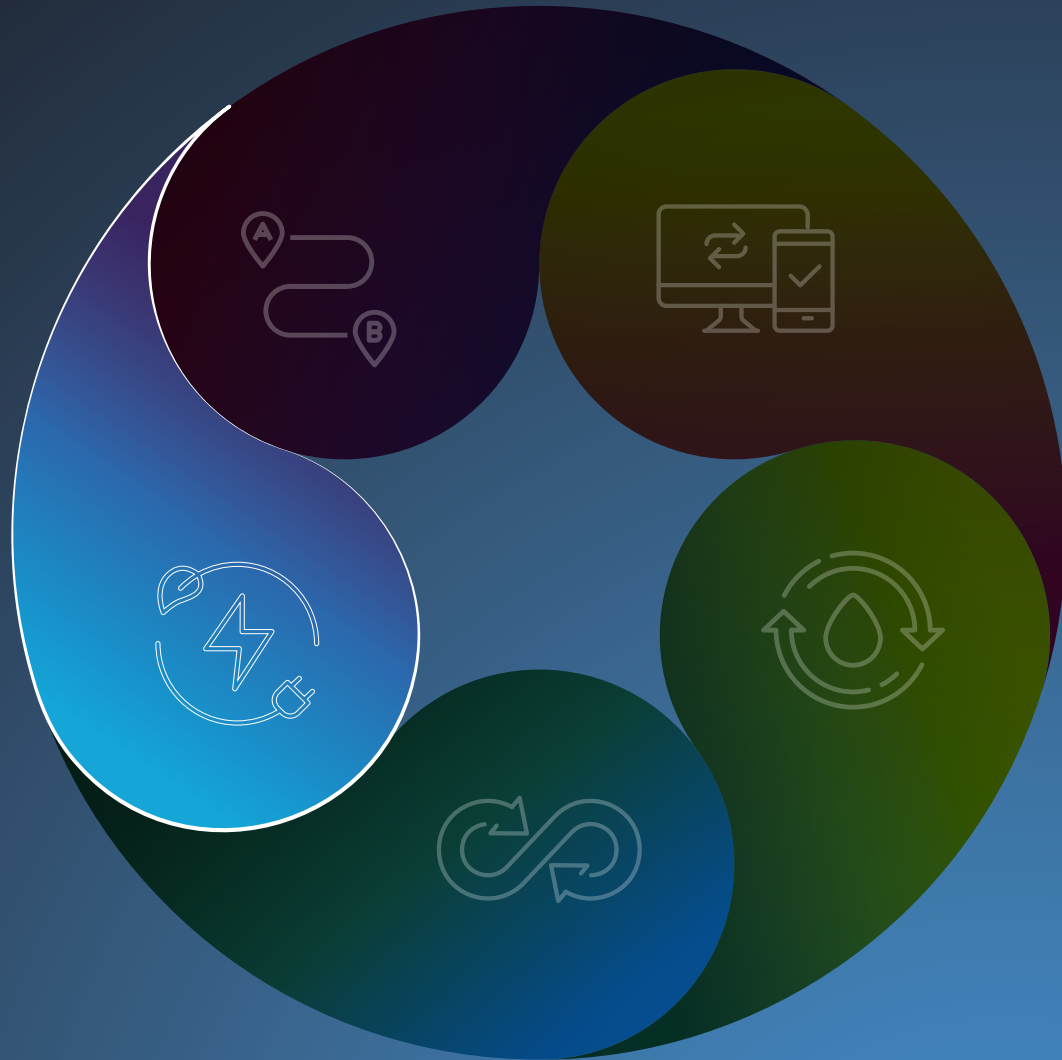




Comisiwn **Seilwaith**
Cenedlaethol **Cymru**
National **Infrastructure**
Commission **Wales**



ENERGY SECTOR INFRASTRUCTURE INSIGHTS EXECUTIVE SUMMARY

in partnership with
 **ARCADIS**

The National Infrastructure Commission for Wales (NICW) commissioned Arcadis to assess the current and future infrastructure needs across energy, water, transport, digital, and the circular economy sectors and identify the key issues for Welsh Government attention.

