Local Area Energy Plan (LAEP)

Torfaen

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

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This Local Area Energy Plan was prepared by Arup, Carbon Trust and Afallen on behalf of Torfaen County Borough Council and co-ordinated across the region by 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.

Abbreviations

Sponsors: Delivery partners:

Acronym	Definition or meaning
ANW	Ambition North Wales
BEIS	Business, Energy and Industrial Strategy
CAPEX	Capital Expenditure
CCGT	Combined Cycle Gas Turbine
CCR	Cardiff Capital Region
CCUS	Carbon Capture, Utilisation and Storage
CPO	Charge Point Operator
COP	Coefficient of Performance
DESNZ	Department for Energy Security and Net Zero
DFES	Distribution Future Energy Scenarios
DfT	Department for Transport
DNO	Distribution Network Operator
ECOFLEX	Flexible Eligibility Energy Company Obligation
ECR	Embedded Capacity Register
EfW	Energy from Waste

Acronym	Definition or meaning
EGW	Energy Generation in Wales
EPC	Energy performance certificate
ESC	Energy Systems Catapult
EV	Electric Vehicle
FES	Future Energy Scenarios
GDN	Gas Distribution Network
GHG	Greenhouse Gas
GIS	Geographic Information System
HGV	Heavy Goods Vehicles
LAEP	Local area energy planning or Local area energy plan
LDP	Local Development Plan
LGV	Light Goods Vehicles

Abbreviations

Sponsors: Delivery partners:

Acronym	Definition or meaning
LSOA	Lower super output area, a small area classification in the UK designed to have a comparable population.
LULUCF	Land Use, Land Use Change and Forestry.
MSOA	Middle super output area, a medium-sized area classification in the UK designed to have a comparable population.
NAEI	National Atmospheric Emissions Inventory.
NGED	National Grid Electricity Distribution.
NHS	National Health Service
NZ	Net Zero.
NWTM	North Wales Transport Model.
NZIW	Net Zero Industry Wales.
OPEX	Operational Expenditure.
OS	Ordnance Survey.
PEDW	Planning and Environment Decisions Wales
PRI	Pressuring Regulating Installation.

Acronym	Definition or meaning
RdSAP	Reduced data Standard Assessment Procedure.
REA	Renewable Energy Assessment.
REPD	Renewable Energy Planning Database.
REPEX	Replacement Expenditure.
RFI	Request for Information.
RIIO	Revenue = Incentives + Innovation + Outputs, a regulatory framework used by the UK energy regulator, Ofgem.
RLCEA	Renewable and Low Carbon Energy Assessment.
RSP	Regional Skills Partnership.
RTP	Regional Transport Plan.
SAP	Standard Assessment Procedure.
SEWBCC	Southeast Wales Business Climate Coalition.
SEWTM	Southeast Wales Transport Model.
SDP	Strategic Development Plan.

Abbreviations

Sponsors: Delivery partners:

Acronym	Definition or meaning
SLES	Smart Local Energy System.
SMR	Steam Methane Reformation.
SPEN	SP Energy Networks.
SSE	Scottish and Southern Energy plc.
SWIC	South Wales Industrial Cluster.
TEC	Transmission Embedded Capacity.
TfW	Transport for Wales.
ULEV	Ultra Low Emissions Vehicle
WIMD	Welsh Index of Multiple Deprivation.
WWU	Wales and West Utilities.
ZEV	Zero Emissions Vehicles

Local Area Energy Plan outline

Sponsors: Delivery partners:

This plan collates evidence to identify the most effective route for Torfaen's to reach a net zero energy system

Overview

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 Torfaen'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 was undertaken. This report will able available upon request.
3. **Renewable Investment Prospectus** highlights short-term, regional and local renewable energy opportunities that have the greatest potential for delivery across the 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.

The Council and the 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.

The actions in this report have been committed to by a range of stakeholders, and it is hoped these inspire you to take action yourself and help with the collaborative journey of transforming the energy system.

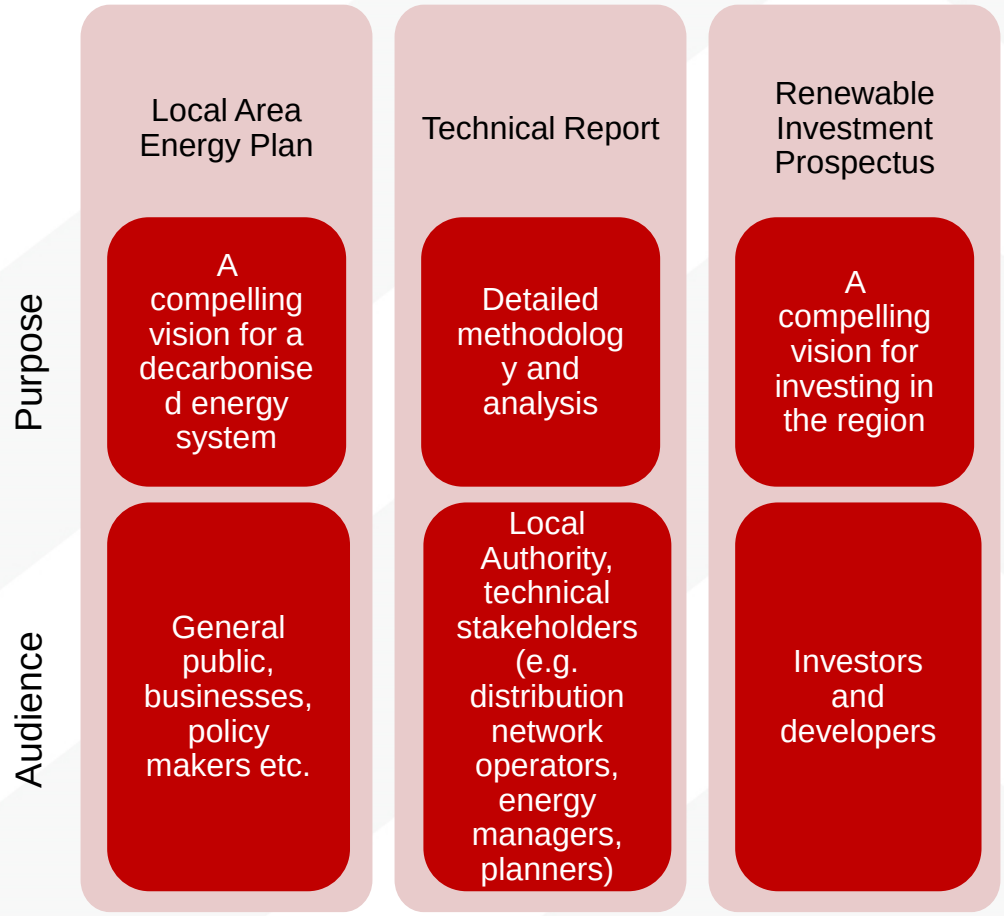


Figure 0.1: LAEP and support documents purpose and audience summary.

Executive summary

Torfaen has a vision to transition the local energy system to net zero

Sponsors: Delivery partners:

The vision for Torfaen's future local energy system is:

Torfaen County Borough Council will support the Cardiff Capital Region and Welsh Government to accelerate decarbonisation activities in South East Wales in line with our national and international obligations. We will also lead, support, facilitate and encourage our local communities, residents and businesses towards a fair transition to net zero by 2050, making the most of innovation, cross boundary partnerships and wider opportunities.

Energy objectives for Torfaen were collectively agreed and describe what needs to be done to create the enabling conditions needed to deliver this LAEP.

1. Make Torfaen more sustainable and connected by engaging with utility providers to ensure that strategic energy infrastructure can support the 2050 net zero energy pathway.

2. Make Torfaen more sustainable and connected by developing enabling infrastructure to support the model shift to zero emission transport.

3. Use procurement, assets and data smartly to create opportunities for supporting the net zero transition.

4. Work collaboratively to identify and co-ordinate skills investment and actions to support the transition to net zero.

5. Involve communities and businesses on the net zero journey by providing information, guidance and support.

6. Make Torfaen a great place to do business by encouraging innovation and entrepreneurial activities relating to our net zero pathway.

Energy proposals for Torfaen describe what needs to change between now and 2050 to decarbonise Torfaen's local energy system and achieve net zero by 2050.

Improve energy efficiency of existing buildings

Decarbonise transport

Decarbonise industry

Deploy onshore renewables

Reinforce and transition energy networks

Executive summary

Torfaen's net zero energy system vision

In 2019, Torfaen County Borough Council declared a climate emergency and committed to becoming a net zero council by 2030. The Council also recognised the important role it has in providing local leadership, collaborating with other organisations, businesses, the community and residents, as we all try to realise our net zero ambitions. Our journey will contribute greatly to the council's 2030 target, the Cardiff Capital Region Energy Strategy and Plan, in addition to the Welsh and United Kingdom targets to reach net zero by 2050.

This Local Area Energy Plan (LAEP) outlines a compelling vision for what a net zero carbon energy system could look like in 2050 for Torfaen. Drawing on a robust evidence base developed during the LAEP's creation, an action plan has been produced to drive the transition of the local energy system towards net zero.

By involving key local stakeholders throughout the LAEP development process, priority energy proposals were identified, and local actions were proposed (Figure 0.2). These represent the areas where physical changes are needed to the energy system. Delivery of the wider objectives of our plan will need to be supported by the right governance and engagement, policy environment and and finance options.

It should be emphasised that continued support, and partnership working with a wide range of stakeholders will be required to deliver this plan and implement the change necessary to ensure Torfaen achieves net zero by 2050.

Sponsors: Delivery partners:

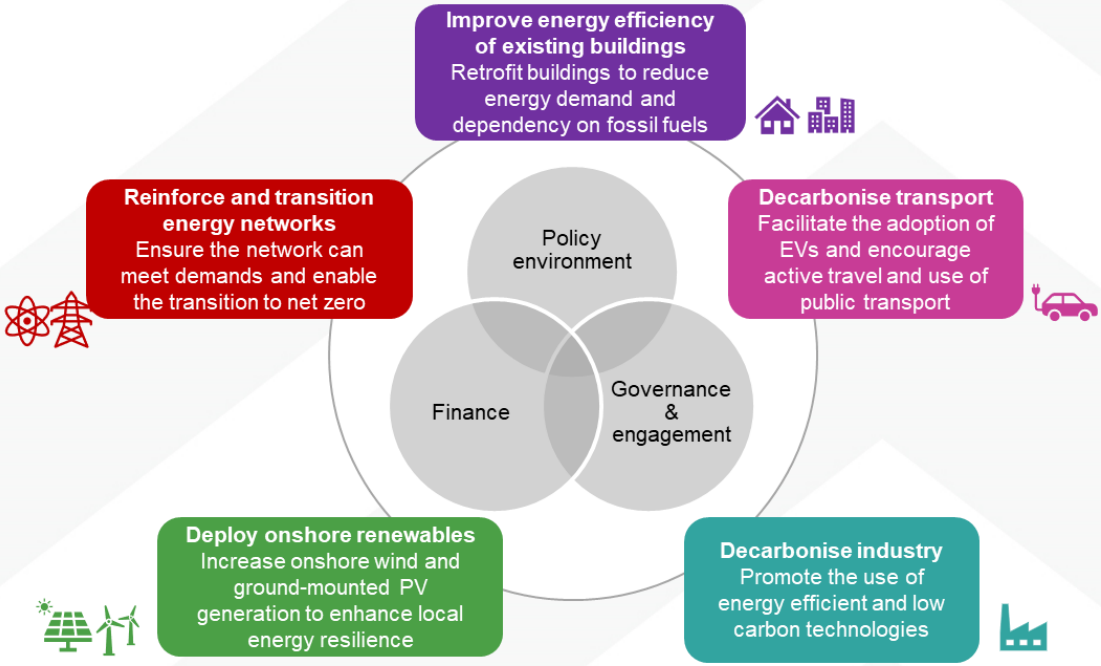


Figure 0.2: Torfaen's energy proposals

Executive summary

Energy proposals for Torfaen in more detail

Sponsors: Delivery partners:

Improve energy efficiency of existing buildings

Enhance the energy efficiency of existing buildings through retrofitting measures aimed at reducing overall electricity and heating demand, while also transitioning away from fossil fuel-intensive heating systems to more efficient, low-carbon technologies.

Low-regret options:

- Retrofit
- Heat pumps

Decarbonise transport

Reduce transport demand by improving active travel routes and enhancing the public transport network with increased frequency and coverage, thereby minimising dependency on private vehicles. Facilitate the adoption of EVs by installing chargepoints across Torfaen.

Low-regret options:

- EV chargers
- Public transport and active travel

Decarbonise industry

Improve the energy efficiency of industrial sites by optimising current processes and upgrading equipment. Explore the potential for decarbonising industrial processes that traditionally rely on fossil fuels by either transition to hydrogen or electrification.

Low-regret options:

- Electrification and energy efficiency

Deploy onshore renewables

Increase Torfaen's renewable energy output by setting both achievable and ambitious generation targets. Ensure that land suitable for renewable energy assets is identified and that a proactive approach is taken when engaging with developers seeking to unlock capacity.

Low-regret options:

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

Reinforce and transition networks

Reinforce the electricity network and explore how grid flexibility and storage solutions can ensure future electricity demand can be met. In addition, upgrade the gas network to ensure hydrogen could be supplied if required.

Low-regret options:

- Flexibility, storage technologies

Figure 0.3: Summary of Torfaen's energy proposals

Executive summary

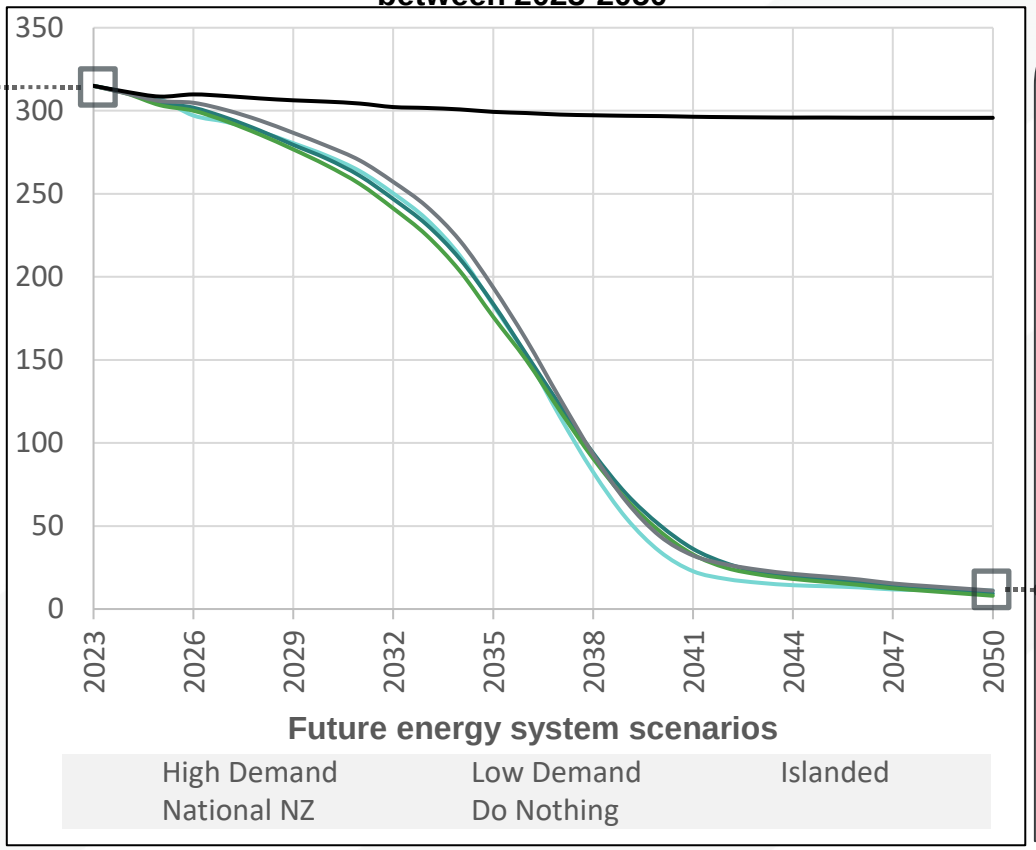
Torfaen's local energy system will need to change significantly to achieve net zero by 2050

Sponsors: Delivery partners:

Torfaen's local energy system in 2023

- **19,000** homes with an EPC of D and below installed
- **100** heat pumps installed
- **40** public EV charge points
- **5.6 MW** rooftop solar PV installed capacity
- **16.6 MW** ground-mounted solar PV installed capacity
- **0 MW** installed capacity

Projected greenhouse gas emission ($ktCO_2e$) between 2023-2050



What Torfaen's net zero local energy system could look like in 2050

- **25,000** homes with insulation measures installed
- **31,00** heat pumps installed
- **11,000** EV charge points
- **85 MW** rooftop solar PV installed capacity
- **800 MW** ground-mounted solar PV installed capacity
- **56 MW** installed capacity

Figure 0.4: Summary of change require to the local energy system

Executive summary

Achieving a net zero local energy system in 2050 aligns with the Well-being of Future Generations (Wales) Act 2015 and could lead to the following

Sponsors: Delivery partners:

Direct impacts

Emissions reduction

GHG emissions could decrease by 97% from 2023 to 2050*

Energy savings

Energy demand from transport could decrease by 56%*

Wider impacts

Energy security and reliability	Diversified local energy supply improves energy security	
Air quality improvements	Reduced fossil fuel combustion from transport, heat and power improves air quality	Up to £150 million of cumulative savings by 2050*
Net job creation	Emerging net zero industries attract investment and create high quality local jobs	2,900 jobs could be created by 2050*
Affordability	Highly insulated homes reduce heat demand, improve affordability and reduce fuel poverty	

National well-being goals

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

***Note:** These figures have been derived from deployment modelling. Detail on the methodology can be found in the Technical Report.

Executive Summary

Spatial representation of opportunities

Figure 0.5 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 deployment in the zone, including all energy components and electricity network infrastructure interventions. Ranges show the minimum and maximum results from each future energy scenario modelled. Note: intervention should still be carried out in 'Progress' zones to transition the local area to Net Zero.

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

Delivery partners: ARUP; CARBON TRUST

Suggested energy components to pilot in each zone (colours are representative of Torfaen's energy proposals)

Heat pumps	Rooftop PV	GM solar
Insulation	EV chargers	Onshore wind

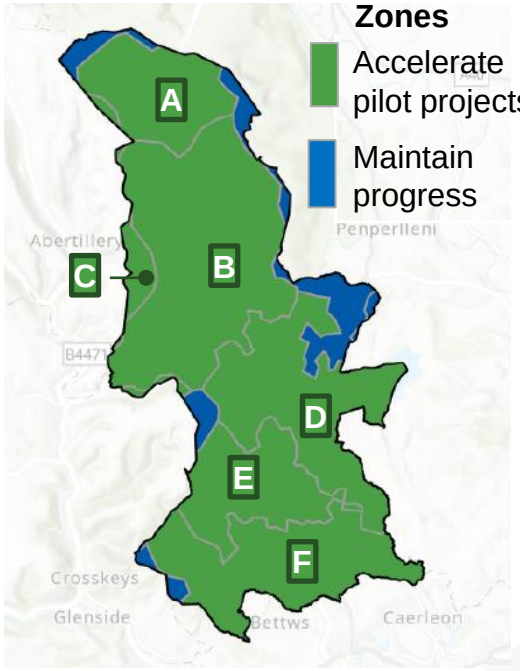


Figure 0.5: Torfaen's spatial representation of opportunities, including 2030 ambition and investment (£ millions). The zone boundaries are delineated by the areas that primary substations service.

