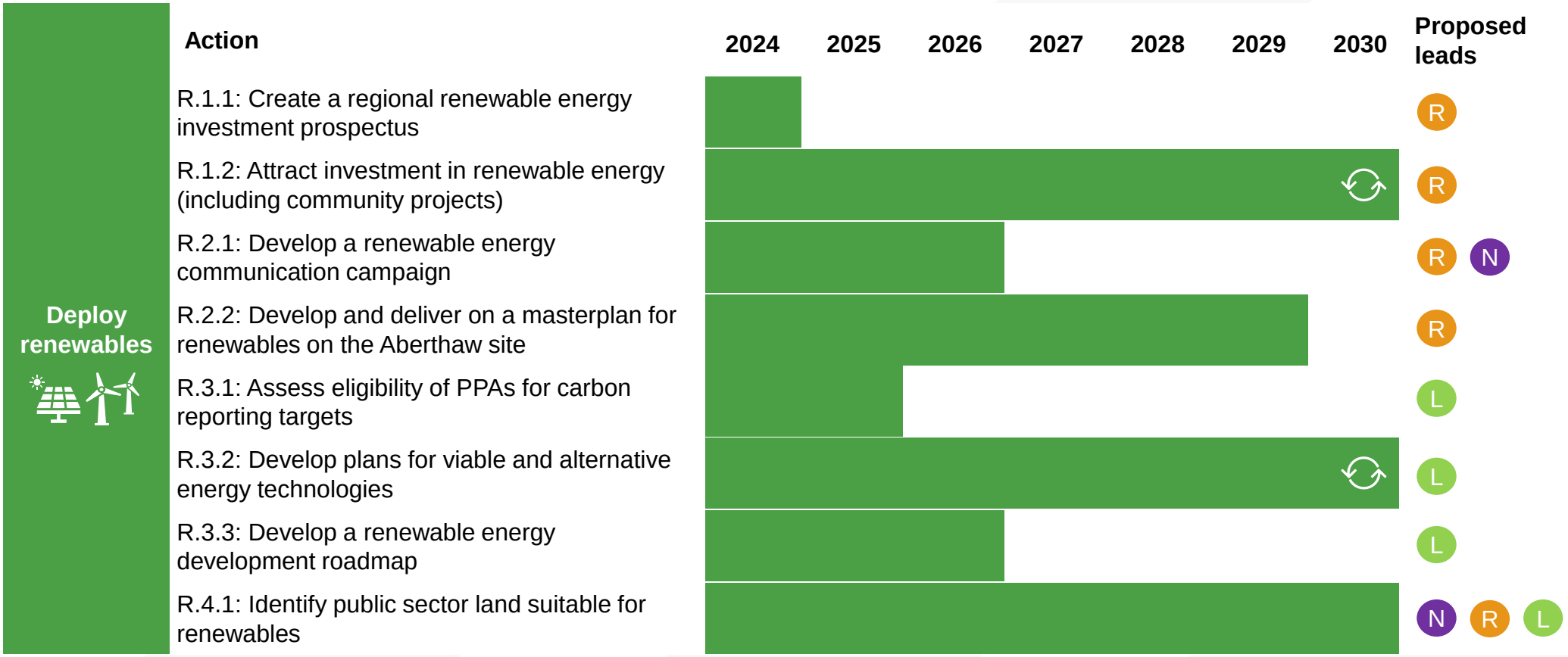
Deploy renewables

(N) Action will be implemented at a national scale, across all of Wales

(R) Action will be implemented at a regional scale, across CCR local authorities

(L) Action will be implemented at a local scale, across Vale of Glamorgan

Timescale for the action is ongoing



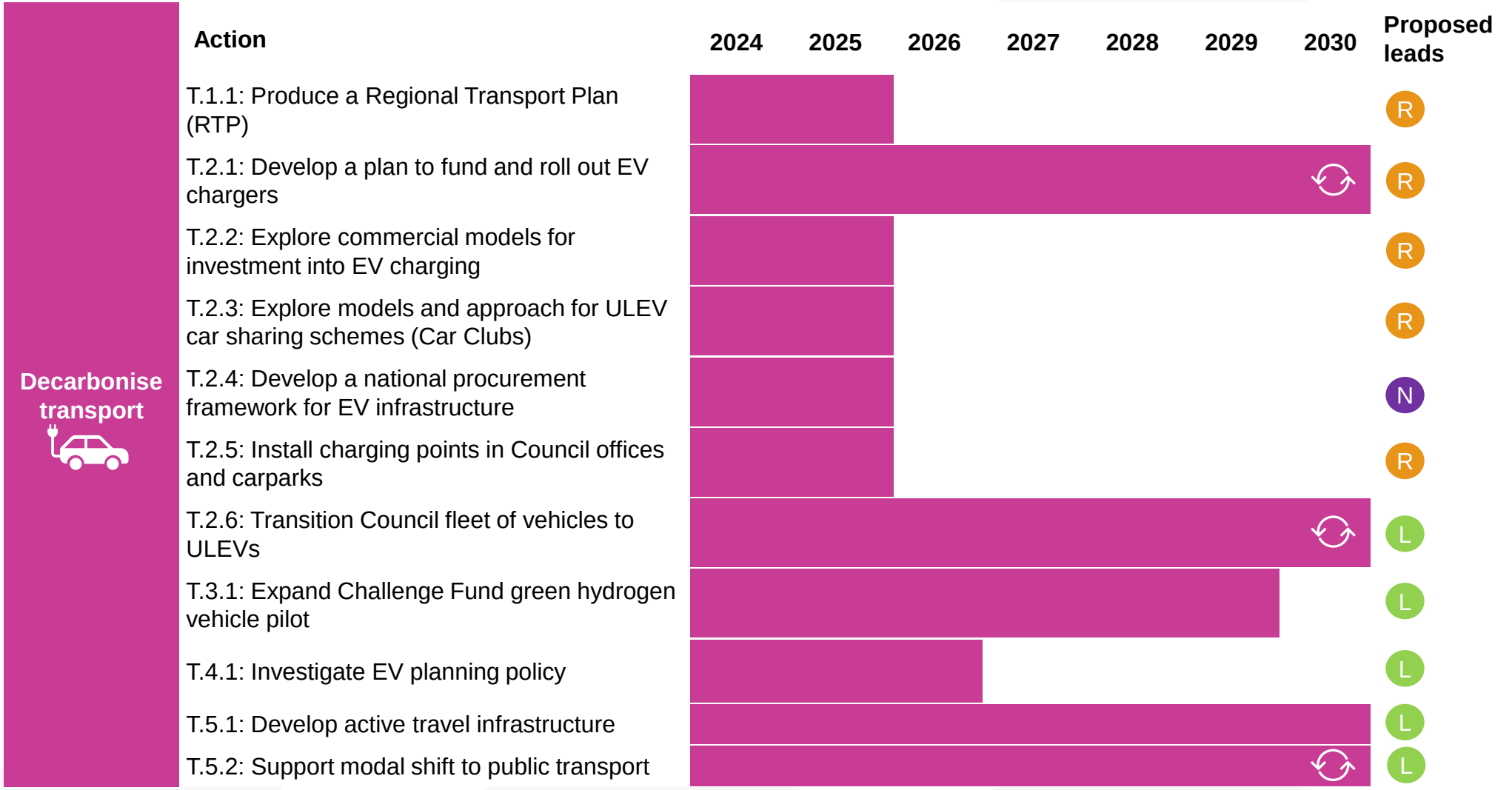
4. Action planning

Sponsors: Delivery partners:

Action routemap

Decarbonise transport

- (N) Action will be implemented at a national scale, across all of Wales
- (R) Action will be implemented at a regional scale, across CCR local authorities
- (L) Action will be implemented at a local scale, across Vale of Glamorgan
- Timescale for the action is ongoing



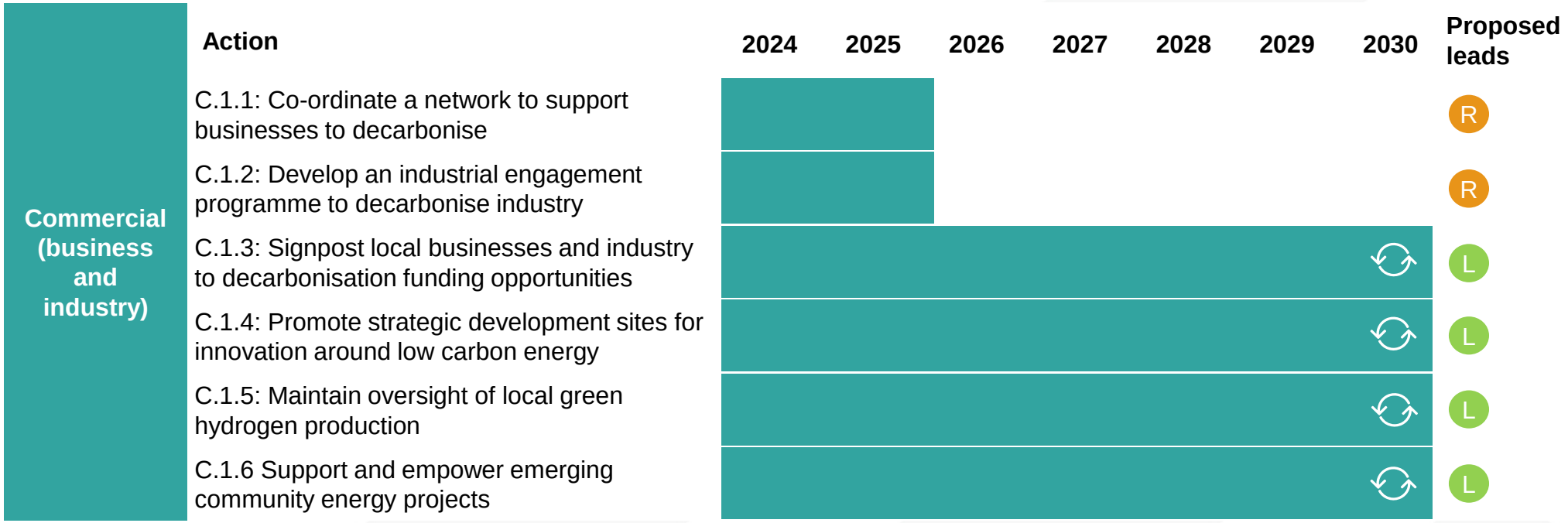
4. Action planning

Sponsors: Delivery partners:

Action routemap

Business and industry

- (N) Action will be implemented at a national scale, across all of Wales
- (R) Action will be implemented at a regional scale, across CCR local authorities
- (L) Action will be implemented at a local scale, across Vale of Glamorgan
- Timescale for the action is ongoing



4. Action planning

Sponsors: Delivery partners:

Action routemap

Innovation

- (N) Action will be implemented at a national scale, across all of Wales
- (R) Action will be implemented at a regional scale, across CCR local authorities
- (L) Action will be implemented at a local scale, across Vale of Glamorgan
- Timescale for the action is ongoing

	Action	2024	2025	2026	2027	2028	2029	2030	Proposed leads
Innovation	I.1.1: Develop plans for viable and alternative energy technologies e.g. heat networks, mine water, energy storage and hydrogen								R
	I.1.2: Creation of net zero clusters (Partnerships) across the region in key net zero themes as identified in the LAEPs.								R
	I.1.3: Identify opportunities for smart local energy systems								L R
	I.1.4: Investigate the feasibility of local heat networks								L

4. Action planning

Action routemap

Energy networks

Sponsors: *Delivery partners:*

Action will be implemented by Wales and West Utilities (WWU)

Action will be implemented by National Grid Distribution Network (NGED)