This summary focuses on the energy sector, examining issues with energy generation, the energy network and energy consumption. The purpose of this is to identify the most critical risks and priorities for Wales.

Energy infrastructure is fundamental to Wales, powering everyday life and also playing an important role in maintaining UK energy security. Reliable and affordable energy underpins economic growth, job creation, and social wellbeing, while enabling critical infrastructure like hospitals, schools, and communications networks. As Wales transitions to low-carbon sources, energy will become even more vital for achieving climate goals, ensuring national security, and driving innovation.

The Welsh energy system is highly complex, involving a diverse mix of generation sources, grid infrastructure, and intricate market mechanisms. UK and Welsh Government bodies, private companies, communities, and regulators play critical roles in shaping its operation and development. Importantly, policy direction and strategic priorities are largely determined by the Welsh Government, which steers the sector toward national goals.

CURRENT ISSUES AND CHALLENGES



Energy Generation

- Continued reliance on fossil fuels remains a challenge for decarbonisation.
- Renewable energy capacity is growing but needs significant acceleration. Renewable projects reaching the end of their operational life will require repowering.
- Onshore and offshore wind deployment has stalled and challenges that have caused this need to be overcome.
- Solar generation is increasing, yet large-scale deployment is constrained by land availability, grid capacity, and economic viability.
- Investment uncertainty and regulatory barriers, including planning and consenting, hinder the new generation projects and limit investment into Wales.
- The Welsh Government has established Trydan Gwyrdd Cymru, its own renewable energy developer.
- In November 2025, the UK government selected the Wylfa site on Anglesey for the country's first Small Modular Reactor (SMR).
- Progress toward community owned energy is strong, however still faces challenges.
- Integration of emerging technologies like hydrogen and energy storage is at an early stage and needs strategic support.



Energy Network

- Major grid capacity upgrades are needed to integrate renewables, support decarbonisation, and maintain network resilience.
- NESO is developing Wales's whole-system energy plan, with completion expected in 2027 or later.
- Welsh planning policy prefers underground cables, increasing grid route costs and adding complexity.
- Greater storage is needed to balance variable renewables, but investment and regulatory clarity are lacking.
- New grid connections are vital to support increasing demand for electrification and rural network capacity, but face significant public opposition.
- Heat network development faces major challenges due to fragmented funding, lack of dedicated capital support, and absence of zoning powers.
- Operators aim to connect wind farms to the grid, but without regional coordination, isolated development could lead to misaligned investment.
- Large rural areas of Wales lack gas network access, with many homes relying on oil, LPG, or electricity.
- Hydrogen grid development is progressing but faces strategic, regulatory, funding, and infrastructure barriers.



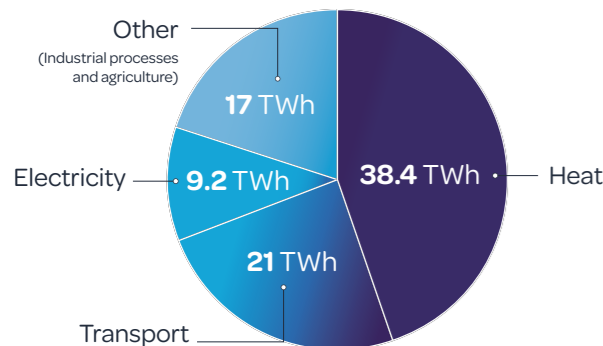
Energy Consumption

- Particular challenges around decarbonising heat remain, with most still coming from fossil fuels, despite Net Zero targets.
- Electricity demand will grow due to increasing electrification of heat, transport, digital infrastructure and cooling. However, limited grid capacity is a major constraint.
- Many Welsh households are in fuel poverty, especially in rural areas.
- Accelerating adoption of heat pumps is essential, but affordability and installer capacity remain key challenges.
- Building Regulations do not enforce the energy hierarchy, leading to inefficient buildings and missed opportunities to reduce heat demand.
- There is a need for improved energy efficiency in both domestic and commercial buildings to reduce overall consumption and costs.



WHERE ARE WE NOW

Wales consumes 85.5 TWh of energy per year (2021). | 45% is used to generate heat.



