
A plan for Wales' renewable energy future:
Essential actions to re-energise Wales by 2035
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MAKING WALES BETTER

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About the IWA

We are the Institute of Welsh Affairs, Wales' leading think tank. We challenge, inspire and drive change, making Wales a better place to live and work for everyone.

We are independent of government and political parties.

We bring together experience and expertise from all backgrounds to collaborate on the most important issues facing Wales.

We come up with ambitious but practical and informed ideas to improve the economy, education, governance, health and social care and the media.

Our vision is to create a Wales where everyone can thrive.

For more information about the IWA, our policy work, and how to join, as either an individual or corporate supporter, contact:

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About *Re-energising Wales*

Re-energising Wales is a three year project (April 2016 - April 2019) to deliver a plan to enable Wales to meet its projected energy demands entirely from renewable sources by 2035.

This final report is our plan for a renewable Wales, building on the evidence gathered through the project:

1 **Energy demand:**
We established a framework to collect and report on operational energy demand data, in order to help collate temporal and geographical data and better understand what drives energy demand.

2 **Developing a future energy systems vision:**
We used the Swansea Bay City Region (SBCR) as a case study exemplar, showcasing how the SBCR can maximise the size and location of its renewable energy resources in order to meet its projected energy demands by 2035. Lessons from this can be applied across Wales.

3 **Setting the economic parameters:**
Building on the SBCR report, we outlined the economic opportunity that arises with a truly transformative approach to energy generation and domestic refurbishment in the SBCR. We also assessed the economic costs and benefits of renewable energy transition in Wales.

4 **Social and Community Issues:**
This work programme was split into two reports. The first part involved interviews with local and community organisations across Wales to capture their experiences around developing renewable energy projects in Wales. The second part outlined recommendations for how to protect, promote and achieve scale in community and local ownership of renewable energy in Wales.

5 **Regulatory and political challenges:**
We assessed what powers and policies are required for a new renewable energy regime to be implemented well in Wales.

There have also been two policy papers: *Funding Renewable Energy Projects in Wales* and *Decarbonising Transport in Wales*.

The IWA *Re-energising Wales* project is kindly supported by the Hodge Foundation, the Friends Provident Charitable Foundation and the Polden-Puckham Charitable Foundation.

About the authors

Shea Buckland-Jones with support from Rhea Stevens

Shea Buckland-Jones

Shea Buckland-Jones coordinates the *Re-energising Wales* project for the Institute of Welsh Affairs. Shea joined the IWA in April 2016 after working in a number of roles at Community Housing Cymru, including public affairs and developing energy policy, strategy and projects. Prior to this, Shea worked on a number of research contracts with UWIC University and Merthyr Tydfil Housing Association.

Rhea Stevens

Rhea Stevens is Policy, Projects and External Affairs Manager for the IWA. Rhea is responsible for making sure the IWA's research and project portfolio is thought-leading, impactful and contributes to making Wales better. She is the Editor of *click on wales*, and managing editor of *the welsh agenda*. Previously Rhea has worked in campaigns and policy roles, specialising in children's and social care policy. She is a trustee of the Sheila McKechnie Foundation, which supports individuals, groups and communities to have the skills and confidence to speak up, and take effective action on issues that matter to them.

Acknowledgments

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We would also like to thank the *Re-energising Wales* project Steering Group, which was established to provide expert oversight and support for the project. This group includes representatives from academia, industry and communities. A full list of Steering Group members is available at Appendix 1.

The IWA would like to thank all the contributors who gave freely of their time, expertise and interest to support *Re-energising Wales*. In particular, we would like to thank the organisations and individuals who were commissioned by us to help write the work package reports: Professor Ian Knight and colleagues at the Cardiff School of Architecture; Johnny Gowdy, Amy Brimmicombe, Jodie Giles, Ky Hoare and colleagues at Regen; Professor Calvin Jones at Cardiff University's Business School; Hywel Lloyd at Facilitating the Future Ltd; Professor Judith Marquand, Kate O'Sullivan and Sioned Pearce at WISERD; and independent consultant Chris Roberts. We would also like to thank event partners innogy and Smart Energy GB for their support.

We would also like to thank David Clubb, Director, RenewableUK Cymru, who has been a great friend to the project.

Finally, we would like to thank Marc Jennings, with whom we have worked closely on the design of *Re-energising Wales'* reports.

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Garwnant intake
Credit: Natural Resources Wales

Foreword
Auriol Miller

In many ways, *Re-energising Wales* is an archetypal IWA project. The essential ingredients are all there: a major issue facing Wales at every level of governance and within a global context; one that straddles a number of policy areas; the stirrings of ambition within Welsh Government but no practical plan to achieve the long-term targets it has set itself so requiring bold and constructive challenge; and a group of stakeholders from all sectors who needed a space to discuss, explore and agree a way forward, with that space moderated by an independent convener. There has been a palpable sense of excitement about this work.

Our 2015 report *An Economic Strategy for Wales?* revealed an opportunity to set the bar high for Wales' renewable energy future. Over the last three years we have worked carefully and steadily with our partners and colleagues across the energy system. We have kept our eye firmly on the prize, and are proud to present a detailed and practical plan that sets out how this ambition can be turned into a reality for us all, and for our future generations.

There are, in our opinion, few policy areas that can have such a multifaceted positive impact on so many areas that affect the day-to-day life of people living and working in Wales.

This is one such opportunity for Wales.

Our ten essential actions to re-energise Wales by 2035 show the way ahead, based on the evidence that we have gathered throughout this project. Our plan is ambitious, and requires shared public and political ambition. We seek a radical change.

We can choose to be a beacon of sustainability and make renewable energy a cornerstone of our Welsh identity. We can reap greater economic benefit, grow local and community ownership of the Welsh economy and tackle the scourge of fuel poverty.

Together, we can and must shape a cleaner, greener chapter in our industrial story.

Auriol Miller | Director, IWA

Re-energising Wales: A plan for Wales' renewable energy future

Essential actions to re-energise Wales by 2035

Our purpose

The Institute of Welsh Affairs' (IWA) *Re-energising Wales* project was set up to deliver a plan for Wales to meet its energy demand entirely from renewables by 2035.

By this we mean both all annual demand by 2035, and all demand day-to-day, week-to-week and season-to-season. The ambition does not require that demand be met purely by real time supply; as is currently the case, stored energy will have an increasingly important part to play.

The project stems from an earlier IWA report *An Economic Strategy for Wales?*, which highlighted Wales' comparative advantage in renewable energy. It set out how it could best be used to secure the step change in Wales' economic fortunes that would shift Wales towards parity with those of England, that is from approximately 70 per cent Gross Value Added (GVA) to nearer 90 per cent of UK GVA per head.

Introduction

Wales has a long history of energy activity, much of it carbon based.

Wales also has a historic legacy of energy infrastructure, with electricity grids reaching east to west in both north and south Wales; a gas grid that serves much of urban Wales and places beyond (although significant areas of Wales, particularly rural areas, are off the gas grid); and a network of petrol and diesel refuelling stations. A number of sizeable thermal fossil fuel power stations continue to supply electricity, while newer lower carbon energy sources, ranging from wind and solar to biogas and energy from waste, have emerged in a mixed economy of energy generation and supply.

Wales currently imports much of its total fuel use. It also generates more electricity than it uses, with much of this generated by fossil fuel plants and the electricity 'exported' for use on other parts of the UK grid.

Wales is starting to reshape its energy generation and export profile. In recent years we have seen a decline in coal fired power stations, increased efficiency of energy use, and the growth of renewable energy supply across the UK and in Wales, such that Wales currently has a confident ambition to deliver a range of renewable energy targets.

Opposite:
Credit: Kirk Schwarz, unsplash

Wales is seeking an increasingly renewable and locally-owned set of generation assets. This change is being driven by Welsh Government's ambitions on climate change and sustainability, exemplified by the *Well-being of Future Generations (Wales) Act 2015* and the new clean electricity targets, and also by an energy revolution, as the costs of renewables continue to plummet and householders and industry back flexible and modern forms of generation.

