# Local Area Energy Plan (LAEP)

Merthyr Tydfil

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

# Abbreviations

Sponsors:

Delivery partners:

| Acronym | Definition or meaning |
|---|---|
| CAPEX | Capital Expenditure |
| CCGT | Combined Cycle Gas Turbine |
| CCR | Cardiff Capital Region |
| DFES | Distribution Future Energy Scenarios |
| ECOFLEX | Flexible Eligibility Energy Company Obligation |
| EPC | Energy performance certificate |
| EV | Electric Vehicle |
| FES | Future Energy Scenarios |
| GHG | Greenhouse Gas |
| HGV | Heavy Goods Vehicles |
| LAEP | Local area energy planning or Local area energy plan |
| LDP | Local Development Plan |
| LGV | Light Goods Vehicles |

| Acronym | Definition or meaning |
|---|---|
| LSOA | Lower super output area, a small area classification in the UK designed to have a comparable population. |
| 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. |
| RIIO | Revenue = Incentives + Innovation + Outputs, a regulatory framework used by the UK energy regulator, Ofgem. |
| RTP | Regional Transport Plan. |
| SDP | Strategic Development Plan. |
| SMR | Steam Methane Reformation. |
| TfW | Transport for Wales. |
| WWU | Wales and West Utilities. |

# Contents



*Sponsors:*

*Delivery partners:*

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


The Plan's development was funded by the Welsh Government

# Foreword

Sponsors:

Delivery partners:

We are pleased to introduce the Merthyr Tydfil Local Area Energy Plan (LAEP) this is an ambitious and comprehensive roadmap specifically tailored to meeting the needs of our community and aligned with our decarbonisation plan goals. This plan demonstrates dedication to decarbonise our local energy system and to fostering a sustainable, resilient and prosperous future for our region.

The Council is working towards achieving net zero and this commitment has been driven forward locally through the Council Decarbonisation Plan (2023-2030) published in June 2023. The Council published the Corporate Well-being Plan (2023-2028), Acting Today for a Better Tomorrow in 2023 which further embeds the Council commitment and aims to deliver the strategic vision where people learn and develop skills to fulfil their ambition; people live, work and have healthy and fulfilled lives; and people visit, enjoy and return.

The LAEP has been developed specifically for Merthyr Tydfil's landscape and has taken into account the challenges and opportunities with practical and scalable solutions, encompassing a broad range of initiatives. These include enhancing energy efficiency in homes and businesses, increasing the deployment of renewable energy sources and exploring innovative technologies. As we embark on this journey to decarbonise Merthyr Tydfil local energy system, we understand the importance of collaboration. This vision has been developed in partnership with key stakeholders over a period of 12 months, which started in February 2023. Achievement of the LAEP will require commitment from the Council, key stakeholders and active participation of our residents, businesses and community leaders.

Together we can transform the way we produce and consume energy. There will be challenges to transition to sustainable energy however by embracing opportunities and change, fostering innovation and working collectively we can ensure a greener and more sustainable Merthyr Tydfil now and for future generations.

**Figure 0.1: Merthyr Tydfil County Borough Council - Civic Centre**

## A note from Councillor Brent Carter, Council Leader

# Local Area Energy Plan outline

This plan collates evidence to identify the most effective route for Merthyr Tydfil to reach net zero

## 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 the Merthyr Tydfil's area-wide local energy plan and actions.
2. **Technical Report** contains the graphs, charts, maps and supporting data for the results published in the Local Area Energy Plan. It also provides more detail about the approach to modelling and scenario analysis that we took. This report is available upon request from decarbonisation@merthyr.gov.uk.
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.

In this plan, the term "we" has therefore been used to refer to the range of people and organisations in Merthyr Tydfil who will support the ambition we set out and take action. The Council and CCR have taken facilitating roles in developing this LAEP, but we will not deliver the ambition it sets out alone. We have developed this Plan with input from a range of stakeholders, and we hope that you will be inspired by the actions that stakeholders have committed to, to take action to transform our energy system too.

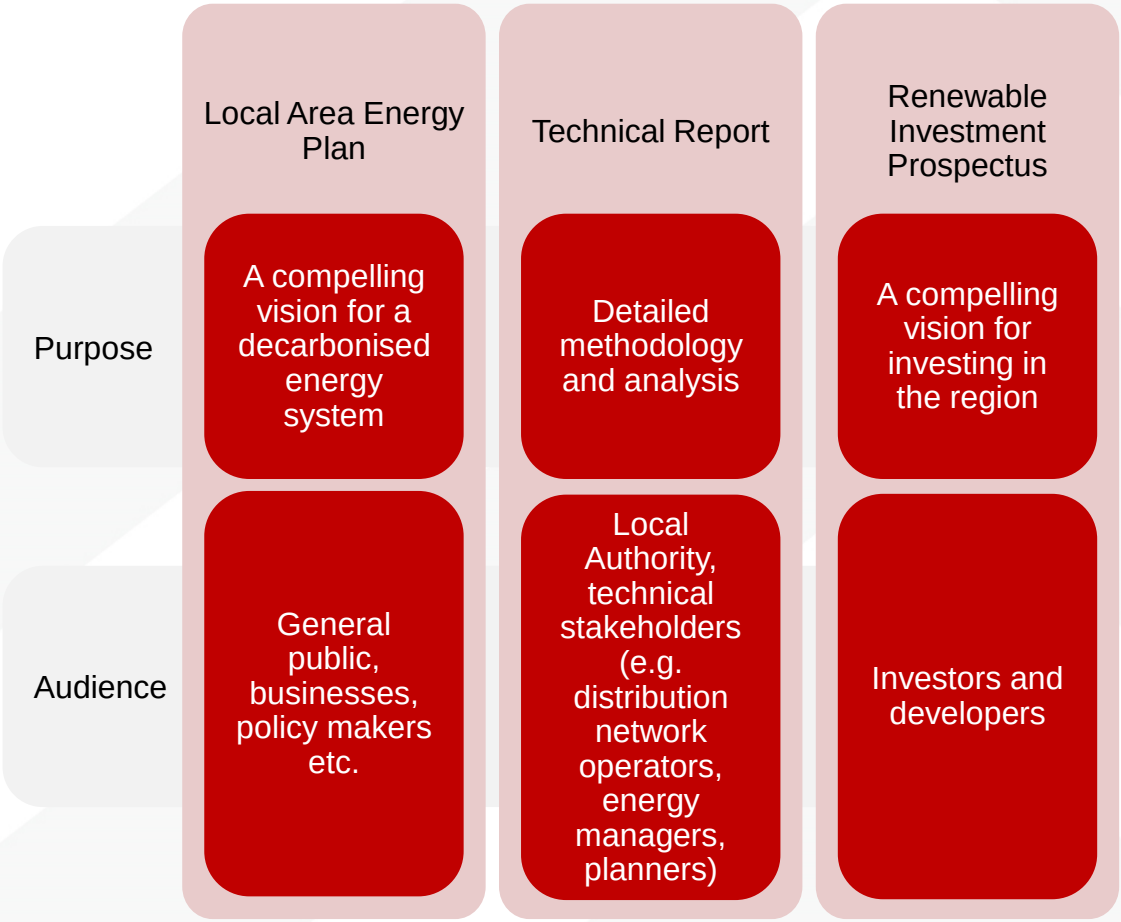


**Figure 0.2: LAEP and support documents purpose and audience summary**

# Executive summary

Merthyr Tydfil has a vision to transition the local energy system to net zero

Sponsors:

Delivery partners:

**The vision** for Merthyr Tydfil's future local energy system is:

**Transitioning our local energy system in a way that provides affordable solutions for our businesses and communities, and offers new opportunities for growth.**

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

1. To provide a resilient energy system capable of meeting future energy demand and resilient to climate change.
2. To maximise reductions in carbon emissions while minimising financial costs.
3. To empower the local economy, through increasing access to local employment and promoting local ownership and supply chains.
4. To provide community engagement, leadership and ownership of our energy systems in relation to our urban and rural communities.
5. To deliver affordable solutions for all and ensure everyone has equitable access to energy.

Our **energy propositions** describe what needs to change between now and 2050 to decarbonise Merthyr Tydfil's local energy system and achieve net zero by 2050.

- Increase building efficiency
- Deploy renewables
- Decarbonise transport
- Reinforce and transition energy networks

# Executive summary

Merthyr Tydfil's energy propositions in more detail

Sponsors: Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

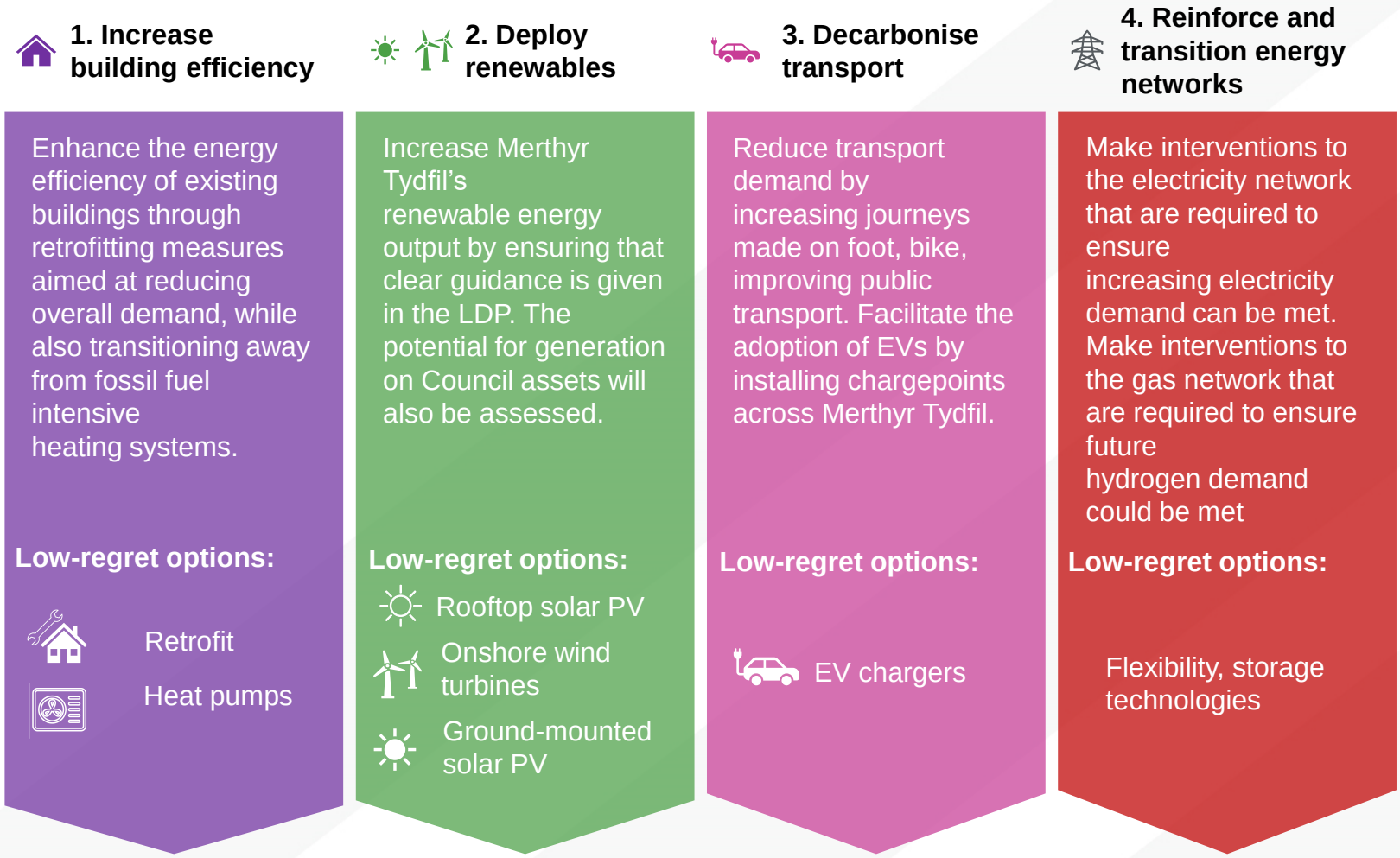


**Figure 0.3: Summary of energy propositions**

# Executive summary

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

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Delivery partners: ARUP; CARBON TRUST

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**Merthyr Tydfil's local energy system today**

- **30** heat pumps installed
- **16,000** homes rated EPC D or below
- **80** EV charge points
- **700** buildings with rooftop solar PV
- **5 MW** ground-mounted solar PV installed capacity
- **1.5 MW** installed capacity

**The rate of change required**

2023 2026 2029 2032 2035 2038 2041 2044 2047 2050

1 Between 2023 and 2030, we assume a slow but steady uptake of low carbon technologies due to factors such as limited awareness, higher capital costs, and the need for network reinforcement.

2 From 2030 onwards, we assume that deployment accelerates as technologies become more commercially attractive, awareness increases, supply chains develop, and they become more affordable.

3 From 2040 onwards, we assume that low carbon technologies are widely used and tend towards their maximum feasible adoption, which causes the deployment rate to stabilise.

**What Merthyr Tydfil's net zero local energy system could look like in 2050**

- **23,000** heat pumps installed
- **13,000** homes retrofitted
- **10,000** EV charge points
- **11,000** buildings with rooftop solar PV
- **23 MW** ground-mounted solar PV installed capacity
- **40 MW** installed capacity

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

Delivery partners: ARUP; CARBON TRUST

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## Direct impacts

**Emissions reduction**

40 times less GHG emissions than in 2023

8-26% less heat used in the average building than in 2023

**Energy savings**

Less then half the energy used for transport compared to 2023

## 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 | £110 million of cumulative savings by 2050 |
| **Net job creation** | Emerging net zero industries attract investment and create high quality local jobs | 1,700 jobs created in 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*

# Executive summary

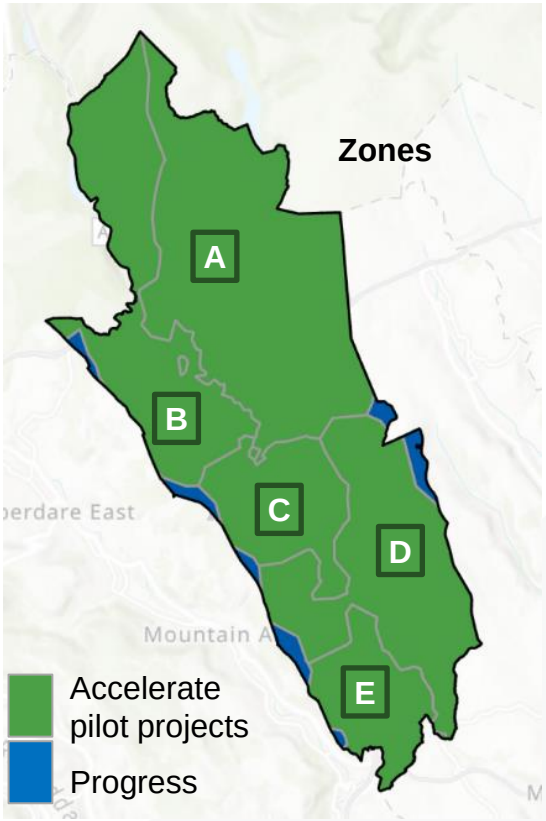
In order to support transformation of the energy system, pilot projects may be useful. The plan on a page below highlights areas that could provide a useful focus for these pilots.

Figure 0.3 identifies zones with particularly favourable conditions for specific energy components, making them ideal locations for pilot studies. The summary tables (shown below) detail the (i) installed capacity opportunity, (ii) required investment for each component and (iii) total investment necessary for both energy component installation and electricity network infrastructure in each zone by 2030. Ranges have been calculated by taking the minimum and maximum results from each future energy scenarios modelled (see the Technical Report for more detail). Note: intervention should still be carried out in 'Progress' zones to transition the local area to Net Zero.

Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council

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

*Delivery partners:* ARUP; Carbon Trust




| | (i) | (ii) | (iii) |
|---|---|---|---|
| **Zone A** | **Swansea Road Merthyr** | | **Zone A total £22-91m** |
| | 5MW | £5m | |
| **Zone B** | **Merthyr East Primary** | | **Zone B total £96–335m** |
| | 63MW | £27m | |
| | 12MW (2050) | £12m (2050) | |
| | 11MW | £12m | |
| | 2,900 – 5,500 homes | £16– 260m | |
| **Zone C** | **Pentrebach** | | **Zone C total £10-52m** |
| | 1.5-2.3 MW (250 - 380 heat pumps) | £1.1 – 1.7 mil | |
| | 0.22 - 0.32 MW (52 - 79 chargers) | £0.18 – 0.29 mil | |

**Suggested energy components to pilot in each zone**

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

| | (i) | (ii) | (iii) |
|---|---|---|---|
| **Zone D** | **Nantwen** | | **Zone D total £36-92m** |
| | 60MW | £26m | |
| | 1.4 – 2.2MW (250 – 370 heat pumps) | £1.1 – 1.6m | |
| | 0.28 – 0.35MW (66 - 83 chargers) | £0.23 – 0.29m | |
| | 760 – 1,100 homes | £4 – 61m | |
| **Zone E** | **Nelson** | | **Zone E total £16-83m** |
| | 8MW (2050) | £8.5m (2050) | |

**Figure 0.4: Merthyr Tydfil's spatial representation of opportunities, including 2030 ambition and investment (million £). Zone boundaries are defined by primary substation service areas.**

# Executive summary

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

Sponsors:

Delivery partners:

## Action routemap

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

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

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

## Next steps

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

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

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

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

Merthyr Tydfil

# Chapter 1: Introduction

# 1. Introduction

## What is Local Area Energy Planning (LAEP)?

### Overview

#### 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 timeframe. By exploring a range of technologies and scenarios through whole energy system modelling and analysis, the most cost-effective preferred pathway to net zero can be identified[M01]. The process follows standardised guidance defined by ESC[M04].

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

A LAEP results in an indicative costed spatial plan that identifies the change needed to the local energy system and built environment, detailing what changes are required, where, when and by whom. The level of detail 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].

#### Vision of a LAEP

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

[a]For example, a LAEP may identify a zone that is best suited to a district heat network by assessing the types of buildings in the zone, their characteristics, and density; however, to deliver the district heat network it would require a full feasibility assessment by an appropriately qualified installation or design company, along with assessment of commercial viability and delivery mechanisms.

# 1. Introduction

## What is Local Area Energy Planning (LAEP)?

### Overview

#### Scope of a LAEP

The UK government's 2021 Net Zero Strategy estimates that **82% of the UK's emissions are "within the scope of influence of local authorities."**[M02]

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

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

#### Benefits of a LAEP

A LAEP provides a long-term plan to deliver net zero. A benefit of LAEP is the 'whole systems approach', aligned to the Wellbeing of Future Generations Act "way of working" on integration. This provides consideration to the most cost-effective solutions to future energy system at the right time 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 plans, a LAEP is built on a common evidence base. The outputs can then be used reliably by stakeholders from Merthyr Tydfil planners to network operators to community groups, knowing they are working towards a common goal built on strong foundations.

# 1. Introduction

## The energy transition across Wales

### Overview

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

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

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

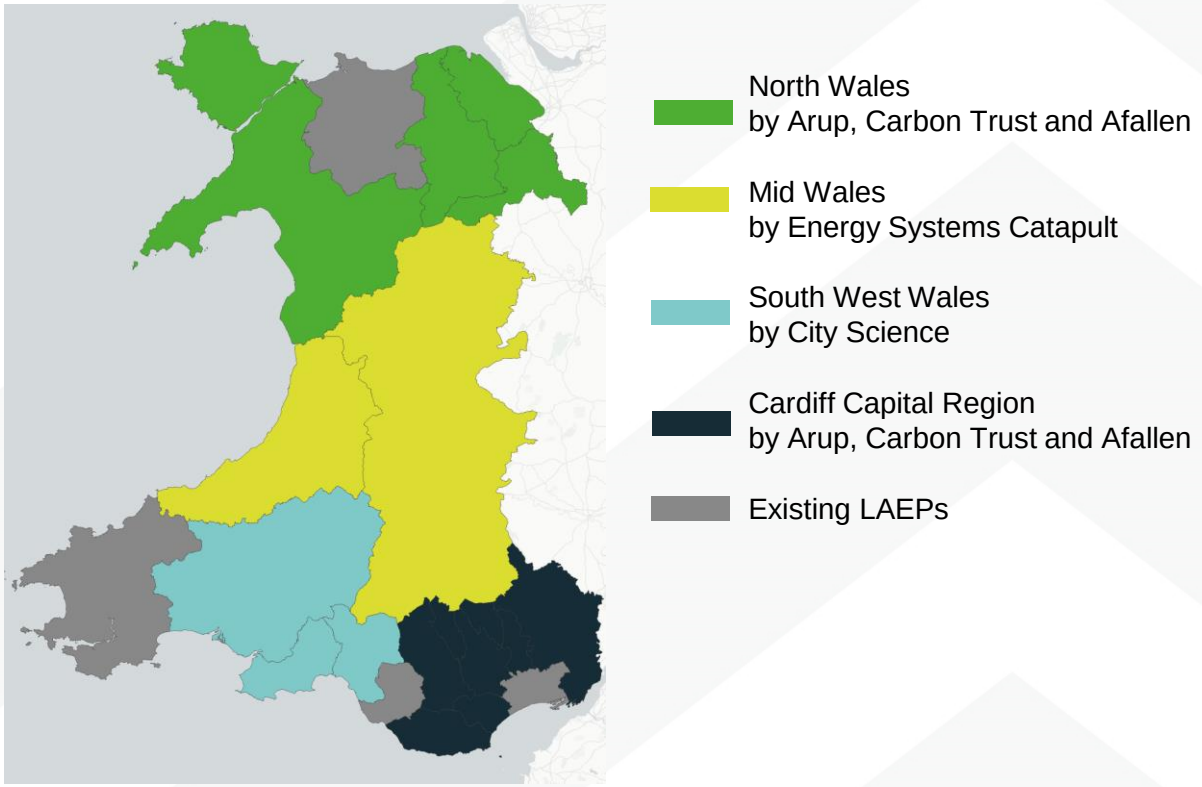



**Figure 1.1: LAEP landscape across Wales**

# 1. Introduction

## Boundary and scope

### Parts of the energy system analysed in a LAEP

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

There are three core parts to the local energy system:

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

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

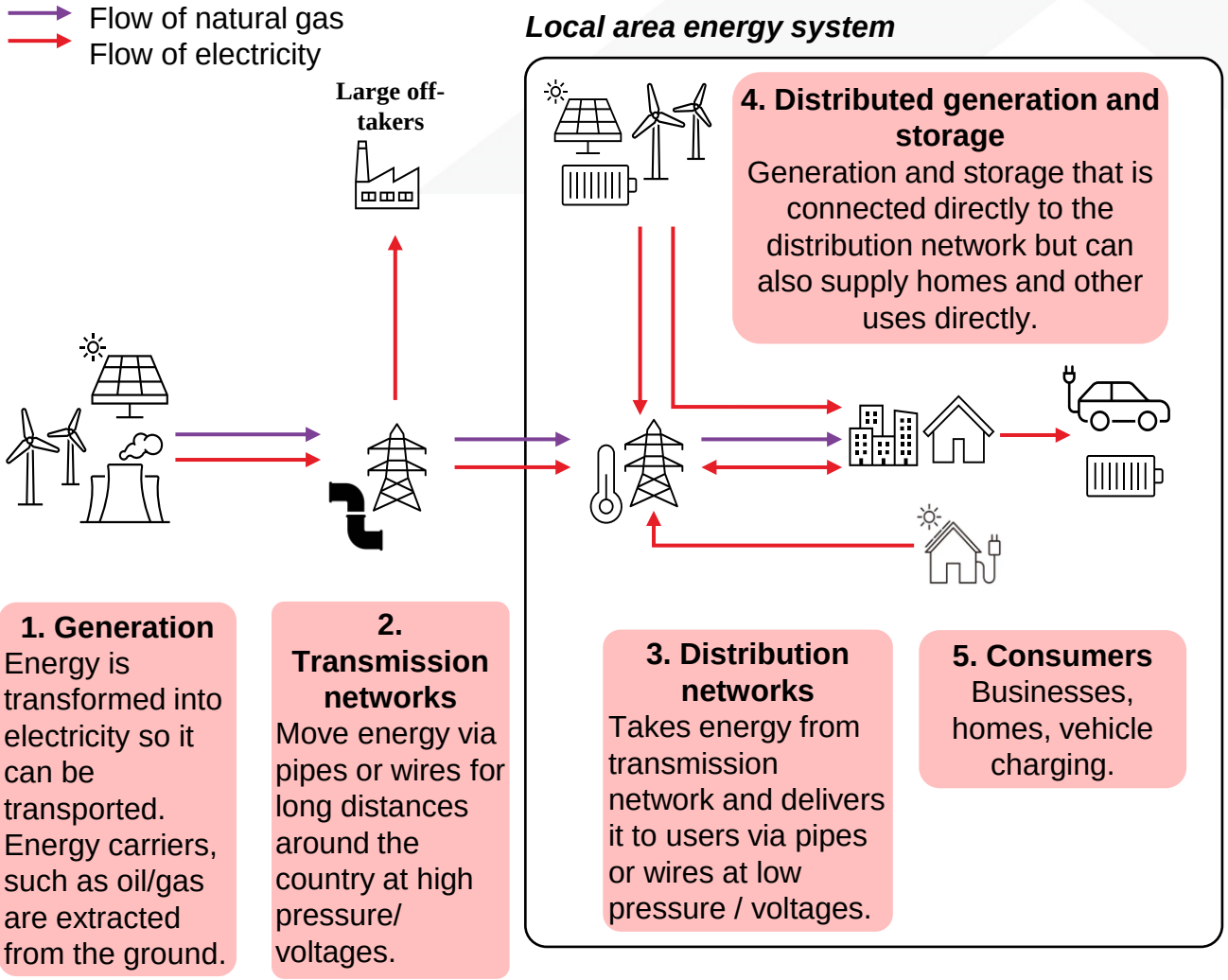



**Figure 1.2: Schematic of electricity and gas transmission and distribution network and the system boundary for LAEP**

# 1. Introduction

## Boundary and scope

### Definitions

#### Scope for the Welsh LAEPs

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

#### Geographic boundary

We used the geographic boundary for Merthyr Tydfil 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 Merthyr Tydfil's decarbonisation journey.

Sponsors: Llywodraeth Cymru Welsh Government; Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Prifddinas Ranbarth Caerdydd Cardiff Capital Region
Delivery partners: ARUP; Carbon Trust

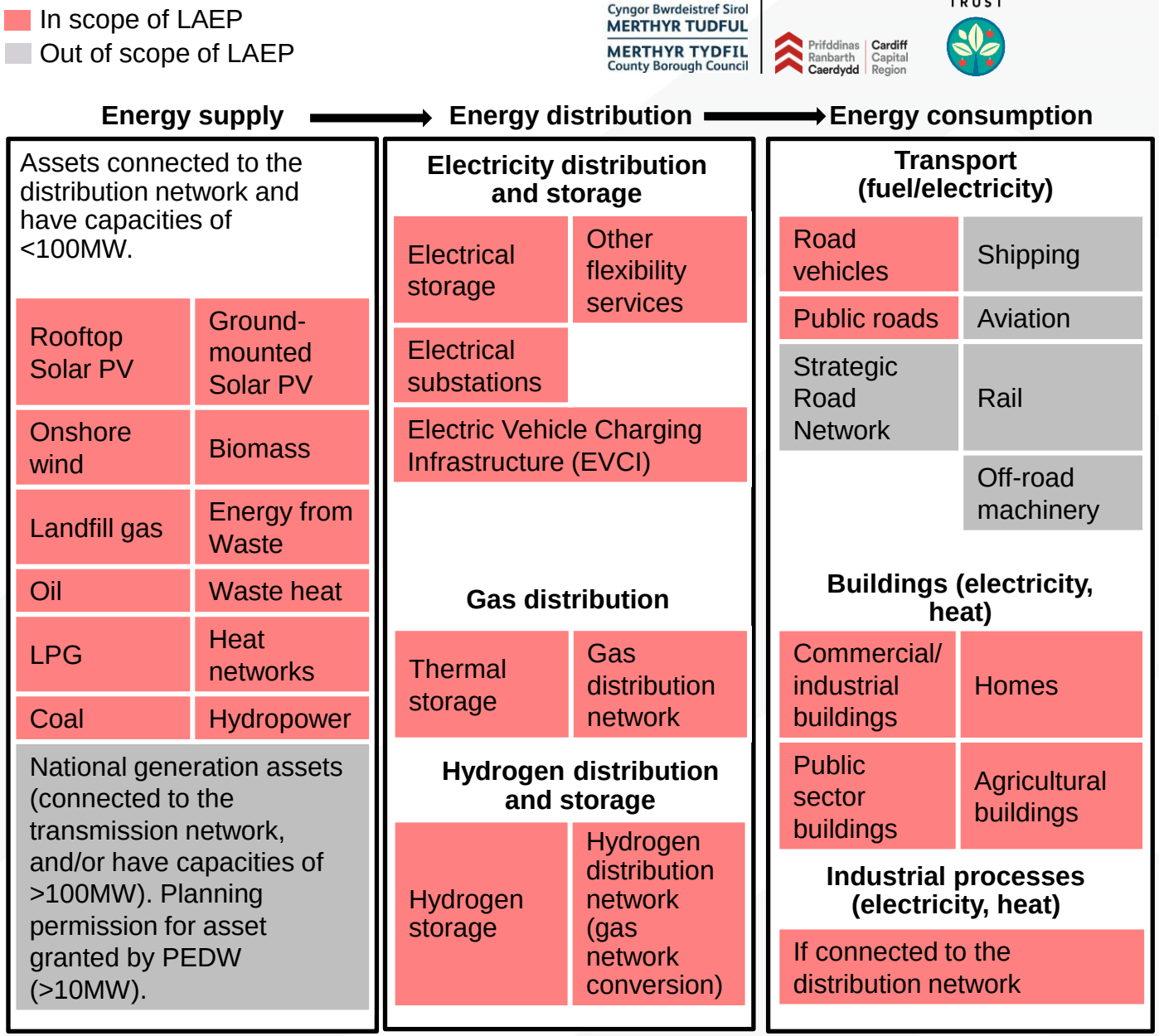



**Figure 1.3: Schematic of the local system scope for LAEP**

# 1. Introduction

## Our vision for Merthyr Tydfil's future local energy system

**Future energy system vision, objectives and principles**

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

*Delivery partners:* ARUP; CARBON TRUST

Cyngor Bwrdeistref Sirol MERTHYR TUDFUL / MERTHYR TYDFIL County Borough Council

We have produced the following vision statement that underpins our ambition for the future net zero energy system in Merthyr Tydfil:

### Merthyr Tydfil's vision

**Transitioning our local energy system in a way that provides affordable solutions for our businesses and communities, and offers new opportunities for growth.**

In shaping the LAEP for Merthyr Tydfil, we established the following objectives. These objectives served as foundation elements that were considered when formulating recommended actions:

### Energy objectives

1. **To provide a resilient energy system capable of meeting future energy demand and resilient to climate change.**
2. **To maximise reductions in carbon emissions while minimising financial costs.**
3. **To empower the local economy, through increasing access to local employment and promoting local ownership and supply chains.**
4. **To provide community engagement, leadership and ownership of our energy systems in relation to our urban and rural communities.**
5. **To support the creation of quality and long-lasting energy related local job opportunities.**
6. **To deliver affordable solutions for all and ensure everyone has equitable access to energy.**

# 1. Introduction

Sponsors: Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

## LAEP contents

This LAEP presents a vision for a net zero local energy system for the whole Merthyr Tydfil area, with a routemap to get there, including a set of recommended actions for the Merthyr Tydfil, 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 Merthyr Tydfil'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 Merthyr Tydfil, including what needs to happen and what we will do.
4. Next steps – outlines immediate next steps and what is needed to create an enabling environment for the delivery of this plan, and a net zero local energy system.