Action will be implemented at a national scale, across all of Wales

Action will be implemented at a regional scale, across CCR local authorities

Action will be implemented at a local scale, across Vale of Glamorgan

Timescale for the action is ongoing

Energy networks

Action	2024	2025	2026	2027	2028	2029	2030	Proposed leads
N.1.1: Provide data for forecasting to NGED and WWU							ongoing	R
N.1.2: Hold regular engagement meetings between the Vale of Glamorgan Council, NGED and WWU							ongoing	L
N.1.3: Consolidate project pipelines across electricity and gas networks								nationalgrid
N.2.1: Inform local authorities about our available data resources							ongoing	nationalgrid
N.2.2: Respond to consultations in support of required investment							ongoing	L
N.2.3: Include new projects from the LAEP in strategic planning process								nationalgrid
N.3.1: Highlight gas infrastructure opportunities							ongoing	
N.3.2: Include new projects from the LAEP in strategic planning process								

4. Action planning

Action routemap

Energy networks

Sponsors: *Delivery partners:*

Action will be implemented by Wales and West Utilities (WWU)

Action will be implemented by National Grid Distribution Network (NGED)

N Action will be implemented at a national scale, across all of Wales

R Action will be implemented at a regional scale, across CCR local authorities

L Action will be implemented at a local scale, across Vale of Glamorgan

Timescale for the action is ongoing

Energy networks

Action	2024	2025	2026	2027	2028	2029	2030	Proposed leads
N.3.3: Support RIIO-GD3 Planning								L
N.3.4: Publish LAEP outputs onto DataMapWales								N
N.3.5: Make the network hydrogen ready								
N.4.1: Develop plans for a green hydrogen production facility								R
N.4.2: Develop a trade association and co-ordinate a regional market for hydrogen								R
N.4.3: Pilot projects for hydrogen, biomethane, flexibility and storage								
N.4.4: Adopt a low carbon hydrogen standard based on that of UK Gov to feed into hydrogen permitting								N
N.4.5: Investigate hydrogen transport demand								

Vale of Glamorgan LAEP

Chapter 5: Next steps

Vale of Glamorgan

5. Next steps

Our LAEP in the context of programmes and projects

Our LAEP gives us a good understanding of the current state of our local energy system, and what it will take to decarbonise it. We have set out a plan of action for the next few years, and intend on delivering this subject to sufficient political, and financial support.

We have assessed each proposition against the diagram to the right in terms of which stage of the development journey it is at. To take each proposition to delivery, programmes and projects will need to go through the entire journey.

Figure 3.8 shows how projects move from context and vision setting, to procurement and project delivery.

Stage 0 Context setting: This stage involves understanding the context, key challenges, strategic objectives as well as our role to support delivery.

Stage 1 Delivery option assessment: This stage involves the initial options exploration with the defining of potential long list commercial options, an appropriate evaluation framework and initial market testing.

Stage 2 Detailed project development (including market testing): Following the initial long listing exercise, detailed development of a shortlist of potential commercial options will be developed and tested with the market. This process will be iterative, as options will be refined based on feedback from the market as well as commercial and technical limitations.

Stage 3 Procurement and project delivery: Stage will include selection of the commercial delivery option which best delivers the objectives and is commercially deliverable. This will be taken forward to procurement (if required) and subsequent delivery.

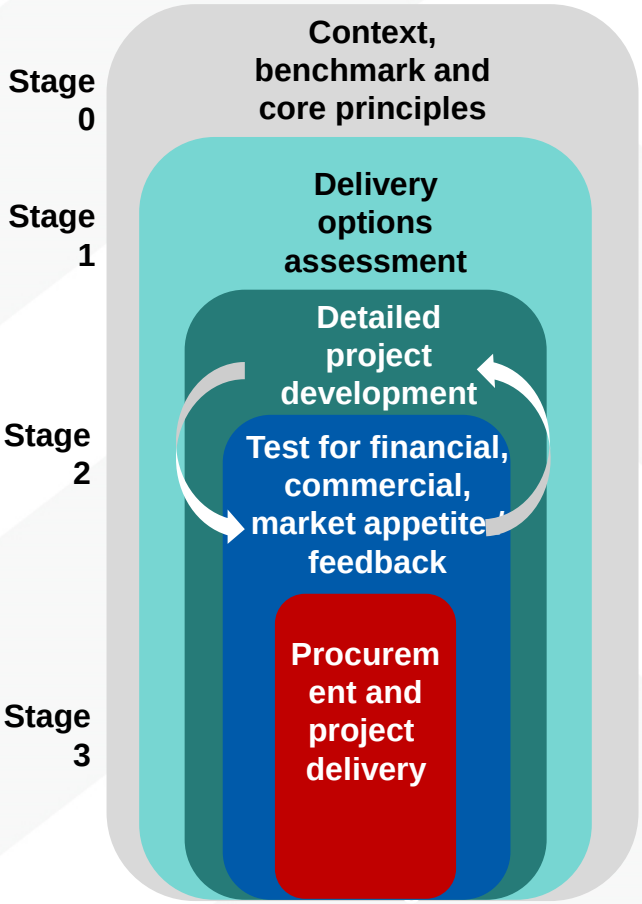


Figure 5.1: How programmes and projects develop

5. Next steps

Enabling conditions for success

Governance

At a local level, the delivery of our LAEP will be overseen by the Council's Project Zero Board and the Cardiff Capital Region.

Recognising the number of different stakeholders who play an important role in delivering the change that will be required to meet the objectives and actions set out in this plan, as a lead stakeholder the Council will work with the Cardiff Capital Region and partners across different sectors. The Cardiff Capital Region will lead on developing and setting up a governance structure that will enable wider input in the plan.

To deliver this, the Vale of Glamorgan Council will decarbonise assets within the Council's direct control, such as Council buildings and the Council's transport fleet. Further, the Council will drive and influence the decarbonisation of the wider area through showcasing, collaborating, and engaging industry and the community.

- Helping to identify the priorities alongside a stakeholder group.
- Helping to identify and monitor potential risks.
- Helping to monitor timelines.
- Helping to monitor the quality of the project as it develops.