Wales has a major opportunity to make renewable energy part of our identity: a cleaner, greener chapter in our industrial story. To achieve this, ambitious leadership is required.

Lesley Griffiths AM, the current Minister for Environment, Energy and Rural Affairs, announced Welsh Government's renewable energy targets for Wales in September 2017:

- Wales to be generating 70% of its electricity consumption from renewable energy by 2030
- One gigawatt of renewable energy capacity in Wales to be locally owned by 2030
- By 2020, new renewable energy projects in Wales will have at least an element of local ownership.

Whilst these are not statutory targets, they set a direction of travel and signal a level of intent.

According to a recent report, *Energy Generation in Wales*, by the end of 2017 some 48% of the electricity consumed in Wales came from renewable resources, compared with 43% in 2016. Wales is therefore currently more than halfway towards meeting the 70% target.

Wales is also more than halfway towards having one gigawatt of renewable energy capacity which is locally owned, with the total installed capacity of locally owned electricity projects up to the end of 2017 at almost 530 MW.

However, according to the same report, 78% of Welsh electricity generation in Wales came from fossil fuel plants in 2017. The other 22% was generated from renewable sources. When compared with Scotland, for example, 52% of Scottish electricity generation came from renewable sources in 2017.

Managing and reducing demand through energy efficiency, greater productivity for a given use of energy, and flexibility in the nature and timing of the use of energy, are all approaches that can assist in meeting the *Re-energising Wales* ambition to meet energy demand entirely from renewables by 2035.

Through our *Re-energising Wales* reports published to date, we have provided the evidence and set out how Wales can reduce energy demand through energy efficiency measures, and increase renewable energy generation in the electricity, heat and transport sectors.

70%

Welsh Government target for percentage of Wales' electricity consumption from renewable energy by 2030

48%

Percentage of Wales' electricity consumption from renewable energy in late 2017

43%

Percentage of Wales' electricity consumption from renewable energy in 2016

78%

Percentage of Welsh electricity generation in Wales came from fossil fuel plants in 2017

Whilst our *Re-energising Wales* objective is challenging, and more ambitious than current Welsh Government targets, it is at the scale required to meet Wales' and the UK's overall ambition to transition to a low-carbon economy, and to meet the commitments made to combat climate change under the Paris Agreement in December 2015.

We need to be bold about the potential for renewable energy to underpin the economic base of Wales and to deliver on our national and global obligations. At all scales and in all geographies, renewable energy can deliver on our well-being goals, making Wales a beacon of sustainability. At the heart of this project we have focused on how Wales should drive this change whilst, at the same time, achieving greater economic benefit for Wales, alongside a range of further co-benefits, such as growing Welsh ownership of the Welsh economy and delivering social benefit through tackling fuel poverty.

Although the way forward will be challenging and will require radical change, this change is necessary to protect our environment and the well-being of our future generations. We are at a crucial point in time to ensure that our energy system is fit for purpose for now and the future. Despite widespread agreement on the important contribution that energy can make to Wales' future prosperity and sustainability, there are diverging opinions on which interventions to pursue. Building on the technical and complex evidence set out in *Re-energising Wales* publications to date, *Re-energising Wales'* final plan sets out a range of essential actions and interventions identified throughout the project that will allow Wales to make the greatest possible progress and have the greatest possible impact by maximising renewable energy generation by 2035.

What Wales run by 100% renewable electricity could look like by 2035[1]

More than 870,000 homes receive energy efficiency measures, a 20% energy demand reduction across the Welsh domestic stock, 9,500 annual FTE jobs in Wales, £2.2bn of gross value added created in Wales

870,000

2,670 MW of solar PV, 1,800 annual full-time equivalent (FTE) jobs in Wales, £1.3bn of gross value added created in Wales

2,545 MW of onshore wind, 2,000 annual FTE jobs in Wales, £520m of gross value added created in Wales

1,700MW

1,700 MW of offshore wind, 1,300 annual FTE jobs in Wales, £430m of gross value added created in Wales

4,000 MW of tidal range, tidal stream, wave and floating wind sectors, 5,200 annual FTE jobs in Wales, nearly £3bn of gross value added created in Wales

at least 55 MW of in-stream hydropower, 50 annual FTE jobs in Wales, £30m of gross value added created in Wales

55MW

£60m

115 MW of fuelled technologies (biomass, anaerobic digestion, energy recovery), 300 annual FTE jobs in Wales, £60m of gross value added created in Wales

Total: 11,085 MW of renewable energy

+ energy efficiency measures to 870,000 homes
= by 2035 supply Wales' annual territorial electricity demand[2]
+ 20,150 jobs annually across Wales during a 15-year investment period (2020-2035)
+ £7.4bn in total Welsh GVA created.

1 The *Re-energising Wales* ambition is to meet energy demand for electricity, heat and transport entirely from renewables. This infographic relates to meeting electricity demand.

2 This may require moderate imports/storage of electricity in the still winter months

Approach

Our analysis of the *Re-energising Wales* evidence base has identified essential actions that need to be delivered between 2019-2035 if we are to work towards meeting the project's ambitions and address our climate change targets in Wales.

The actions we set out are challenging, and will require shared political and public ambition.

These *Re-energising Wales* actions get us a long way but there are challenges that still need to be overcome, particularly to decarbonise heat and transport fully. We consider these and other issues which require further investigation in this report's conclusion.

The actions identified will help us make significant strides and ensure the conditions are right to support Wales' energy system of the future, much of which we cannot predict. However, understanding the scale of the challenge and what can be done is crucial, as are acknowledging the barriers that must be overcome and recognising the opportunities that could be harnessed.

Based on our analysis, the actions set out below are those which are most urgent, will have the greatest impact and are already within the competence of organisations in Wales to deliver.

The time for action is now.

Our 10 point plan for a renewable Wales: the urgent and essential actions

1

Fund the future: through an immediate 12-18 month low carbon economic stimulus for Wales which accelerates action on renewable energy and energy efficiency

2

Renew Wales' homes: through improved building standards and a long-term greener homes programme

3

Retain the benefits in Wales: by requiring all new renewable projects above 5MW to have between 5 and 33% community and local ownership by 2020

4

Use local land for local benefit: by ensuring that planning regulations and public land are used in support of new renewable energy schemes and create maximum local benefit

5

Focus on delivery: by ensuring there is sufficient capacity and expertise in key public bodies to deliver the vision in practice

6

Future-proof the grid:
by getting the electricity grid ready to meet Wales' energy aspirations

7

Get SMARTer:
by ensuring Welsh businesses, local and community organisations are supported to capitalise on and lead the shift to smarter energy technology and business transformation

8

Get ahead in marine:
by taking a coordinated approach between government, industry, academia and others to establish a global advantage over marine energy and floating offshore wind as niche Welsh services