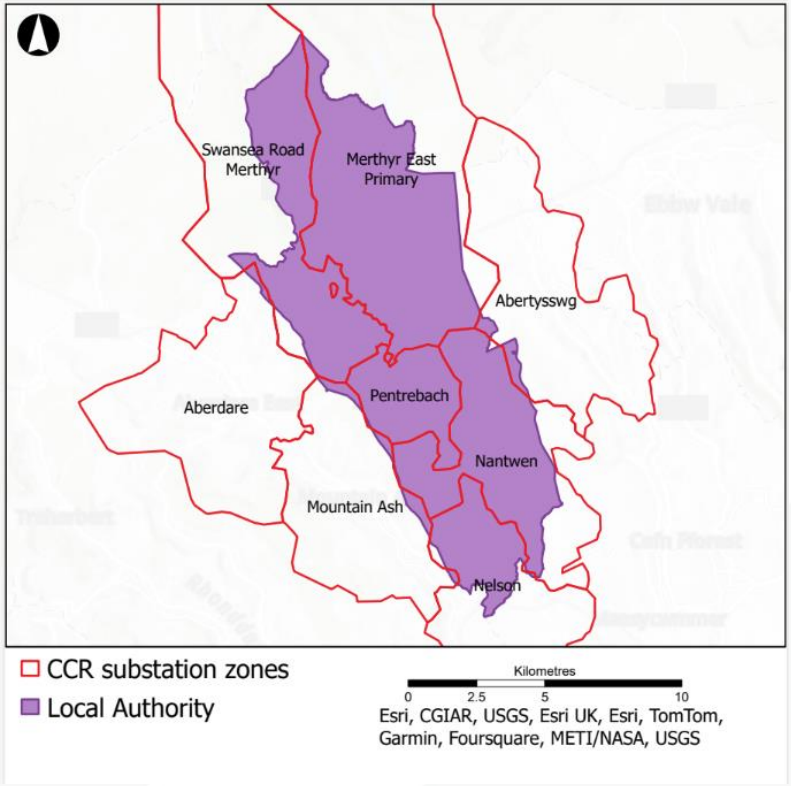



**Figure 1.4: Geographic boundary of the LAEP**

Figure 1.4 shows the boundaries of Merthyr Tydfil (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. We most often present the analysis, results, and maps herein in terms of these smaller modelling zones, which may also be called “substation zones” or simply “zones.”

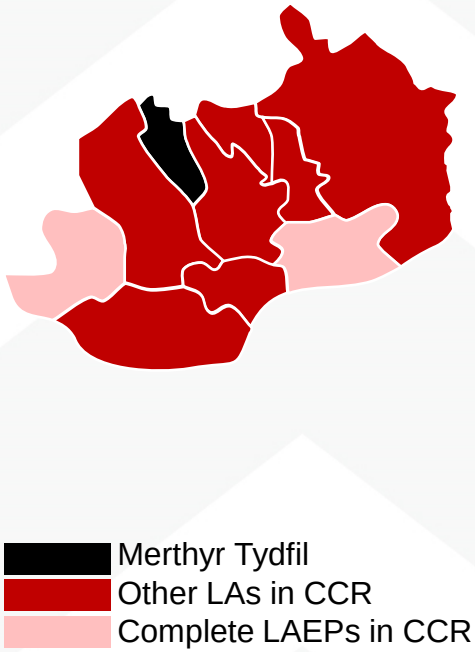



**Figure 1.5: Cardiff Capital Region**

Merthyr Tydfil

# Chapter 2: The current energy system

# The current local energy system

Sponsors:

Delivery partners:

## Analysis - local context

Located in the Heads of the Valleys, within the Cardiff Capital Region, Merthyr Tydfil County Borough is the smallest Welsh local authority, with a population of around 60,000 and an area of approximately 111km$^2$ of which 23km$^2$ lies within the Brecon Beacons National Park.[ML01]

It consists of the northern part of the Taff Valley and the smaller neighbouring Taff Bargoed Valley, and around 75% of the population live within the main town of Merthyr Tydfil. [ML01]

In this report Merthyr Tydfil refers to the County Borough of Merthyr Tydfil rather then the town, unless otherwise stated. The County Borough of Merthyr Tydfil has a relatively high proportion of social housing, and a projected population decline from 2024, with the loss of working aged people to elsewhere in the UK. Merthyr Tydfil County Borough has a high proportion of its working age population with no qualifications, and a high need for social, affordable and older person housing. [ML01]

Merthyr Tydfil has an industrial past and contains numerous important cultural and historical designations such as the Merthyr Tydfil landscape of outstanding historic interest and the Cyfarthfa Heritage Area. One of the historic industries is coal, and Ffos y Fran, which was the largest open cast coal mine in the UK, closed in November 2023.

Other industries which could potentially lead to job losses due to decarbonisation are those relating to manufacturing parts of internal combustion engine vehicles. There are potential areas of economic opportunity through decarbonisation, particularly for electrical contractors to upskill to install low carbon technologies.

There is some scope for renewable energy development outside of urban areas, the Brecon Beacons National Park and other designations. The terrain of Merthyr Tydfil, with many parts consisting of steeply sides valleys, will however reduce suitable areas for renewable energy generation.

Transport in Merthyr Tydfil is dominated by car use, and the A470 (north-south) and A465 (east-west) meet to the north-west of Merthyr Tydfil and are the County Borough's major roads. The Valley lines rail network supports a half hourly service from Merthyr Tydfil to Cardiff with future capacity improvements planned as part of the South Wales Metro Improvements. Whilst there are extensive walking and cycling routes they are not well connected and east-west travel is difficult, and the number of people who walk or cycle for trips of less than 5km is low. [ML01]

# 2. The current energy system

## Policy context

### Summary of policies

*Sponsors:* *Delivery partners:*

### Welsh Government policy

Key national policies that relate to this LAEP include:

- Both the UK and Welsh[M49] governments have set net zero emissions targets for 2050,[M74] and the Welsh public sector has set a net zero target by 2030. [M54]
- The Welsh Government has set its low carbon delivery plan for 2021-25 and is targeting a reduction of 44% against a 1990 baseline.[M03] It considers a just transition as key and sees decarbonisation as a means to deliver social and economic justice.
- The **Well-being of Future Generations (Wales) Act** 2015 [M06] 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** [M03], 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

Key regional policies that relate to this LAEP include:

- The **CCR Energy Strategy (2021)**[MC31], which establishes a strategic pathway identifying key interventions to deliver on the region's ambitions for decarbonising its energy system. This regional strategy is comprised of baseline energy assessment, results from future energy system modelling, and an economic evaluation. It outlines the subsequent steps for transitioning CCR's energy system.
- The **South East Wales Valleys Transport Plan (2015)**[ML02] 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. It outlines both short-term and long-term strategic interventions designed to realise these objectives.
- The Cardiff Capital Region **Regional Economic and Industrial Plan**[MC35] 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

### Summary of policies

#### Local policy

Key local policies that relate to this LAEP include:

- The **Merthyr Tydfil County Borough Council Decarbonisation Plan (2023-2030)**[ML03] was approved in 2023; it will supersede the Carbon Management Plan (2019-2025) . The Decarbonisation Plan includes action plans for council operations which will become live documents to be updated for each department. .
- The **Merthyr Tydfil County Borough Council Asset Management Plan (2021-2036)** [ML04] sets out the vision for the Council's property portfolio. This does not include social houses; all social housing in Merthyr Tydfil is owned by housing associations.
- A review of the **Merthyr Tydfil County Borough Council Local Development Plan (2016-2031)** [ML01] will start in January 2024, with the Preferred Strategy due to be published by 2026.
- Other relevant Council policies include: Well Being Plan 2023 and Procurement Strategy (due 2025).

# 2. The current energy system

## Our collaborative approach to developing and delivering our LAEP

### Stakeholder engagement approach

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

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

We engaged stakeholders at different stages of the development process to make sure 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 forward 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: Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

| Sector | Examples of stakeholders engaged |
|---|---|
| Buildings | Housing developers, housing associations |
| Transport | Transport providers |
| Renewable energy generation | Energy project developers |
| Industry and private sector | Local businesses, larger industrial players |
| Community engagement | Social enterprise |
| Networks | Distribution Network Operators, gas distribution networks |
| Public sector | Public services board, public service providers, Welsh Government, educational institutions |

**Table 2.1: Summary of stakeholders**

Merthyr Tydfil

# Chapter 2: The current energy system

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### How to read a Sankey diagram

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

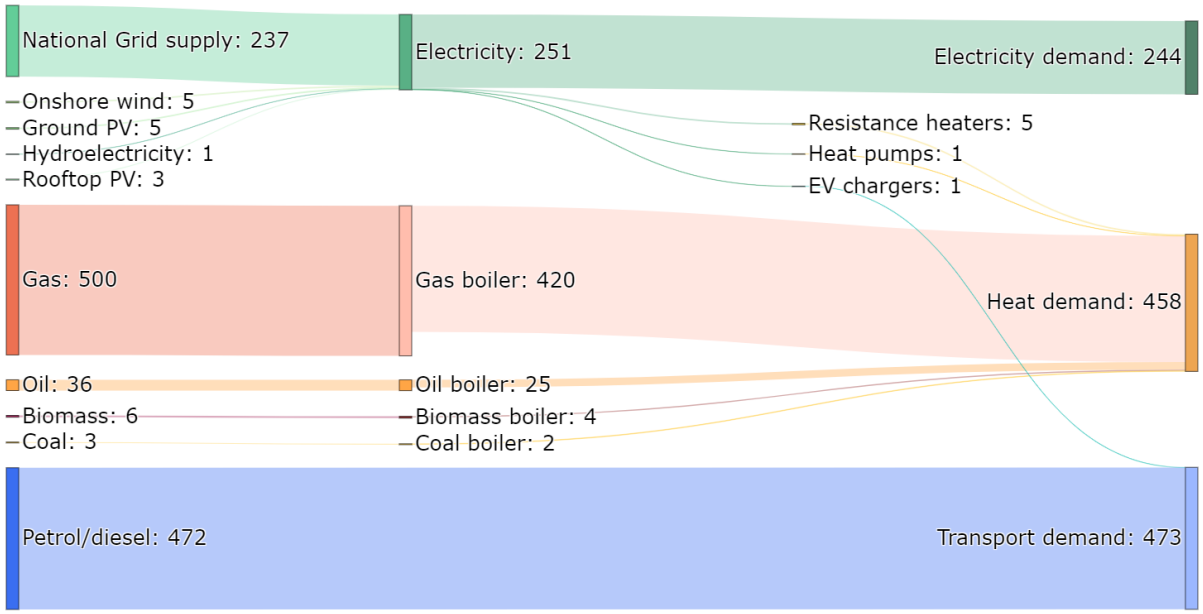
Results presented reflect the energy baseline in Merthyr Tydfil in 2023, apart from the transport data (2015) and industry data (2019). Transport and industry datasets are the least likely to have changed in terms of electrification over the years 2019 to 2023, and transport is the most likely dataset to have changed due to COVID-19.

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

They are read from left to right and show a snapshot of a scenario in time e.g., 2050

Energy transfers are drawn to scale and so are helpful to identify the size of each transfer and compare different scenarios.

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




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

2. How the energy is being converted

3. Where the energy is being used
This side represents the **final demands** for each energy vector: heat demand, electricity, demand, transport demand.

**Figure 2.1: How to read a Sankey diagram (units are GWh/year)**

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### Energy demand

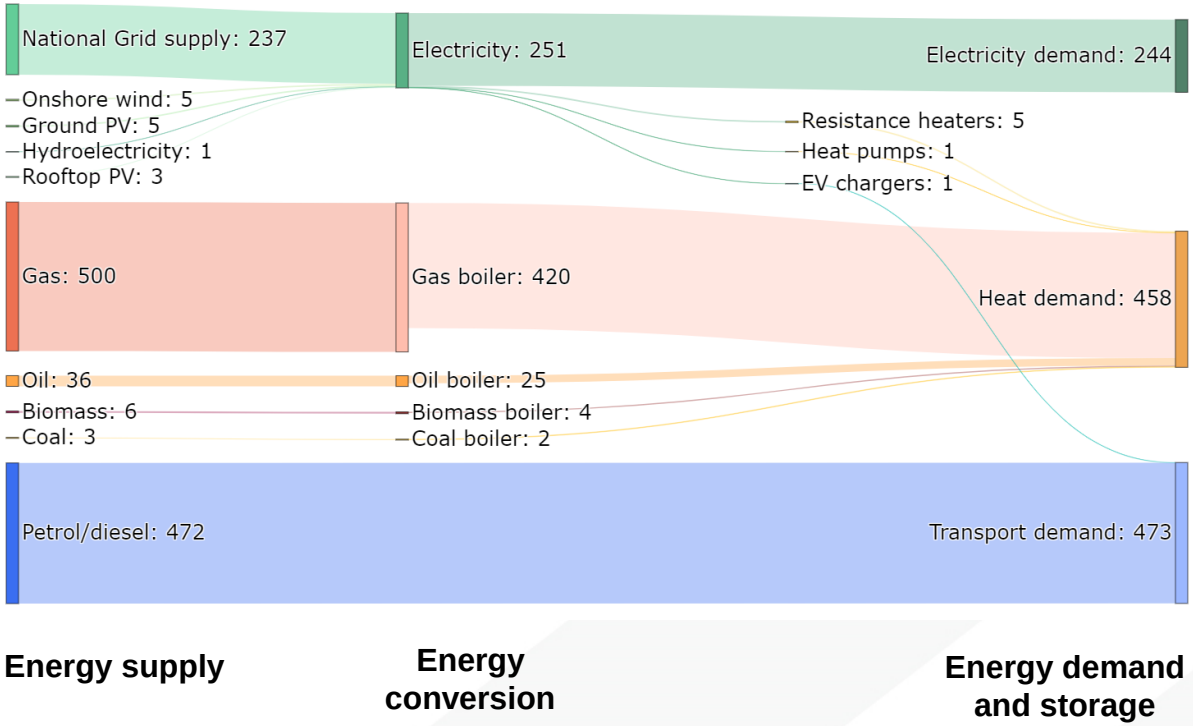



**Figure 2.2: Sankey diagram showing energy input, conversion and output in Merthyr Tydfil in GWh/year**

**Electricity**

6% total electrical demand from renewables

3% of electricity used for heating

Electricity made up 21% total energy demand

**Transport**

Transport made up 40% total energy demand

Nearly 100% of vehicles were internal combustion engine

67% car ownership[M65]

**Heat**

Heat made up 39% total energy demand

92% of heat demand was met by gas boilers, with 97% of homes connected to gas grid

42% of homes had EPC rating of A-C

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### Energy demand by sector

Sponsors:

Delivery partners:

### Electricity consumption

Highest electricity consumption is in and around Merthyr Tydfil town itself, particularly on the eastern side which has the greatest density of homes and businesses.

### Transport consumption

Highest transport consumption in and around outskirts of Merthyr Tydfil town, particularly on the eastern side. This data represents trips that either start of terminate in each LSOA; traffic passing through on major roads such as the A470 and A465 is therefore not included.