We are involved in a range of projects, initiatives, and partnerships with different levels of control. Some of these examples are shown on page 32.

Across the CCR, we see synergies in terms of the propositions chosen. We believe there will be efficiencies in undertaking many of the programmes and projects forward regionally and/or nationally.

If funding allows, the Council will look to recruit or purchase additional expertise to support decarbonisation activities to help drive actions emerging from the LAEP.

Our sphere of influence would include:

- Seeking finance to support the LAEP actions.
- Raising awareness and sharing good practice.
- Helping to define and achieve the project outcomes.
- Acting as a lead partner in the development of a local stakeholder delivery group.

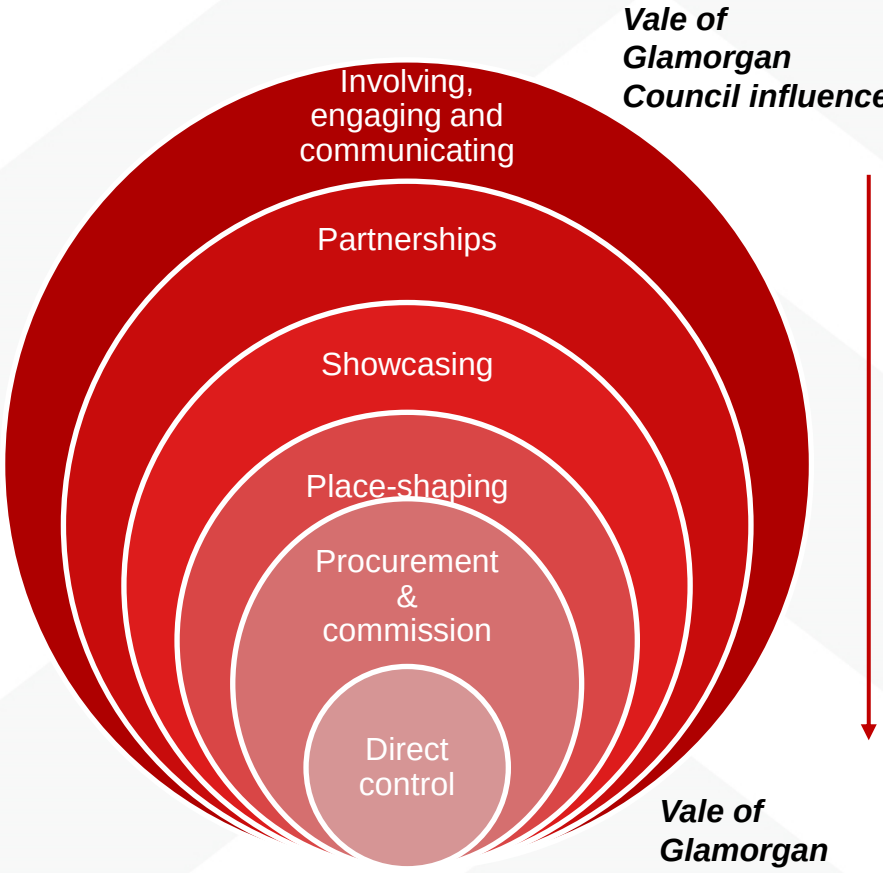


Figure 5.2: Local Authority roles and level of influence

5. Next steps

Enabling conditions for success

Monitoring and review

This plan sets out our key actions for the first five years that will set us on the right journey to achieve the ambitions in our longer-term routemap. The plan needs to be flexible to adapt to changes in the future.

Working across the region, the Cardiff Capital Region will develop a consistent performance management framework and facilitate monitoring and review of the LAEPs across the region (see action E.1.2). An annual monitoring report will be produced, building on the Welsh Government's Energy Generation in Wales reports[M61], which will describe our progress against the actions set out in this plan and also against key output metrics as follows:

- Number of homes retrofitted
- Number of non-domestic buildings retrofitted
- Number of EV charging points installed
- Total installed capacity of renewables such as solar PV and onshore wind
- Heat pumps installed
- Number of low carbon energy innovations.

To monitor these metrics, CCR will make use of publicly available datasets such as the DFES reports undertaken by NGED[MC70], Energy Performance Certificate Register[M72], the Micro Generation Certification Scheme[M73] and the Renewable Energy Planning Database[M62].

CCR will develop a baseline understanding of these metrics based on existing data and monitor changes annually.

GHG emission reduction for the area will be tracked as part of the annual reporting process which will be in addition to the Welsh Government public sector reporting that we undertake as a local authority. We recognise that available data will lag a few years behind.

The whole plan will be updated at least every five years to take account of key factors, including policy changes at a UK and Welsh Government level, changes in costs and the effectiveness of technologies.

Sponsors:

Delivery partners:

Finance

The Cardiff Capital Region will develop a business plan which will include funding arrangements to support the delivery of the LAEPs across the region. This may be from usual capital markets or through more innovative financing mechanisms, such as community municipal investments, Pay As You Save, or netmetering. Innovative finance options to be explored for individual energy consumers include green mortgages.

5. Next steps

Sponsors:

Delivery partners:

What are we going to do first

Acting as a lead stakeholder and continuing from the LAEP engagement process, the Council will mobilise a key stakeholder delivery group. This will be a group consisting of a variety of partners listed on P26 but also those who have key influence in being able to deliver LAEP actions. We will look to raise awareness of the LAEP, aligning it with our Project Zero Climate Challenge Plan, focussing on the quick wins.

We are energised by the LAEP development process and are keen to continue engaging with local and regional stakeholders to capitalise on the traction developed.

What do we want from others?

We can't decarbonise the energy system on our own, while we might have influence over our local system, we do not own it all and we are reliant on others to support the decarbonisation of the Vale of Glamorgan. We need others to undertake actions assigned to them and to work with us.