9

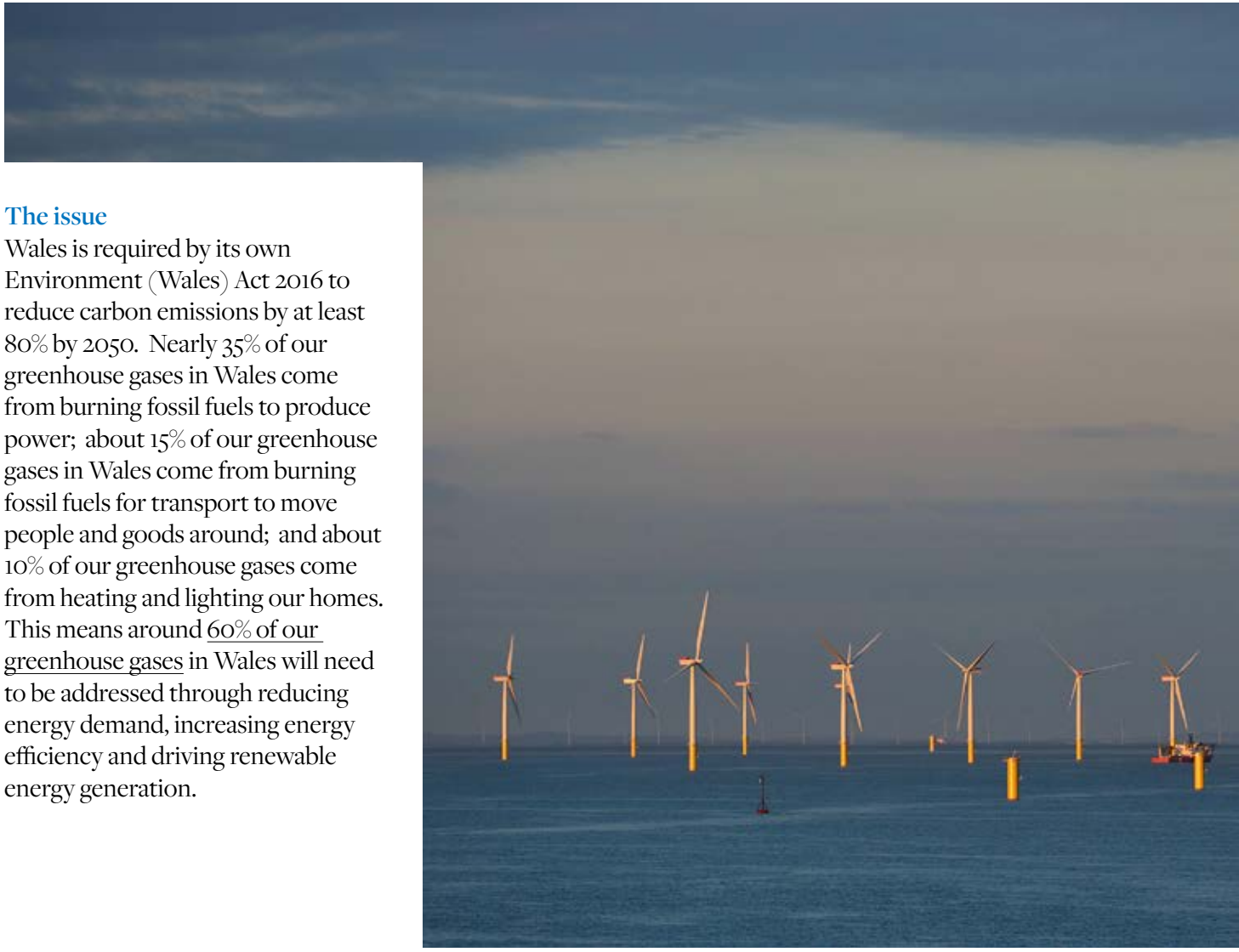
Harness the potential of bioenergy:
enabling Wales to create a world class circular economy

10

Decarbonise transport:
through a comprehensive 'Transport Decarbonisation Plan' co-produced by key public bodies and the transport sector, backed up by a national travel survey

1

Fund the future: through an immediate 12-18 month low carbon economic stimulus for Wales which accelerates action on renewable energy and energy efficiency



The issue

Wales is required by its own Environment (Wales) Act 2016 to reduce carbon emissions by at least 80% by 2050. Nearly 35% of our greenhouse gases in Wales come from burning fossil fuels to produce power; about 15% of our greenhouse gases in Wales come from burning fossil fuels for transport to move people and goods around; and about 10% of our greenhouse gases come from heating and lighting our homes. This means around 60% of our greenhouse gases in Wales will need to be addressed through reducing energy demand, increasing energy efficiency and driving renewable energy generation.

Currently, Energy doesn't get anywhere near enough funding to reflect this in the Welsh block grant. In the final Welsh Government 2019/20 budget, the 'Energy, Planning and Rural Affairs' expenditure group only made up just over 2% of the Welsh block grant. Welsh Government's capital spend programme could have a significant impact on emissions.

Alongside Welsh Government spending, other Welsh resources and investment mechanisms could, in part, be invested into renewable projects. One of those is Welsh Local Government pension schemes. There are eight Welsh Local Government pension schemes in Wales that operate with a collective investment of approximately £15 billion. However, a significant proportion of this £15 billion is invested outside of Wales and not directly in Welsh assets, including over £1 billion worth of investment in fossil fuels.

Meanwhile, a European Commission report has revealed that the UK leads the European Union in giving subsidies to fossil fuels. It found €12bn (£10.5bn) a year is spent in support of fossil fuels in the UK, significantly more than the €8.3bn spent on renewable energy.

Left: Gwynt y Môr offshore wind site
Credit: innogy Renewables UK

Below: Pen-y-Cymoedd wind farm
Credit: Vattenfall

The solution ▶

1

The solution

Renewable energy and energy saving are key national indicators within the Well-being of Future Generations (Wales) Act 2015. To make maximum progress towards achieving the well-being goals under the Act, Welsh Government need to align carbon budgets with financial budgets to ensure that investment in decarbonisation reflects ambition. This was recommended in the *Advice to Welsh Government on taking account of the Well-being of Future Generations Act in the budget process* report by the Office of the Future Generations Commissioner for Wales. On an ongoing basis, 2% of the Welsh Block Grant is insufficient to make real progress and we recommend the expenditure group be reviewed to ensure the resource allocated matches the urgent need.

With the shadow of Brexit already affecting the Welsh economy, and the urgency of the decarbonising challenge upon us, Wales' new First Minister should instigate a 12-18 months Low Carbon Economic Stimulus. This would both ramp up Welsh action on renewable energy and energy efficiency, and boost the Welsh economy through the Brexit period. The stimulus could be funded through the Welsh block grant or through the Welsh Government borrowing powers derived from the Wales Act 2017.

Our evidence suggests the Low Carbon Economic Stimulus should include measures to:

- grow Welsh ownership of the energy economy
- secure energy wealth in Wales through a whole house, every house, 'homes as power stations' type scheme
- secure complete coverage of Wales by electric vehicle and hydrogen refuelling facilities
- establish the comparative advantage of hydrogen and marine energy as niche Welsh services in the wider UK and global economies.

This should be supported by a new Welsh Government Ministerial Portfolio which unites energy, home, place and community. This would make the most of Welsh powers in the energy domain, for instance by making homes more energy efficient – if not turning them into power stations – and building community and local ownership.

As a part of the development of the new portfolio, we propose a number of interim ambitions to guide delivery and practice, including a revised renewable electricity target of 100 per cent by 2030.

Welsh Local Government pension funds should significantly reduce their exposure to investment in fossil fuels as soon as possible. All investment funds in Wales should identify and take climate change into account as a key risk, as underpinned by the duties set out in the Well-being of Future Generations (Wales) Act 2015. This should include scope to drive direct investment into local renewable energy projects in Wales.

The impact of investment would be substantial. Using an example from the *Re-energising Wales* Swansea Bay City Region (SBCR) report, investment in 2.7 GW of electricity generation by 2035 would enable the region to produce renewable electricity generation equivalent to 100% of electricity consumption on an annual basis in the region. This would include investment in solar PV, onshore wind, offshore wind, wave, tidal stream, tidal range, in-stream hydropower, and fuelled technologies (biomass, anaerobic digestion, energy recovery). This would cost around £4.6bn (based on 2018 costs) and result in significant economic benefits for Wales, especially in the development and construction phases with around £1.1bn of gross value added over the period for Wales, whilst supporting around 2,300 FTE jobs annually over the 15-year period (2020-2035) across Wales, with some 1,500 of these within the SBCR.

Investing £1.16bn in energy efficiency measures for just over 200,000 homes in the SBCR by 2035 – the scale required to put Wales on track to achieve the Environment (Wales) Act 2016 target of at least an 80% reduction in emission by 2050 – could create 33,000 person years of employment in Wales over a 15-year period (2020-2035). This equates to 2,200 full time jobs annually, with GVA impacts totalling £520m over the period or around £35m per annum.