### Heat consumption

Highest baseline heat demand in the north of Merthyr Tydfil, particularly in the northeast of the county, which has the greatest density of homes and businesses. The data is based on meter level gas consumption (MWh/year)

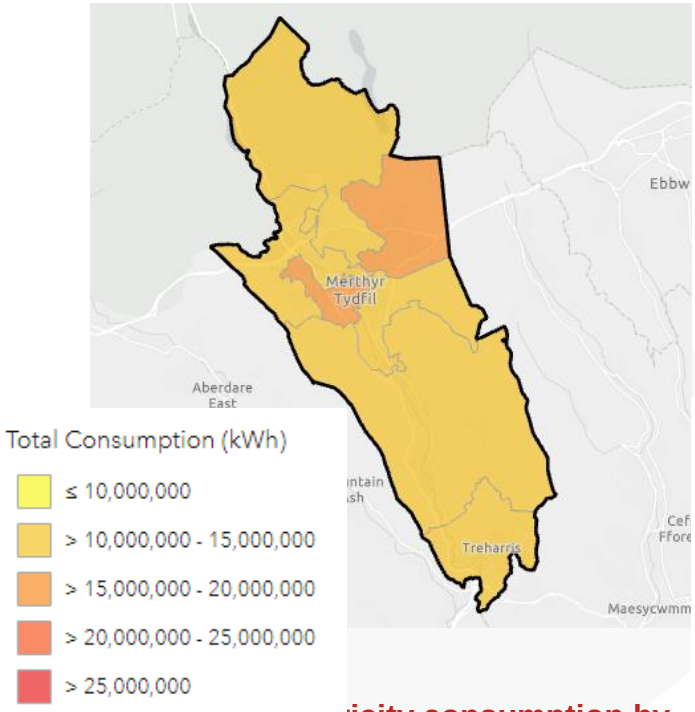



**Figure 2.3: Electricity consumption by Middle Super Output Area (MSOA) across Merthyr Tydfil in 2023**

***The data is based on meter level electricity consumption data***

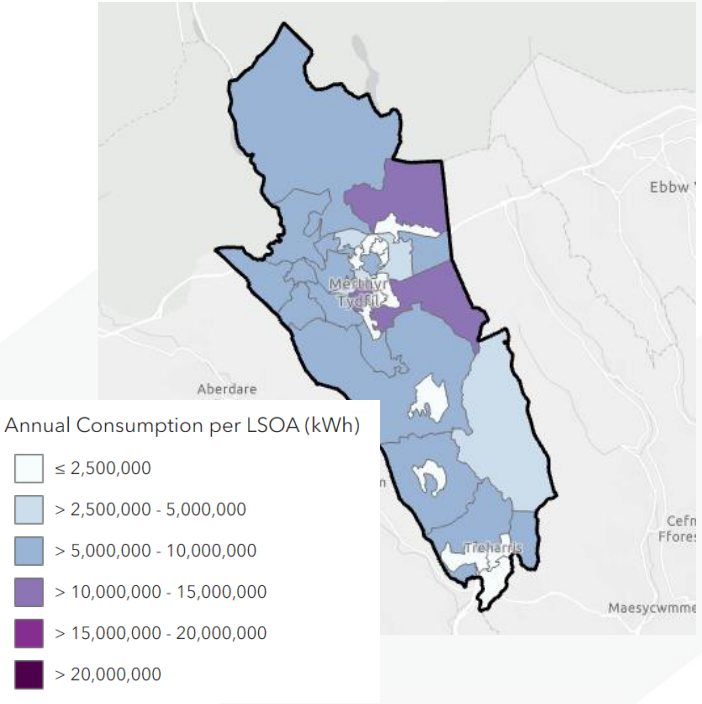



**Figure 2.4: Transport energy consumption (combined total across cars, light goods vehicles (LGV) and heavy goods vehicles (HGV) by LSOA, in 2015 as a baseline year**

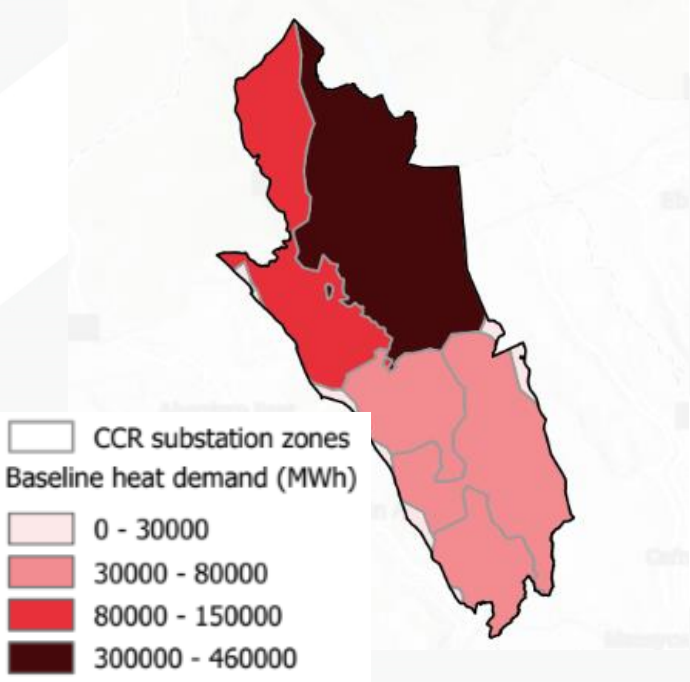



**Figure 2.5: Heat demand (2023) by substation zone**

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### Energy generation

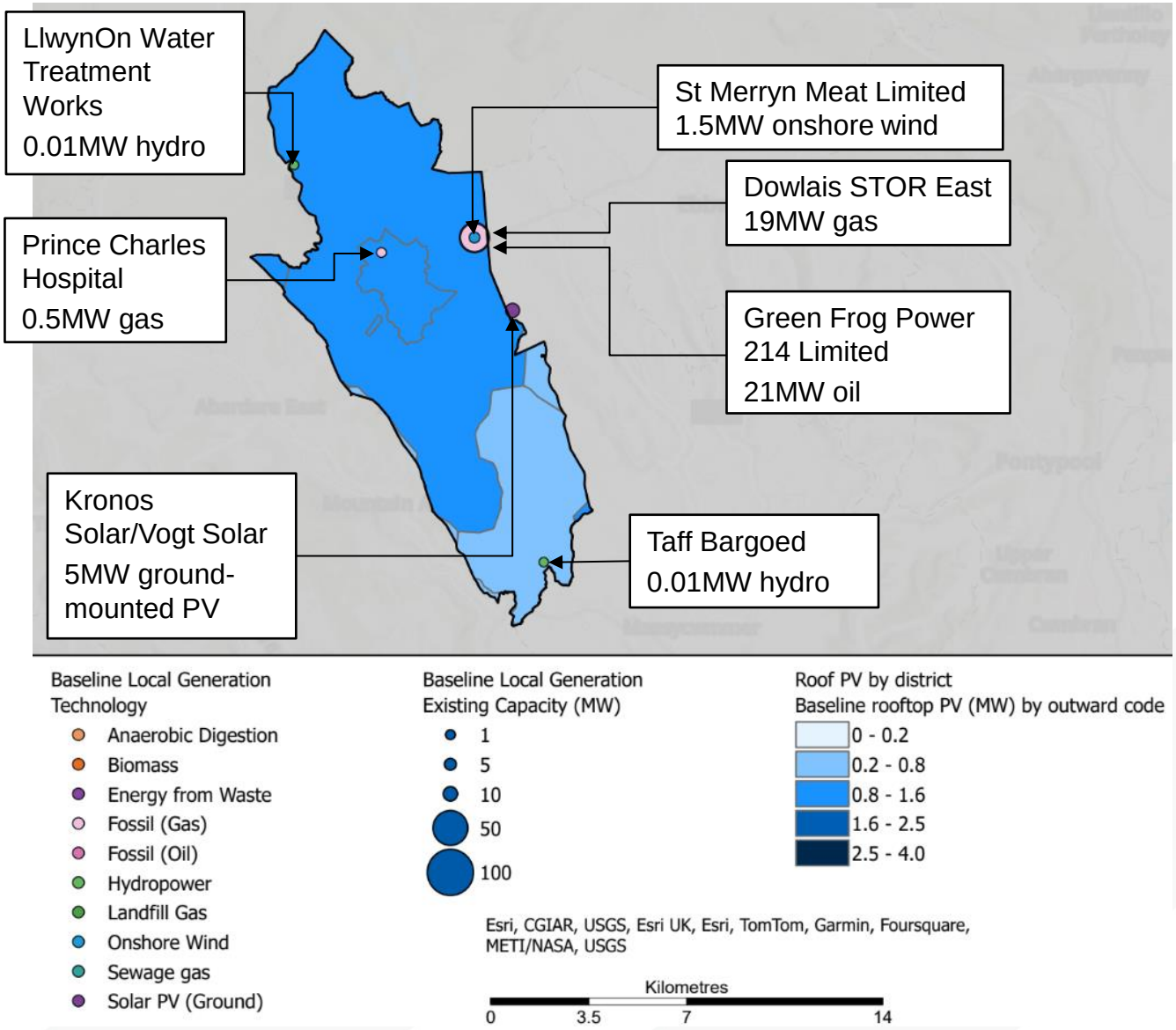



**Figure 2.6: Local energy generators and their respective capacities (MW) and domestic and non-domestic rooftop solar PV (MW) by outward code (2023)**

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*Delivery partners:*
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**10MW total renewables**

5MW ground-mounted PV

3MW rooftop PV

1.5MW wind turbines

0.2MW hydroelectric

**40MW total fossil fuel installed capacity**

19MW gas

21MW oil

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### Networks and infrastructure

Generation and demand headroom in a local authority's electricity distribution network refers to the capacity surplus or deficit between the electricity generated and the electricity consumed, crucial for maintaining a stable and reliable power supply to meet the community's needs.

Presently, Merthyr Tydfil faces challenges due to existing grid limitations, which often lead to delays in new connections and substantial associated expenses. These constraints impact the ability to develop new energy sources and infrastructure, highlighting the need for grid upgrades and enhancements.

Merthyr Tydfil's demand headroom varies across the region, from 0-4 MW per substation (median of 0-2 MW) representing varied short-term opportunities for increased energy demand, with less capacity in the South of the county.

Merthyr Tydfil's generation headroom varies across the region, from 0-8 MW per substation (median of 0-2 MW) representing varied opportunities for electricity generation, these areas are generally similar to the demand headroom areas

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*Delivery partners:*
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**Generation headroom**

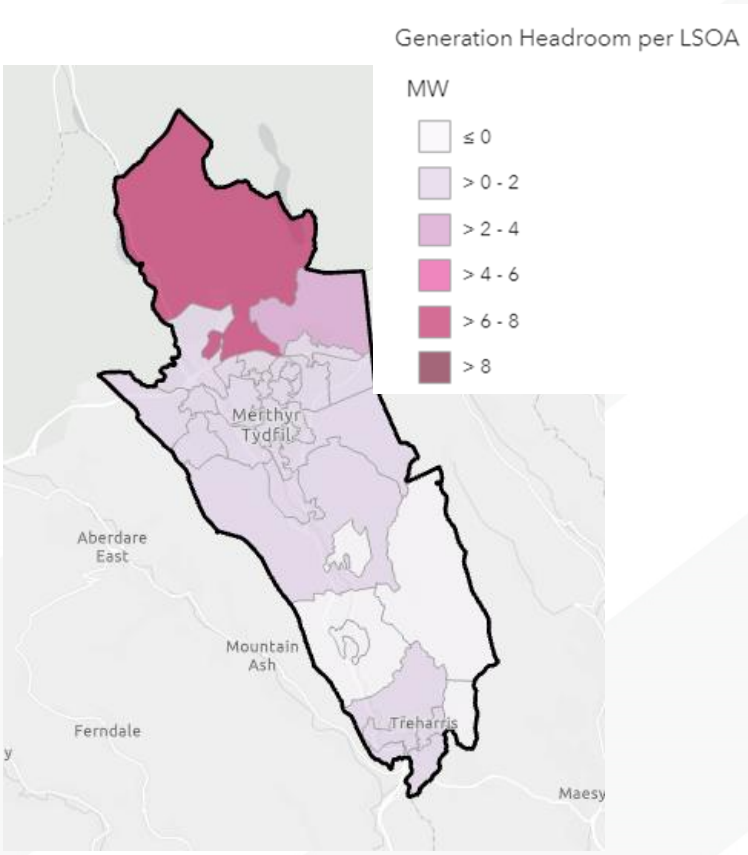


**Figure 2.7: Electricity generation headroom (2023). Electricity generation headroom is the difference between the capacity of the network to have energy exported to it from generators, and the actual supply**

**Demand headroom**

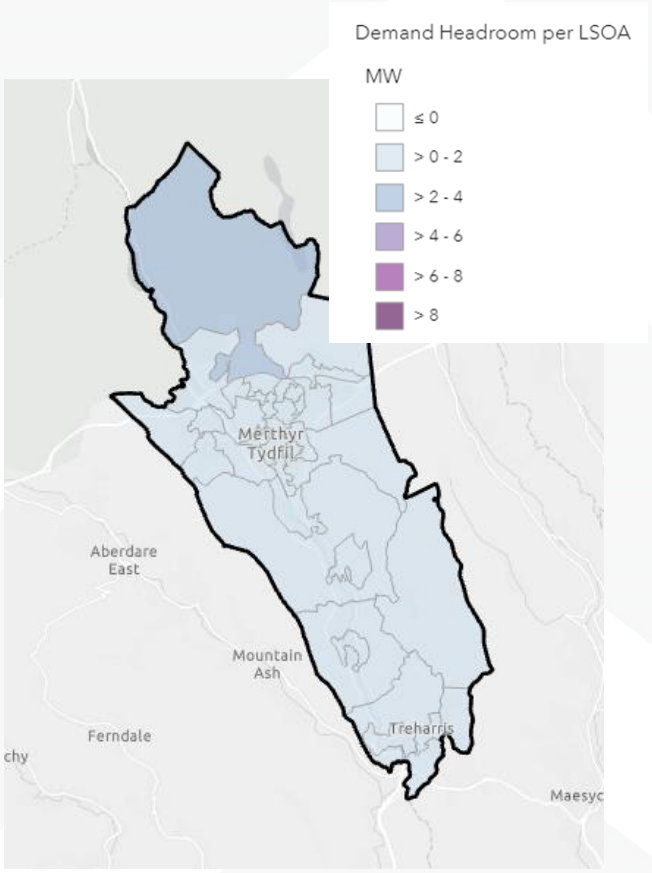


**Figure 2.8: Electricity demand headroom (2023). Electricity demand (or generation) headroom is the difference between the capacity of the network to meet demand, and the actual demand**

# 2. The current energy system

## Merthyr Tydfil's energy baseline

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

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*Delivery partners:* ARUP; Carbon Trust

### Land

111km$^2$ total land area ML05

23km$^2$ in Brecon Beacons National Park ML06

Three sites of special scientific interest (SSSIs) in Merthyr Tydfil totalling 2.5km$^2$ ML07

No special areas of conservation (SACs) or No special areas of conservation (SACs) or special protection areas (SPAs) in Merthyr Tydfil ML08

### Demographics

75% of the population live in the town of Merthyr Tydfil ML09

59,000 population (2% of Wales's population) ML09

0% population growth between 2011 and 2021 (2021 census) ML10

46% terraced houses

62% homes EPC D or below (Welsh average 60%) ML11

### Socio-economics

12% of households in fuel poverty (Welsh average 14%) ML12

30% social housing (Welsh average 20%)

9,200 commuters out of the area, with 8,300 people commuting in ML13

93% of addresses residential

### Emissions

4.2tCO$_2$e per capita ML14

2023 emissions two thirds of 2005 levels ML14

Largest CO$_2$ emission sectors in 2023:

49% Buildings

41% Road vehicles

10% Local electricity generation

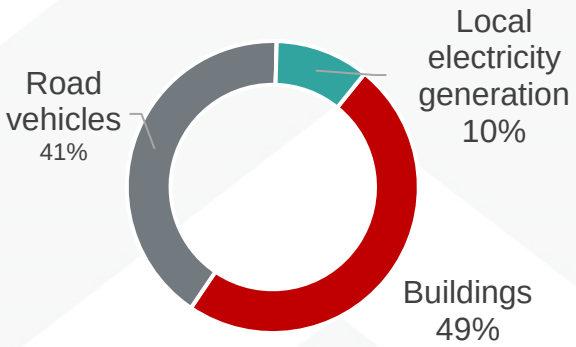



**Figure 2.9: Emissions by sector**

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### Progress to date

Merthyr Tydfil County Borough Council has worked to reduce its organisational GHG carbon emissions and to provide the means for the wider community to do the same, as we transition to a net zero energy system.

Since 2019/2020, Merthyr Tydfil County Borough Council has reduced its' overall carbon emissions on buildings, street lighting, business travel and land use by 27%.