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Glossary of terms

Term	Definition or meaning
Action	The process of doing something – a specific action assigned to a responsible person preferably with a date to be completed.
Anaerobic Digestion	Processes biomass (plant material) into biogas (methane) that can be used for heating and generating electricity.
Baseline	The baseline is the data showing the current energy system, containing the 2019 data sets provided by the LA and publicly available data.
Batteries	Devices that store electrical energy to be used at a later time.
Biomass boiler	A boiler which burns wood-based fuel (e.g. logs, pellets, chippings) to generate heat and electricity.
Carbon Capture and Storage (CCS)	The process of capturing and then storing carbon emissions before they enter the atmosphere.
Carbon neutral	Balancing anthropogenic carbon emissions with removals or offsets over a specified period. No emissions reduction is necessary
Cardiff Capital Region	The Cardiff Capital Region, that covers the 10 local authority areas covering South East Wales -Blaenau Gwent; Bridgend; Caerphilly; Cardiff; Merthyr Tydfil; Monmouthshire; Newport; Rhondda Cynon Taf; Torfaen; and Vale of Glamorgan.
Certainties	A fact that is definitely true or an event that is definitely going to take place. In terms of a local energy system, certainties include funded projects, etc.
Demand	Local energy demand that the local energy system needs to meet.
Demand headroom	The difference between the electrical capacity of a substation, and the electricity demand at the substation at the time of peak demand.

Glossary of terms

Term	Definition or meaning
Deployment modelling	A model investigating rates by which to deploy specific technologies between the baseline year and 2050 to achieve the end state developed by the optimisation model for each scenario. The model considers broader plan objectives and local, regional, and national strategic priorities, policies, and targets to help us to define a suitable level of ambition and inform an action plan.
Dispatchable energy generation	Energy generation that can turn on and off (i.e. isn't controlled by the weather) – this is likely to be gas turbines of some sort.
Distribution network	Takes energy from transmission network and delivers it to users via pipes or wires at low pressure / voltages.
Electricity network	Interconnected infrastructure which consists of power stations, electrical substations, distribution lines and transmission lines. The network delivers electricity from the producers to consumers.
Electrolyser	A piece of equipment that uses electricity to split water into hydrogen and oxygen.
Energy Proposition	A proposition is an energy component with a scale and a timescale. For instance, X MW of wind turbine to be built in 5 years, 10,000 buildings to retrofit with XX by 2030, or a pilot project such as hydrogen storage innovation. These are typically near term, low regrets energy components that are needed in future energy systems (it is likely that these appear in all scenarios).
Energy System Component	A term used to describe anything that can have a direct impact on energy demand and/or the way energy is supplied. E.g. installing retrofit measures can reduce overall heating demand, increasing solar PV capacity can change the supply mix and the way that the energy system operates.
Focus zone	A modelling zone which has been identified as an area in which to target near-term installation, upgrade, retrofit, or other activities related to a specific energy system component.

Glossary of terms

Term	Definition or meaning
Generation	Local generation – size below 100MW.
Generation headroom	Generation headroom in a local authority's electricity distribution network refers to the remaining primary substation capacity at the time of peak generation, crucial for maintaining a stable and reliable power supply to meet the community's needs
Grid electricity	Electricity that is supplied by the electricity network.
Grid substation	The physical equipment comprising a substation with a 132kV-33kV transformer(s) connecting the grid-level, extra high voltage electricity lines to the primary-level, high voltage electricity lines. The grid substation facilitates connection with the national grid.
Heat network	A distribution system of insulated pipes that takes heat from a central source and delivers it to a number of domestic or non-domestic buildings.
Heat pump	A piece of equipment that uses a heat exchange system to take heat from air, ground or water and increases the temperature to heat buildings.
Hydrogen	A flammable gas that can be burned, like natural gas, to generate heat or power vehicles. The by-product is water only, no carbon.
Infrastructure	Local energy distribution infrastructure, includes storage assets if these are at grid level.
Landfill gas	Gases such as methane that are produced by micro-organisms in a landfill site that can be used as a source of energy.
Lever	We use the term policy levers to refer to the 'governing instruments' (Kooiman, 2003) which the state has at its disposal to direct, manage and shape change in public services.

Glossary of terms

Term	Definition or meaning
Local energy system	The distribution level energy system, excludes the transmission and national assets.
Longer-term options	The likely outcome of these is less certain and dependent upon actions and decisions being made that are not under our control, e.g. a national policy or the capability / availability of a technology.
Major industrial load	The power demand of industrial sites in the 2019 NAEI Point Sources data are large enough to be classified as major industrial loads. Sites that aren't included in this database are likely too small to have a significant impact on the energy system singlehandedly.
Methane reformation	Process of producing hydrogen by heating methane from natural gas and steam, usually with a catalyst. Produces carbon dioxide as a by product.
Modelling zone	A specified area in our modelling which is the smallest level of granularity for analysis. The zones are used through energy modelling, deployment modelling, and mapping. Zones were created by intersecting the Local Authority boundary with the primary substation service area boundary, as described in the "Methodology - electricity and gas network infrastructure" section of the Technical Report. *May also be called "zone" or "substation zone" in the reports.*
National Asset	National infrastructure (can be supply or demand and the accompanying transmission / distribution infrastructure) – defined as over 100MW, unless it produces heat which can only be used locally this is generally excluded from LAEP particularly the modelling.
National grid	A generic term used in the reports referring to the electricity network serving Wales, including both the transmission and distribution networks and facilitating the flow of electricity between neighbouring areas or regions. *May also be called generically "grid" in the reports.*

Glossary of terms

Term	Definition or meaning
National Net Zero	The National Net Zero modelled in the LAEP. Details of assumptions are in the methodology section.
Natural Heritage	This includes features which are of ecological, geological, geomorphological, hydrological or visual amenity importance within the landscape, and which form an essential part of the functioning of the natural environment and natural assets of RCT.
Net Zero	Balancing greenhouse gas emissions with removals or offsets over a specified period. Net Zero requires a reduction of GHG emissions in line with the Paris Agreement. Net zero when used in this LAEP is the energy net zero as it does not include all emissions, only energy emissions.
No regrets/ low regrets	Options which are common to all scenarios, cost-effective, provide relatively large benefits, and are very likely to be important parts of the future energy system, regardless of future uncertainty.
Optimisation modelling	Modelling to create the most cost and carbon optimal system.
Outward code	The first part of a postcode i.e. BS1.
Pathway	A pathway is how we get from the current energy system, to the most likely net zero end point. The pathway will consider what is needed from across the scenarios, the supply chain, number of installers etc. The propositions will make up the more certain part of the pathway, whereas the longer-term energy components will need further definition in the future.
Power factor	The ratio between useful power (kW) and apparent power (kVA) consumed or transformed by electrical equipment.