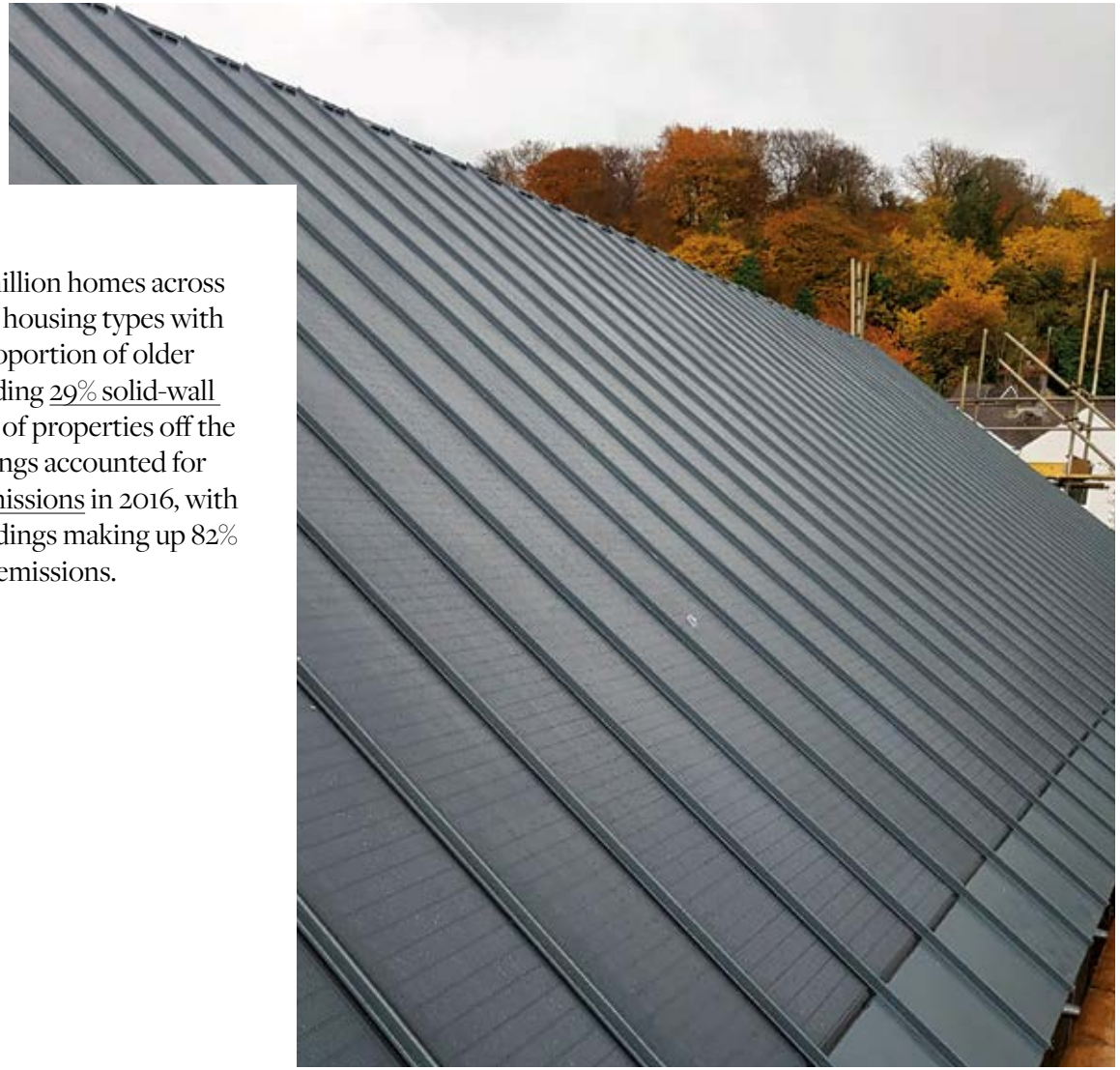
Translating this to a Wales-wide level, our evidence shows that the development of an energy system that can enable Wales to become 100% self-sufficient in renewable electricity by 2035 requires around £25bn of investment in renewable electricity generation, and £5bn in domestic energy efficiency interventions. This analysis indicates that some 40% of renewable electricity gross spending (£9.7bn) could potentially be captured by Wales, along with 70% of domestic energy efficiency gross spending (£3.7bn). These investments could support some 20,150 jobs annually across Wales during a (notional) 15-year investment period (2020-2035), with around £7.4bn in total Welsh GVA created in total.

2

Renew Wales' homes:
through improved building standards and a long-term greener homes programme

The issue

Wales has 1.4 million homes across a wide range of housing types with a significant proportion of older buildings including 29% solid-wall homes and 21% of properties off the gas grid. Buildings accounted for 9% of Welsh emissions in 2016, with residential buildings making up 82% of this sector's emissions.



Active Homes site Neath
Credit: Pobl/SPECIFIC/TRJ

There are currently 291,000 households living in fuel poverty, equivalent to 23% of households in Wales. Countries which have more energy efficient housing have lower excess winter deaths. Excess winter deaths in Wales almost doubled in 2017-18 – rising from 1,850 the year before to 3,400 – meaning Wales had the highest regional index.

Over the last 10 years, the Welsh Government Warm Homes programme has installed energy efficiency measures in over 50,000 homes, with plans to install measures in a further 25,000 homes by 2021. Whilst this programme of work is welcome, it does not currently meet the scale of the challenge which faces us.

Furthermore, at least 6,000 new dwellings are built in Wales each year, with planning permission for significant growth to follow. Despite the impact that buildings regulations could have on reducing carbon emissions and tackling issues such as fuel poverty, Wales opted for an 8% reduction in carbon emissions in the 2014 review of building regulations, despite the previously planned 40% reduction.

The solution ▶

2

The solution

Building regulations

The Welsh Government's 2019 review of Part L of the building regulations should set out a clear timetable for increasing the energy efficiency of new homes and delivering 'homes as power stations' (or 'net energy zero'/'energy positive') standards by 2022. Homes as power stations are those that produce enough energy to balance the overall annual demand of the household with generation. This would go beyond the current nearly-zero energy homes in operation, meaning that house builders, the supply chain and skills providers can prepare for these changes by 2022. Energy consumption could be cut by more than 60% – saving the average household over £600 a year – if homes were designed to 'homes as power stations' standard so that they generate, store and release their own solar energy.

A key feature of this should be implementing the energy hierarchy within the design of new buildings by prioritising fabric first, along with landscaping measures for minimising energy demand for heating, lighting and cooling. Sustainable Wales-sourced timber construction would be a preference as sustainable timber has numerous environmental, functional and aesthetic benefits. On-site renewable energy generation should also be a requirement, alongside opportunities to provide energy storage and demand management measures so as to tie in with local and national energy security priorities. This should be backed up where possible by monitoring energy use, indoor air quality and overheating risk.

The Welsh Government, Welsh Local Government Association and industry bodies should work together to create enhanced capacity and capability in the building sector. This could involve the attraction of more high value services, development of intellectual property, a skilled workforce and support for the supply chain such as fabrication and manufacturing. This should include the promotion of best practice, whilst ensuring that building control carry out improved building standards enforcement across Wales as part of the quality control process. We need a workforce that can go beyond current basic enforcement, prepared for the changing nature of new homes, with training to apply building control to homes that have higher energy standards including modular build and innovative designs such as those developed through the SPECIFIC programme. Such an approach could also take advantage of the UK-wide Industrial Strategy approach to the future of construction, in particular the Transforming Construction Industrial Strategy Challenge Fund.

Existing funding programmes should be evaluated to consider how to maximise funding for energy measures, for example reshaping the Social Housing Grant Programme to build 'homes as power stations' and ensuring that new housing estates build in other measures which reduce energy demand, such as infrastructure for active travel.

Credit: Keith Jones, National Trust

A 'Greener Homes' programme

Welsh Government should also develop a 'Greener Homes' programme that maximises energy efficiency, increases on-site renewable energy generation and supports energy storage. As part of this, Welsh Government should take the lead and develop an energy efficiency implementation plan that has clear targets at a local level, minimum standards and clear pathways for delivery.