1 Energy Use in Wales - Third Edition

Wales aims to generate 100% of its electricity from renewable energy by 2035

27% or 7.8 TWh

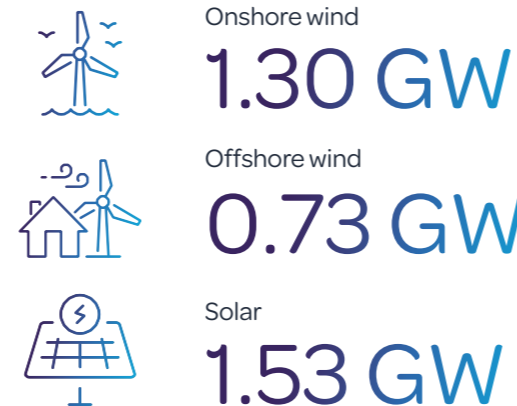
is currently from renewable sources (2023)

Significant scaling up of renewables capacity is therefore required.



2 Energy Generation in Wales 2023

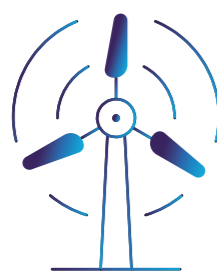
Installed capacity for renewables is currently:



3 BEIS Regional Renewable Statistics - See Regional Statistics 2003-2024: Installed Capacity Spreadsheet

600MW

of onshore wind will reach the end of operational life by 2035 and this will impact capacity. Repowering will be important to consider.



4 Welsh Energy Targets Review: Graphing Output

Wales aims to have 1.5GW of locally owned renewable capacity by 2035

900 MW

is currently community owned



5 Energy Use in Wales - Third Edition

Electricity demand in Wales is currently 13TWh. If Wales is to meet Net Zero it is expected that by 2050 this will increase to over

33 TWh



6 Wales Target Advice Full Dataset

Heat accounts for

45%

of total energy use in Wales. Over 90% comes from fossil fuels (2021)



7 Energy Use in Wales 2023

22,000

air source heat pumps have been installed in Wales (2023).

Target = 580,000 by 2035.



8 Energy Use in Wales 2023

340,000

households in Wales are living in fuel poverty



9 Fuel poverty modelled estimates for Wales (October 2024)

FUTURE CHALLENGES

The main challenge for the future is that current renewables deployment simply isn't sufficient to meet 2035 targets.

Medium-Term Challenges

1. The social licence for energy infrastructure and delivering Net Zero is under threat.
2. Funding gaps and fragmented policy limit scaling of heat networks and new technologies.
3. Integrating renewables, hydrogen, and carbon capture and storage needs major system upgrades and coordination.
4. Shortage of skilled workers and supply chain constraints may hinder energy transition.

Long-Term Challenges

1. Policy stability and investor confidence are essential for sustained decarbonisation.
2. Transitioning away from fossil fuels while ensuring affordable, secure energy for all communities is a fundamental challenge.
3. Eradicating fuel poverty requires ongoing investment in efficient, low-carbon homes and fair pricing.

FUTURE AMBITION

Whilst Wales has clear energy targets, in practice there are a range of policy conflicts which cause issues for the delivery of renewable energy.

Wales should aim to have a resilient, secure, decarbonised and affordable energy sector/ supply and capacity supported by suitable electricity transmission and distribution network and, where appropriate, heat networks.

This ambition requires the following:

- Clear and integrated Welsh policy alignment across sectors on energy.
- Coordinated renewable and supporting infrastructure and investment strategy, including retaining economic benefit in Wales from assets such as Crown Estate land.
- Creating a favourable, confidence inspiring, context for clean energy investment.
- Greater support for local energy ownership.
- Balanced generation, storage, and grid reliability.
- Strategic grid planning and development for renewables integration.
- Targeted heat decarbonisation and energy efficiency.
- Equitable pricing to address fuel poverty.
- Renewable sector leadership in skills development and training.
- Consistent long-term climate protection policies, avoiding political uncertainty.