Glossary of terms

Term	Definition or meaning
Primary substation	The physical equipment comprising a substation with a 33kV-11kV transformer(s) connecting the primary-level, high voltage electricity lines to the consumer-level, low voltage electricity lines.
Primary substation service area	The area bounding the buildings or other electricity demands which are served by a primary substation (or, in ANW, a group of primary substations acting together to serve one area).
Programme	A series of projects, usually with a theme, that is run collectively.
Project	Strategic scale projects being implemented or planned for implementation in the local energy system that will significantly affect local demand or local supply.
Quick win projects	Very short-term actions, certain as no major blockers.
Resistance heating/ heater	Generate heat by passing electrical currents through wires.
Scenario	A scenario is a set of assumptions for a particular end point (usually 2050) which are modelled in our optimisation model. We modelled 5 different scenarios to see what was common across the scenarios and therefore is a “no regrets” measure, and what changed between the modelled scenarios.
Solar PV	Convert solar radiation into electricity using photovoltaic (PV) cells.

Glossary of terms

Term	Definition or meaning
Strategic objective	Strategic objectives are purpose statements that help create an overall vision and set goals and measurable steps to achieve the desired outcome. A strategic objective is most effective when it is quantifiable either by statistical results or observable data. Strategic objectives further the vision, align goals and drive decisions that impact change.
Sewage gas	A mixture of gases generated in sewer systems, used in a reciprocating gas engine to produce heat and electricity.
Strategic options	Strategic options are longer-term changes to demand, generation and infrastructure that will lead onto decarbonisation of the local energy system - and the key variables that determine scenarios.
Substation upgrades	Interventions at an existing primary substation designed to increase the capacity of the substation, such as upgrading an existing primary substation or installing a new primary substation. *May also be called 'substation interventions' in the reports.*
Supply	Energy supply options – this is how energy is delivered from the point of source – so a supply option would be solar PV.
Supply/generation headroom	The difference between the electrical capacity of a substation, and the power being supplied to the substation at a given time.

Glossary of terms

Term	Definition or meaning
Transmission network	Move energy via pipes or wires for long distances around the country at high pressure/ voltages.
Uncertainties	Uncertainty results from lack of information or from disagreement about what is known or even knowable.
We	The range of people and organisations in the Vale of Glamorgan who will support the ambition and take action.
Wind power	Harnessing the kinetic energy of wind to turn a turbine to generate electricity.

Units of measure

Unit	Definition or meaning
°C	Degree(s) Celsius – a unit of temperature on the Celsius scale.
GWh	Gigawatt hour(s) – a unit of energy representing 1 billion watt-hours.
kgCO2e	Kilogram(s) of carbon dioxide equivalents – a unit of measurement for greenhouse gas warming potential, expressing the equivalent weight of carbon dioxide with the same global warming potential.
ktCO2e	Kilotonne(s) of carbon dioxide equivalents - a unit of measurement for greenhouse gas warming potential, expressing the equivalent weight of carbon dioxide with the same global warming potential. Represents 1 million kgCO2e.
kV	Kilovolt(s) – a unit of potential energy of a unit charge in a point of a circuit relative to a reference (ground) representing 1000 volts.
kW	Kilowatt(s) – a metric unit of power measuring rate of energy consumption or production representing 1000 watts.
kWh	Kilowatt hour(s) - a unit of energy representing 1000 watt-hours.
kWp	Peak kilowatt(s) – the maximum power rating possible produced by an energy generation source (i.e., amount of power produced in ideal generation conditions).
MVA	Mega volt amp(s) – a metric unit of apparent power measuring rate of energy consumption or production and considering the efficiency by which electrical power is converted into useful output. It is related to MW by the power factor of the system or equipment.
MW	Megawatt(s) – a metric unit of power measuring rate of energy consumption or production representing 1 million watts.
MWe	Megawatt(s) electric – a unit of electric power output from a generation source representing 1 million watts electric.

Units of measure

Unit	Definition or meaning
MWth	Megawatt(s) thermal – a unit of thermal power output from a generation source representing 1 million watts thermal.
MWh	Megawatt hour(s) - a unit of energy representing 1 million watt-hours.
tCO_2 per capita	Tonne(s) of carbon dioxide per capita – a unit of mass of carbon dioxide emitted per member of a population per year. Represents 1000 $kgCO_2$ per capita.

Bibliography

ID number	Reference
M01	[1] Energy Systems Catapult (2024) The future of Local Area Energy Planning in the UK. Available at: https://es.catapult.org.uk/report/the-future-of-local-area-energy-planning-in-the-uk/ [2] Energy Systems Catapult (2024) Guidance on creating a Local Area Energy Plan. Available at: https://es.catapult.org.uk/guide/guidance-on-creating-a-local-area-energy-plan/
M02	Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy (2021) Net Zero Strategy: Build Back Greener. Available at: https://www.gov.uk/government/publications/net-zero-strategy
M03	Welsh Government (2021) Net Zero Wales Carbon Budget 2 (2021-25) . Available at: https://www.gov.wales/sites/default/files/publications/2021-10/net-zero-wales-carbon-budget-2-2021-25.pdf
M04	Energy Systems Catapult (2024) Homepage. Available at: https://es.catapult.org.uk/
M05	Welsh Government (2024) Data Map Wales, Data and maps from the Welsh public sector. Available at: https://datamap.gov.wales/
M06	Welsh government (2015) Well-being of Future Generations (Wales) Act 2015: the essentials. Available at: https://www.gov.wales/well-being-future-generations-act-essentials-html
M07	Legislation (2016) Environment (Wales) Act 2016. Available at: https://www.legislation.gov.uk/anaw/2016/3/contents/enacted OR Welsh Government (2019) Environment (Wales) Act 2016: factsheets. Available at: https://www.gov.wales/environment-wales-act-2016-factsheets
M08	Ofgem (2021) Network price controls 2021-2028 (RIIO-2) . Available at: https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/network-price-controls-2021-2028-riio-2/gas-distribution-price-control-2021-2026-riio-gd2