The *Re-energising Wales* Swansea Bay City Region (SBCR) study showed we need at least a 20% reduction in heat and electricity demand if the region is to stay on track to meet climate change targets. This would result in over 200,000 domestic properties (60% of households in the SBCR) needing to be improved by at least one Energy Performance Certificate band rating in the SBCR alone.

Scaling this up to Wales, a programme to deliver 20% efficiency savings across the Welsh domestic stock would need to target 870,000 households by 2035, and would cost around £5bn over the next 15 years.

The majority of the £5bn spend has the potential to be local if Welsh supply chains can be developed in good time. This would result in:

- 10,000 FTE jobs per annum supported across Wales during a notional 15-year implementation period
- the creation of around £2.2bn in Welsh GVA
- savings to householders of at least £350 on their annual combined energy bill
- Wales' energy demand reduced by around 3, 500 GWh
- huge costs savings to the NHS as poor quality housing costing the NHS in Wales more than £67m a year.

The programme should target homes from the social housing sector, private rented sector and owner-occupied sector. It should also consider homes which are connected or not connected to gas and electricity grids, with consideration of the different levers available to drive action for each tenure and housing type.

A variety of financial mechanisms linked to each tenure will be required. Existing funding programmes for each sector should be evaluated to consider how to maximise funding for energy measures, for example reshaping existing funding for social housing organisations such as major repair allowance and dowry schemes to meet higher standards which should be set within the Welsh Housing Quality Standard post 2020.

3

Retain the benefits in Wales:

by requiring all new renewable projects above 5MW to have between 5 and 33% community and local ownership by 2020

The issue

Whilst 100% community-owned projects will deliver the most value to communities, our evidence shows that for Wales to achieve the target of 1 GW of local ownership by 2030, there will also need to be an increase in partnership projects with commercial developers.

Shared ownership is a key activity for driving more community and local ownership of energy in Wales, but more guidance and support is needed for community and local organisations to ensure they have the sufficient capacity and expertise to be part of shared ownership schemes.

Planning, financing, and grid connections must be made easier for shared ownership projects to minimise the effort required by commercial developers to make offers of shared ownership.

Above:
Ynni Ogwen hydro scheme
Credit: Community Energy Wales

Left:
Awel Aman Tawe wind site
Credit: Awel Aman Tawe

The solution

To ensure there is more shared ownership of renewable energy projects in Wales, the Welsh Government should require all new renewable energy projects in Wales above 5MW to have between 5% and 33% community and local ownership by 2020. This is in addition to the Welsh Government target for all new renewable energy projects to have at least an element of local ownership by 2020.

To complement this, Welsh Government policy should require local authorities to offer 50% business rate relief on the community percentage of shared ownership projects, and a sliding scale of business rate relief for the developer proportionate to the community share. For example, if the community share is 15% then the developer would get 15% business rate relief. Non-domestic (business) rates are normally assessed every five years, and the next revaluation is due in 2022. To achieve the required increase in shared ownership, this rate relief should be in place before 2020 and guaranteed for at least 10 years to provide certainty in financial modelling. To achieve this, Welsh Government should undertake an extra-ordinary business rates review during 2019 to mitigate the loss of subsidy for renewables projects.

As part of the required increased funding for renewables, Welsh Government should increase financial support to the Welsh Government Energy Service (WGES) to provide enhanced support to community organisations developing shared ownership projects. This should include covering the communities' legal costs, accessible bridging finance and commercial negotiation support. The Development Bank of Wales can also play a valuable role by providing loans with low interest rates. If this resource is provided alongside the other solutions outlined here, we believe the 1 GW of local ownership by 2030 target can be delivered whilst maximising significant local value to communities. We also consider the 1GW target should be reviewed in 2025, and strengthened if the sector is well on track to meeting it.

4

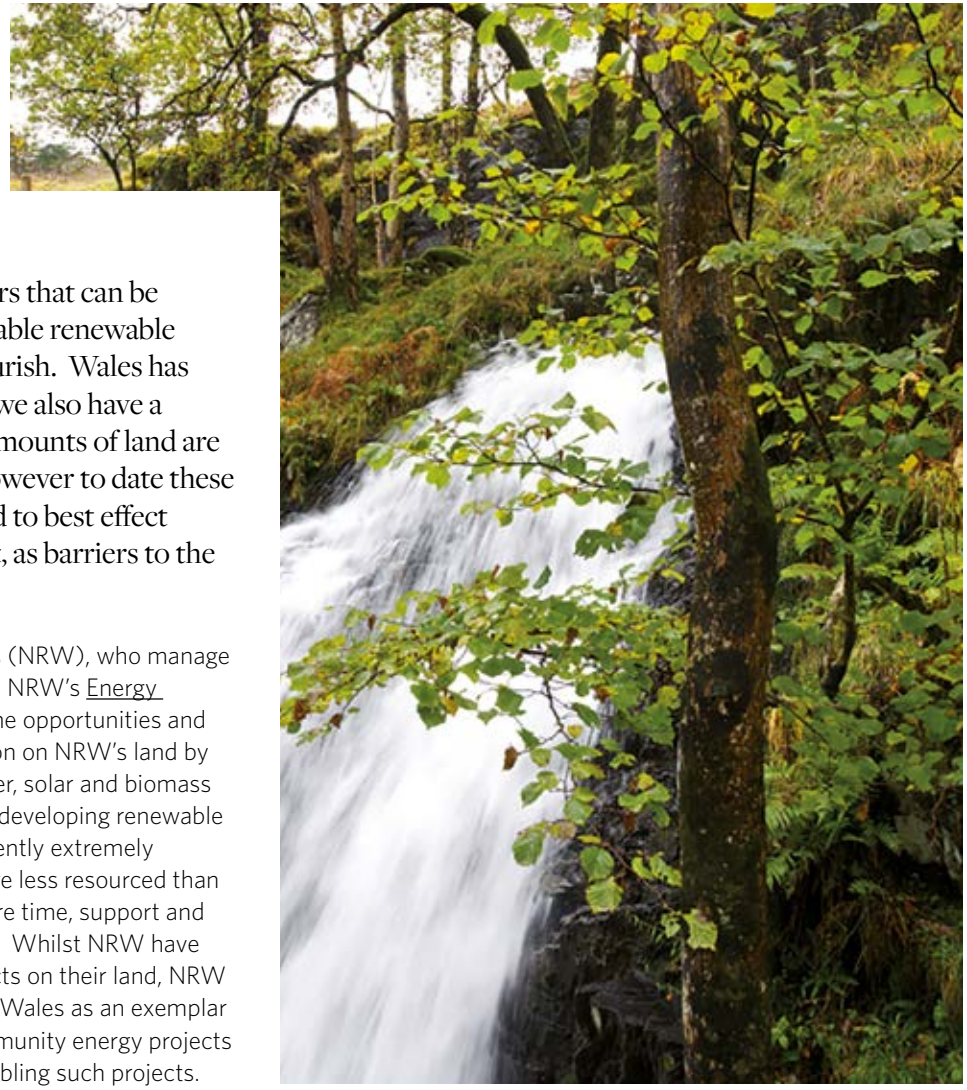
Use local land for local benefit:

by ensuring that planning regulations and public land are used in support of new renewable energy schemes and create maximum local benefit

The issue

Wales has a number of key levers that can be used to create conditions to enable renewable energy projects in Wales to flourish. Wales has control of its planning system; we also have a unique advantage in that vast amounts of land are owned by the public estate. However to date these levers have not been maximised to best effect and still remain, to some extent, as barriers to the development of projects.

The role of Natural Resources Wales (NRW), who manage 7% of the land area in Wales, is key. NRW's Energy Delivery Programme aims to seize the opportunities and increase renewable energy generation on NRW's land by facilitating onshore wind, hydropower, solar and biomass projects. NRW's tender process for developing renewable energy projects on their sites is currently extremely challenging for communities, who are less resourced than large companies and often need more time, support and a track record to respond to tenders. Whilst NRW have some small community hydro projects on their land, NRW has the opportunity to demonstrate Wales as an exemplar in the promotion of large-scale community energy projects by supporting, encouraging, and enabling such projects.