	(i)	(ii)	(iii)
Zone A	**Blaenavon**		
	1.3 – 2 MW	£ 1 M – 1.5 M	**Zone A total £ 5 M- 56 M**
	420 – 460 kW	£ 340 k – 370 k	
Zone B	**Abersychan**		
	3.1 – 4.7 MW	£ 2.3 M– 3.5 M	**Zone B total £ 43 M - 200 M**
	670 – 720 kW	£ 550 k – 590 k	
	61 – 90 MW	£ 26 M – 39 M	
	330 – 580 kW	£ 360 k – 630 k	
	1,400 – 2,900 homes	£ 9 M – 150 M	
Zone C	**Abertillery**		
	46 – 50 kW	£ 38 k – 41 k	**Zone C total £ 2 M – 8 M**

	(i)	(ii)	(iii)
Zone D	**Panteg**		
	41 – 43 MW	£18 M – 19 M	**Zone D total £ 44 - 260 M**
	22 – 42 kW	£ 24 k – 46 k	
	12 MW	£ 13 M	
	1,600 – 4,200 homes	£ 12 M – 210 M	
Zone E	**Cwmbran**		
	6 – 8.6 MW	£ 4.5 M – 6.4 M	**Zone E total £ 27 - 210 M**
	11 MW	£ 12 M	
	740 – 4,700 homes	£ 10 M – 180 M	
Zone F	**Llantarnam**		
	76 MW	£ 32 M	**Zone F total £ 49 - 180 M**
	7.9 MW	£ 8.7 M	

Note that the figures shown in the tables above do not represent the absolute limits of the system, both in terms of the technology's 'pilot ambition' capacity (MW) and their geographic locations. It is also important to note that these figures are not set targets and are therefore non-binding.

Executive summary

To deliver the LAEP, a set of actions and next steps have been developed

Sponsors: *Delivery partners:*

Action routemap

Although the exact form of the decarbonised energy system in 2050 is uncertain, there are actions that can be taken now with relative certainty that they will help maintain the ability to meet the 2050 Net Zero ambition and capitalise on the opportunities that this transition will bring.

The action routemap takes each energy proposal and outlines critical, enabling actions for all stakeholders in the coming decade, with a particular focus on what can be achieved 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, it is expected to evolve over time and be regularly updated to make sure it stays relevant. Torfaen's routemap can be found in Chapter 4: Action planning.

Next steps

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

Governance: Where possible, oversight of LAEP should be integrated with the delivery with existing governance structures. Options will need to be explored to support delivery of the actions in plan.

Monitoring: Torfaen Council will work with regional and national partners to develop a monitoring framework which builds on existing processes to give understanding of the progress Torfaen is making towards its committed actions and ambitions set out in this plan.

Engagement & collaboration:
Many stakeholders with an interest and 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. The development of this LAEP has brought those with interest and influence together.

Torfaen

Chapter 1: Introduction

1. Introduction

What is Local Area Energy Planning (LAEP)?

Sponsors: Delivery partners:

Definition of a LAEP

A LAEP sets out the changes required to transition an area's energy system to net zero carbon emissions against a specified time. 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. 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.

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 in a LAEP is equivalent to an outline design or masterplan and is intended to identify core areas that require focus over the next 25 years. It proposes future sector-specific action plans that set 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 LAEP defines a long-term vision for an area but ideally should be updated approximately every 3–5 years (or when significant technological, national policy or local changes occur) to ensure the long-term vision remains relevant.

1. Introduction

What is Local Area Energy Planning (LAEP)?

Sponsors: Delivery partners:

Scope of a LAEP

The scope of a LAEP covers the current and projected future energy consumption and associated greenhouse gas (GHG) emissions, primarily focusing on an area's built environment (all categories of domestic, non-domestic, and industrial buildings), energy used for road transport (excl. energy used in rail, aviation, and shipping), local renewable generation and the 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 including 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.

A benefit of LAEP is the "whole systems approach". This provides consideration to the most cost-effective solutions to future energy system as a whole. For example, deploying different heat decarbonisation technologies to avoid a high-cost upgrade 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 outputs 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

The Welsh Government's "Net Zero Wales" plan 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 LAEPs to all its local authorities. The programme is being coordinated through a regional approach, where LAEPs are being developed for local authorities in Mid Wales, South West Wales, North Wales and the Cardiff Capital Region. The rational 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 Figure 1.1.

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 (ESC) 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. ESC is also providing technical advisory support to Welsh Government throughout the programme.

The LAEPs will also form the basis of the 'National Energy Plan' Welsh Government has committed to produce in 2024.

North Wales
by Arup, Carbon Trust and Afallen

Mid Wales
by Energy Systems Catapult

South West Wales
by City Science

Cardiff Capital Region
by Arup, Carbon Trust and Afallen

Existing LAEPs

Sponsors: Delivery partners:

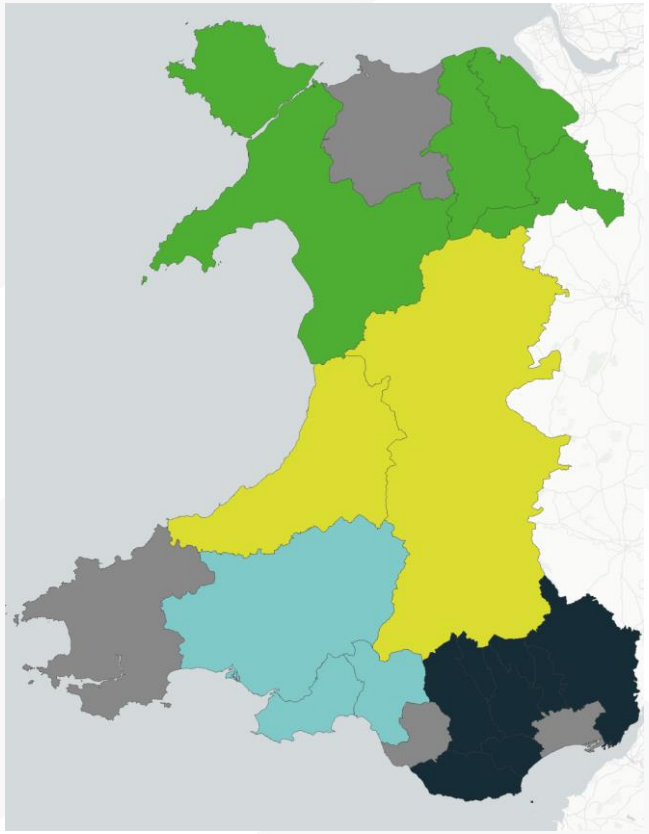


Figure 1.1: The LAEP landscape across Wales

1. Introduction

Boundary and scope - parts of the energy system analysed in a LAEP

Sponsors: Delivery partners:

A LAEP considers energy use, supply and generation within the Torfaen boundary.

There are three core parts to the local energy system:

- **Infrastructure** – This covers the physical assets associated with the energy system such as electricity substations.
- **Supply** – This covers the generation (renewable and non-renewable), storage and distribution of energy to local consumers for use in homes, businesses, industry and transport.
- **Demand** – This covers 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.

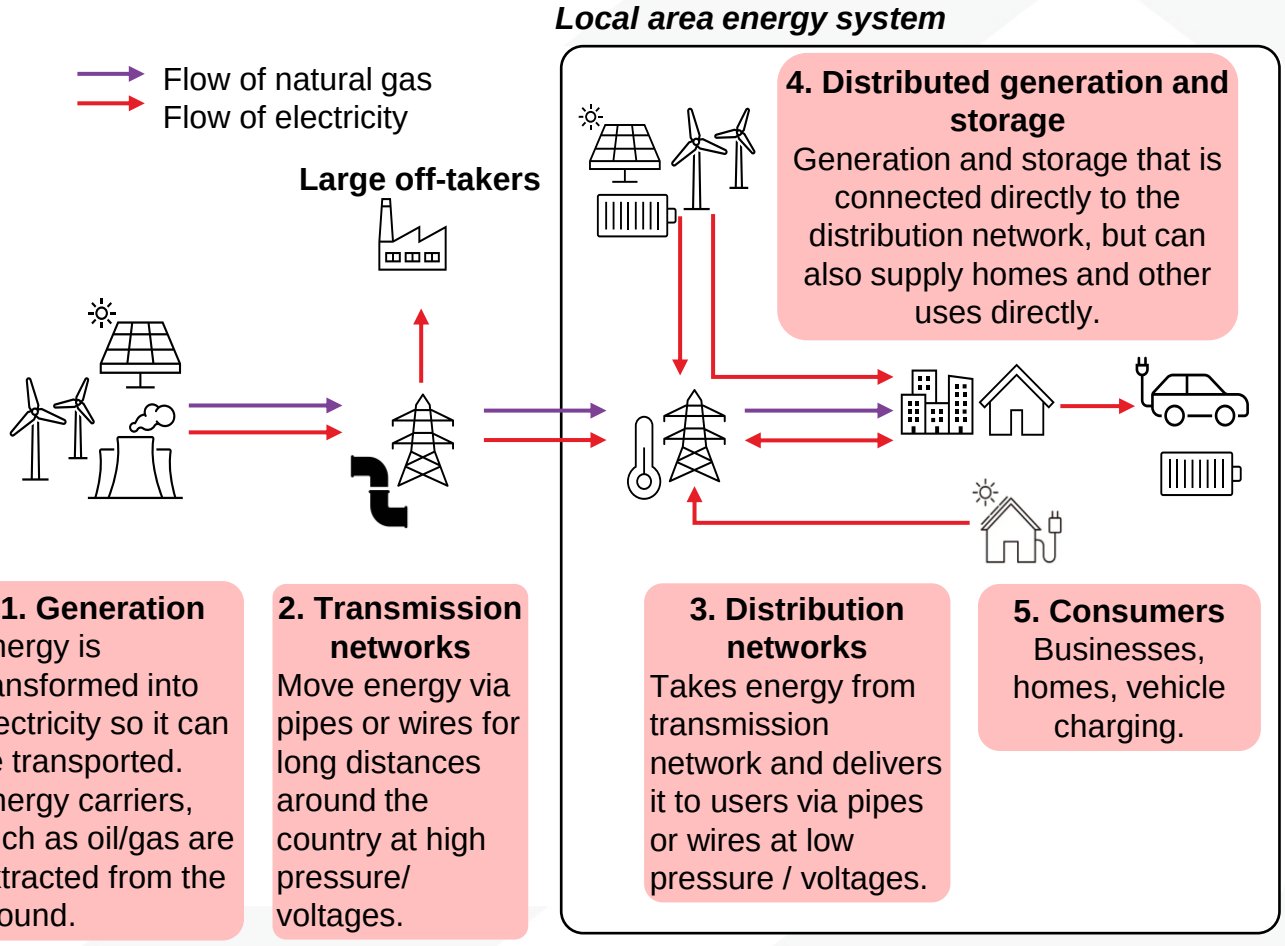


Figure 1.2: Schematic of electricity and gas transmission and distribution network and the system boundary for LAEP

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 Torfaen 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 Torfaen's decarbonisation journey.

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

In scope of LAEP
Out of scope of LAEP

Energy supply → **Energy distribution** → **Energy consumption**

Assets connected to the distribution network and have capacities of <100MW.

Rooftop Solar PV	Ground-mounted Solar PV
Onshore wind	Biomass
Landfill gas	Energy from Waste
Oil	Waste heat
LPG	Heat networks
Coal	Hydropower

National generation assets (connected to the transmission network, and/or have capacities of >100MW). Planning permission for asset granted by PEDW (>10MW).

Electricity distribution and storage

Electrical storage	Other flexibility services
Electrical substations	

Electric Vehicle Charging Infrastructure (EVCI)

Gas distribution

Thermal storage	Gas distribution network

Hydrogen distribution and storage

Hydrogen storage	Hydrogen distribution network (gas network conversion)

Transport (fuel/electricity)

Road vehicles	Shipping
Public roads	Aviation
Strategic Road Network	Rail
	Off-road machinery

Buildings (electricity, heat)

Commercial/ industrial buildings	Homes
Public sector buildings	Agricultural buildings

Industrial processes (electricity, heat)

If connected to the distribution network

Figure 1.3: Schematic of the local system scope for LAEP

1. Introduction

Torfaen's vision for the future local energy system

Sponsors: Delivery partners:

The following vision statement that underpins Torfaen County Borough Council's ambition for the future net zero energy system in Torfaen:

Torfaen's vision

Vision
Torfaen Council will support the Cardiff Capital Region and Welsh Government to accelerate decarbonisation activities in South East Wales in line with our national and international obligations. We will also lead, support, facilitate and encourage our local communities, residents and businesses towards a fair transition to net zero by 2050, making the most of innovation, cross boundary partnerships and wider opportunities.

Energy objectives

Objectives
1. Make Torfaen more sustainable and connected by engaging with utility providers to ensure that strategic energy infrastructure can support the 2050 net zero energy pathway. 2. Make Torfaen more sustainable and connected by developing enabling infrastructure to support the model shift to zero emission transport. 3. Use procurement, assets and data smartly to create opportunities for supporting the net zero transition. 4. Work collaboratively to identify and co-ordinate skills investment and actions to support the transition to net zero. 5. Involve communities and businesses on the net zero journey by providing information, guidance and support. 6. Make Torfaen a great place to do business by encouraging innovation and entrepreneurial activities relating to our net zero pathway.

In shaping the LAEP for Torfaen, energy objectives have been established. The proposed actions outlined in Section 4 of this plan are designed to implement changes that will facilitate Torfaen in achieving these objectives.

1. Introduction

LAEP contents

This LAEP presents a vision for a net zero local energy system for the whole Torfaen area, with a route map to get there, including a set of recommended actions for the Torfaen, 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 Torfaen'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 Torfaen, including what needs to happen and by who.
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 shows the boundaries of Torfaen (purple) and each of the primary substation service areas (red). Where primary substation service areas intersected one or more Local Authority boundaries, they were divided into smaller modelling zones at that boundary. The analysis, results, and maps herein are presented in terms of these smaller modelling zones, which may also be called "substation zones" or simply "zones."

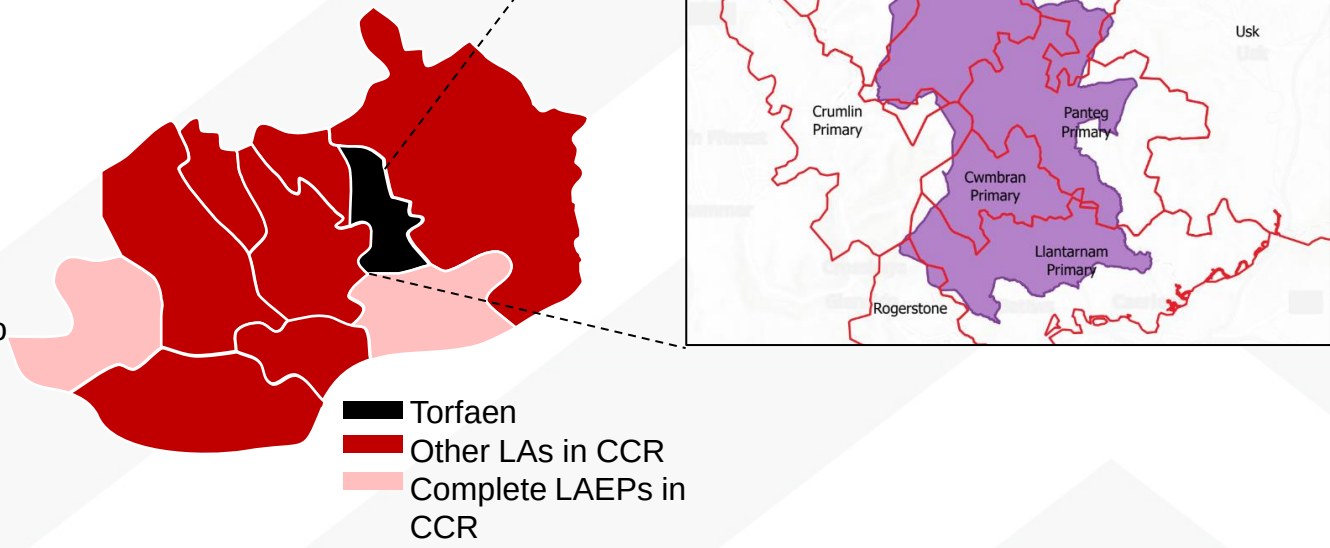


Figure 1.4: Geographic boundary for Torfaen's LAEP

Torfaen

Chapter 2: The current energy system

2. The current energy system

Policy context

Sponsors: Delivery partners:

Welsh Government policy

- Both the UK and Welsh governments have set net zero emissions targets for 2050. Welsh government has also set out that it wants the public sector to be Net Zero by 2030.
- **The Well-being of Future Generations (Wales) Act 2015** provides the legally binding framework for public sector activities to be in line with sustainable development principles in Wales, outlining seven goals for prosperity and sustainability.
- **Net Zero Wales**, published in 2021, sets out 123 policies and proposals to meet the second carbon budget (2021-25). Policy 20 of net zero Wales aims to de-risk and integrate investment in Wales through energy planning**.**

Regional policy

- **The CCR Energy Strategy (2021)** objective is to develop a strategic pathway identifying key interventions that deliver on the region's ambitions for decarbonising its energy system. This regional strategy is comprised of a baseline energy assessment, results from future energy system modelling, an economic evaluation and outlines the subsequent steps for transitioning CCR's energy system.
- **The South East Wales Valleys Transport Plan (2015)** [ML01] was developed collaboratively by the local authorities of Blaenau Gwent, Caerphilly, Merthyr Tydfil, Rhondda Cynon Taf and Torfaen. This articulates a vision and objective for the sub-region's transport system.
- **Regional Transport Plan:** The Cardiff Capital Region as a Corporate Joint Committee have a statutory responsibility to develop a transport plan for the region. This plan is currently under development and will be published in June 2025. The plan will provide a vision of accessible, sustainable and efficient transport system that is fit for future generations and places people and tackling climate change at the heart of decision making.
- **The Cardiff Capital Region Regional Economic and Industrial Plan** sets out a number of levers including Green Technologies: Grow the green economy through innovation initiatives centred on green technologies and future skills. Net Zero Transition: Begin the transition of the regional transport network to net zero through the deployment of green technologies and infrastructure. Net Zero Energy Production: Support the development of net zero energy production facilities in the region to give greater energy security and reduce dependency on imported' energy.

2. The current energy system

Policy context

Local policy

- **Future Torfaen - A County Plan (2022-2027)** [ML02] highlights key challenges for Torfaen to address, covering five key themes; well-being, sustainability, connectivity, culture and heritage, finance. The plan also defines Torfaen's well-being objectives for the 5-year period. Well-being Objective 5, is to "respond to the climate and nature emergencies, recycle more and make improvements to the local environment".
- **Climate and Nature Emergency Action Plan (March 2022)** [ML03] sets out how the Council intends to respond to the climate and nature emergencies, detailing four key workstreams with identified annual delivery plan actions. The LAEP links to Workstream 2 - *The Council leads, supports, facilitates and encourages Torfaen's communities, residents and businesses towards net zero carbon by 2050.*
- **The Local Development Plan (LDP) (2011-2021)** [ML04] was adopted in 2013. Work on a Replacement Local Development Plan (RLDP) is currently underway.

2. The current energy system

The collaborative approach taken to developing and delivering our LAEP

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 Torfaen's influence which is why stakeholder engagement is the foundation for the development of our LAEP.