Bibliography

ID number	Reference
M09	Welsh Parliament, Osian Bowyer (2022) Collaboration nation: what are Corporate Joint Committees and what will they do? Available at: https://research.senedd.wales/research-articles/collaboration-nation-what-are-corporate-joint-committees-and-what-will-they-do/ OR Welsh Government (2021) Consultation on the Corporate joint committees: draft statutory guidance. Available at: https://www.gov.wales/consultation-corporate-joint-committees-draft-statutory-guidance-html
M10	Ofgem (2021) Network price controls 2021-2028 (RIIO-2) . Available at: https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/network-price-controls-2021-2028-riio-2/electricity-distribution-price-control-2023-2028-riio-ed2
M11	Ofgem (2023) Decision on frameworks for future systems and network regulation. Available at: https://www.ofgem.gov.uk/publications/decision-frameworks-future-systems-and-network-regulation
M12	Ogem (2023) Decision on future of local energy institutions and governance. Available at: https://www.ofgem.gov.uk/publications/decision-future-local-energy-institutions-and-governance
M13	Welsh Government (2019) Prosperity for all: a low carbon Wales. Available at: https://www.gov.wales/prosperity-all-low-carbon-wales
M14	Welsh Government (2021) Tackling fuel poverty 2021 to 2035, A plan to support people struggling to meet the cost of their domestic energy needs. Available at: https://www.gov.wales/tackling-fuel-poverty-2021-2035-html
M15	Welsh Government (2023) Heat strategy for Wales. Available at: https://www.gov.wales/heat-strategy-wales
M16	Welsh Government (2019) Future Wales: the national plan 2040. Available at: https://www.gov.wales/future-wales-national-plan-2040
M17	Welsh Government (2018) Planning policy Wales. Available at: https://www.gov.wales/planning-policy-wales
M18	Welsh Government (2022) Stronger, fairer, greener Wales: a plan for employability and skills. Available at: https://www.gov.wales/stronger-fairer-greener-wales-plan-employability-and-skills

Bibliography

ID number	Reference
M23	Welsh Government (2023) Electric vehicle charging: strategy and reports. Available at: https://www.gov.wales/electric-vehicle-charging-strategy-and-reports
M26	J. James (2023) Written Statement: Publication of Summary of Responses to the Consultation on Wales's Renewable Energy Targets. Available at: https://www.gov.wales/written-statement-publication-summary-responses-consultation-wales-renewable-energy-targets
M40	Department for Business,Energy and Industrial Strategy (2022) Subnational Electricity and Gas Consumption Statistics. Available at: https://assets.publishing.service.gov.uk/media/63a31383e90e075875eae2e7/subnational_electricity_and_gas_consumption_summary_report_2021.pdf
M41	Age UK (2021) The cost of cold. Available at: https://www.ageuk.org.uk/our-impact/campaigning/the-cost-of-cold/
M42	CAG Consultants (2021) Devon Community Energy: Socio Economic Impact Assessment. Available at: https://cagconsultants.co.uk/wp-content/uploads/2021/06/Final-Report-March2021.pdf
M43	Department for Transport (2020) Find and use data on public electric vehicle chargepoints. Available at: https://www.gov.uk/guidance/find-and-use-data-on-public-electric-vehicle-chargepoints
M44	Department for Business, Energy and Industrial Strategy, Department for Energy Security and Net Zero and Prime Minister's Office, 10 Downing Street (2022) British energy security strategy. Available at: https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy#hydrogen
M45	HM Government (2021) UK Hydrogen Strategy. Available at: https://assets.publishing.service.gov.uk/media/64c7e8bad8b1a70011b05e38/UK-Hydrogen-Strategy_web.pdf
M46	Department for Levelling Up, Housing and Communities (2023) The Future Homes and Buildings Standards: 2023 consultation. Available at: https://www.gov.uk/government/consultations/the-future-homes-and-buildings-standards-2023-consultation
M47	Welsh Government (2021) Welsh Development Quality Requirements 2021, creating beautiful homes and places. Available at: https://www.gov.wales/sites/default/files/publications/2021-08/development-quality-requirements-for-housing-associations.pdf

Bibliography

ID number	Reference
M48	Welsh Government (2023) Welsh Housing Quality Standard 2023. Available at: https://www.gov.wales/welsh-housing-quality-standard-2023-0
M49	Welsh Government (2021) Climate change targets and carbon budgets. Available at: https://www.gov.wales/climate-change-targets-and-carbon-budgets
M51	Legislation (2015) The Energy Efficiency (Private Rented Property) (England and Wales) Regulations 2015. Available at: https://www.legislation.gov.uk/uksi/2015/962/contents/made
M53	Department for Transport, Office for Zero Emission Vehicles and A. Browne MP (2024) Pathway for zero emission vehicle transition by 2035 becomes law. Available at: https: https://www.gov.uk/government/news/pathway-for-zero-emission-vehicle-transition-by-2035-becomes-law#:~:text=The%20zero%20emission%20vehicle%20(%20ZEV,increasing%20to%20100%25%20by%202035.
M54	Welsh Government (2021) Net zero carbon status by 2030, a route map for decarbonisation across the Welsh public sector. Available at: https://www.gov.wales/sites/default/files/publications/2021-07/a-route-map-for-decarbonisation-across-the-welsh-public-sector.pdf
M61	Welsh Government (2021) Energy generation in Wales: 2021. Available at: https://www.gov.wales/energy-generation-wales-2021
M62	Department for Business, Energy and Industrial Strategy (2022) Renewable Energy Planning Database (REPD) . Available at: https://www.data.gov.uk/dataset/a5b0ed13-c960-49ce-b1f6-3a6bbe0db1b7/renewable-energy-planning-database-repd
M63	Welsh Government (2021) The Co-operating Agreement: full policy programme. Available at: https://www.gov.wales/co-operation-agreement-full-policy-programme-html
M65	Office for National Statistics (2023) Car or van availability. Available at: https://www.ons.gov.uk/datasets/TS045/editions/2021/versions/1/filter-outputs/80cf8ca0-0455-4907-94f0-01e8736f2331#get-data
M66	Carbon Hwb (2024) About. Available at: https://zerocarbonhwb.cymru/about/
M67	Welsh Government (2023) Optimised RetroFit Programme. Available at: https://www.gov.wales/optimised-retrofit-programme