Credit: Keith Jones, National Trust

The solution

The planning system plays a key role in the decarbonisation of our energy system and the ability of communities to develop projects and own generation assets in their area. *Planning Policy Wales Edition 10* now gives material weight to social, environmental and economic benefits associated with renewable energy developments in Wales and supports shared ownership, a very positive development. To realise this at scale, Welsh Government should create more Strategic Search Areas where there is capacity on the electricity network to connect and export power, whilst ensuring that community-owned projects are favourably considered, even if outside Strategic Search Areas.

Through the increased funding allocated to renewables, Welsh Government should also ensure the Welsh Government Energy Service is sufficiently resourced to support local authorities to make planning decisions that enable more community and local energy in Wales. Welsh Government should also require each local authority to develop a future energy strategy that identifies sites and supports renewable energy and low carbon development by 2020. This should align with and complement existing requirements for local authorities to set local targets for renewable energy in their local development plans. Support should be provided to authorities through the Welsh Government Energy Service to procure high quality resource assessments to underpin these strategies. The *Re-energising Wales* *Swansea Bay City Region: A Renewable Energy Future Energy system vision for 2035* report methodology developed by Regen could be a template.

Building on our evidence base, we believe that a number of recommendations should be implemented to ensure the delivery of more community and local renewable energy schemes on public land. Firstly, NRW should simplify its tendering process in the Energy Delivery Programme. This could involve giving communities a longer lead time to respond to tenders and having a dedicated point of contact to help guide community groups through the tender process, which would fall in line with its guiding energy principle on supporting communities to generate energy from local resources.

We believe NRW should allocate at least 5 sites for at least 15 MW per year from 2019 onwards, for 100% community and local authority owned renewable energy developments at nominal/peppercorn rent. They should also allocate at least 3 sites for at least 60 MW per year from 2019 onwards for shared ownership schemes at nominal/peppercorn rent. NRW themselves could also have an ownership stake in schemes.

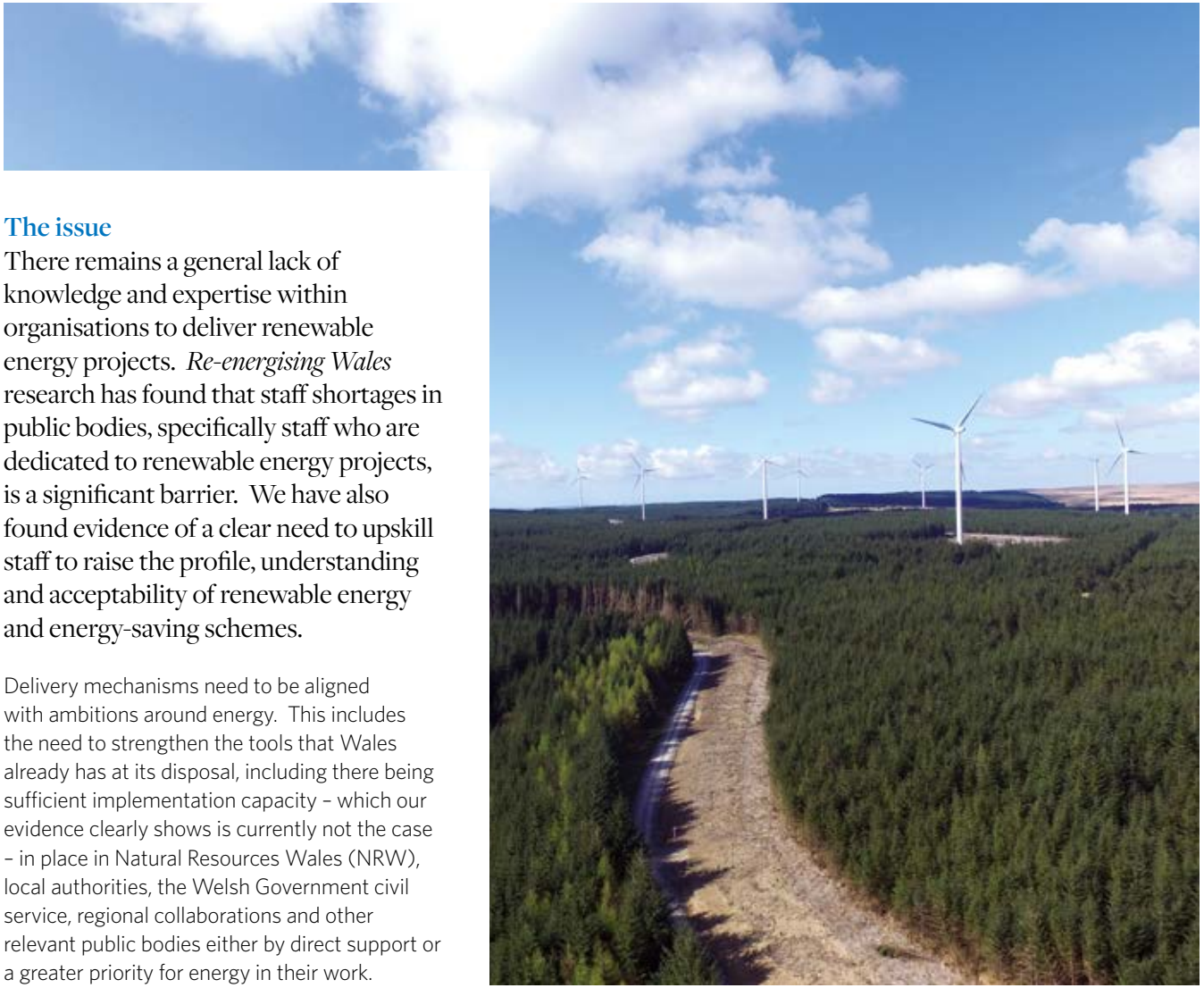
Welsh Government should set a policy framework for community organisations to have the right to have first option or a right to bid on public land to develop renewables projects by 2020. This should ensure all renewable energy projects on public land are either community owned or have at least a 20% shared ownership stake. To make progress at the required rate, this is required by 2020 to operate alongside the Welsh Government local ownership target for all new renewable energy projects to have at least an element of local ownership by 2020.

Furthermore, all public bodies should give greater weight to social benefit alongside local benefit in their scoring and evaluation of bids for developing renewable energy projects on public land by 2020. Public sector bodies such as NRW and local authorities – who make land available to community and local energy projects – should be able to count the carbon savings from those projects towards their targets to be carbon neutral by 2030. Given NRW's energy demand is low when compared to how much land they own, this target could well be increased so that NRW becomes carbon positive by 2030.

These measures would help to create Welsh advantage by supporting community and local energy projects to flourish at scale to maximum local benefit, potentially exceeding the Welsh Government target of 1 GW of local ownership by 2030.

5

Focus on delivery:
by ensuring there is sufficient capacity and expertise in key public bodies to deliver the vision in practice



The issue

There remains a general lack of knowledge and expertise within organisations to deliver renewable energy projects. *Re-energising Wales* research has found that staff shortages in public bodies, specifically staff who are dedicated to renewable energy projects, is a significant barrier. We have also found evidence of a clear need to upskill staff to raise the profile, understanding and acceptability of renewable energy and energy-saving schemes.

Delivery mechanisms need to be aligned with ambitions around energy. This includes the need to strengthen the tools that Wales already has at its disposal, including there being sufficient implementation capacity – which our evidence clearly shows is currently not the case – in place in Natural Resources Wales (NRW), local authorities, the Welsh Government civil service, regional collaborations and other relevant public bodies either by direct support or a greater priority for energy in their work.

The solution

The Welsh Government has shown political will by putting renewable energy targets and policies in place because they recognise the value that a thriving renewables sector can bring to communities, businesses and the public sector in Wales. Harnessing and retaining that value locally is vital. Mechanisms of delivery need to be much more closely aligned to Wales' energy ambitions. A low carbon stimulus needs to be accompanied by sufficient implementation capacity in key public bodies including Natural Resources Wales, local authorities, the Welsh Government civil service, regional collaborations and other relevant public bodies.