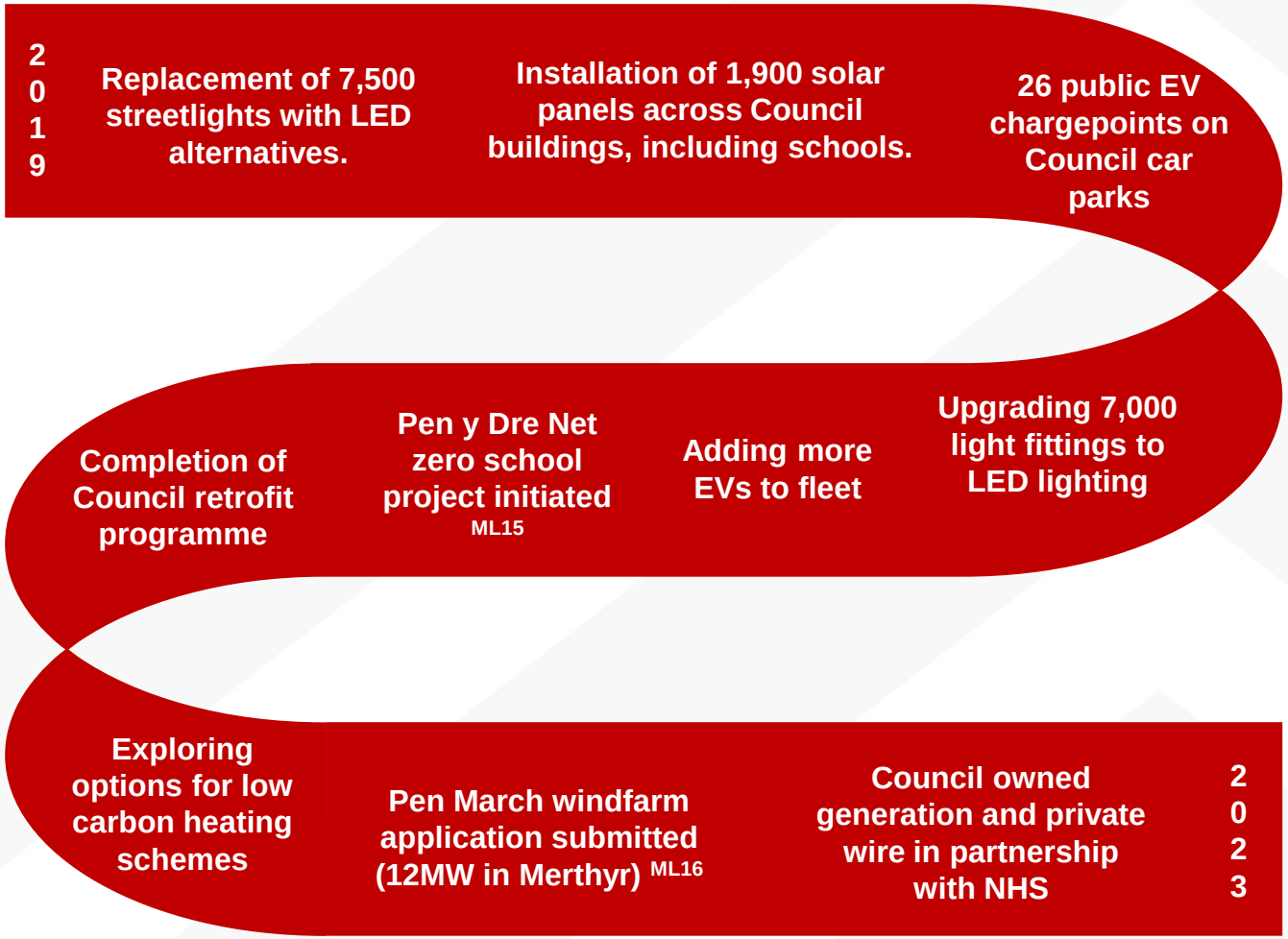



**Figure 2.10: Summary of activities to date that have contributed to decarbonising the local energy system**

# 2. The current energy system

## Merthyr Tydfil's energy baseline

### Plans for the future

*Sponsors:*

*Delivery partners:*

### Renewable generation

In the baseline year of 2023, Merthyr Tydfil had:

- 5MW installed capacity of ground-mounted PV
- 3MW of rooftop PV
- 1.5MW of wind power
- 0.2MW hydroelectricity

There is significant potential for more renewable generation in the future. A Renewable Energy Assessment undertaken for Merthyr Tydfil County Borough Council in 2017 which suggests there is significant further potential for renewable energy in Merthyr Tydfil.

The Council is exploring the potential for generation on their assets and are developing a 1MW ground-mounted PV scheme in partnership with the NHS.

Other potential renewables projects include the 30MW RWE Pen March wind farm development, 12MW of which will be situated in Merthyr Tydfil and with the opportunity for the local authority to invest in part ownership. An application has been submitted to Planning and Environment Decision Wales (PEDW) and a decision is expected in 2024.

### Reducing energy demand

Merthyr Tydfil County Borough Council is working towards accreditation to ISO50001 for a number of Council buildings. All new schools in Merthyr Tydfil will be built to Net Zero Carbon Standards, and the Council will be targeting a 20% reduction on the amount of embodied carbon. The Council is also targeting that all lighting in Council buildings will be LED by 2030

The Council does not own any housing stock; social housing in the borough is owned by four housing associations, the largest of which is Merthyr Valley Homes who is currently carrying out a number of initiatives and planning what improvements will be made in future.

Working in partnership with Connected Kerb and the Cardiff Capital Region, Merthyr Tydfil County Borough Council is installing public EV chargepoints across the area.

Merthyr Tydfil

# Chapter 3: The future energy system

# 3. The future energy system

## Overview

### Vision

Transitioning our local energy system in a way that provides affordable solutions for our businesses and communities, and offers new opportunities for growth.

### Objectives of the plan

1. To provide a resilient energy system capable of meeting future energy demand and resilient to climate change.
2. To maximise reductions in carbon emissions while minimising financial costs.
3. To empower the local economy, through increasing access to local employment and promoting local ownership and supply chains.
4. To provide community engagement, leadership and ownership of our energy systems in relation to our urban and rural communities.
5. To support the creation of quality and long-lasting energy related local job opportunities.
6. To deliver affordable solutions for all and ensure everyone has equitable access to energy.

### Understanding the future energy system

We know that we need to transition our energy system in Merthyr Tydfil to net zero by 2050.

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

### Scenario analysis

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

### Deployment modelling

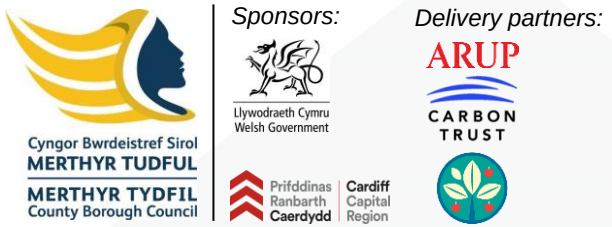
We looked at how aspects of each energy proposition might be deployed between now and 2050, creating **deployment pathways**. Deployment pathways indicate:

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

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

# 3. The future energy system

## Overview




**The current energy system (*Chapter 2*)**

**Merthyr Tydfil's energy baseline**

- We used available data sources to create a picture of how energy is generated and used in Merthyr Tydfil, focusing on the local energy system, which is defined in earlier chapters.

**The future energy system (*Chapter 3*)**

**Scenario analysis**

- We defined modelling parameters such as the maximum amount of solar and wind which can be installed in Merthyr Tydfil.
- We modelled four future energy scenarios and explored the most cost- and carbon- effective mix of technologies to generate energy to meet future demand.
- We compared the results to identify low-regret energy system components to consider as high priorities for near-term action.

**Deployment modelling**

- We modelled the rate of deployment for low-regret energy system components, helping us understand by how much we need to ramp up adoption of different technologies over time.
- We estimated the wide benefits of each scenario, looking at the impact of GHG emissions, air quality and employment in the local area.

**Action planning (*Chapter 4*)**

**Energy propositions**

- We looked at **where** critical system components could be prioritised for deployment and identified priority focus zones, accounting for technical and social factors.
- We took what we learnt from scenario analysis, deployment modelling and zoning analysis to create 5/6 energy propositions that form the framework for Merthyr Tydfil's LAEP, and the focus for the next 5-6 years.

**Action routemap**

- We asked local stakeholders to think about their influence over the energy system, and what they could do to support delivery of each energy proposition.
- We then combined this feedback into an action routemap describe the collective effort required to deliver the ambitions and near-term energy propositions set out in Merthyr Tydfil's LAEP.

**Figure 3.1: Summary of steps taken to produce the LAEP**

# 3. The future energy system

## Scenario analysis

### Summary of future energy scenarios

| | |
|---|---|
| **Do Nothing** | • A scenario for comparison which considers committed activities, and assumes that current and consulted upon policy goes forward and remains consistent.<br>• This scenario provides a cost counterfactual.<br>• There is no decarbonisation target for this scenario, and we do no use it in optimisation modelling. |
| **National Net Zero** | • Uses the lowest cost and carbon combination of technologies to meet Wales' 2050 net zero target.<br>• Assumes a moderate level of energy demand reduction across the system.<br>• Model is allowed to import and export to the electricity grid, this assumes that the electricity grid is decarbonised and reinforced to allow for the demands, likely to be a combination of offshore wind, hydrogen CCGT, grid level battery storage, nuclear (these are considered as national assets and outside the scope of the LAEP). |
| **Low Demand** | • Considers the lowest future energy demand across different sectors.<br>• Explores the impact of energy-reducing initiatives (home fabric improvements) and uptake of active travel and public transport use.<br>• Model finds the lowest cost and carbon combination of technologies to meet predicted future energy demand.<br>• Import and export of electricity as National Net Zero |
| **High Demand** | • Considers the highest future energy demand across sectors.<br>• Model finds the lowest cost and carbon combination of technologies to meet predicted future energy demand.<br>• Import and export of electricity as National Net Zero |
| **High Hydrogen** | • Considers the highest plausible future energy demand across sectors<br>• High local hydrogen production<br>• Considers hydrogen for heavy goods vehicles |

**Figure 3.2: Summary of future energy scenarios**

# 3. The future energy system

## Scenario analysis

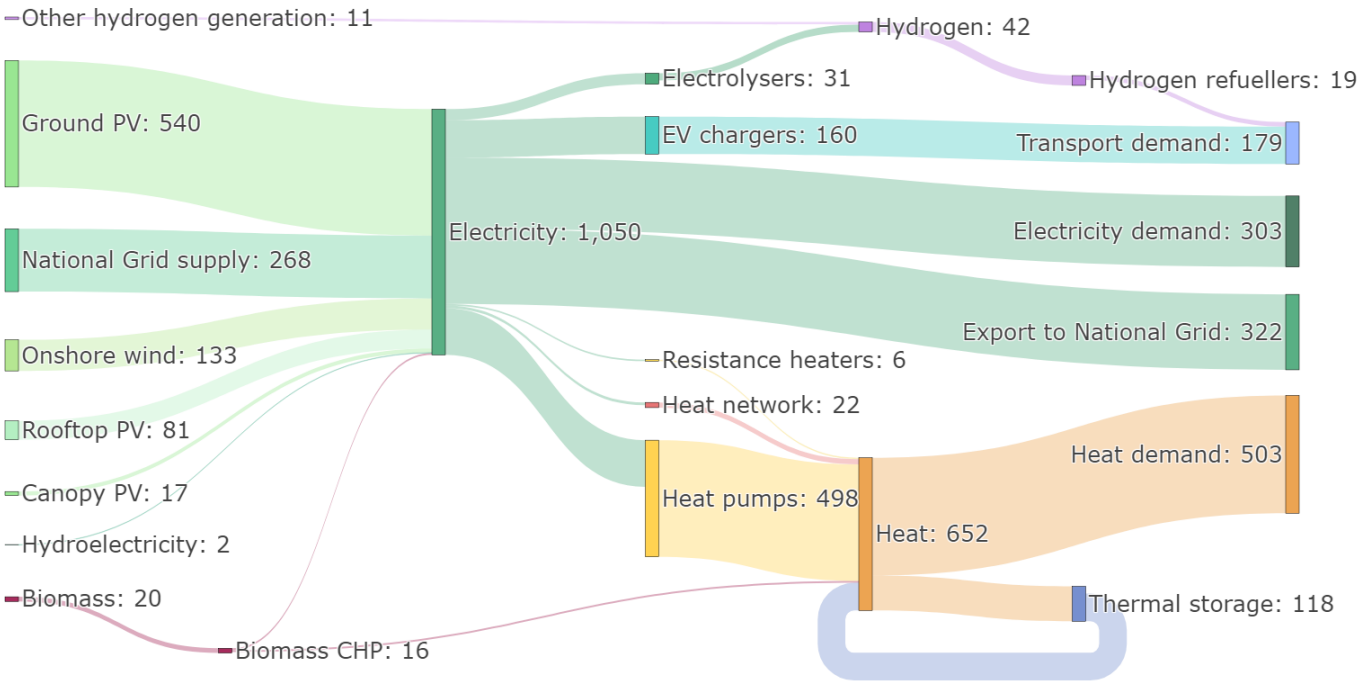
### National Net Zero scenario

Figure 3.3 shows a potential future energy system for Merthyr Tydfil. This system results from modelling to create the most cost and carbon optimal system. We have run a number of scenarios to support us in making decisions. The optimisation modelling informs the deployment modelling and the actions that go into the plans, but is not the "final plan" for the local authority area. A comparison of the outputs of the main parts of the energy system for all scenarios is provided in table 3.1.

Green hydrogen imports and hydrogen could be generated from electrolysis to serve transport demand.

There could be a significant increase in renewable energy generation, particularly ground-mounted PV which is 26 x the baseline

Electricity supplied by the National Grid could increase by 13% from the baseline.




Small contribution from biomass, which serves both electricity and heat demand.

Annual electricity use could be 4.2 x larger than the baseline.

Majority of transport demand could be met by electricity supplied through EV chargers. Hydrogen refuellers could meet 11% of demand.

Significant portion, (31%) of the generated electricity could be surplus and is subsequently exported.

Heat supply could be predominately met by heat pumps (76%)

**Figure 3.3: National Net Zero scenario Sankey diagram (GWh, 2050)**

# 3. The future energy system

## Scenario analysis

### Energy system components

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

Optimisation modelling shows ground-mounted, rooftop solar and onshore wind generation consistently increasing across all scenarios. Optimisation modelling shows solar and onshore wind generation consistently increasing across all scenarios. The model selects PV over wind as it considers it the lower cost way of carbon reduction but does not take into account other more complex factors, so the renewable technologies installed in practice may differ from those shown in the model.

Hydrogen is incorporated into the energy mix in all scenarios, sustaining Merthyr Tydfil's industrial and transport demands.

Transport demand decarbonises, primarily due to the supply of electricity through EV charge points. Hydrogen also contributes to this demand, albeit to a lesser extent.

Heat demand is predominantly catered for by heat pumps, a trend that is consistent across all scenarios. While heat networks and other technologies contribute to this demand, their usage is comparatively less.

| Energy Elements | Baseline | National Net Zero | High Demand | Low Demand | High Hydrogen |
|---|---|---|---|---|---|
| Ground-mount PV | 5GWh | ↑ to 540GWh | | | |
| Rooftop PV | 3GWh | ↑ to 81GWh | | | |
| Onshore wind | 5GWh | ↑ to 133GWh | | | |
| Hydroelectricity | 1GWh | ↑ to 2GWh | | | |
| Biomass | 6GWh | ↑ to 20GWh | | ↑ to 19GWh | ↑ to 20GWh |
| Hydrogen import | 0GWh | ↑ to 11GWh | ↑ to 10 GWh | | ↑ to 34GWh |
| Electrolysers | 0GWh | ↑ to 31GWh | ↑ to 29GWh | ↑ to 32GWh | ↑ to 84GWh |
| Import from Grid | 237GWh | ↑ to 268GWh | ↑ to 273GWh | ↑ to 206GWh | ↑ to 281GWh |
| EV chargers | 1GWh | ↑ to 160GWh | ↑ to 172GWh | ↑ to 160GWh | ↑ to 126GWh |
| Hydrogen refuellers | 0GWh | ↑ to 19GWh | ↑ to 18GWh | ↑ to 19GWh | ↑ to 53GWh |
| Heat pumps | 0GWh | ↑ to 498GWh | | ↑ to 323GWh | ↑ to 497GWh |
| Heat networks | 0GWh | ↑ to 22GWh | | | |
| Resistance heaters | 5GWh | ↑ to 6GWh | | ↓ to 3GWh | ↑ to 6GWh |

**Table 3.1: Comparison across the scenarios**

# 3. The future energy system

## Deployment modelling

### Impact on energy demand

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

Figure 3.4 shows how the energy demand could change over time in the different sectors for the baseline, 2030 and 2050. The energy demand is then converted into carbon emissions, numbers of jobs and air quality as you can see on the next page.