Stakeholders were prioritised 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.

Stakeholders were engaged at different stages of the development process to make sure stakeholders could help shape the plan and key development milestones. Regional steering groups were held 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.*

Sponsors: *Delivery partners:*

Sector	Examples of stakeholders engaged
Renewable energy generation	Energy project developers, land owner
Industry and private sector	Local businesses, larger industrial players
Community engagement	Community energy groups
Networks	Distribution Network Operators, gas distribution networks
Public sector	Public services board, public service providers, Welsh Government, educational institutions

Figure 2.1: Examples of stakeholder engaged

2. The current energy system

Torfaen's energy baseline

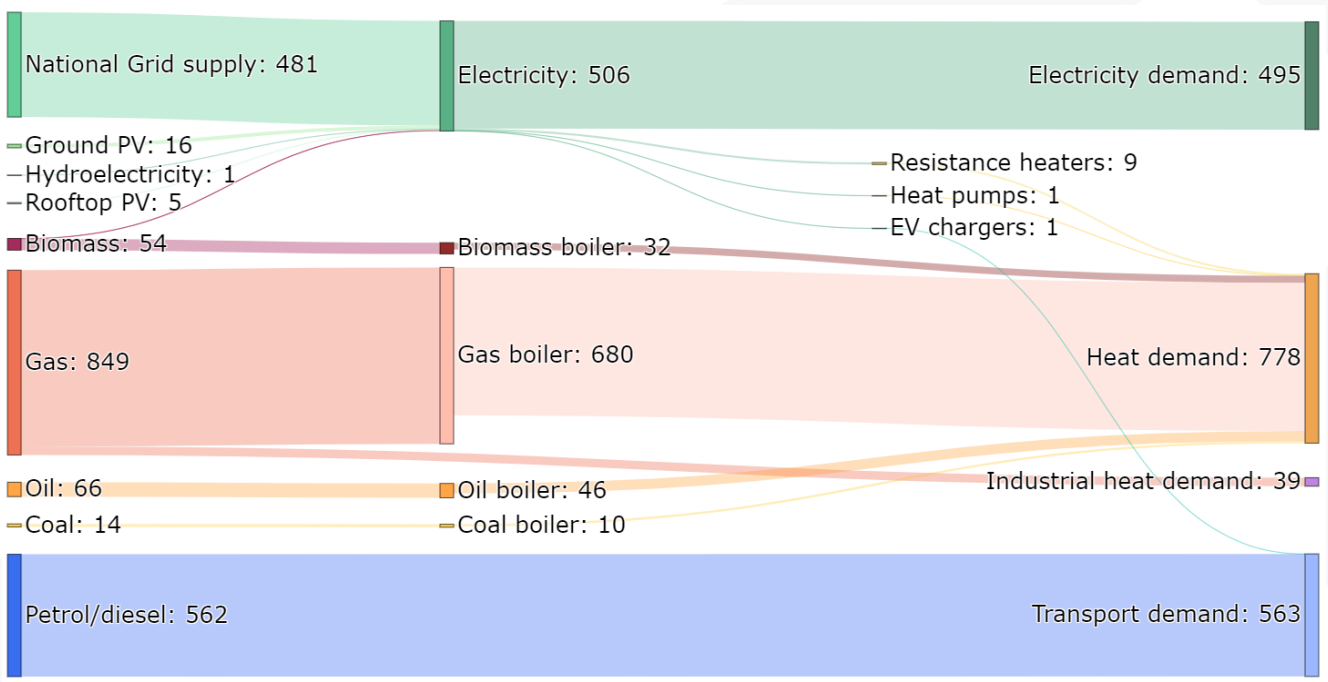
Energy demand

Sankey diagrams are a way of showing energy flows from sources to demands via conversion technologies.

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

Figure 2.2 presents Torfaen's baseline Sankey diagram. It shows electricity is generated locally from rooftop solar, ground-mounted PV and hydroelectricity. It also shows the import of electricity from the national grid to meet local demands for electricity, transportation, and heating. Heat demands are primarily met gas boilers supplemented by resistance heating, biomass, coal and oil boilers. Transport demand is predominantly being met by petrol/ diesel, with a small contribution from EV chargers.

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



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 (GWh/year)

2. The current energy system

Torfaen's energy demand

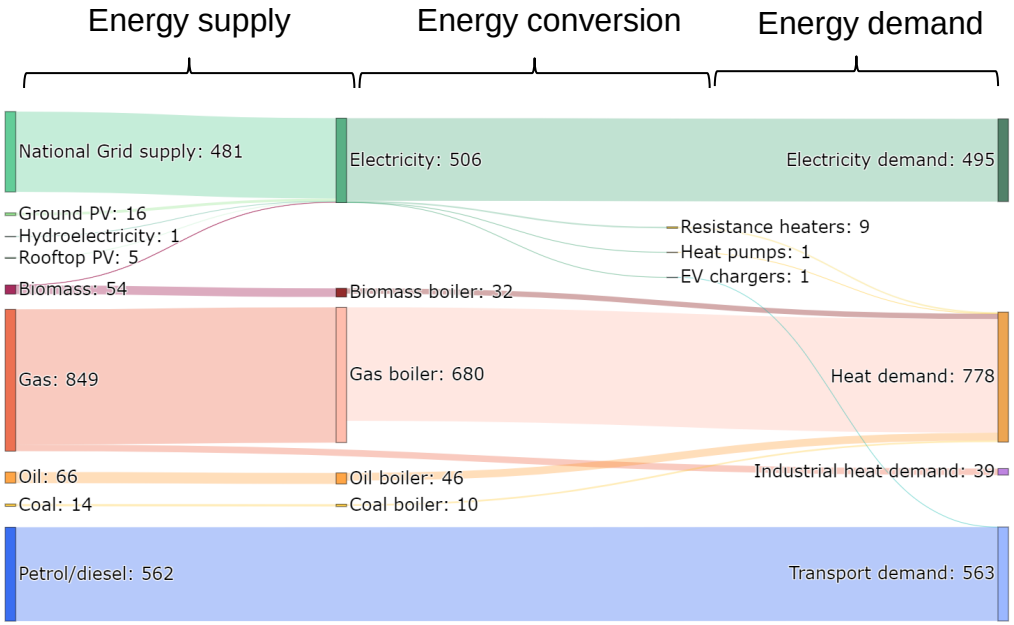


Figure 2.3: Sankey diagram showing energy input, conversion and output in Torfaen (GWh)

Industry

In 2019, industry accounted for 2% (39GWh) of the total energy demand.

A key industrial site identified is Knauf Manufacturing, located in Cwmbran. At this site, loft and roof insulation are manufactured.

Electricity

In 2023, electricity accounted for 26% (495GWh) of the total energy demand.

1% (10GWh) of heating demand was met by electricity, using resistance heater and heat pumps.

EV chargers catered to <1% (1GWh) of the total transport demand.

Transport

In 2015, transport accounted for 30% (563GWh) of the total energy demand. Internal Combustion Engines were the dominant vehicle type. 76% of households owned a car, with an average of 1.2 cars per household.

In 2023, 13 public EV chargepoints installed.

Heat

In 2023, heat accounted for 41% (778GWh) of the total energy demand.

49% of properties achieved A-C EPC ratings.

Only 3% of properties are not connected to the gas network.

2. The current energy system

Sponsors: Delivery partners:

Torfaen's energy demand by sector

Figure 2.4 shows fossil fuel consumption from transport at the Lower Super Output Area (LSOA) level, which represents areas with 400 to 1,200 households. Consumption was particularly high in urban areas such as Ponthir, Cwmbran and Pontypool, as well as in the more rural area of Blaenavon. Urban towns and cities tend to have high transport fuel consumptions because population densities are higher, and people often commute to these areas for work. Rural regions can have high transport fuel consumption due to the widespread distribution of amenities, requiring people to travel longer distances.

Figure 2.5 shows Torfaen's baseline heat demand by primary substation service area. Heat demand is highest in zones covering built-up areas and lowest in more rural areas, such as Blaenavon in the north of the county.

Using the National Atmospheric Emissions Inventory, Knauf Insulation Manufacturing was identified as the only major industrial energy load in Torfaen's baseline. This facility in Cwmbran produces loft and roof insulation.

Transport

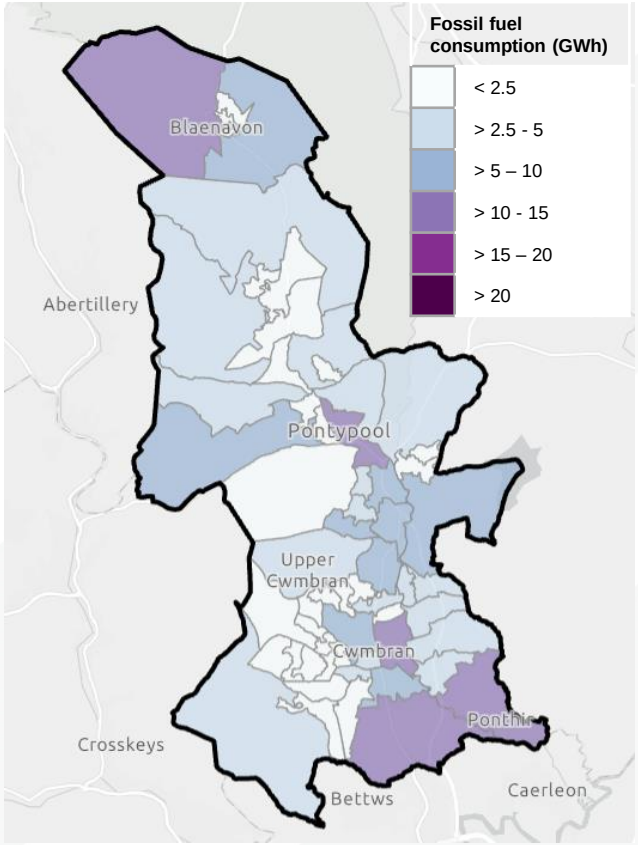


Figure 2.4: Transport energy consumption (combined total across cars, light goods vehicles (LGV) and heavy goods vehicles (HGV) by LSOA (2019)

Industry

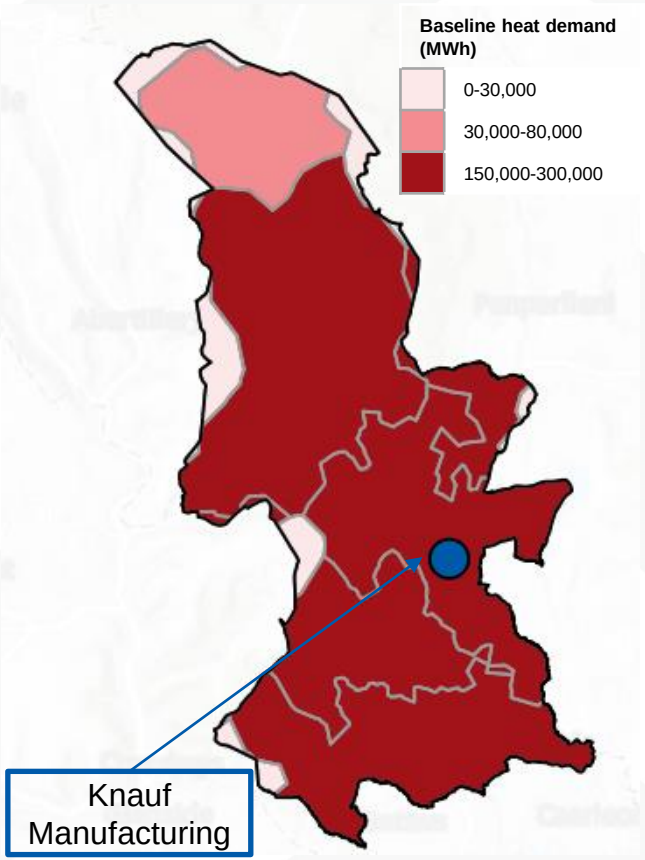


Figure 2.5: Baseline heat demand (2023) by primary substation service area and major industrial loads

Note: A primary substation lowers electricity voltage for safe use in buildings. A substation serves specific areas, creating boundaries referred to as primary substation service areas.

2. The current energy system

Torfaen's energy generation

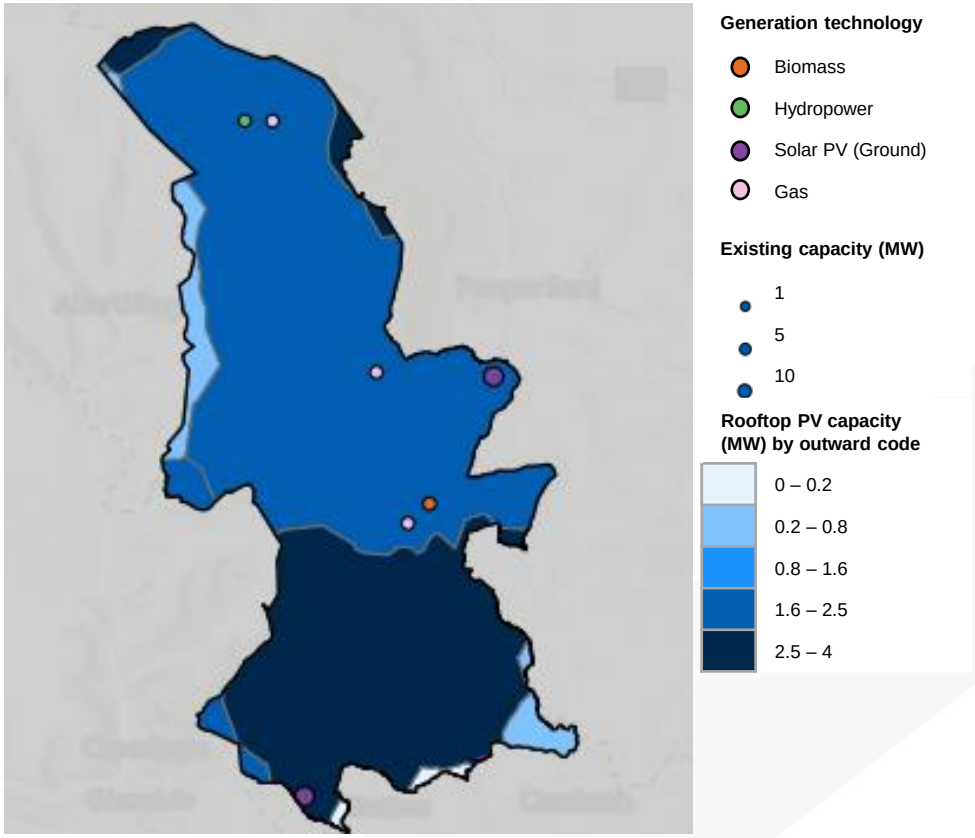


Figure 2.6: Local solar energy generators. Data is based on Energy Generation Wales (2019) and Renewable Energy Generation Database (2023). Note: An outward code is the first part of a UK postcode and covers a geographical area that can range from a single street to several streets or a small town.

Electricity generation

In 2023, local generation assets had a total installed capacity of 10.4MW. Ground-mounted solar assets, had the largest total installed capacity at 10MW. Other renewable generation included hydroelectricity and biomass however, the installed capacities of these sites are significantly smaller at 0.03MW and 0.4MW, respectively.

The outward code area covering Cwmbran had the highest rooftop PV capacity. This is likely due to the urban area's higher building density.

Heat generation

The primary source meeting heating demand was natural gas, distributed to consumers through the Wales and West Utilities distribution network.

There were no heat networks in Torfaen. Workstream 2 of the Climate and Nature Emergency Action Plan states that the Council will encourage District Heat Networks to be incorporated within the strategic developed sites identified in Torfaen's RLDP.

2. The current energy system

Sponsors: Delivery partners:

Torfaen's networks and infrastructure

Figures 2.7 and 2.8 display primary substation's supply and demand headroom across Torfaen, providing an insight to the network capacity in 2023. In this context, headroom is an indicative measure of a primary substation's capacity (in more general terms, the ability of that substation to handle the total flow of electricity through it). This metric offers an overview of the electricity network's capacity, highlighting areas where constraints may be present.

In 2023, both supply and demand headroom were highest in northern Torfaen. Given Blaenavon's rural nature, it is reasonable to infer that its electricity demand is lower compared to other, more urban areas in Torfaen, potentially resulting in more headroom. The high supply and demand headroom in the north may be influenced Blaenavon's status as a UNESCO Industrial World Heritage Site, which provides the area with protection from certain types of development, including renewable energy projects.

It is important to note that Figures 2.7 and 2.8 may not show the full extent of Torfaen's electricity network constraints. Headroom provides insights into the distribution networks (11kV) capacity, however constraints can occur both upstream and downstream of primary substations.

Supply headroom

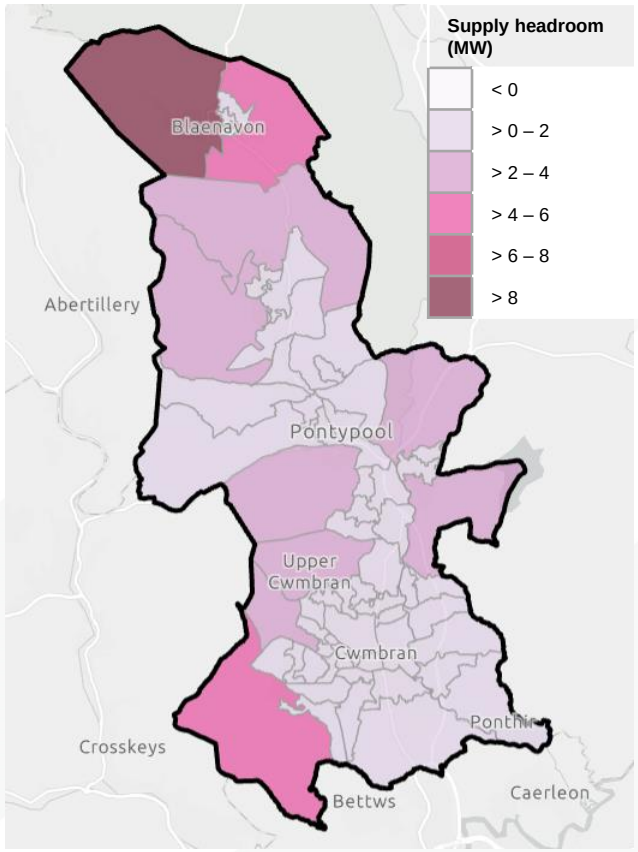


Figure 2.7: Electricity supply headroom

Demand headroom

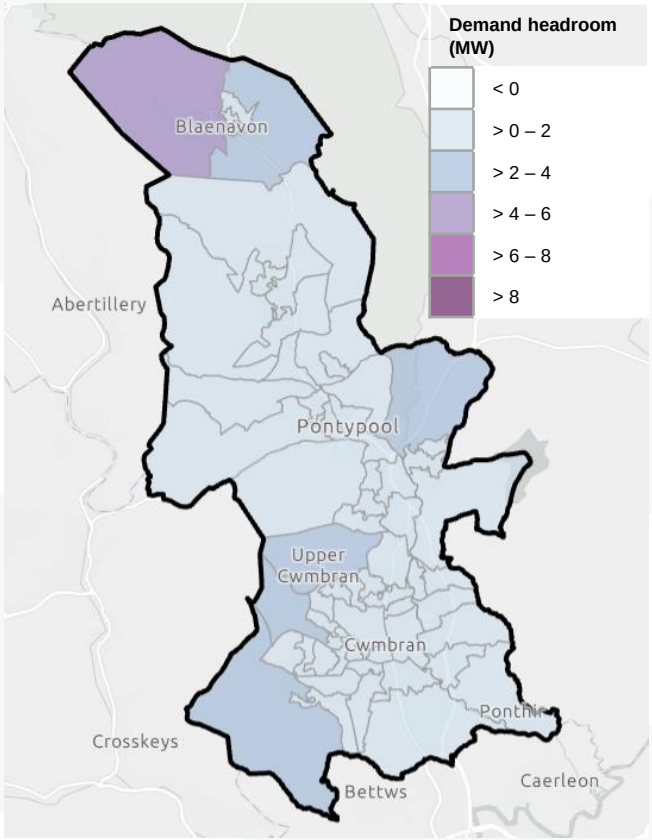


Figure 2.8: Electricity demand headroom

2. The current energy system

Local environmental, social and economic factors that influence energy

Sponsors: Delivery partners:

Land

Torfaen is located in the southeastern region of Wales, sharing borders with Monmouthshire, Newport, Caerphilly and Blaenau Gwent. Torfaen covers an area of around 126 square kilometres. ML05

The principal settlements in Torfaen include Blaenavon, Pontypool and Cwmbran. Torfaen is a predominantly urban area, with rural towns in the north around Blaenavon.