Bibliography

ID number	Reference
M68	InfoBaseCymru (2022) Carbon emissions. Available at: https://www.infobasecymru.net/IAS/themes/environmentandsustainability/environment/tabular?viewId=518&geoId=1&subsetId
M72	Department for Levelling Up, Housing & Communities (2024) Energy Performance of Buildings Data: England and Wales. Available at: https://epc.opendatacommunities.org/
M73	MCS Certified (2023) Micro Generation Certification Scheme. Available at: https://mcscertified.com/
M74	Department for Business, Energy & Industrial Strategy (2019) UK becomes first major economy to pass net zero emissions law. Available at https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law
MC31	Welsh Government (2021) Regional energy strategy: Cardiff capital region. Available at: https://www.gov.wales/regional-energy-strategy-cardiff-capital-region
MC32	Cardiff Capital Region Skills Partnership (2019) Employment and Skills Plan 2019-22. Available at: https://businesswales.gov.wales/skillsgateway/sites/skillsgateway/files/documents/2020_02_005%20Cardiff%20Capital%20Region%20Skills%20Partnership%20Employment%20and%20Skills%20Plan%202019%20-%202022..pdf
ML01	Vale of Glamorgan Project Zero (2021) Vale of Glamorgan Council Climate Change Challenge Plan. Available at: https://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Consultation/Project-Zero-Challenge-Plan.pdf
ML02	Vale of Glamorgan Council (2020) Vale of Glamorgan Corporate Plan. Available at: https://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Corporate-Plan/Corporate-Plan-2020-25/Corporate-Plan-2020-2025.pdf
ML03	Vale of Glamorgan Council (2017) Vale of Glamorgan Local Development Plan. Available at: https://www.valeofglamorgan.gov.uk/Documents/Living/Planning/Policy/LDP/LDP-Adoption/Adopted-LDP-Written-Statement-June-2017-final-interactive-web-version.pdf https://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Corporate-Plan/Corporate-Plan-2020-25/Corporate-Plan-2020-2025.pdf

Bibliography

ID number	Reference
ML04	Vale of Glamorgan Council (2024) Vale of Glamorgan Replacement Local Development Plan. Available at: https://www.valeofglamorgan.gov.uk/en/living/planning_and_building_control/Planning/planning_policy/RLDP/Replacement-Local-Development-Plan.aspx
ML05	Welsh Government, Stats Wales (2019) Population estimates by local authority and year. Available at: https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Estimates/Local-Authority/populationestimates-by-localauthority-year
ML06	Welsh Government (2023) Fuel poverty in Wales: interactive dashboard. Available at: https://www.gov.wales/fuel-poverty-interactive-dashboard
ML07	Department for Energy Security and Net Zero (2023) UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2021. Available at: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-national-statistics-2005-to-2021
ML08	Welsh Government (2022) Commuting patterns by Welsh local authority and measure. Available at: https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Commuting/CommutingPatterns-by-WelshLocalAuthority-Measure
ML09	Office for National Statistics (2021) How life has changed in the Vale of Glamorgan: Census 2021. Available at: https://www.ons.gov.uk/visualisations/censusareachanges/W06000014/
ML10	Vale of Glamorgan (2021-2030) Vale of Glamorgan Council Climate Change Challenge Plan. Available at: https://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Consultation/Project-Zero-Challenge-Plan.pdf
ML11	Vale of Glamorgan (2023) Project Zero Update Report. Available at: https://www.valeofglamorgan.gov.uk/Documents/_Committee%20Reports/Scrutiny-ER/2023/23-06-20/Project-Zero-Update-Report.pdf
ML12	Wardell Armstrong (2023) Vale of Glamorgan Council Renewable Energy Assessment. Available at: https://valeofglamorgan.oc2.uk/docfiles/26/BP15%20Renewable%20Energy%20Asessment%20(Wardell%20Armstrong).pdf

Bibliography

ID number	Reference
ML13	Office for National Statistics (2022) Population estimates for England and Wales: mid-2022. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/populationestimatesforenglandandwales/mid2022
ML14	Vale of Glamorgan Council (2024) Enterprise Zones. Available at: https://www.valeofglamorgan.gov.uk/en/working/Business-Support/Enterprise-Zones.aspx
ML15	Vale of Glamorgan Council (2024) Bathing Waters. Available at: https://www.valeofglamorgan.gov.uk/en/enjoying/Coast-and-Countryside/Bathing-Waters.aspx#:~:text=The%20designated%20bathing%20waters%20in%20the%20Vale%20are%3B,The%20Knap%20Col-Huw%20%28Llantwit%20Major%29%20Dunraven%20Bay%20%28Southerndown%29
ML16	Varbes (2024) Economy of Vale of Glamorgan. Available at: https://www.varbes.com/economy/vale-of-glamorgan-economy
ML17	Vale of Glamorgan Council (2020) Delivering net-zero carbon schools fit for future generations. Available at: https://www.valeofglamorgan.gov.uk/Documents/Working/Education%20and%20Skills/21st-Century-Schools/Vale-Net-Zero-Carbon-School-Journey-Document-English.pdf