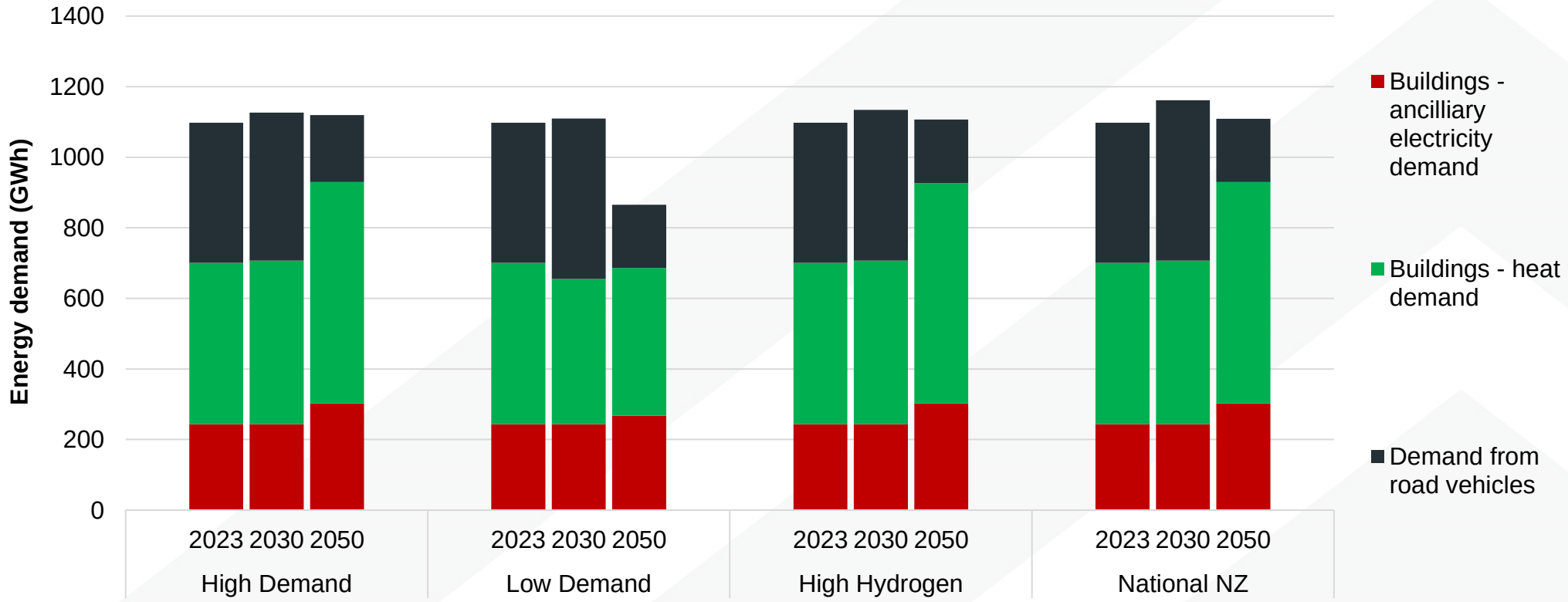



**Figure 3.4: Energy demand over time for each scenario**

# 3. The future energy system

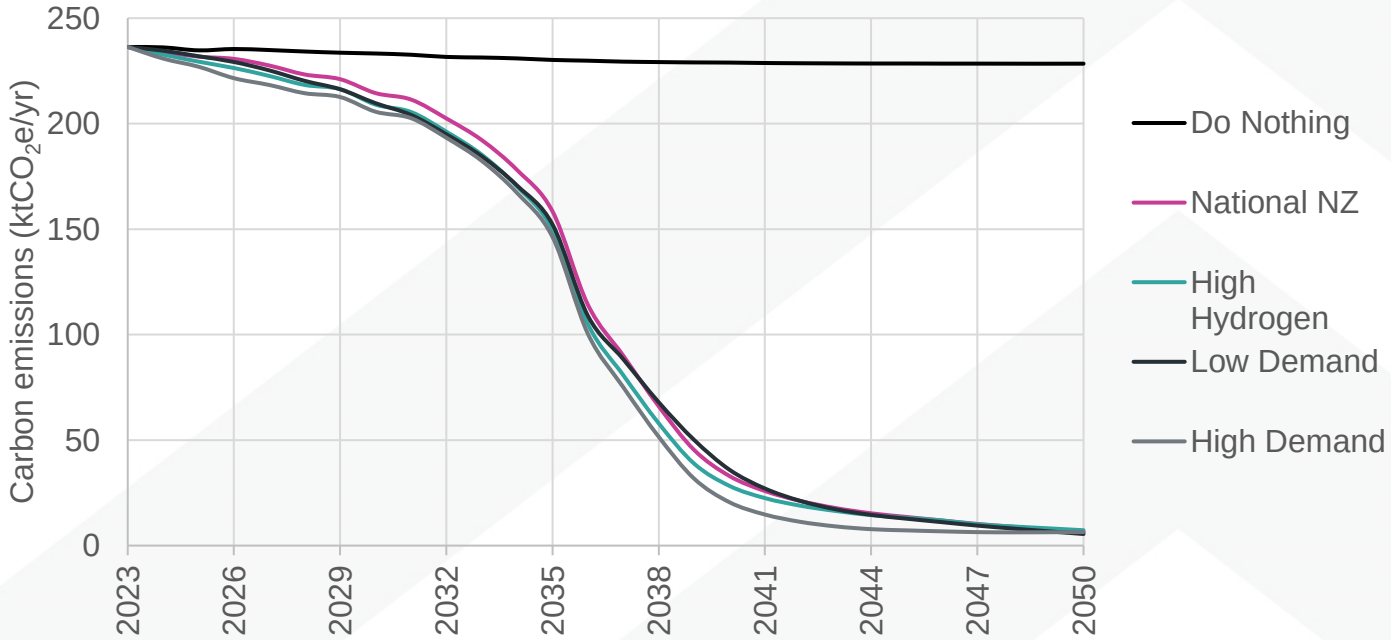
## Deployment modelling

### Impact on GHG emissions

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

None of the scenario's fully reach net zero by 2050 due to residual emissions. The most common sources of residual emissions in 2050 are from electricity demand (FES projection for grid carbon factor goes very low, but not zero or negative) and electricity generation from biomass. Offsetting would be needed to reach net zero, however this is not in the scope of the LAEP.

The deployment modelling also shows how these pathways contribute to the Welsh Government emissions reduction targets. For Merthyr Tydfil, we see that the 2023 baseline is a 59% reduction on the 1990 levels, with the pathways all performing better than the targets to 2050. 2050 is slightly missed, because there is residual electricity in the network, however the average reduction is 99% against the 1990 levels.




| Scenario | 2030 | 2040 | 2050 |
|---|---|---|---|
| Welsh Gov targets | -63% | -89% | -100% |
| National Net Zero | -50% | -92% | -99% |
| High Hydrogen | -51% | -93% | -98% |
| Low Demand | -51% | -92% | -99% |
| High Demand | -52% | -95% | -98% |
| Do Nothing | -45% | -46% | -47% |

**Figure 3.5: GHG emissions ($ktCO_2e$) over time for each scenario compared to the Do Nothing scenario. The table shows % GHG emissions reduction for each scenario compared to the Welsh Government emissions reduction targets, relative to 1990.**

# 3. The future energy system

## Deployment modelling

### Socio-economic impacts

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

### Employment impacts

Investments in local energy systems can be expected to 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[M42].

### Impact on air quality

It can also impact the quality of the air which in turn impacts: human health, productivity, wellbeing and the environment, which is why it is so important to understand when planning future policy or programmes of work. Activity costs presented in Table 3.2 show estimates for the impact of air pollution per unit of fuel consumed in each future energy scenario and estimates for the employment impacts associated with each future energy scenario, compared to the Do Nothing scenario

| Metric | Do Nothing | National Net Zero | High Demand | Low Demand | Local scenario |
|---|---|---|---|---|---|
| **Energy change (GWh, relative to 2023)** | ~0 | +1% | +2% | -21% | +1% |
| **Cumulative air quality activity costs between 2023-2050 (£'million) (2022 prices)** | £180 | £120 | £110 | £120 | £110 |
| **Employment impacts between 2023-2050 (FTE)** | 210 | 1700 | 1700 | 2200 | 1900 |

**Table 3.2: 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**

# 4. The future local energy system

## Deployment modelling

### Summary of deployment for low-regret energy system components

Deployment modelling can help us better understand what the impacts of each scenario are over time. It provides a starting point to frame the challenge and for more detailed analysis. We have included theoretical pathways which have a high degree of uncertainty as there are many variable factors and unknowns. The deployment modelling can't consider every factor, some of the things that will impact deployment include:

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

**2023:**

- **30 buildings** with heat pumps installed
- **16,000 homes** rated EPC D or below
- **80** EV chargepoints[a]
- **700 buildings** with rooftop solar PV[c]
- **5 MW** of ground solar PV capacity
- **1.5 MW** of onshore wind capacity

**By 2030:**

- **Up to 4,100 buildings** with heat pumps installed
- **Up to 5,500 homes** retrofitted
- **Up to 1,400** EV chargepoints[b]
- **6,200 buildings** with rooftop solar PV[c]
- **Up to 160 MW** of ground solar PV capacity
- **Up to 13 MW** of onshore wind capacity

**By 2050:**

- **Up to 23,000 buildings** with heat pumps installed
- **Up to 13,000 homes** retrofitted
- **Up to 10,000** EV chargepoints[b]
- **11,000 buildings** with rooftop solar PV[c]
- **Up to 575 MW** of ground solar PV capacity
- **Up to 40 MW** of onshore wind capacity

[a]According to the National Charge Point Registry [M43] as of May 2023 and Merthyr Tydfil County Bourgh Council Jan 2024. Refers to individual chargepoints.

[b]Assuming 4kWp per charge point. Note that the power rating selected will be dependent on location and use case. E.g. Rapid chargers are more suitable at service stations due to the length of stay of customers.

[c]Assuming 4kWp per roof and per installation

**Figure 3.6: Merthyr Tydfil's energy system component deployment rates – high demand scenario**

Merthyr Tydfil

# Chapter 4: Action planning

# 4. Action planning

## Energy propositions

Sponsors: Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

We shared what we learnt from exploring different energy futures and deployment pathways with our stakeholders and discussed with them the key drivers which will be critical to achieve the deployment pathways and the transition to net zero. We then considered their feedback, our strategic vision and objectives, and the agreed energy propositions to bring together a framework for Merthyr Tydfil's LAEP. There are numerous inter-dependencies and interactions between these propositions, as shown here. This highlights the importance of a whole system approach with a co-ordinated programme of delivery to meet the net zero target by 2050.

**Merthyr Tydfil's vision**

Transitioning our local energy system in a way that provides affordable solutions for our businesses and communities, and offers new opportunities for growth.

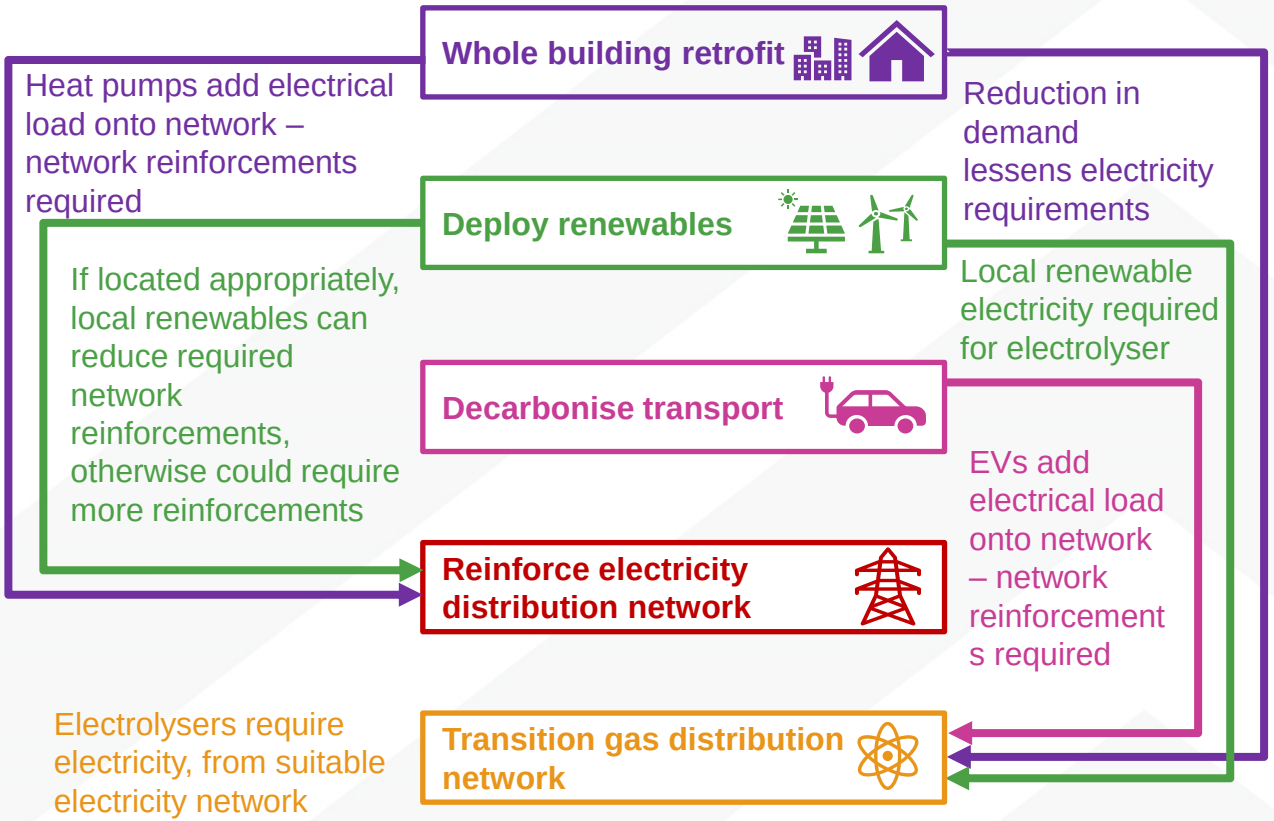



**Figure 4.1: Summary of energy propositions and their inter-dependencies**

# 5. Action Planning

## Energy propositions

**Merthyr Tydfil's Energy propositions in more detail**

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

Delivery partners: ARUP; CARBON TRUST

### Increase building efficiency

**Ambition:** Enhance the energy efficiency of existing buildings through retrofitting measures aimed at reducing overall demand, while also transitioning away from fossil fuel intensive heating systems. The following interventions will be considered under this proposition:

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

**CAPEX: £330 - 1,880 million**

### Deploy renewables

**Ambition:** Increase Merthyr Tydfil's renewable energy output by ensuring that clear guidance is given in the LDP. The potential for generation on Council assets will also be assessed. The following interventions will be considered under this proposition:

- ground-mounted solar PV
- wind turbines

**CAPEX: £300 million**

### Decarbonise transport

**Ambition:** Reduce transport demand by increasing journeys made on foot, bike, improving public transport. Facilitate the adoption of EVs by installing chargepoints across Merthyr Tydfil. The following interventions will be considered under this proposition:

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

**CAPEX: £30-50 million**

### Reinforce and transition energy networks

**Ambition:** Make interventions to the electricity network that are required to ensure increasing electricity demand can be met. Make interventions to the gas network that are required to ensure future hydrogen demand could be met.