Blaenavon is a UNESCO World Heritage Site due to its Industrial Landscape, serving as a testament to miners and iron workers of the past.

Demographics

In 2021, Torfaen's population surpassed 92,000. This represents a growth of 1.3% over the decade from 2011 to 2021. Interestingly, this growth rate is slightly lower than the overall population increase of 1.4% observed across Wales during the same period.

Torfaen was the third-most densely populated local authority area in Wales, after Cardiff and Newport. ML07

Socio-economics

According to the Welsh Index of Multiple Deprivation (WIMD) 2019ML08, the LSOAs Trevethin 1, Upper Cwmbran 1 and Pontnewydd 1 fell in the most deprived 10% of Wales.

In 2021, 2.7% of Torfaen's population were unemployed, down from 4.3% in 2011. In Torfaen, the largest job sector was 'human health and social work activities', employing 16% (6,660) of people over 16 years old. The next largest sector was 'wholesale and retail trade', employing 15% (6,250) of people. ML09

Businesses in Torfaen are leading innovation in modern healthcare, e-mobility and manufacturing productivity. ML10

GHG Emissions

In 2019, greenhouse gas emissions totalled at 5.0tCO_2e per capita, the joint second lowest out of all 22 Welsh local authorities. ML11

Transport was the largest carbon dioxide emitter in 2019, accounting for 33% (140ktCO_2e) of Torfaen's total emissions. ML11

Carbon emissions decreased by 39%, from 680ktCO_2e to 420ktCO_2e between 2005 and 2019. ML11 This trend mirrors the national decrease in emissions, which can be attributed to the shift away from coal-fired power generation towards increased renewable energy generation.

2. The current energy system

Progress to date

Sponsors: Delivery partners:

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

The Council has since implemented key projects and policies, which are highlighted in Figure 2.9. Particularly noteworthy is the Climate and Emergency Action Plan produced and adopted in 2022. This document outlines current decarbonisation initiatives and proposed actions, grouped by key transition themes including energy efficiency, renewable energy generation, improve mobility and transport. Regular monitoring of this plan is conducted through annual net zero reporting, ensuring accountability and progress tracking.

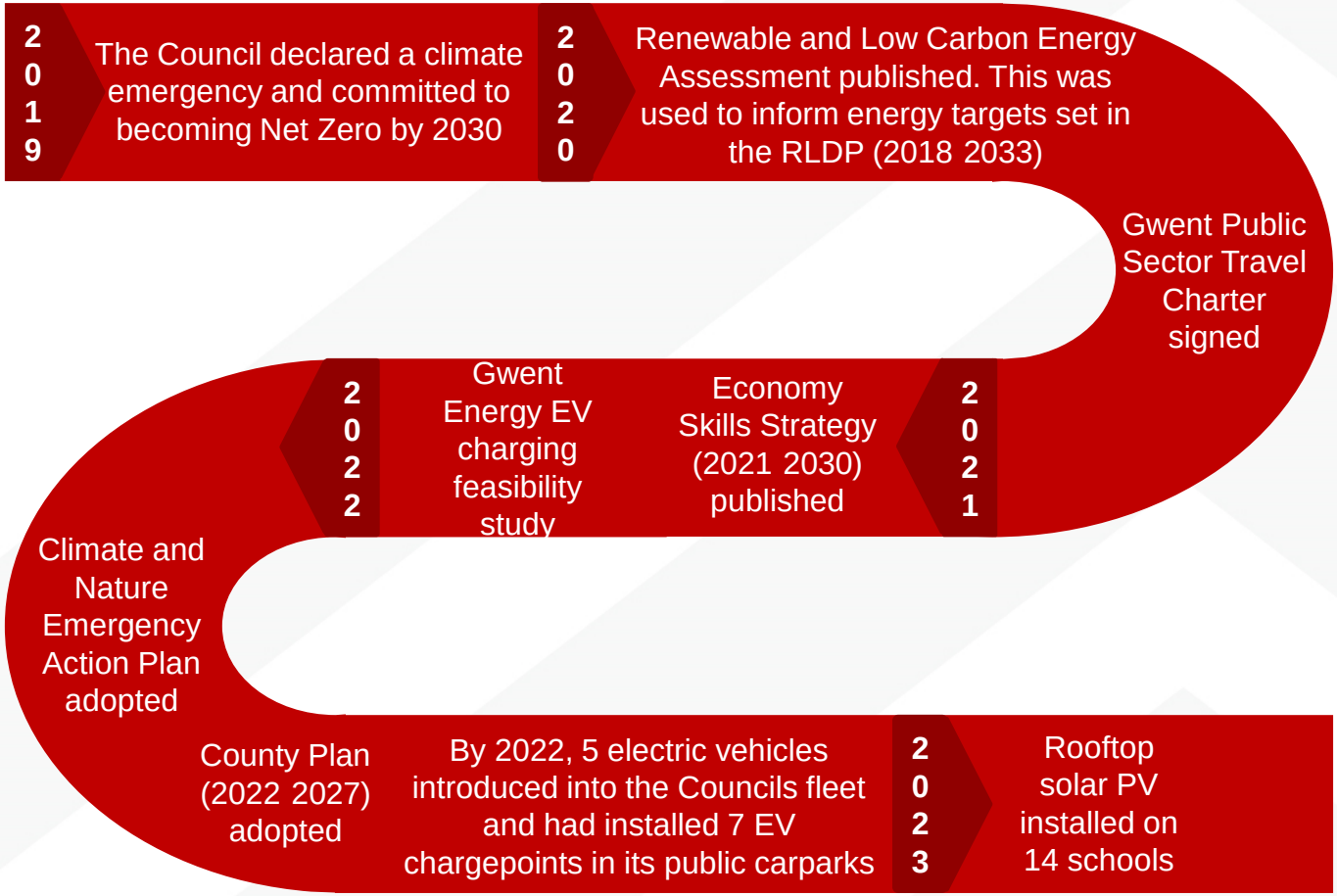


Figure 2.9: Summary of activities to date that have contributed to decarbonising the local energy system

2. The current energy system

Progress since 2019 and plans for the future

Sponsors: Delivery partners:

Reducing energy demand

Since 2019, Torfaen County Borough Council has made significant investments towards reducing local energy demand. By 2022, the Council introduced five electric vehicles (EVs) into their fleet and have plans for further expansion. The Council is also supporting the increasing number of EVs in Torfaen by installing 40 EV chargers, which they both own and operate. Furthermore, they plan to assess the feasibility of different on-street charging techniques, with results informing future chargepoint deployment.

The Council is also actively improving its public transport network. As part of the Cardiff Capital Region Metro Plus scheme, a project is currently underway to upgrade the existing Pontypool and New Inn Railway station with a Park and Ride station. Substantial improvements are being made to station and platform facilities. The park-and-ride will feature EV charging bays and extra secure bike spaces. This initiative aims to promote the adoption of sustainable transport options.

Over the next year, the Council will deliver various active travel schemes outlined in the Active Travel Delivery Plan. Additionally, they are aiming to deploy four heat pumps across their own estate by December 2024.

Renewable generation

The borough already has a moderate amount of renewable energy generation, with significant potential for more. A Renewable Energy and Low Carbon Assessment undertaken in 2020 highlighted large amounts of land which had theoretical potential for renewables. Further refinement of this assessment will be undertaken to account for further factors that are likely to impact potential capacity of generation.

In 2023, solar was the most prominent renewable energy source harnessed in Torfaen, with a total installed capacity of approximately 10MW. Hydroelectric and biomass generators also contributed to the local energy mix, however the capacity of these sites is small (0.03MW and 0.4MW for hydropower and biomass, respectively).

There are 33MW ground-mounted solar panel are currently in the pipeline, according to various data sources. In 2023, rooftop solar panels were installed on 14 schools across Torfaen. The energy produced by these panels is used directly on-site, significantly reducing the overall demand for energy supply from the grid.

There are currently no operational wind farms in Torfaen. Whilst there are wind farm pipeline projects being considered, current grid capacity will restrict bring all projects forward to delivery.

There are restrictions with wind development in Torfaen. Blaenavon experiences optimal wind speeds for turbines; however, this site holds World Heritage status, which presents a challenge in obtaining permissions for development due to area's cultural significance.

Torfaen

Chapter 3: The future energy system

3. The future energy system

Overview

Optimisation modelling was undertaken to create different future energy scenarios. Across the four modelled scenarios (see diagram overleaf), trends in energy system components (e.g. ground-mounted solar PV installed capacity increased significantly) were identified. These common trends were considered as low-regret, near-term energy proposals. For example, since onshore wind and ground-mounted PV increased in every scenario, a key proposal for Torfaen is the deploy renewables proposal.

Aspects of each energy proposal were looked at to understand how they might be rolled-out 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.

Pathways and deployment rates for different components were informed by broader plan objectives, local and regional strategic priorities, policies and national targets. This context helped define a suitable level of ambition and bring evidence together into an action plan.

Sponsors: Delivery partners:

Firstly, different future energy system scenarios were modelled:

1. Define modelling assumptions

For example, the maximum amount of solar and wind which can be installed in Torfaen was set.

2. Model the future energy system

The model selects the most cost and carbon effective components needed to meet the energy demands in 2050. This modelling is repeated for different

3. Identify common energy components

Scenario results were analysed to identify common energy system components, such as wind farms and heat pumps, that consistently emerge in the 2050 energy system. These energy components are considered for high-priority options for Council intervention.

Then, the rate at which different energy technologies would need to be installed to achieve a net zero energy system were modelled:

4. Deployment modelling

The rate of installations required to reach net zero were modelled, helping us understand by how much we need to ramp up the adoption of different technologies.

Results from the modelling inform our action planning combined with views from key stakeholders help inform the shape our action plan:

5. Creating a plan

The modelling result, LAEP objectives and stakeholder views help determine the key energy proposals that form the framework of the action plan.

Figure 3.1: Steps taken to produce this LAEP

3. The future energy system

Scenario analysis

Summary of future energy scenarios

A scenario is used in modelling to test a range of hypothetical futures. The scenarios described in Figure 3.2 have been used to envision the energy system in 2050, testing how changes in demand might impact the local energy mix and the adoption of low-carbon technologies required for a transition towards net zero. In the National Net Zero, Low Demand, High Demand scenarios, the energy system is assumed to reach net zero by 2050. In contrast, the Do Nothing scenario portrays a future where net zero is not achieved by 2050.

Do nothing	• Considers committed policies, like the ban for selling petrol and diesel vehicles. It is not seen as a realistic future as new policies will be implemented or changed over time. • Acts as counterfactual to evaluate the impact of policies and technologies on the emissions. By comparing it with the other four scenarios that reach net zero by 2050, we can understand the extent of changes needed to the energy system. • There is no decarbonisation target for this scenario, and we do not use it in optimisation modelling.
National net zero	• Energy system decarbonises to achieve net zero emissions by 2050. • Modelled to understand the range of technologies needed meet a predicted future energy demand. • Future energy demand reaches a moderate level across the sectors. • 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)

Figure 3.2: Torfaen's future energy scenarios

3. The future energy system

Scenario analysis

Summary of future energy scenarios

Sponsors: Delivery partners:

Low demand	• Energy system decarbonises to achieve net zero emissions by 2050. • Explores the impact of energy-reducing initiatives such as home fabric improvements and uptake of active travel and public transport use. • Considers the lowest future energy demand across different sectors. Factors contributing to this low demand include high retrofit rates, high conversion to active travel and low population growth. • Import and export of electricity as National Net Zero
High demand	• Energy system decarbonises to achieve net zero emissions by 2050. • Explores the impact low-levels of intervention has on local energy generation. • Considers the highest plausible future energy demand across sectors. Factors contributing to this high demand include low retrofit rates, low conversion to active travel and high population growth. • Modelled to understand the range of technologies needed meet a predicted future energy demand. • Import and export of electricity as National Net Zero
Islanded	• Energy system decarbonises to achieve net zero emissions by 2050. • Considers a system that does not import or export electricity, therefore generation is balanced with demand. By restricting electricity supply from the National Grid, we can explore the impact increasing energy system reliance has on local renewable generation. • Modelled to understand the range of technologies needed meet a predicted future energy demand.

Figure 3.2: Torfaen's future energy scenarios

The future local energy system

Scenario analysis

National net zero scenario

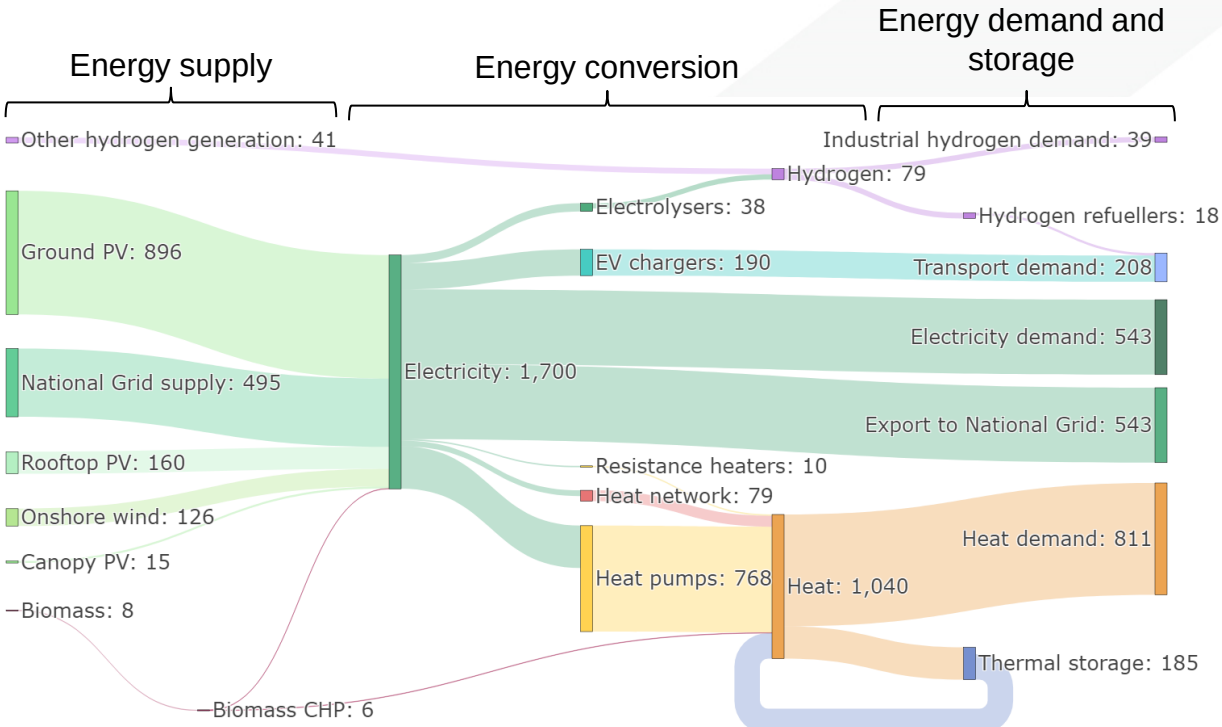
Figure 3.3 is an example output from the modelling and shows a potential future energy system for Torfaen under the National Net Zero scenario. This scenario assumes the future energy system meets Welsh Government's target of achieving Net Zero by 2050. One notable trend (shown below) is that ground-mounted PV generation increases significantly, with approximately a third of the energy generated being exported to the national grid. However, this amount of solar generation may not be realised due to various factors that can restrict the development of solar farms, (e.g. competing land use and the presence of conservation areas). It is therefore important to note that this Sankey diagram does not present the final plan for Torfaen's future energy system. The National Net Zero scenario presents similar trends to the High Demand and Low Demand scenarios.

Hydrogen imports and hydrogen generated from electrolysis contribute to meeting transport and industrial demands.

Significant increase in renewable energy generation, especially ground-mount PV (56x higher than baseline).

Electricity supplied by the National Grid increases by 3% from the baseline.

Smaller output from biomass, which contributes towards both electricity and heat demands.



Electricity system is 3.4 x larger than the baseline

Majority of transport demand met by electricity supplied through EV chargers. Hydrogen refuellers meet only 9% of demand.

A sizeable portion (32%) of the generated electricity is surplus and is subsequently exported to National Grid's transmission network.

Majority of heat supply (74%), is met through heat pumps, while heat networks contribute 8%, resistance heaters account for 1%, and biomass makes a small contribution at 0.6%.

Figure 3.3: Annotated Sankey diagram showing energy flows under the National Net Zero scenario (GWh in 2050)

The future local energy system

Islanded scenario - Energy flows (GWh, 2050)

Sponsors: Delivery partners:

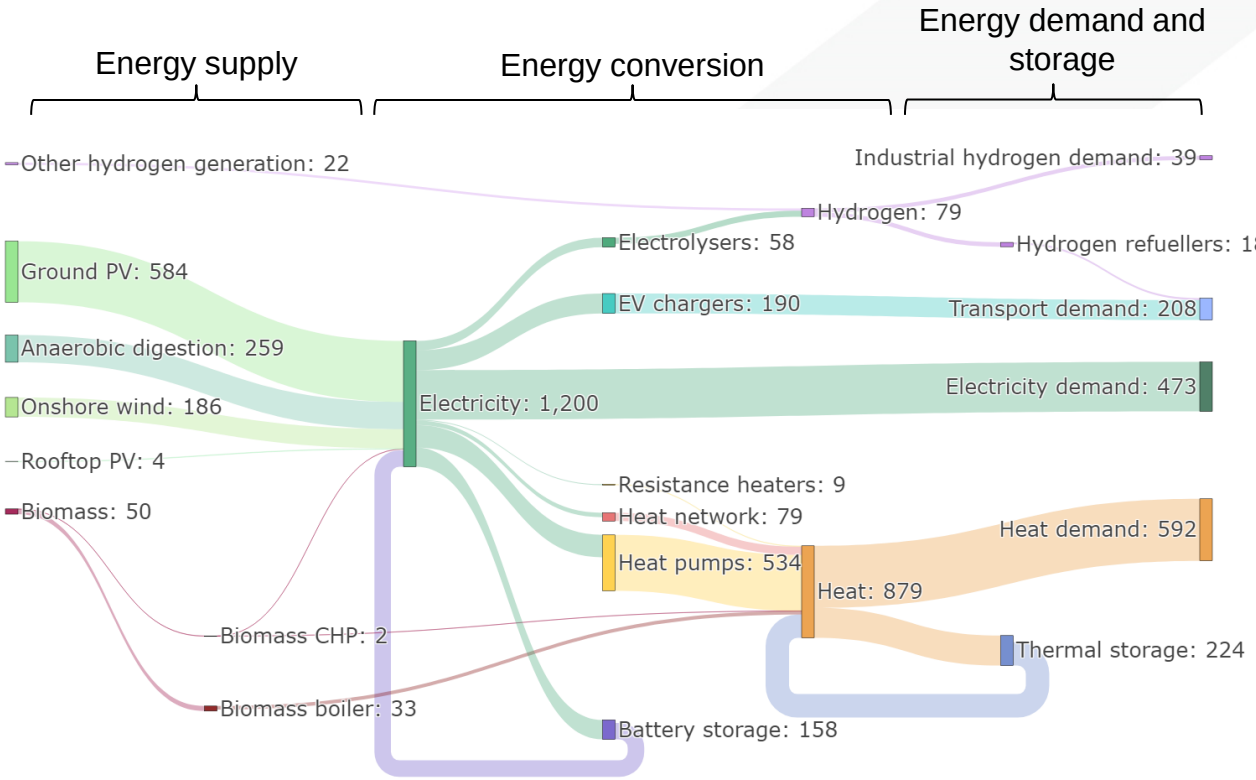
Torfaen aims to be more self-sufficient in generating and supplying electricity to its residents. Under the Islanded scenario, there is no electricity supplied from the national gird. Therefore, the primary consideration is to make buildings more energy-efficient and use storage to help balance supply and demand. Anaerobic digestion is introduced to the energy mix for a consistent energy supply that is not dependent on the weather. It is important emphasise that the future energy system scenarios are hypothetical and are used to help inform Torfaen County Borough Council's approaches to meeting Net Zero. The Sankey diagram shown in Figure 3.4 is therefore not the final plan for Torfaen's energy future.