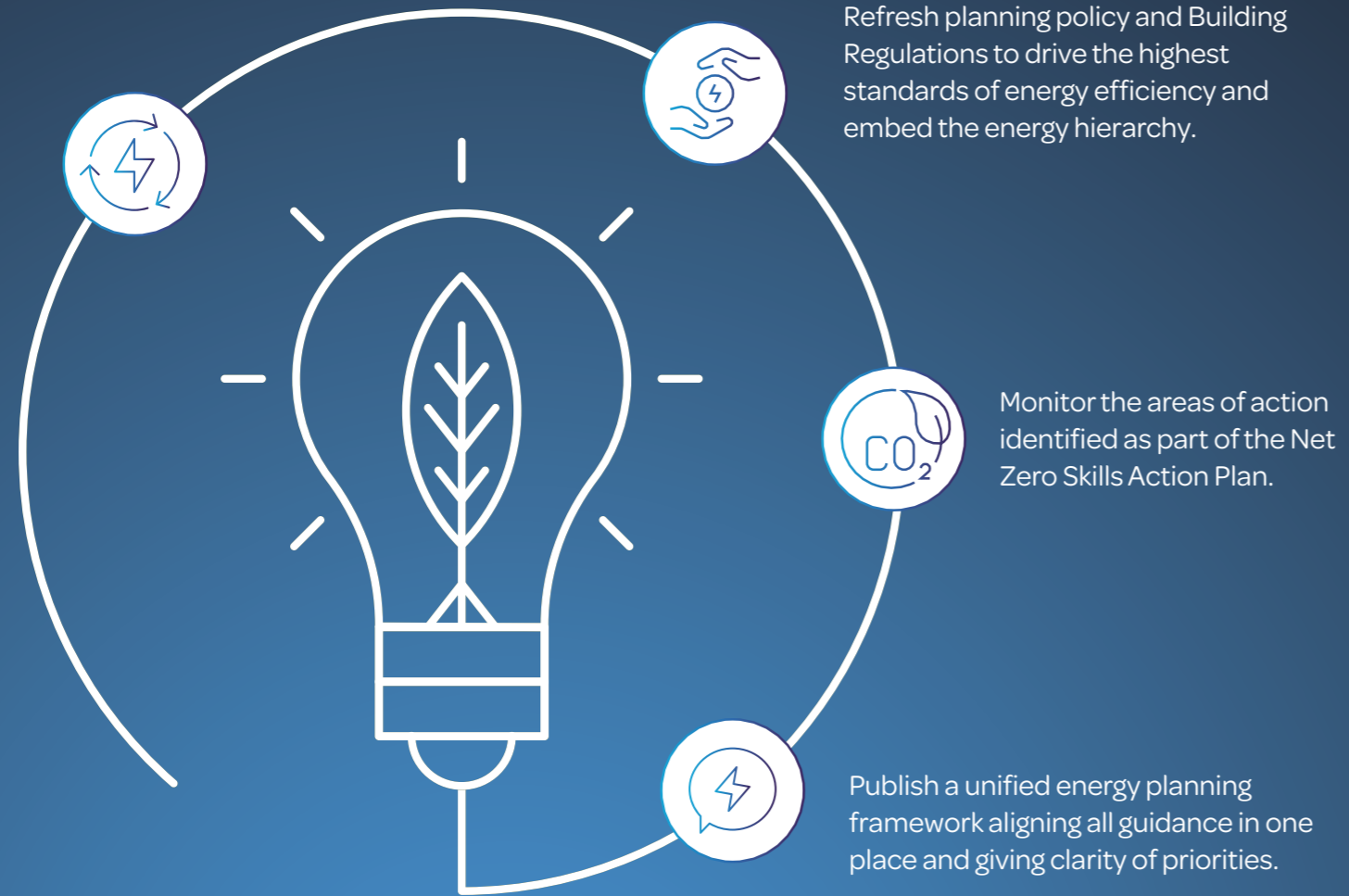
PRIORITY ACTIONS

This review has identified a range of issues and challenges that require further action.

Top priorities are to:

Develop clear and integrated national energy policy to include:

1. Publication of Local Area Energy Plans.
2. Stronger policies for deploying and repowering renewable infrastructure and grid upgrade.
3. Support for reusing or repurposing outdated energy assets.
4. Long term clarity, to protect the sector from short term political changes.



For more information,
please scan the QR code.