**CAPEX: key uncertainty**

Note: The CAPEX given on this page is the total CAPEX needed to meet the 2050 figures in the optimisation model scenarios - not the total that Merthyr Tydfil County Borough Council itself needs to spend to implement the actions. The CAPEX figure for the transport scenario only includes the cost to install EV chargepoints - it does not include investment required to improve active travel routes and public transport networks.

# 4. Action planning

## Energy propositions

### Identifying priority focus zones and action routemap

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

### Plan on a page

As a starting point, our “plan on a page,” shown in Figure 4.2 on the next page, indicates the location and scale of recommended near-term changes required across Merthyr Tydfil. The map highlights five modelling zones identified as priority focus zones for the low-regret energy system components included in Merthyr Tydfil’s energy propositions: heat pumps, EV chargers, rooftop PV, ground-mounted PV, onshore wind, and insulation retrofits. To prioritise where each low-regret energy system component should be deployed, each modelling zone was ranked using various technical and social factors such as the available capacity at each substation and the Welsh Index of Multiple Deprivation. For more details on the methodology behind the “plan on a page”, please see the Technical Report.

### Action routemap

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

Each action will require four key elements to be successful:

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

As Merthyr Tydfil County Borough Council, our role in delivering each energy proposition will vary. Some actions call for council action in the material delivery of programmes, whilst others require the council to act as the facilitator for market-driven change.

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

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

The following section provides further detail on each of the actions that we will undertake under each energy proposition, as well as our key asks of others. Due to the relative uncertainty of longer-term actions, we have chosen not to focus on detailed scoping of these in this report and instead, focus on actions we intend to deliver in the short-term, subject to appropriate support. For more details on the action plan, please see chapter 5 in our Technical Report for further details.

# 4. Action Planning

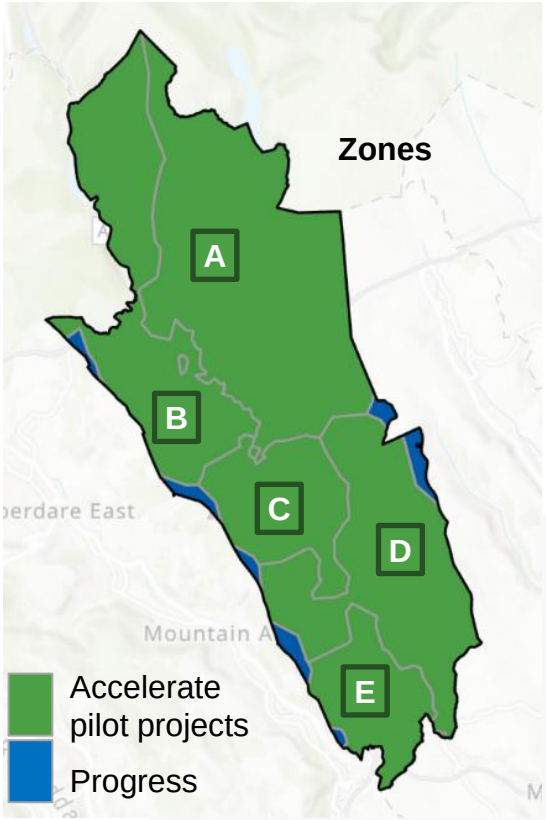
In order to support transformation of the energy system, pilot projects may be useful. The plan on a page below highlights areas that could provide a useful focus for these pilots.

Figure 4.2 identifies zones with particularly favourable conditions for specific energy components, making them ideal locations for pilot studies. The summary tables (shown below) detail the (i) installed capacity opportunity, (ii) required investment for each component and (iii) total investment necessary for both energy component installation and electricity network infrastructure in each zone by 2030. Ranges have been calculated by taking the minimum and maximum results from each future energy scenarios modelled (see the Technical Report for more detail). 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

Cyngor Bwrdeistref Sirol MERTHYR TUDFUL / MERTHYR TYDFIL County Borough Council




| | (i) | (ii) | (iii) |
|---|---|---|---|
| **Zone A** | **Swansea Road Merthyr** | | **Zone A total £22-91m** |
| | 5MW | £5m | |
| **Zone B** | **Merthyr East Primary** | | **Zone B total £96–335m** |
| | 63MW | £27m | |
| | 12MW (2050) | £12m (2050) | |
| | 11MW | £12m | |
| | 2,900 – 5,500 homes | £16– 260m | |
| **Zone C** | **Pentrebach** | | **Zone C total £10-52m** |
| | 1.5-2.3 MW (250 - 380 heat pumps) | £1.1 – 1.7 mil | |
| | 0.22 - 0.32 MW (52 - 79 chargers) | £0.18 – 0.29 mil | |

**Suggested energy components to pilot in each zone**

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

| | (i) | (ii) | (iii) |
|---|---|---|---|
| **Zone D** | **Nantwen** | | **Zone D total £36-92m** |
| | 60MW | £26m | |
| | 1.4 – 2.2MW (250 – 370 heat pumps) | £1.1 – 1.6m | |
| | 0.28 – 0.35MW (66 - 83 chargers) | £0.23 – 0.29m | |
| | 760 – 1,100 homes | £4 – 61m | |
| **Zone E** | **Nelson** | | **Zone E total £16-83m** |
| | 8MW (2050) | £8.5m (2050) | |

**Figure 4.2: Merthyr Tydfil's spatial representation of opportunities, including 2030 ambition and investment (million £). Zone boundaries are defined by primary substation service areas**

# 4. Action planning

## Action routemap

### National policies and targets

Sponsors: Llywodraeth Cymru Welsh Government; Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

| | Action | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|
| National targets | Up to 1GW of electrolytic hydrogen secured (2025) [UK][M44] | | | | | | | |
| | Decision on hydrogen to heat buildings (2026) [UK][M45] | | | | | | | |
| | Up to 10GW hydrogen capacity (50% electrolytic) [UK][M44] | Progressing towards 2030 | | | | | | |
| | Up to 50GW of offshore wind capacity including up to 5GW of innovative floating wind (2030) [UK][M44] | Progressing towards 2030 | | | | | | |
| | Future Homes Standard consultation suggests all space heating and hot water demand be met through low carbon sources in new builds (2025) [M46] | | | | | | | |
| | All new social homes built to Welsh Development Quality Requirements 2021 without fossil fuel heating (from 2025)[M47] | | | | | | | |
| | All existing social homes to have a plan for minimising environmental impact and improving energy performance (2027) [Wales][M48] | | | | | | | |
| | -37% GHG emissions by 2025 (rel. to 1990) [Wales][M49] | | | | | | | |
| | -63% GHG emissions by 2030 (rel. to 1990) [Wales] [M49] | Progressing towards 2030 | | | | | | |
| | Meet the equivalent of 100% of electricity needs from renewable sources by 2035 [Wales][M26] | Progressing towards 2035 | | | | | | |
| | 1.5GW of renewable capacity to be locally owned (exc. Heat pumps) (2035) [Wales] [M26] | Progressing towards 2035 | | | | | | |
| | 580,000 heat pumps to be installed in Wales by 2035, contingent on scaled up support from the UK Government and reductions in the cost of technology[x] (2035) [Wales] [M26] | Progressing towards 2035 | | | | | | |
| | Minimum EPC E to rent out any property (from 2020 onwards) and EPC C from 2030 [UK][M51] | | | | | | | |
| | 1 public charge point for every 7 to 11 electric vehicles (2025) [Wales][M23] | | | | | | | |
| | Rapid charging available every 20 miles on the strategic trunk road (2025) [Wales] [M23] | | | | | | | |

# 4. Action planning

## Action routemap

### National policies and targets

| | 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] M53 | Progressing towards 2030 | | | | | | |
| | 100% new cars and vans sold to be 0 emissions (2035) (ZEV mandate) [UK] M53 | Progressing towards 2035 | | | | | | |
| | Net zero public sector by 2030 [Wales] M23 | Progressing towards 2030 | | | | | | |

# 4. Action planning

## Action routemap

### Enabling actions

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

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

(L) Action will be implemented at a local scale, across Merthyr Tydfil

Timescale for the action is ongoing

*Sponsors:* Llywodraeth Cymru Welsh Government; Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

*Delivery partners:* ARUP; Carbon Trust

**Enabling actions**

| Action | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Proposed leads |
|---|---|---|---|---|---|---|---|---|
| E.1.1: Develop a governance structure and performance management framework | | | | | | | | R |
| E.1.2: Facilitate monitoring of the LAEP across the Region | | Review annually | | | | | | R |
| E.1.3: Develop a business plan for delivery of the LAEPs across the region | | | | | | | | R |
| E.2.1: Develop a regional Strategic Development Plan (SDP)[MC33] | | | | | | | | N |
| E.2.2: Develop a national energy plan | | | | | | | | R N |
| E.3.1: Map and identify skills and labour needs | | | Review every 5 years | | | | | R N |
| E.3.2: Review and develop educational programmes to meet skills needed | | | | | | | | R N |
| E.3.3: Develop a communication strategy to promote jobs | | | | | | | | R |
| E.3.4: Identify supply chain needs | | | Review every 5 years | | | | | R N |
| E.4.1: Investigate possible procurement and investment frameworks that could be considered for larger projects of scale | | | | | | | | R |

# 4. Action planning

## Action routemap

### Enabling actions

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

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

L Action will be implemented at a local scale, across Merthyr Tydfil

Timescale for the action is ongoing

Sponsors: Llywodraeth Cymru Welsh Government; Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

**Enabling actions**

| Action | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Proposed leads |
|---|---|---|---|---|---|---|---|---|
| E.4.2: Share best practice for energy decarbonisation | | | | | | | ↻ | R |
| E.4.3: Access funding for energy decarbonisation | | | | | | | ↻ | R |
| E.5.1: Co-ordinate a network to support businesses to decarbonise | | | | | | | | R |
| E.5.2: Develop an industrial engagement programme to decarbonise industry | | | | | | | | R |
| E.5.3 : Develop plans for viable and alternative energy technologies e.g. heat networks, mine water, energy storage and hydrogen | | | | | | | | R |
| E.5.4: Creation of Net Zero Clusters (Partnerships) across the region in key net zero themes as identified in the LAEPs. | | | | | | | | R |
| E.5.5: Identify opportunities for smart local energy systems | | | | | | | | L R |
| E.6.1: Deliver the Merthyr Tydfil County Borough Council decarbonisation plan | | | | | | | | L |

# 4. Action planning

## Action routemap

**Increase building efficiency**

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

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

L Action will be implemented at a local scale, across Merthyr Tydfil

Timescale for the action is ongoing

*Sponsors:* Llywodraeth Cymru Welsh Government; Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

*Delivery partners:* ARUP; Carbon Trust

**Increase building efficiency**

| Action | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Proposed leads |
|---|---|---|---|---|---|---|---|---|
| B.1.1: Develop a retrofit prioritisation plan | | | Review annually | | | | | R |
| B.1.2: Develop a delivery plan for owner-occupied retrofit | | | Review every 5 years | | | | | R N |
| B.1.3: Review the current ECOFLEX programme | | | Review annually | | | | | R |
| B.1.4: Consider mechanisms for encouraging greater uptake of retrofit | | | | | | | ⟳ | N |
| B.1.5: Apply lessons learnt from ORP[M67] through the Welsh Zero Carbon Hwb[M66] | | | | | | | | N |
| B.2.1: Signpost to or develop a retrofit and energy efficiency information hub for consumers | | | | | | | | R N |
| B.3.1: Engage with housing associations | | | | | | | ⟳ | L |
| B. 4.1: Assess Council assets to improve energy efficiency | | | | | | | ⟳ | L |

# 4. Action planning

Sponsors:

Delivery partners:

## Action routemap

### Increase building efficiency

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

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

(L) Action will be implemented at a local scale, across Merthyr Tydfil

Timescale for the action is ongoing

| | Action | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Proposed leads |
|---|---|---|---|---|---|---|---|---|---|
| Increase building efficiency | B.4.2: Implementation of ISO50001 Energy Management System for key Council buildings | | | | | | | ↻ | L |
| | B.5.1: Identify specific planning constraints limiting progress to net zero | | | | | | | | N |
| | B.5.2: Consider tighter building regulations to support delivery of net zero ready buildings | | | | | | | | N |
| | B.5.3: Standardise a defined approach for new buildings to aim to be built to a net zero standard | | | | | | | | L |

# 4. Action planning

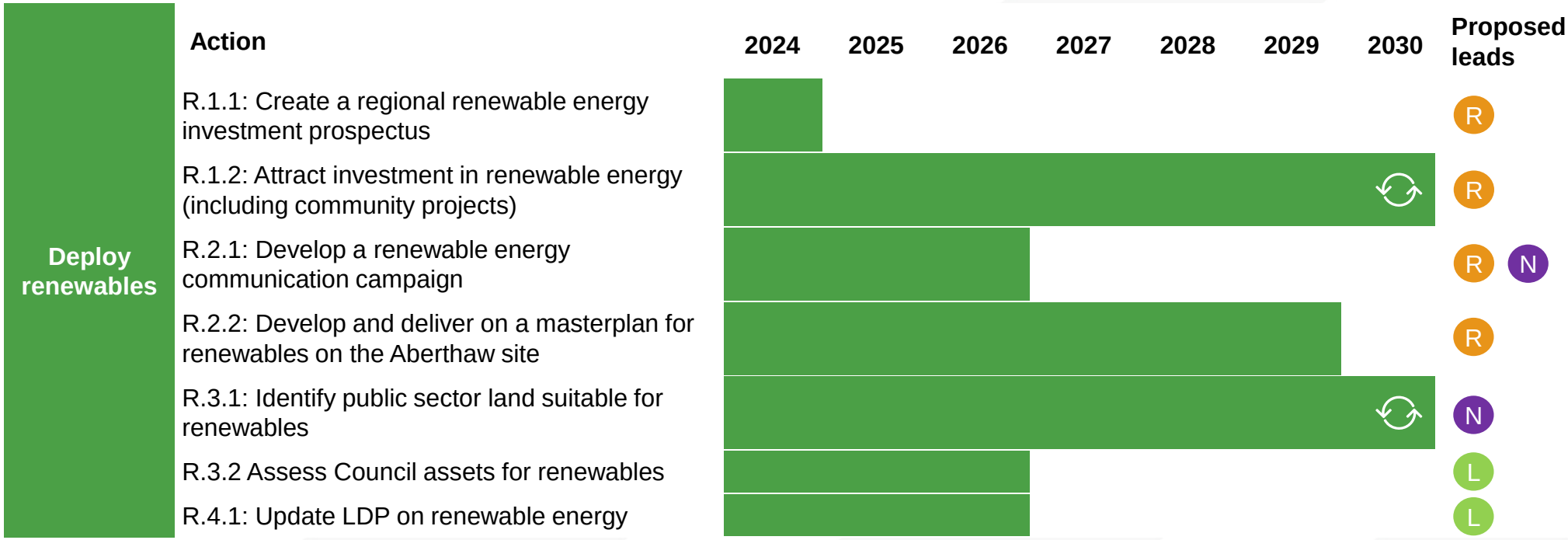
## Action routemap

**Deploy renewables**

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

*Sponsors:* Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

*Delivery partners:* ARUP; Carbon Trust



# 4. Action planning

## Action routemap

**Decarbonise transport**

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

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

L Action will be implemented at a local scale, across Merthyr Tydfil

Timescale for the action is ongoing

*Sponsors:* Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Llywodraeth Cymru Welsh Government; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

*Delivery partners:* ARUP; Carbon Trust

**Decarbonise transport**

| Action | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Proposed leads |
|---|---|---|---|---|---|---|---|---|
| T.1.1: Produce a Regional Transport Plan (RTP) | | | | | | | | R |
| T.2.1: Develop a plan to fund and roll out EV chargers | | | | | | | | R |
| T.2.2: Explore commercial models for investment into EV charging | | | | | | | | R |
| T.2.3: Explore models and approach for ULEV car sharing schemes (Car Clubs) | | | | | | | | R |
| T.2.4: Develop a national procurement framework for EV infrastructure | | | | | | | | N |
| T.2.5: Deploy EV chargepoints on Council and other public land | | | | | | | | L |
| T.3.1: Expand Challenge Fund green hydrogen vehicle pilot | | | | | | | | R |
| T.4.1: Encourage public transport | | | | | | | | L |
| T.4.2 Promote active travel | | | | | | | | L |