Hydrogen imports and hydrogen generated from electrolysis contribute to transport and industrial demands.

Significant increase in ground-mount PV generation (37x higher than baseline).

Anaerobic digestion is relied upon for a constant supply of electricity as a digesters ability to generate is not dependent on the weather.

Smaller output from biomass, which contributes to both electricity and heat demands.



Electricity system is 2.3 x larger than the baseline

Majority of transport demand met by electricity supplied through EV chargers. Hydrogen refuellers meet only 9% of demand.

There is significant demand reduction across transport, electricity and heat.

Majority of heat supply (61%), is met through heat pumps, while heat networks contribute 9%, biomass account for 3.4%, and resistance heaters make a smaller contribution at 1%.

Figure 3.4: Annotated Sankey diagram showing energy flows under the Islanded scenario (GWh in 2050)

The future local energy system

Scenario analysis

Energy system components

Figure 3.5 summarises Torfaen's optimisation modelling results. It's important to emphasise that these scenarios are hypothetical and used as a guide to inform the LAEP's action plan. Common trends across the scenarios help shape the direction our strategy should take. In practice, factors such as site availability, suitability and competing land uses will need to be considered. The figures shown in Figure 3.5 therefore represent maximum values.

Some of the key findings that we can draw include:

- **Generation:** Electricity generated from ground-mounted solar and wind farms increases significantly across all scenarios, with biomass use for electricity generation decreasing. To reach Net Zero by 2050, Torfaen's electricity system will be more dependent on lower cost renewables such as wind and solar.
- **Demand:** Transport decarbonises across all scenarios due to the roll out of EVs displacing petrol and diesel vehicles. Heat demand decarbonises primarily through the roll out of heat pumps. Whilst other heating technologies, such as heat networks and biomass also contribute, their usage is comparatively smaller.

The future local energy system

Scenario analysis

Energy system components

Energy Components	Baseline 2023	National Net Zero	High Demand	Low Demand	Islanded
Ground-mount PV	16 GWh	↑ to 896	↑ to 896	↑ to 896	↑ to 584
Rooftop PV	5 GWh	↑ to 160	↑ to 160	↑ to 160	↓ to 4
Onshore wind	0 GWh	↑ to 126	↑ to 126	↑ to 126	↑ to 186
Canopy PV	0 GWh	↑ to 15	↓ to 15	↑ to 15	= no change
Biomass	54 GWh	↓ to 8	↑ to 8	↓ to 8	↓ to 50
Other hydrogen generation	0 GWh	↑ to 41	↑ to 40	↑ to 38	↑ to 22
Electrolyser	0 GWh	↑ to 38	↑ to 36	↑ to 41	↑ to 58
Import from Grid	481 GWh	↑ to 495	↑ to 502	↓ to 399	↓ to 0
EV charger	1 GWh	↑ to 190	↑ to 204	↑ to 190	↑ to 190
Hydrogen refuellers	0 GWh	↑ to 18	↑ to 17	↑ to 18	↑ to 18
Heat pumps	1 GWh	↑ to 768	↑ to 768	↑ to 541	↑ to 534
Heat networks	0 GWh	↑ to 79	↑ to 79	↑ to 79	↑ to 79
Anaerobic digestion	0 GWh	= no change	= no change	= no change	↑ to 259

Key: **Increase** in use of technology ↑ | **Decrease** in use of technology ↓

Note: In the Islanded scenario, rooftop PV installation decreases due to the implementation of more optimal measures under assumed conditions. However, it should be noted that, in reality, rooftop PV installations would not be removed.

Figure 3.5: Scenario result comparison (GWh in 2050)

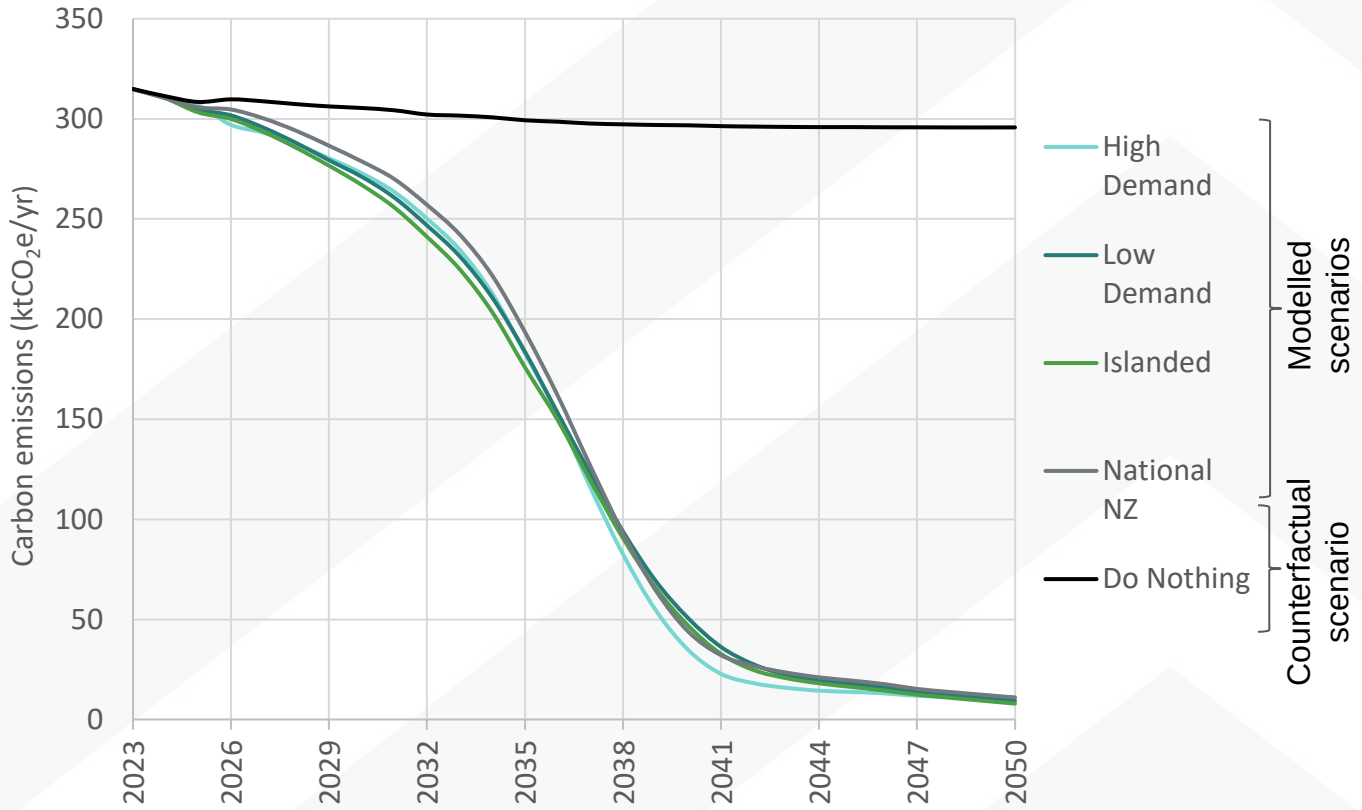
3. The future energy system

Deployment modelling

Impact on energy demand

Figure 3.6 shows carbon emissions from now until 2050 for the Do Nothing and modelled scenarios. In the Do Nothing scenario, the rate of change is based on current deployment rates and policy levers. The other modelled scenarios show trajectories that align with the optimisation models results. The difference in emissions between the Do Nothing and modelled scenarios in 2050 highlight the step-change in policy and behaviour required to reach Net Zero.

These pathways have been developed through deployment modelling, which involves forecasting the installation rates of various energy interventions required to reach the future energy system by 2050. For instance, deployment modelling can be used to determine how rapidly rooftop solar PV installations must occur between now and 2050 to reach the required future capacity. Modelling compares these rates against a counterfactual pathway, reflecting current trends and targets. This comparison helps us recognise how quickly we need to accelerate the adoption of these technologies. It also allows us to see the impact on emissions over time for different future energy system scenarios. This insight can guide our actions over the next five years to ensure we can enable the adoption of these technologies at a rate necessary to reach the proposed energy system.



Note (1) The National Net Zero, High Demand, Low Demand and Islanded scenario where modelled to achieve net zero emissions. The Do Nothing scenario does not have a decarbonisation target and is based on current committed activities. **(2)** Residual emissions associated with Stream Methane Reformation (SMR) means emission don't reach zero by 2050. SMR is how the hydrogen imported is being produced.

Figure 3.6: Torfaen's carbon emissions ($ktCO_2e$) over time for each scenario

3. The future energy system

Energy demand trends in 2023, 2030 and 2050

The projected changes in energy consumption across various sectors for 2023, 2030, and 2050 are shown in Figure 3.7. Key trends and insights include:

- **Overall energy demand** in the National Net Zero scenario declines marginally by 2050 due to moderate interventions aimed at improving energy efficiency. In the Low Demand and Islanded scenarios, overall energy demand significantly reduces due to initiatives focused on retrofitting buildings, promoting public transport, and encouraging active travel.
- **Heat demand** increases significantly between 2023 and 2050 in both the High Demand and National Net Zero scenarios, primarily due to a rise in new developments across the county. In the Islanded and Low Demand scenarios, the increase in heat demand is less significant, due to the higher rates of building retrofit.
  Transport demand from road vehicles declines from 2023 to 2050 across all scenarios. This reduction is driven by the uptake of active travel and the increased use of public transport services, which assume citizen behaviour change and increased availability of third-party transport services.
- **Industrial demand** remains low but consistent between 2023 and 2050 across all scenarios. Increasing energy demand due to greater industrial activity is offset by efforts to make industrial operations and processes more energy efficient.

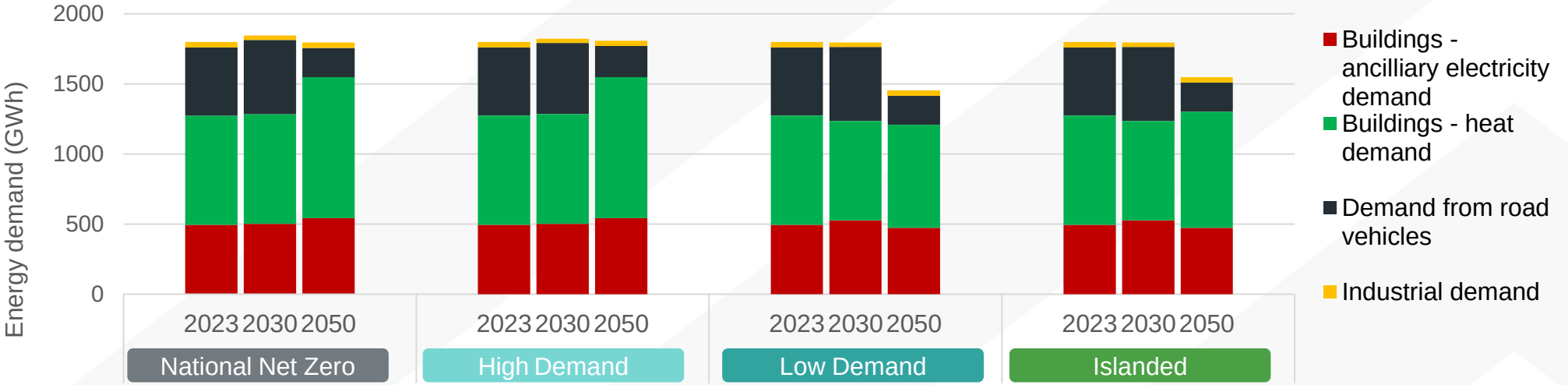


Figure 3.7: Energy demand (GWh) over time for each scenario in Torfaen. Note, this analysis only considered large industrial sites

3. The future energy system

Socio-economic benefits – job creation

The transition to a net zero energy system will be accompanied by socio-economic benefits, particularly through job creation. New and emerging industries grow as demand for their services increases.

Along with our deployment analysis, we have forecasted the number of new jobs to be created in Torfaen across the four future energy scenarios. Referring to the example projection for the National Net Zero scenario shown in Figure 3.8:

1. Gradual increase (Now to 2030): Job numbers rise steadily as deployment progresses, reflecting installation rates and technology adoption.
2. Acceleration (2030 to 2040): The pace quickens, driven by increased uptake and technological advancements.
3. Plateau (2040 to 2050): Job growth stabilises as the market reaches saturation.

The installation of renewable energy assets will create job opportunities, mainly during the construction phase. However, due to the generator's longer lifespan and lower maintenance requirements, these jobs are less permanent. On the other hand, energy efficiency retrofitting and heat pumps involve a higher frequency of installations, ongoing maintenance, and have a shorter lifecycle, resulting in a larger number of available jobs.

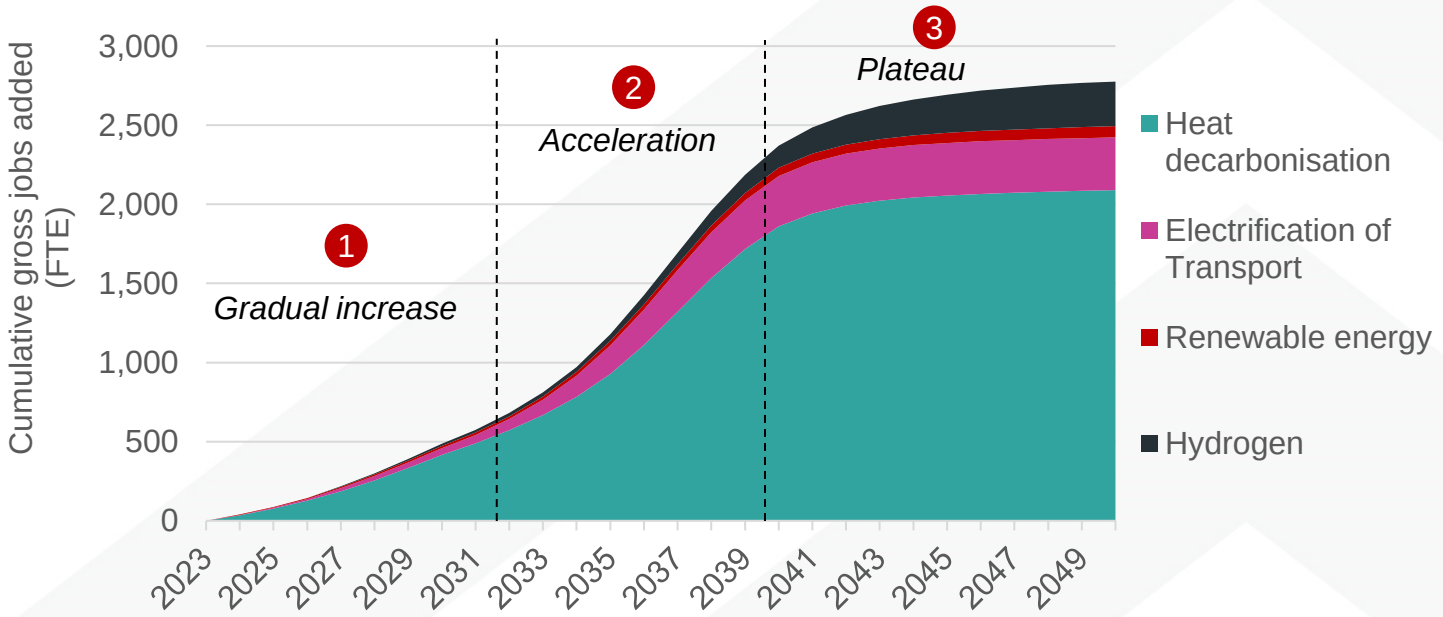


Figure 3.8: Cumulative gross jobs added (full-time equivalent) in the National Net Zero scenario from 2023-2050

Sector	Gross jobs added (FTE) by 2050 – scenario average
Heat decarbonisation (incl. energy efficiency retrofit)	2,100
Electrification of transport	340
Hydrogen	320
Renewable energy	90

Figure 3.9: Jobs added per sector by 2050. Note: This is an average taken from results across all scenarios

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).

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 3.10 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.

Employment impacts

Investments in local energy systems can be expected to have 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.