The public sector is a substantive enabler of a renewable future for Wales. New models of delivery could include allocated sites for small-scale community developments on the Welsh Government estate; a large-scale development on NRW land in which Welsh Government has a stake; or shared ownership schemes between developers and community groups. Public organisations such as NRW should be allowed to ringfence some of the money they raise through existing renewable projects for financing new ones.

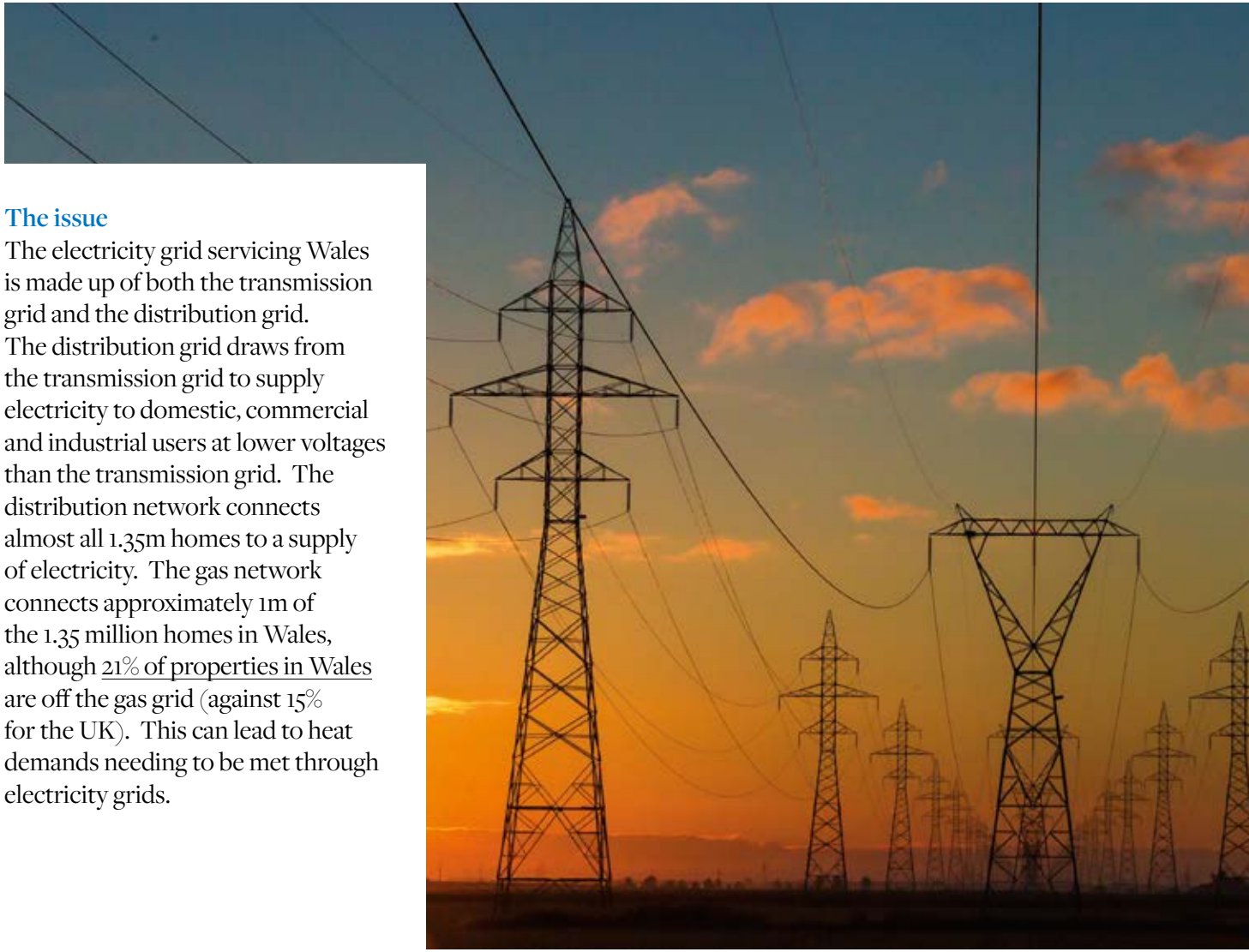
The four regional economic collaborations (the North Wales Economic Ambition Board; Growing Mid Wales; Swansea Bay City Region; and the Cardiff Capital Region) were identified as routes to action within our research. Taking a strategic view of the energy opportunities across the four areas would give each their best chance of flourishing. The rural nature and the existing energy infrastructure of mid Wales, for example, means the region potentially holds a different energy future (for example, all electric) to that of the other regions. A growing Welsh emphasis on local area energy mapping, combined with the energy interest of the four regions, suggests a different approach is needed which more clearly unites energy, home, place and community.

Being focused on this 'tier' approach benefits from sufficient scale across the built environment, transport and the economy of an area, while being close enough to the work to engage the local authorities and other partners in collective action. The regions can provide a strategic view of energy across their component local authority areas. These strategic views should then guide local authorities' future energy strategies, that are informed by high quality resource assessments that identify specific potential renewable energy sites.

Left:
Brechfa Forest West wind farm
Credit: innogy Renewables UK

6

Future-proof the grid:
by getting the electricity grid ready to meet Wales' energy aspirations



The issue

The electricity grid servicing Wales is made up of both the transmission grid and the distribution grid. The distribution grid draws from the transmission grid to supply electricity to domestic, commercial and industrial users at lower voltages than the transmission grid. The distribution network connects almost all 1.35m homes to a supply of electricity. The gas network connects approximately 1m of the 1.35 million homes in Wales, although 21% of properties in Wales are off the gas grid (against 15% for the UK). This can lead to heat demands needing to be met through electricity grids.

Credit:
Matthew Henry, unsplash

There is a growing appreciation of opportunities to integrate the systems that provide energy; decarbonisation and digitisation create opportunities to provide energy for warmth, power and mobility differently. This opens up significant questions about the energy infrastructure that we will require to fuel our homes and vehicles.

An electricity distribution grid that is fit for purpose and meets the needs of this energy transition and Wales' energy ambitions, is a priority. Key issues include: grid capacity and connectivity; cost of 'access'; ease of connection; constraints; the challenges of maintaining reliable supply, ensuring standards are met and broadly ensuring anyone connected to either gas or electricity grid gets the same standard of service support.

Current electricity grid capacity in Wales, both in distribution and transmission, is a significant challenge. Many new renewable projects face costs to upgrade the system, leaving many projects unviable. The grid is squeezed across the whole of Wales and this impacts on renewable generation, storage and smart use.

Electricity grids need to be 'future-proofed' for decarbonisation, especially when considering the expected increase in demand for electricity with the electrification of heating and transport. We need to address the availability of grid issues across the whole of Wales now to both support the rollout of electric vehicles, and to allow more renewable schemes to connect.

Part of the issue is the certainty which Distribution Network Operators (DNOs) need, both in terms of the investment and the commitment that schemes will go ahead before the infrastructure is built.

The solution ▶

6

The solution

There are a number of activities that should feed into the development of a proactive plan that future-proofs Wales' electricity grids so they can be utilised to respond to Wales' specific energy aspirations.

Firstly, the newly-established National Infrastructure Commission for Wales should immediately carry out a strategic review of the electricity grid during 2019 to recommend what actions should be taken to ensure the grid is fit for purpose to respond to Wales' specific energy aspirations.

The Wales Act 2017 includes provisions which give a formal consultative role to the Welsh Government and National Assembly for Wales in designing renewables incentives and Ofgem strategic priorities. Welsh Government should use its convening power and strengthened relationship to engage with Ofgem, and the distribution and transmission operators serving Wales, to secure commitment to a fit-for-purpose electricity grid through the RIIO-2 process. During 2019, network company business plans for the 2020s will be submitted to Ofgem through the RIIO-2 process. The Welsh Government should urgently resource a dedicated Wales Ofgem team to support Ofgem and the network operators over the next 18 months to secure the best RIIO-2 settlement and ensure that network company business plans are sufficient to meet Wales' energy aspirations.