# 4. Action planning

## Action routemap

### Energy networks

Sponsors: Llywodraeth Cymru Welsh Government; Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council; Prifddinas Ranbarth Caerdydd Cardiff Capital Region

Delivery partners: ARUP; Carbon Trust

- 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 Merthyr Tydfil
- Timescale for the action is ongoing

**Energy networks**

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

# 4. Action planning

## Action routemap

### Energy networks

Sponsors: Delivery partners:

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

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

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

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

L Action will be implemented at a local scale, across Merthyr Tydfil

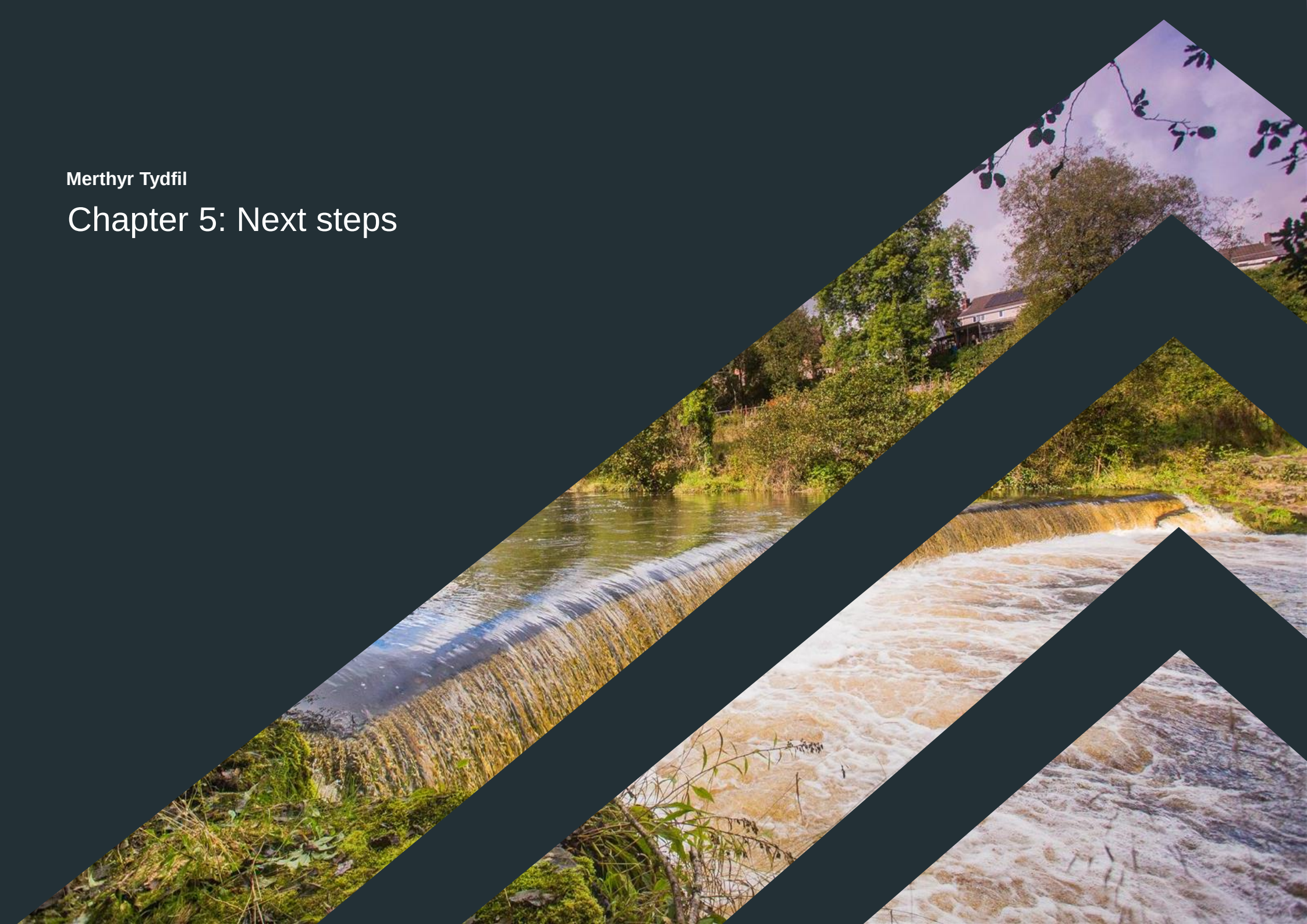
Timescale for the action is ongoing

**Energy networks**

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

Merthyr Tydfil

# Chapter 5: Next steps



# 5. Next steps

## Our LAEP in the context of programmes and projects

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

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

Figure 5.1 shows how projects move from context and vision setting, to procurement and project delivery.

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

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

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

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

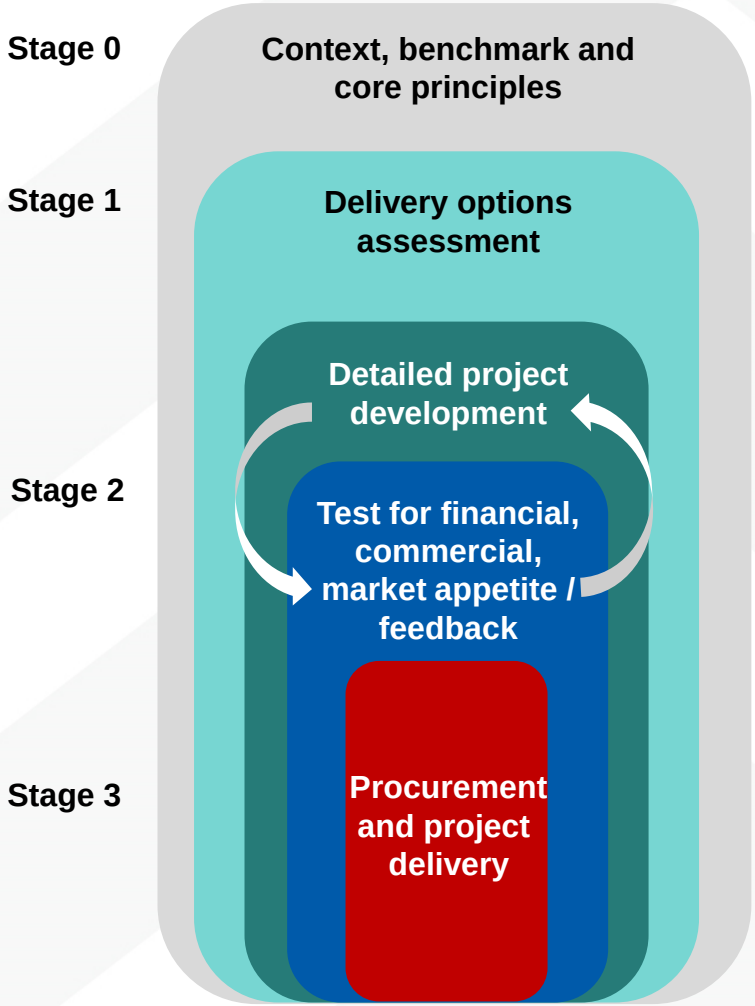



Figure 5.1: How programmes and projects develop

# 5. Next steps

## Enabling conditions for success

### Governance

Delivery of our LAEP will be overseen by Merthyr Tydfil County Borough Council and the Cardiff Capital Region.

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

To deliver this, we (Merthyr Tydfil County Borough Council) will decarbonise assets within our direct control, such as Council buildings and the Council's transport fleet. Further, we will drive and influence the decarbonisation of the wider area through showcasing, leading by example, collaborating and engaging the community.

Our 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**
- **Procurement**
- **Planning policy and regulation**

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

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

Merthyr Tydfil County Borough Council published the Decarbonisation Plan in 2023, this documents the ambition to reach net zero by 2030. This is being delivered through a programme management approach using themed area action plans. These are the following themes: Buildings and Estates; Transport; Procurement; Land Management and Governance. The delivery of the Council led LAEP actions will be included in the Decarbonisation action plans going forward.

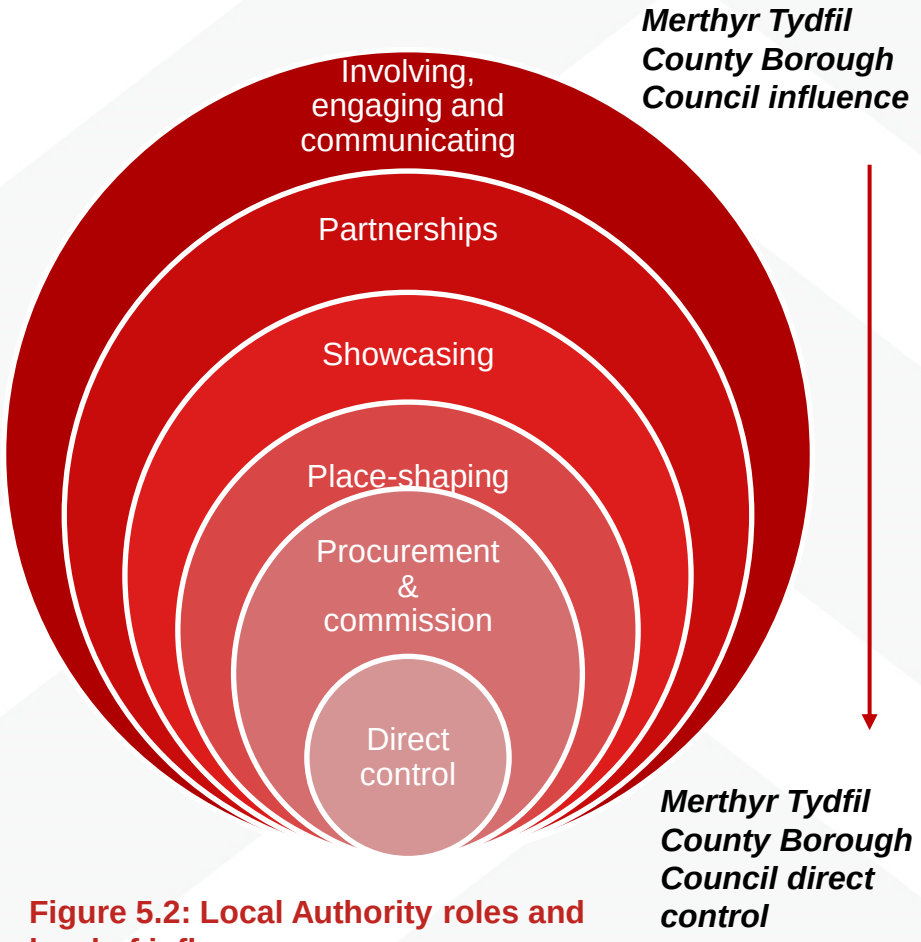



**Figure 5.2: Local Authority roles and level of influence**

# 5. Next steps

## Enabling conditions for success

### Monitoring and review

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

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

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

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

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

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

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

# 5. Next steps

Sponsors:

Delivery partners:

## What are we going to do first?

Once the LAEP has been endorsed by Cabinet, it will transition from the development to the operational phase.

Representatives from Cardiff Capital Region, the Council and key stakeholders will form a team to address the actions. This team will engage with the main stakeholders to define objectives and targets for each of the actions. These actions will be aligned with Merthyr Tydfil County Borough Council's decarbonisation plan.

## What do we want from others?

We can't decarbonise the energy system on our own, while we might have influence over a significant amount of our local system, we do not own it all and we are reliant on others to support the decarbonisation of Merthyr Tydfil. We need others to undertake actions assigned to them and to work with us. We want to continue the collaboration started by this LAEP to continue to strengthen our relationships with local stakeholders.

# Table of figures

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

Delivery partners: ARUP; CARBON TRUST

Cyngor Bwrdeistref Sirol MERTHYR TUDFUL / MERTHYR TYDFIL County Borough Council

# Table of figures

# Table of figures

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# Glossary of terms

Sponsors:

Delivery partners:

| 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. |
| Demand headroom | The difference between the electrical capacity of a substation, and the electricity demand at the substation at the time of peak demand. |

# Glossary of terms

Sponsors:

Delivery partners:

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

# Glossary of terms

Sponsors:

Delivery partners:

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

# Glossary of terms

Sponsors:

Delivery partners:

| Term | Definition or meaning |
|---|---|
| Local energy system | The distribution level energy system, excludes the transmission and national assets. |
| Longer-term options | The likely outcome of these is less certain and dependent upon actions and decisions being made that are not under our control, e.g. a national policy or the capability / availability of a technology. |
| Major industrial load | The power demand of industrial sites in the 2019 NAEI Point Sources data are large enough to be classified as major industrial loads. Sites that aren't included in this database are likely too small to have a significant impact on the energy system singlehandedly. |
| 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.* |
| Merthyr Tydfil | In this report Merthyr Tydfil refers to the County Borough of Merthyr Tydfil rather then the town, unless otherwise stated. |
| National Asset | National infrastructure (can be supply or demand and the accompanying transmission / distribution infrastructure) – defined as over 100MW, unless it produces heat which can only be used locally this is generally excluded from LAEP particularly the modelling. |
| National grid | A generic term used in the reports referring to the electricity network serving Wales, including both the transmission and distribution networks and facilitating the flow of electricity between neighbouring areas or regions. *May also be called generically "grid" in the reports.* |

# Glossary of terms

Sponsors:

Delivery partners:

| Term | Definition or meaning |
|---|---|
| National Net Zero | The National Net Zero modelled in the LAEP. Details of assumptions are in the methodology section. |
| Natural Heritage | This includes features which are of ecological, geological, geomorphological, hydrological or visual amenity importance within the landscape, and which form an essential part of the functioning of the natural environment and natural assets of RCT. |
| Net Zero | 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. |
| Option | A term used to describe ways that a particular objective can be achieved. In the context of this LAEP, an option could be deploying a particular energy system component |
| Outward code | The first part of a postcode i.e. BS1. |
| Pathway | A pathway is how we get from the current energy system, to the most likely net zero end point. The pathway will consider what is needed from across the scenarios, the supply chain, number of installers etc. The propositions will make up the more certain part of the pathway, whereas the longer-term energy components will need further definition in the future. |

# Glossary of terms

Sponsors:

Delivery partners:

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

# Glossary of terms

Sponsors:

Delivery partners:

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

# Glossary of terms

| Term | Definition or meaning |
|---|---|
| Transmission network | Move energy via pipes or wires for long distances around the country at high pressure/ voltages. |
| Uncertainties | Uncertainty results from lack of information or from disagreement about what is known or even knowable. |
| We | The range of people and organisations in Merthyr Tydfil County Borough 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 |
|---|---|
| GWh | Gigawatt hour(s) – a unit of energy representing 1 billion watt-hours. |
| kgCO2e | Kilogram(s) of carbon dioxide equivalents – a unit of measurement for greenhouse gas warming potential, expressing the equivalent weight of carbon dioxide with the same global warming potential. |
| ktCO2e | Kilotonne(s) of carbon dioxide equivalents - a unit of measurement for greenhouse gas warming potential, expressing the equivalent weight of carbon dioxide with the same global warming potential. Represents 1 million kgCO2e. |
| kV | Kilovolt(s) – a unit of potential energy of a unit charge in a point of a circuit relative to a reference (ground) representing 1000 volts. |
| kW | Kilowatt(s) – a metric unit of power measuring rate of energy consumption or production representing 1000 watts. |
| kWh | Kilowatt hour(s) - a unit of energy representing 1000 watt-hours. |
| kWp | Peak kilowatt(s) – the maximum power rating possible produced by an energy generation source (i.e., amount of power produced in ideal generation conditions). |
| MVA | Mega volt amp(s) – a metric unit of apparent power measuring rate of energy consumption or production and considering the efficiency by which electrical power is converted into useful output. It is related to MW by the power factor of the system or equipment. |
| MW | Megawatt(s) – a metric unit of power measuring rate of energy consumption or production representing 1 million watts. |
| MWe | Megawatt(s) electric – a unit of electric power output from a generation source representing 1 million watts electric. |

# Units of measure

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

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