Metric	Do Nothing	National Net Zero	High Demand	Low Demand	Islanded
Difference in energy demand between 2023-2050 (GWh)	No change between 2023 and 2050	Energy demand **increases by 560 GWh**	Energy demand **increases by 570 GWh**	Energy demand **increases by 220 GWh**	Energy demand **increases by 310 GWh**
Cumulative air quality activity costs between 2023-2050 (£'million) (2022 prices)	£250 M	£140 M **46% less** than the Do Nothing scenario	£130 M **51% less** than the Do Nothing scenario	£140 M **46% less** than the Do Nothing scenario	£190 M **26% less** than the Do Nothing scenario
Jobs added between 2023-2050 (FTE)	1,200	2,800 **1,600 FTEs more** than the Do Nothing scenario	2,800 **1,600 FTEs more** than the Do Nothing scenario	3,400 **2,200 FTEs more** than the Do Nothing scenario	2,500 **1,300 FTEs** more than the Do Nothing scenario

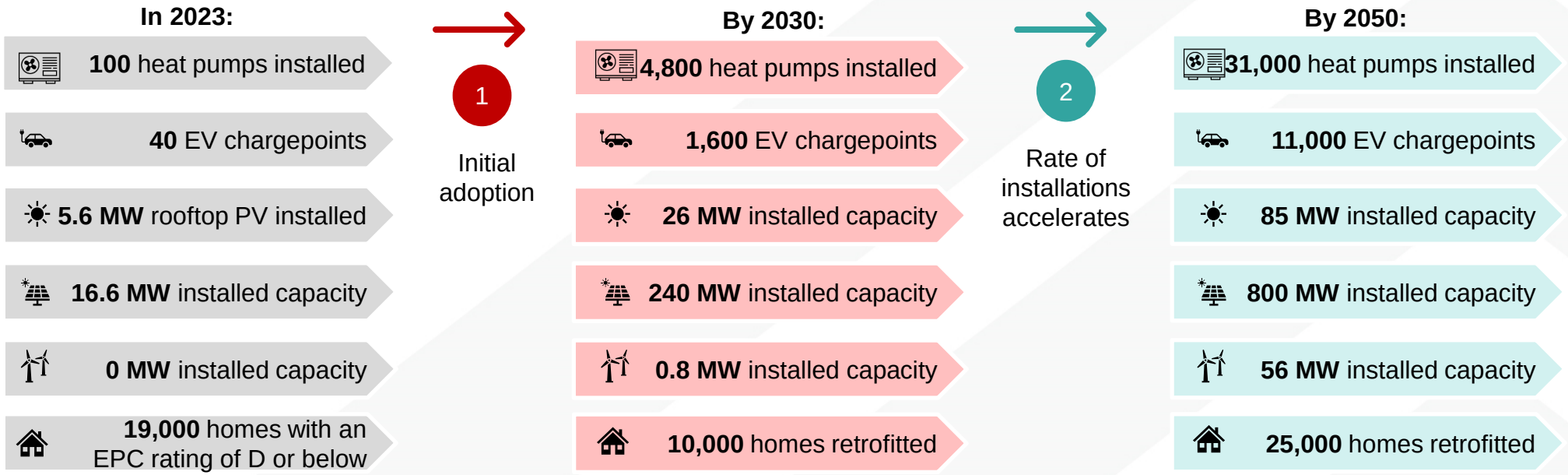
Table 3.10: Summary of economic impacts for each scenario: employment impacts and air quality activity costs. Figures shown relate to the period 2023 – 2050. Air quality activity costs are presented using 2022 prices and are not discounted

3. The future energy system

Deployment modelling

Summary of deployment

Figure 3.11 provides a breakdown of the energy components and interventions required for achieving a net zero energy system by 2050. These values were derived from an average deployment rate taken across the modelled scenarios. 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 the requirement for more detailed analysis. We have included theoretical pathways which have a high degree of uncertainty as there are many variable factors and unknowns. Some of the factors that are not considered in our modelling but still impact deployment are (i) technological advance and innovation, (ii) supply chains and how they develop and (iii) large scale activity to decarbonise infrastructure at other levels: regional, UK and beyond.



1 Between 2023 and 2030, new technologies continue to enter the market, but their adoption rate is more gradual. The slower adoption during the initial years can be due to factors such as limited awareness, higher costs, and the need for infrastructure reinforcement.

2 The installation rate accelerates between 2030 and 2050 as barriers to adoption diminish. Factors that can contribute to higher installation rates include increased awareness of the technologies and economies of scale which lead to reduced installation costs.

Figure 3.11: Torfaen's energy system component deployment rates

Torfaen

Chapter 4: Action planning

4. Action planning

Energy proposals

Learnings from the modelling were shared with local stakeholders and key drivers were discussed that will be critical for Torfaen to transition towards net zero. Stakeholder feedback was considered alongside Torfaen's strategic vision and objectives to agree realistic energy proposals that form the framework for Torfaen's action plan.

The relationships between these chosen energy proposals are shown in Figure 4.1. All the proposals are interconnected, which means implementing one proposal will impact on another and it requires us to consider the whole energy system. Adopting a whole-systems approach encourages collaboration amongst stakeholders involved in different aspects of the energy system, it maximises efficiency and drives value for energy end users.

This diagram also clearly highlights the critical role the DNOs will have in the energy transition going forwards. Both of Torfaen's DNOs for electricity (National Grid Electricity Distribution) and natural gas (Wales and West Utilities) have been key stakeholders throughout the development of this LAEP, proving insights, data and guidance.

A more detailed explanation of each energy proposal's ambition is set out overleaf.

The following energy proposals have been selected by considering modelling results, feedback from stakeholders and the LAEP's objectives:

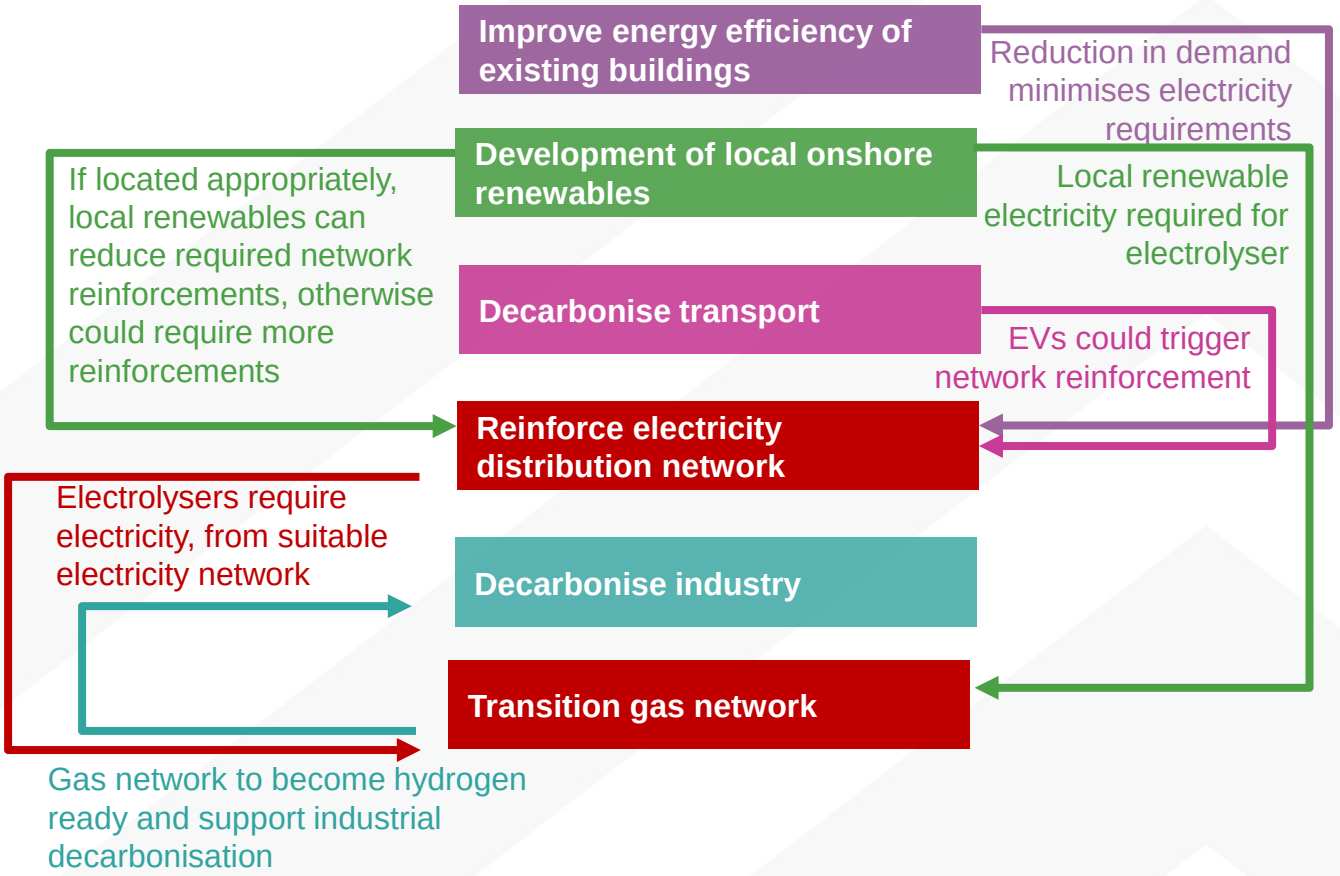


Figure 4.1: Energy proposal inter-dependencies

4. Action planning

Energy proposals in more detail

Sponsors: *Delivery partners:*

1. Improve energy efficiency of existing buildings

Ambition: Enhance the energy efficiency of existing buildings through retrofitting measures aimed at reducing overall electricity and heating demand, while also transitioning away from fossil fuel-intensive heating systems to more efficient, low-carbon technologies. The following interventions will be considered under this proposals:

- Improving building fabric
- Installing heat pumps
- Installing rooftop PV

CAPEX required to deliver: £1,600M

2. Deploy onshore renewables

Ambition: Increase Torfaen's renewable energy output by setting both achievable and ambitious generation targets. Ensure that land suitable for renewable energy assets is identified and that a proactive approach is taken when engaging with developers seeking to unlock capacity. The following interventions will be considered under this proposal:

- Deployment of ground-mounted solar PV
- Deployment of onshore wind farms

CAPEX required to deliver: £400M

3. Decarbonise transport

Ambition: Reduce transport demand by improving active travel routes and enhancing the public transport network with increased frequency and coverage, thereby minimising dependency on private vehicles. Facilitate the adoption of EVs by installing chargepoints across Torfaen. The following interventions will be considered under this proposal:

- Installation of EV chargepoints
- Improving active travel routes and public transport network

CAPEX required to deliver: £40M*

*This CAPEX figure only includes the cost to install EV chargepoints. It does not include investment required to improve active travel routes and public transport networks.

Note: CAPEX required to deliver has not been calculated for proposals 4, 5 and 6 due to the high uncertainty associated with these proposals.

4. Action planning

Energy proposals in more detail

Sponsors: Delivery partners:

4. Decarbonise industry

Ambition: Improve the energy efficiency of industrial sites by optimising current processes and upgrading equipment. Explore the potential for decarbonising industrial processes that traditionally rely on fossil fuels by either transition to hydrogen or electrification. The following interventions will be considered under this proposal:

- Improving the site's energy efficiency
- Conversion to hydrogen and/or electrification

5. Reinforce the electricity network

Ambition: Make upgrades to the electricity network that are required to ensure increasing electricity demand can be met. This is key to ensuring the success of proposals (1), (2), (3) and (4). National Grid Electricity Distribution are onboard with their role in Torfaen's energy system going forward. The following interventions will be considered under this proposal:

- Facilitate necessary capacity of network including upgrades as required

6. Transition gas network

Ambition: Make upgrades to the gas network that are required to ensure future hydrogen demand could be met. This will be key in ensuring proposal (4) can be achieved. Wales and West Utilities are onboard with their role in Torfaen's energy system going forward. The following interventions will be considered under this proposal:

- Facilitate necessary capacity of network including upgrades as required

*This CAPEX figure only includes the cost to install EV chargepoints. It does not include investment required to improve active travel routes and public transport networks.

Note: CAPEX required to deliver has not been calculated for proposals 4, 5 and 6 due to the high uncertainty associated with these proposals.

4. Action planning

Identifying priority focus zones and action routemap

Sponsors: Delivery partners:

The energy proposals represent specific sectors that should be the focus of Torfaen's energy decarbonisation efforts. For each proposal, a detailed routemap has been developed, listing actions that will be taken collectively with stakeholders over the next decade. It is important to recognise the advances in decarbonisation technologies, as well as updates to Net Zero policies and targets. The LAEP should be reviewed every 5 years to account for these changes and actions in this plan will be revised accordingly.

Each action will require four key elements to be successful:

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

Torfaen County Borough Council's, role in delivering each energy proposal will vary. Some actions will require the Council to play a lead role and deliver projects, whilst others require the Council to act as an advisor on projects.

Actions have also been identified that are best delivered regionally by collaborating with the Cardiff Capital Region. In some instances, it will be more efficient and cost effective to take a joined-up approach and deliver projects across multiple local authorities. These 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 technologies and processes. The Council should take an active role in supporting the Cardiff Capital Region deliver these actions 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 with Plaid Cymru, which includes key goals on tackling climate change in a way that maximises local benefits.

Longer-term actions are not included in this report due to their inherent uncertainty. Instead, actions have been included that can be delivered in the short-term, subject to appropriate support. For more details on how the action plan was developed, please refer to the Technical Report.

As a starting point, the spatial representation of opportunities shown in Figure 4.1 on page 50, indicates the location and scale of recommended short-term changes required across Cardiff Capital Region, by energy proposal. The map considers six energy interventions: heat pumps, EV chargers, rooftop PV, ground-mounted PV, onshore wind, and insulation retrofits. While these energy interventions will need to be implemented across the entire Local Authority, the "plan on a page" highlights six substation zones identified as focus locations for addressing at least one of the interventions in the short-term. The prioritisation process considered both technical factors (current domestic energy efficiency and heating strategy, substation capacity, quantity of listed buildings, etc.) as well as social considerations (affordability, social housing, etc.). The tables set out the total scale of change required, indicating either the total capacity (MW) to be installed between now and 2050 or (in the case of insulation retrofits) the existing number of homes currently rated at EPC D or lower. For more details on the methodology behind the "plan on a page", please refer to the Technical Report.

Action planning

Spatial representation of opportunities

Figure 4.2 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 deployment in the zone, including all energy components and electricity network infrastructure interventions. Ranges show the minimum and maximum results from each future energy scenario modelled. Note: intervention should still be carried out in 'Progress' zones to transition the local area to Net Zero.

Sponsors: Delivery partners:

Suggested energy components to pilot in each zone (colours are representative of Torfaen's energy proposals)

Heat pumps	Rooftop PV	GM solar
Insulation	EV chargers	Onshore wind

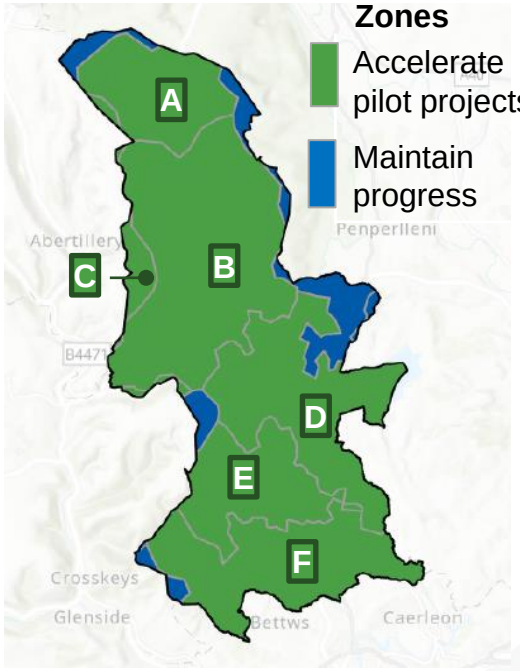


Figure 4.2: Torfaen's spatial representation of opportunities, including 2030 ambition and investment (£ millions). The zone boundaries are delineated by the areas that primary substations service.

	(i)	(ii)	(iii)
Zone A	**Blaenavon**		
	1.3 – 2 MW	£ 1 M – 1.5 M	**Zone A total £ 5 M- 56 M**
	420 – 460 kW	£ 340 k – 370 k	
Zone B	**Abersychan**		
	3.1 – 4.7 MW	£ 2.3 M– 3.5 M	**Zone B total £ 43 M - 200 M**
	670 – 720 kW	£ 550 k – 590 k	
	61 – 90 MW	£ 26 M – 39 M	
	330 – 580 kW	£ 360 k – 630 k	
	1,400 – 2,900 homes	£ 9 M – 150 M	
Zone C	**Abertillery**		
	46 – 50 kW	£ 38 k – 41 k	**Zone C total £ 2 M – 8 M**
Zone D	**Panteg**		
	41 – 43 MW	£18 M – 19 M	**Zone D total £ 44 - 260 M**
	22 – 42 kW	£ 24 k – 46 k	
	12 MW	£ 13 M	
	1,600 – 4,200 homes	£ 12 M – 210 M	
Zone E	**Cwmbran**		
	6 – 8.6 MW	£ 4.5 M – 6.4 M	**Zone E total £ 27 - 210 M**
	11 MW	£ 12 M	
	740 – 4,700 homes	£ 10 M – 180 M	
Zone F	**Llantarnam**		
	76 MW	£ 32 M	**Zone F total £ 49 - 180 M**
	7.9 MW	£ 8.7 M	

Note that the figures shown in the tables above do not represent the absolute limits of the system, both in terms of the technology's 'pilot ambition' capacity (MW) and their geographic locations. It is also important to note that these figures are not set targets and are therefore non-binding.

4. Action planning

Action routemap

National policies and targets

Sponsors: Delivery partners:

	Action	2024	2025	2026	2027	2028	2029	2030
National targets	Up to 1GW of electrolytic hydrogen secured (2025) [UK][M40]							
	Decision on hydrogen to heat buildings (2026) [UK][M41]							
	Up to 10GW hydrogen capacity (50% electrolytic) [UK][M40]	Progressing towards 2030						
	Up to 50GW of offshore wind capacity including up to 5GW of innovative floating wind (2030) [UK][M40]	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) [M42]							
	All new social homes built to Welsh Development Quality Requirements 2021 without fossil fuel heating (from 2025)[M43]							
	All existing social homes to have a plan for minimising environmental impact and improving energy performance (2027) [Wales][M44]							
	-37% GHG emissions by 2025 (rel. to 1990) [Wales][M45]							
	-63% GHG emissions by 2030 (rel. to 1990) [Wales] [M45]	Progressing towards 2030						
	Meet the equivalent of 100% of electricity needs from renewable sources by 2035 [Wales][M46]	Progressing towards 2035						
	1.5GW of renewable capacity to be locally owned (exc. Heat pumps) (2035) [Wales] [M46]	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] [M46]	Progressing towards 2035						
	Minimum EPC E to rent out any property (from 2020 onwards) and EPC C from 2030 [UK][M47]							
	1 public charge point for every 7 to 11 electric vehicles (2025) [Wales][M48]							
	Rapid charging available every 20 miles on the strategic trunk road (2025) [Wales] [M48]							

4. Action planning

Action routemap

National policies and targets

Sponsors: *Delivery partners:*

	Action	2024	2025	2026	2027	2028	2029	2030
National targets	-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] M48	Progressing towards 2030						
	100% new cars and vans sold to be 0 emissions (2035) (ZEV mandate) [UK] M48	Progressing towards 2035						
	Net zero public sector by 2030 [Wales] M50	Progressing towards 2030						

4. Action planning

Enabling actions

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

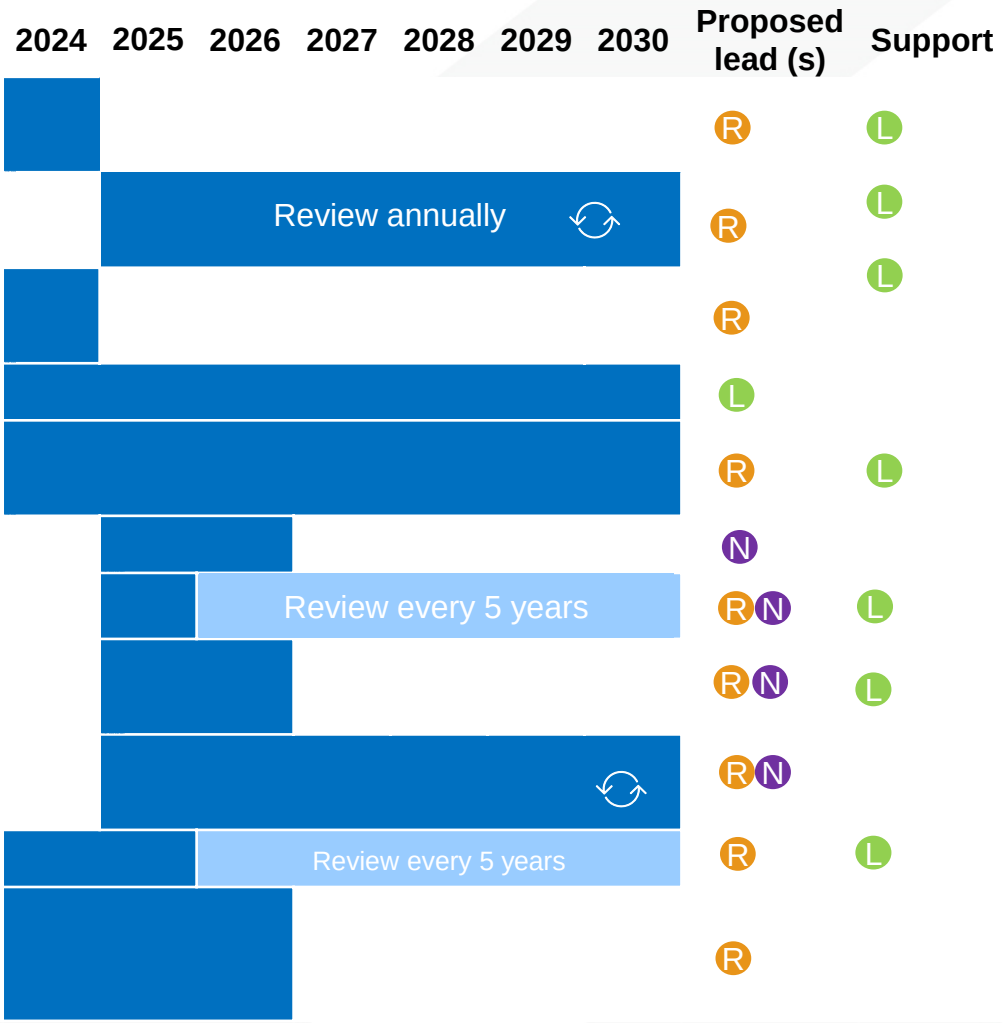
R Action will be implemented at a regional scale, across CCR local authorities

L Action will be implemented at a local scale, across Torfaen

Timescale for the action is ongoing

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

Delivery partners: ARUP; CARBON TRUST



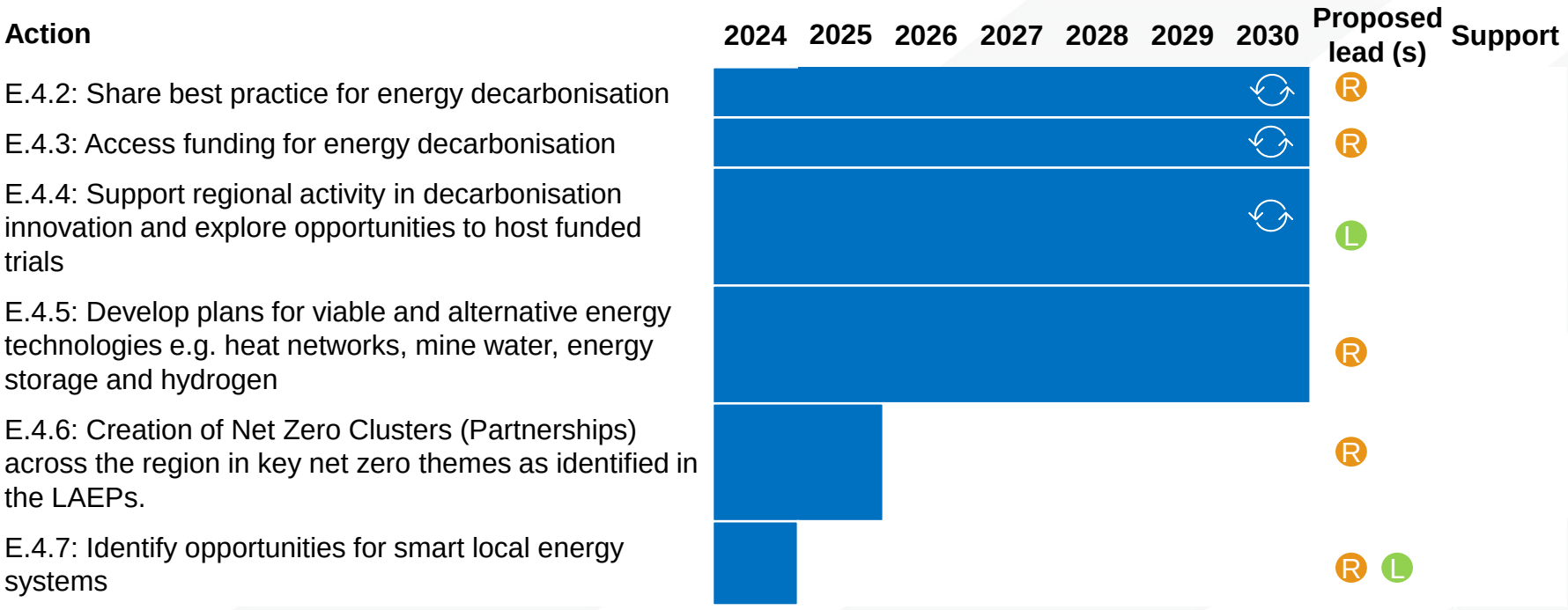
Action	Proposed lead (s)	Support
E.1.1: Develop a governance structure and performance management framework	R	L
E.1.2: Facilitate monitoring of the LAEP across the Region	R	L
E.1.3: Develop a business plan for delivery of the LAEPs across the region	R	L
E.1.4: Ensure resource is available to deliver actions	L	
E.2.1: Develop a regional Strategic Development Plan (SDP)	R	L
E.2.2: Develop a national energy plan	N	
E.3.1: Map and identify skills and labour needs	R N	L
E.3.2: Review and develop educational programmes to meet skills needed	R N	L
E.3.3: Develop a communication strategy to promote jobs	R N	
E.3.4: Identify supply chain needs	R	L
E.4.1: Investigate possible procurement and investment frameworks that could be considered for larger projects of scale	R	

4. Action planning

Enabling actions

Sponsors: Delivery partners:

- (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 Torfaen
- Timescale for the action is ongoing



4. Action planning

Improve energy efficiency of existing buildings

Sponsors: Delivery partners:

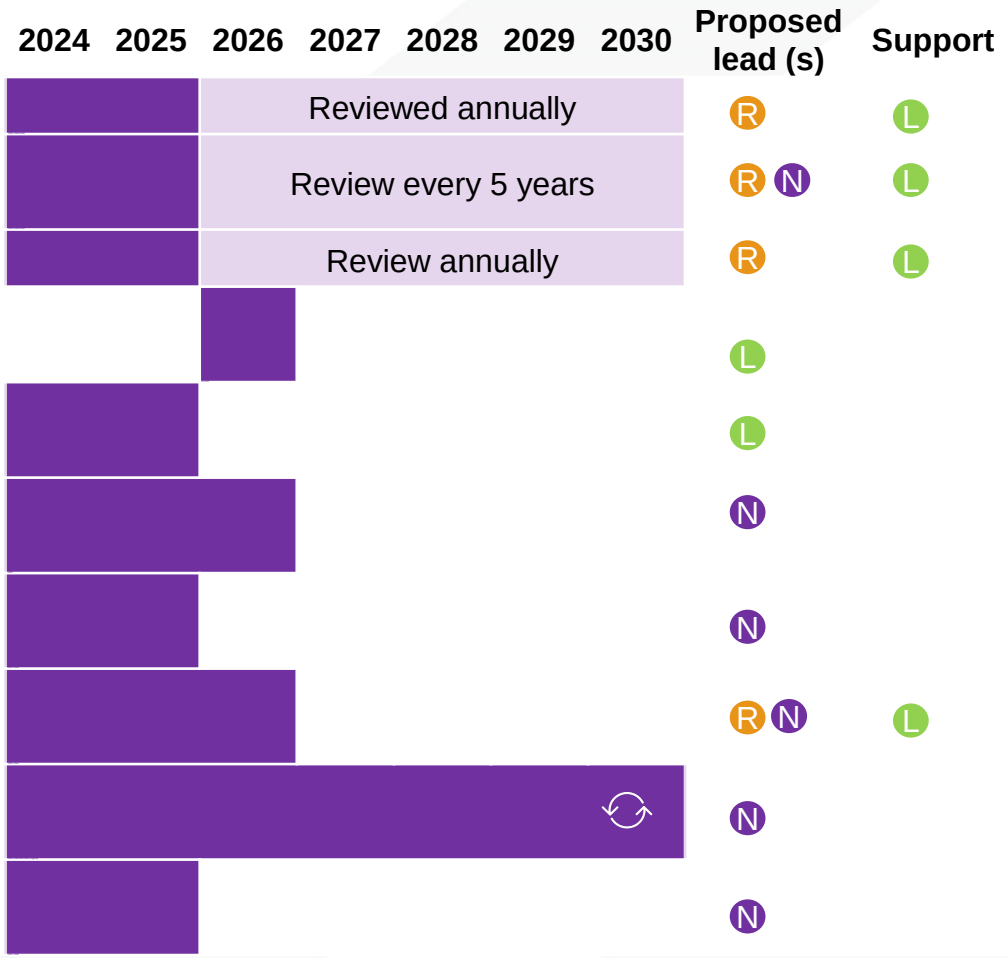
Llywodraeth Cymru Welsh Government

Prifddinas Ranbarth Caerdydd | Cardiff Capital Region

ARUP

CARBON TRUST

- (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 Torfaen
- Timescale for the action is ongoing



Action	Proposed lead (s)	Support
B.1.1: Develop a retrofit prioritisation plan	R	L
B.1.2: Develop a delivery plan for owner-occupied retrofit	R N	L
B.1.3: Review the current ECOFLEX programme	R	L
B.1.4: Support the delivery of B.1.3 by developing a residential awareness campaign	L	
B.1.5: Support the delivery of B.1.3 by identifying areas with a high prevalence of fuel poverty	L	
B.1.7: Consider mechanisms for encouraging greater uptake of retrofit	N	
B.1.8: Apply lessons learnt from ORP through the Welsh Zero Carbon Hwb	N	
B.2.1: Signpost to or develop a retrofit and energy efficiency information hub for consumers	R N	L
B.4.1: Identify specific planning constraints limiting progress to net zero	N	
B.4.2: Consider tighter building regulations to support delivery of net zero ready buildings	N	

4. Action planning

Deploy onshore renewables

Sponsors: Delivery partners:

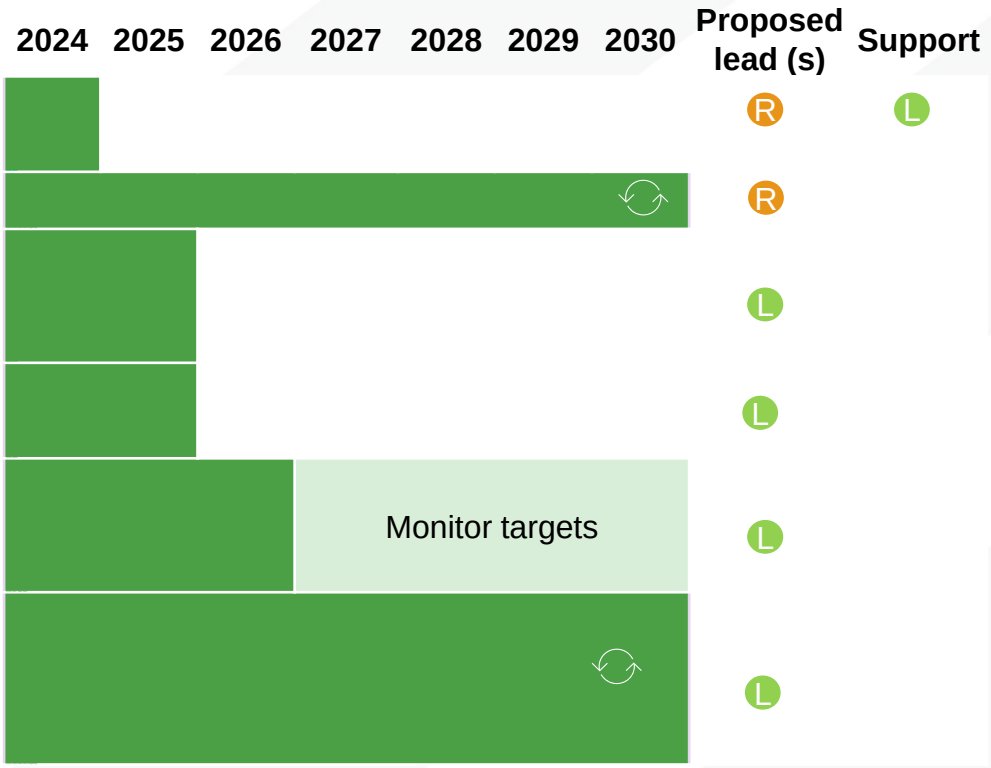
Llywodraeth Cymru Welsh Government

Prifddinas Ranbarth Caerdydd | Cardiff Capital Region

ARUP

CARBON TRUST

- (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 Torfaen
- Timescale for the action is ongoing

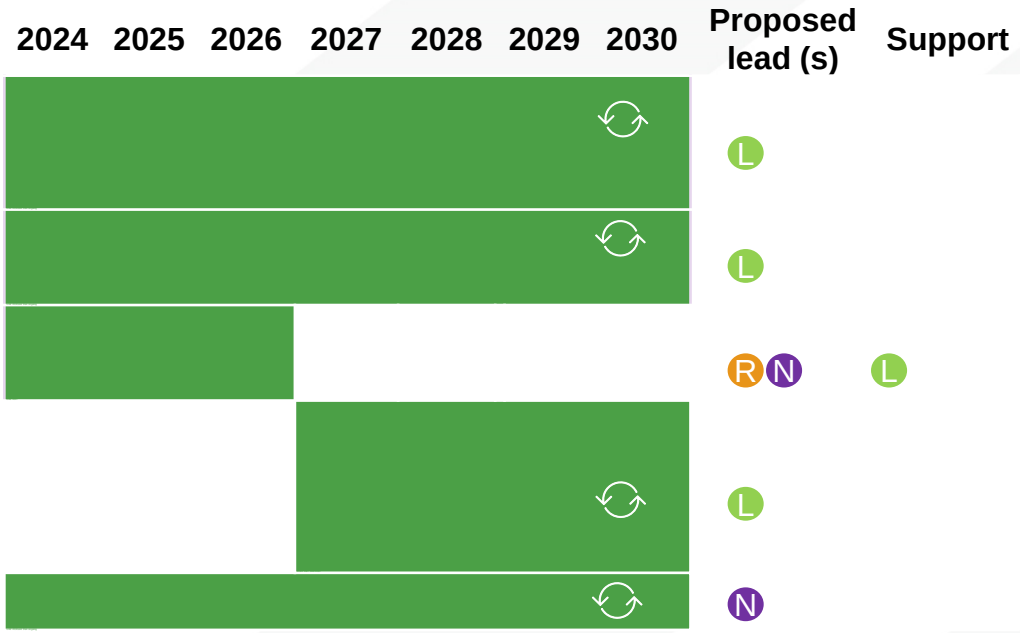


4. Action planning

Deploy onshore renewables

Sponsors: Delivery partners:

- (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 Torfaen
- Timescale for the action is ongoing

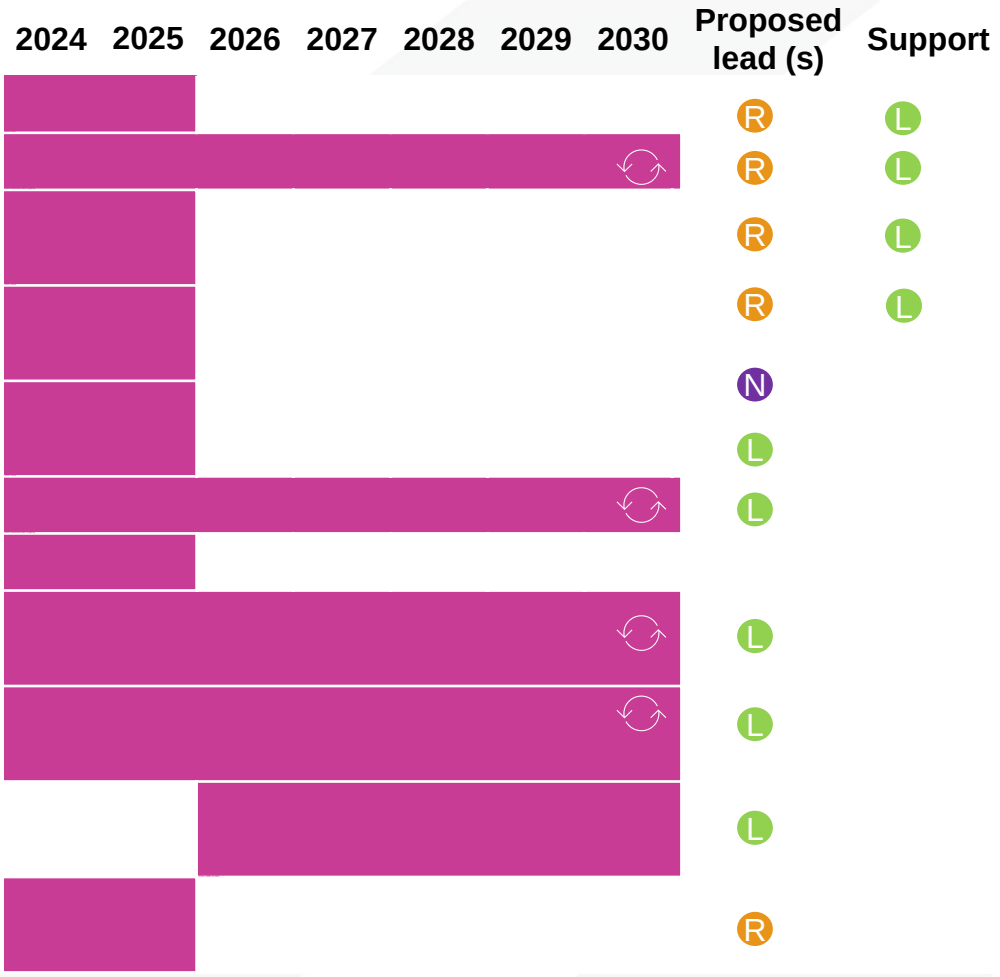


44. Action planning

Decarbonise transport

Sponsors: Delivery partners:

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



4. Action planning

Decarbonise business and industry

Sponsors: Delivery partners:

- (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 Torfaen
- Timescale for the action is ongoing

Action	2024	2025	2026	2027	2028	2029	2030	Proposed lead (s)	Support
C.1.1: Co-ordinate a network to decarbonise local businesses								R	L
C.1.2: Develop an industrial engagement programme to decarbonise industry								R	L
C.1.3: Encourage local businesses to decarbonise according to their specific requirements								L	

4. Action planning

Reinforce and upgrade energy networks

Sponsors: Delivery partners:

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

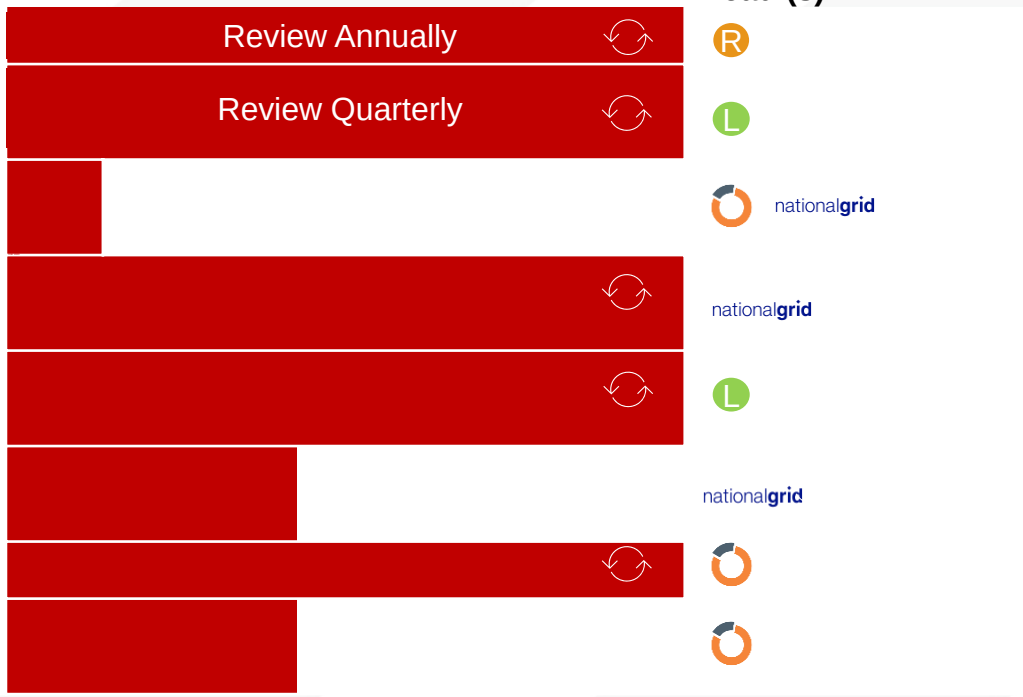
Action will be implemented by National Grid Distribution Network (NGED)

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 Torfaen

Timescale for the action is ongoing



4. Action planning

Reinforce and upgrade energy networks

Sponsors: Delivery partners:

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

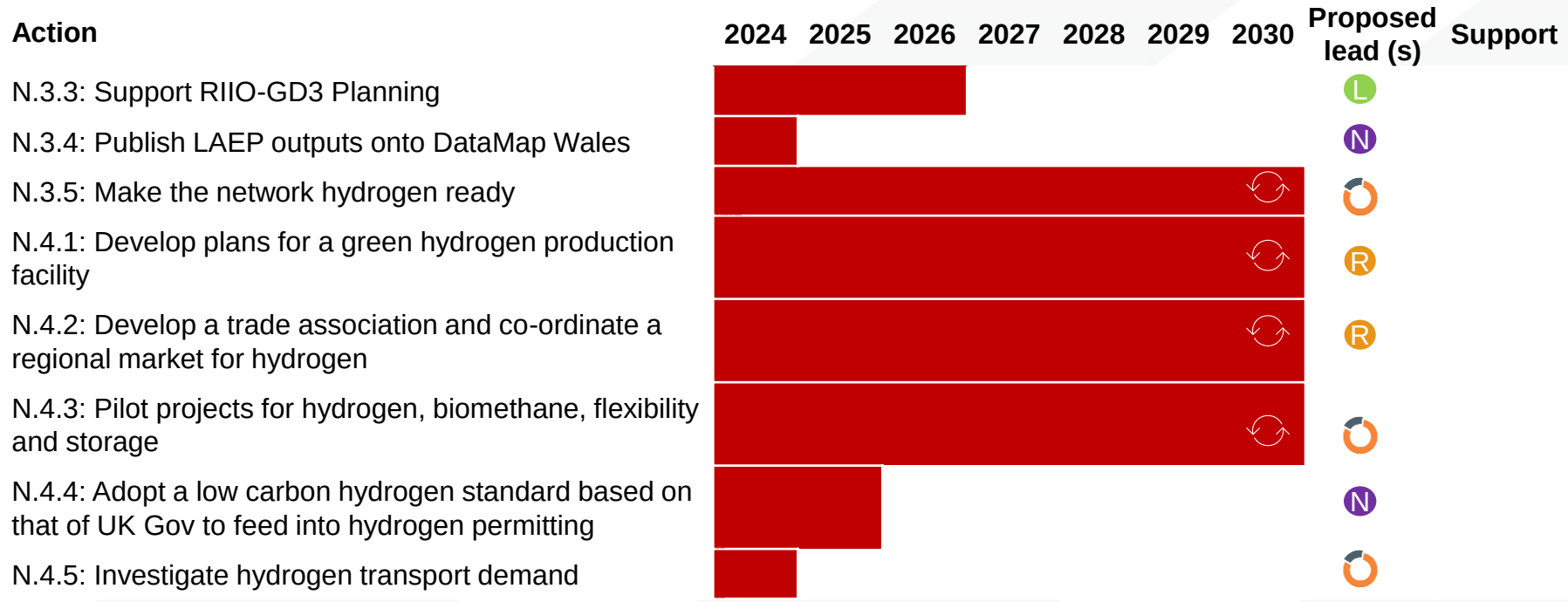
Action will be implemented by National Grid Distribution Network (NGED)

(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 Torfaen

Timescale for the action is ongoing



Torfaen

Chapter 5: Next steps

5. Next steps

Torfaen's LAEP in the context of programmes and projects

The LAEP gives a good understanding of the current state of Torfaen's local energy system, and what it will take to decarbonise it. A plan of action has been set out which upon delivery will support Torfaen's journey towards net zero, subject to sufficient political and financial support.

Figure 5.1 shows how projects move from context and vision setting, to procurement and project delivery. To take each proposal to delivery, programmes and projects will need to go through the entire journey.

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.

Sponsors: Torfaen County Borough / Bwrdeistref Sirol Torfaen; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

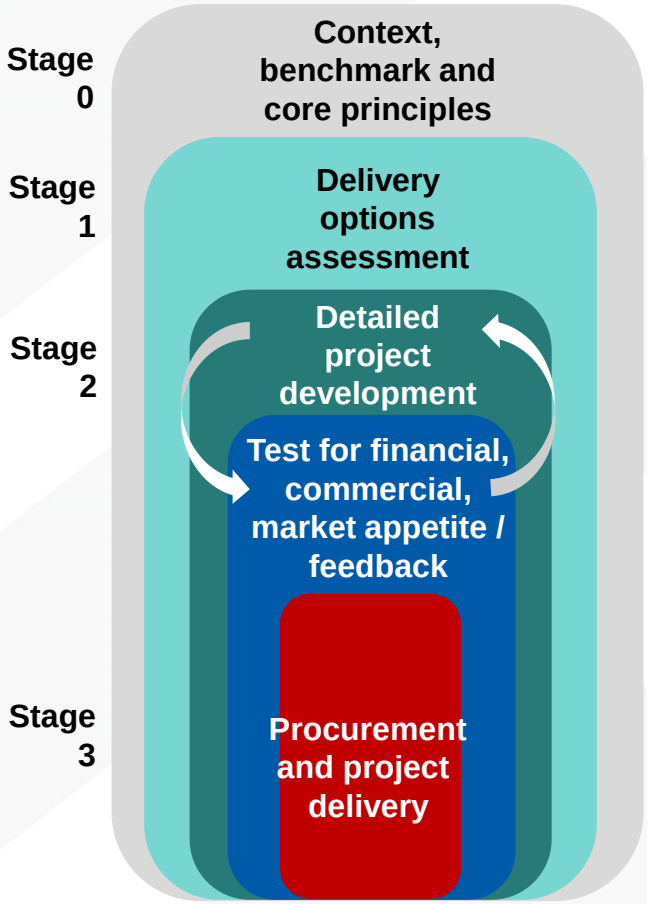


Figure 5.1: How programmes and projects develop

5. Next steps

Torfaen's LAEP in the context of programmes and projects

Sponsors: Delivery partners:

During the LAEP process, the context and vision for five energy proposals has been developed. Whilst, for each of these, work has started and some projects have been delivered, there is a need for a different scale of investment and change to reach net zero.

This means that, as well as continuing to deliver individual projects, the next step for each of the proposals is taken in considering the delivery options.

Improve energy efficiency of existing buildings

Whilst progress has already been made in retrofitting Torfaen's social housing, there is still more work to be done to improve the energy efficiency of existing buildings across all tenure types as well as businesses. Over the next six years, the Cardiff Capital Region will take the lead in developing regional retrofit plans, reviewing current programmes and funding and developing advice services for consumers. Support will also be required to implement their committed actions at a local level in Torfaen.

Deploy onshore renewables

Torfaen currently has ~17MW of renewable energy generators producing electricity to help meet local demand. However, achieving a net zero energy system by 2050 will require a substantial increase in renewable energy output. To ensure a clean and reliable future electricity supply, the Council will need to establish ambitious but achievable renewable generation targets and engage with developers to encourage local installations. Additionally, Torfaen can support the Cardiff Capital Region's regional communication campaign.

Decarbonise the transport

Torfaen, like the rest of the UK, relies heavily on petrol and diesel vehicles for travel. Transition towards a decarbonised transport system will require an increased uptake of EVs and promotion of the use of public transport services and active travel networks. The sub-regional Gwent transport plan outlines committed actions to enhance these options. The council has already installed EV chargepoints in most of their estate's car parks and aims to expand Torfaen's EV infrastructure, provide guidance on EV charging, and improve accessibility to active travel routes and public transport services. Supporting regional activity led by the Cardiff Captial Region's is also integral to Torfaen's approach.

Decarbonise business and industry

This LAEP, has identified local businesses and industry in Torfaen. Locally supporting the Cardiff Capital Region as they engage with stakeholders in Torfaen will encourage decarbonisation at a local scale.

Reinforce and transition energy networks

As Torfaen transition towards a net zero energy system, it is essential energy infrastructure is upgraded to ensure reliable supply to consumers in Torfaen. NGED and WWU have actively participated in developing this LAEP and remain committed to supporting the energy transition across our region.

5. Next steps

Enabling conditions for success - Governance

Delivery of the LAEP will be overseen by Torfaen County Borough Council and the Cardiff Capital Region. The Cardiff Capital Region will develop a business plan for the delivery of actions set out in the LAEP, across the region.

Different stakeholders play an important role in delivering the change that will be required to meet the objectives and actions set out in this plan. The Cardiff Capital Region will lead on developing and setting up a governance structure that will enable wider input from these different stakeholders in the plan.

To deliver this, Torfaen County Borough Council can lead the way by decarbonising assets within its direct control, such as council buildings and the council transport fleet. The Council can also drive and influence the decarbonisation of the wider area through showcasing, collaborating and engaging the community.

The Council's sphere of influence might include:

- Budget and finance
- Defining and helping to achieve the project outcomes
- Identifying the priorities
- Identifying potential risks and monitoring risks
- Monitoring timelines
- Monitoring the quality of the project as it develops

Torfaen Council is involved in a range of projects, initiatives and partnerships with different levels of control. Some of these examples are shown on page 30.

Across the Cardiff Capital Region, there are synergies in terms of the proposals chosen. As such, there will likely be efficiencies in undertaking many of the programmes and projects forward regionally and/or nationally.

Sponsors: Delivery partners:

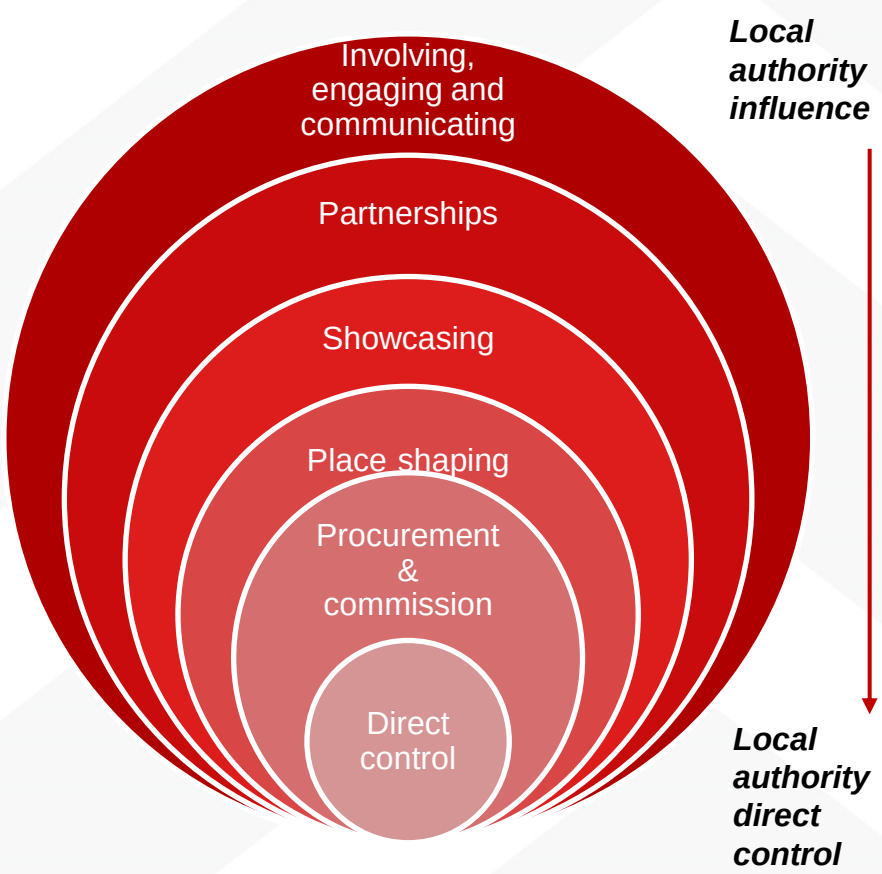


Figure 5.2: Local Authority roles and level of influence

5. Next steps

Enabling conditions for success - Monitoring and review

This plan sets out key actions for the first six years that will set Torfaen 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. An annual monitoring report will be produced, building on the Welsh Government's Energy Generation in Wales reports, which will describe 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
- Hydrogen electrolysers
- Battery installations
- Number of low carbon energy innovations.

To monitor these metrics, publicly available datasets such as the DFES reports undertaken by NGED, Energy Performance Certificate Register, the Micro Generation Certification Scheme and the Renewable Energy Planning Database can be used.

A baseline understanding of these metrics can be developed based on existing data and changed can be monitored annually.

GHG emissions 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 is undertaken by local authorities. It is recognised 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.

Torfaen

Appendix

Sponsors: Delivery partners:

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Sponsors: Delivery partners:

Table of figures

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.
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.

Glossary of terms

Term	Definition or meaning
Demand headroom	The difference between the electrical capacity of a substation, and the electricity demand at the substation at the time of peak demand.
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 proposal	A proposal 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).
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.
Generation	Local generation – size below 100MW.

Glossary of terms

Term	Definition or meaning
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	The term policy levers in this report refer to the 'governing instruments' (Kooiman, 2003) which the state has at its disposal to direct, manage and shape change in public services.
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.

Glossary of terms

Term	Definition or meaning
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.
Microgeneration	Small-scale generation of heat and electricity by individuals, households, communities or small businesses for their own use.
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.*
National Net Zero	The National Net Zero modelled in the LAEP. Details of assumptions are in the methodology section.
National 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.

Glossary of terms

Term	Definition or meaning
Net Zero	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 proposals 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.
Power Purchase Agreement (PPA)	A contract between two parties where one produces and sells electricity and the other purchases electricity.
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.

Sponsors: Delivery partners:

Glossary of terms

Term	Definition or meaning
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.
Renewable Energy Guarantees of Origin (REGO) Agreement	A scheme that tells consumers what proportion of their electricity comes from renewable sources.
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.
Sensitivities	Sensitivities of a specific scenario can be tested – for instance to test the impact of increasing electricity/hydrogen prices on the scenario. Testing a sensitivity is when you change one thing multiple times to assess the impact on the cost/carbon.
Sewage gas	A mixture of gases generated in sewer systems, used in a reciprocating gas engine to produce heat and electricity .
Solar PV	Convert solar radiation into electricity using photovoltaic (PV) cells.
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.

Glossary of terms

Term	Definition or meaning
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.
TfW zone	An area used by the Transport for Wales (TfW) as a point of origin or departure for vehicle trips. M*ay also be called "transport zone" within the reports.*
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 (AREA) 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.

Sponsors: Delivery partners:

Units of measure

Unit	Definition or meaning
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.
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

Ref. 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/
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
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/

Bibliography

Ref. number	Reference
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
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

Bibliography

Ref. number	Reference
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
M72	Department for Levelling Up, Housing & Communities (2024) Energy Performance of Buildings Data: England and Wales. Available at: https://epc.opendatacommunities.org/

Bibliography

Ref. number	Reference
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
MC33	
MC34	Welsh Government (2023) Regional transport plans: guidance for Corporate Joint Committees. Available at: https://www.gov.wales/regional-transport-plans-guidance-corporate-joint-committees
MC35	Cardiff Capital Region (2023) Cardiff Capital Region unveils Regional Economic & Industrial Plan 2023-2028, to create a South East Wales that is more Competitive, Connected and Resilient. Available at: https://www.cardiffcapitalregion.wales/news-events/latest-news/cardiff-capital-region-unveils-regional-economic-industrial-plan-2023-2028-to-create-a-south-east-wales-that-is-more-competitive-connected-and-resilient/
MC70	National Grid Electricity Distribution (2024) Distribution Future Energy Scenarios. Available at: https://www.nationalgrid.co.uk/dso/distribution-future-energy-scenarios
ML01	Torfaen Government (2015) South East Wales Valleys Local Transport Plan. Available at: https://www.torfaen.gov.uk/en/Related-Documents/Roads-Highways-and-Pavements/Local-Transport-Plan/South-East-Wales-Valleys-Local-Transport-Plan.pdf
ML02	Torfaen Government (2022) Future Torfaen: A County Plan. Available at: https://www.torfaen.gov.uk/en/AboutTheCouncil/ImprovingTorfaen/County-Plan/County-Plan-2022-2027.aspx

Bibliography

Ref. number	Reference
ML03	Torfaen Government (2022) Climate and Nature Emergency Action Plan. Available at: https://getinvolved.torfaen.gov.uk/net-zero-torfaen/widgets/46825/documents
ML04	Torfaen Government (2011) The Local Development Plan. Available at: https://www.torfaen.gov.uk/en/PlanningAndDevelopment/Planningpolicy/LocalDevelopmentPlan/Local-Development-Plan.aspx
ML05	Torfaen Government (2011) Designation of SLA Study Report. Available at: https://www.torfaen.gov.uk/en/Related-Documents/Forward-Planning/SD67-DesignationofSpecialLandscapeAreas(versionuploadedMay2011.pdf
ML06	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
ML07	Office for National Statistics (2021) How life has changed in Torfaen: Census 2021. Available at: https://www.ons.gov.uk/visualisations/censusareachanges/W06000020/
ML08	Torfaen Government (2029) Welsh Index for Multiple Deprivation (WIMD) 2019: LSOA Profiles. Available at: https://www.torfaen.gov.uk/en/AboutTheCouncil/StatisticsCensusInformation/WIMD/WIMD-LSOA-Profiles.aspx
ML09	Office for National Statistics (2021) How life has changed in Torfaen: Census 2021. Available at: https://www.ons.gov.uk/visualisations/censusareachanges/W06000020/
ML10	Torfaen Government (2021) Torfaen Economy & Skills Strategy: 2021-2030. Available at: https://www.torfaen.gov.uk/en/AboutTheCouncil/Strategies-Plans-and-Policies/Economy-Skills-Strategy/Torfaen-Economy-Skills-Strategy-2021-2030.aspx#:~:text=COMPANIES%20BY%20SECTOR%3A%20Torfaen's%20business,and%20hospitality%20also%20feature%20strongly.
ML11	Torfaen Government (2022) Climate and Nature Emergency Action Plan. Available at: https://getinvolved.torfaen.gov.uk/net-zero-torfaen/widgets/46825/documents