It takes time to build new grid infrastructure, yet meanwhile the energy market is changing quickly all the time. Distribution Network Operators (DNOs) need certainty that schemes will go ahead before the infrastructure is built. Welsh Government and public bodies could play a role in reducing the risk of lack of project development. Local authorities, in particular, have a responsibility

Credit:
Andreas Gucklhorn, unsplash

to provide assurances to DNOs that a project will go ahead. This should align with existing requirements for local authorities in Wales to set targets for renewable energy in their local plans, and align with requirements outlined in *Planning Policy Wales Edition 10*:

> *'Planning authorities should consider the energy needs of new development it is considering for its area and assess, with grid operators, if the necessary infrastructure is in place to meet future demand... planning authorities should consider the best places for local renewable energy generation to help improve the resilience of the grid in the future.'*

Now is the opportunity to drive appropriate anticipatory investment in the electricity grid as part of the RIIO-2 process, a process that could align with more local ownership of renewables in Wales. Given Welsh powers over grid infrastructure of 132Kv lines and lower voltages, there is a role for Welsh Government and other bodies to provide certainty through upfront investment in infrastructure to ensure DNO business plans align with Welsh energy aspirations.

7

Get SMARTer:
by ensuring Welsh businesses, local and community organisations are supported to capitalise on and lead the shift to smarter energy technology and business transformation

The issue

The security and cost effectiveness of future renewable energy systems is predicated on development of new technology and new business models that will generate additional value for energy customers, while at the same time improving energy system balancing and security, and provide increased levels of flexibility.

This flexibility will enable best use of variable energy resources, harnessing energy to the maximum extent possible when the sun shines and the wind blows, and allowing system operators to balance the energy system to ensure security of supply at a national and local constraint level.

Smart flexibility will come from a variety of sources including energy storage, local supply markets, time of use tariffs, hybrid heat pumps, demand side response, flexible generation and optimised smart energy solutions which will encourage greater local ownership of energy, potentially reduce consumer bills and minimise energy system imbalance, grid impacts and imports. Already, a number of new technologies and business models are beginning to emerge including energy storage, whose market potential has grown significantly on the back of falling costs, and a variety of local supply models including local energy clubs, local generation tariffs and private wire systems.

The solution

Wales should seize the opportunity to be in the vanguard of the technology and business transformation that will accompany the drive towards smarter energy. In particular, building on the strength of the Welsh community energy sector and schemes like the Bethesda energy club, community energy groups and local organisations should be supported by the Welsh Government Energy Service to participate in local energy trials to provide flexibility, demand management, peer to peer trading and other specific services to the grid like network costs avoidance. Balancing local demand will help to minimise storage as much as possible, although battery storage technology does offer the biggest growth opportunity for Wales.

The electrification of both heat and transport and the appropriate matching of demand and supply over time is a significant problem. Intra- or inter-day matching is, arguably, fairly straightforward but inter-seasonal matching – to account for the fact that currently employed UK renewables produce much less power in the winter, when most needed – is far more problematic. Inter-seasonal matching can be solved in a renewable system via, for example:

- the storage of biomass fuel for burning when needed;
- the storage of renewably-generated compressed hydrogen;
- the storage of electricity in large scale batteries or via 'pumped-storage' approaches whereby water is pumped uphill at times of low electricity demand and released to generate electricity at times of high demand.

Lastly, a territory can import electricity (or renewable fuel) from an outside territory when required. Any of the above options implies a cost additional to the generation system itself.

According to the The National Infrastructure Commission,

> *'Innovations will help us deliver greater flexibility – interconnection, storage, and demand flexibility – which have the potential to displace part of the need for new generating capacity, save money for businesses and domestic consumers and help the UK meet its climate reduction targets. The saving could be as large as £8 billion a year by 2030.'*

Collectively, Wales has new commercial and business opportunities to optimise energy usage, reduce energy costs and monetise flexibility services. Wales could also become a world leader in the development of local energy supply markets including energy clubs, local generation tariffs and peer-to-peer trading.

Credit:
Matt Seymour, unsplash

8

Get ahead in marine:

by taking a coordinated approach between government, industry, academia and others to establish a global advantage over marine energy and floating offshore wind as niche Welsh services

The issue

Wales has significant potential in marine energy, including wave and tidal stream resource both off the coast of Pembrokeshire, into the Celtic Sea and off the coast of Anglesey. This is some of the best potential resource in the world. Floating offshore wind technology offers a significant opportunity for innovation for which the Pembroke Wave Demonstration Zone and the deeper waters off the outer Bristol Channel and Celtic Sea are prime sites for deployment.

Credit: OpenHydro

However, in UK policy, wave, tidal stream and floating offshore wind in particular are still considered to be emerging technologies. Although there are a number of demonstration projects, there are no commercial scale tidal stream, floating wind or wave energy projects deployed in Wales. There are significant difficulties for less mature marine technologies competing for UK Government subsidy on a level playing field with established technologies like seabed fixed offshore wind, which have been operating at a commercial scale (8,000 MW installed) in the UK for over a decade.

The challenge for marine technologies in Wales is to move to commercialisation and scale. This will be particularly tricky when European funding for demonstration projects is no longer available after Brexit.

Above: Milford Haven Waterway
Credit: Marine Energy Wales

Left: A DeltaStream tidal turbine
Credit: Tidal Energy Ltd

The solution ▶

8

Credit: Tidal Energy Ltd

The solution

Wales needs to establish a comparative advantage over marine energy as a niche Welsh service in the wider UK and global (export) economies. Marine is an emerging industry where Wales can establish a first-mover advantage.

New technologies are already being attracted to Wales and their commercial development will position Wales as a leading nation for the development of marine energy. The development of marine energy is already seen as a strategic priority by the Welsh Government, supported by the Marine Energy Wales partnership. The Welsh National Marine Plan makes provision for Strategic Resource Areas which may apply for marine energy, enabling the introduction of clear policy support for sustainable development from a planning perspective. Furthermore, Wales already has access to expert academic and research facilities on marine renewables. Wales must capitalise on the future economic growth and jobs benefit of the sector by developing Welsh-focused supply chains that are competitive. This is a stark challenge given Wales' poor prior energy supply chain performance.

There are eight strategically located ports sited along the north, west and south coast of Wales. Our evidence shows that in order to capture the significant opportunities offered by marine, the Welsh economic offer would have to change – and rapidly – to encompass investment capital, truly Welsh research and innovation, more high value services and support for our existing fabrication and manufacturing business to diversify. The Pembroke Marine project within the Swansea Bay City Deal, for example, could potentially attract significant relevant multinational manufacturing operations post-Brexit. Manufacturing and intellectual property capture occurs in places where national or subnational policy is strongly supportive of the roll out of novel renewables. Substantial benefits for Wales will arise only with ownership – in part or whole – of the capital and intellectual property that is employed in decarbonisation.

Welsh Government should continue to strongly lobby the UK Government for marine to be in a subcategory of earlier stage renewables for subsidy support and also feature as a significant opportunity within the Industrial Strategy. A tidal lagoon project could help in this regard as a strategic project which could help create a new tidal energy industry. It is also important to note that the synergy between offshore wind, wave energy, tidal stream and tidal range (lagoons) should be exploited.

The intra-seasonality of renewable electricity supply is a particular issue for winter. Although solar photovoltaic and wind are highly complementary – with wind picking up much of the generation as solar tails off – there are inevitable periods over the winter when both wind and solar generation are low. Marine renewables, particularly of the scale of tidal lagoon projects, have the potential to help the overall generation portfolio ride over these periods (as we know, for example, when tides will create energy), particularly when combined with energy storage and demand-side management. The potential value of the marine portfolio in Wales should therefore be viewed as a UK system-wide asset with investment from the public to facilitate its development. Wales also needs to develop its marine licensing to allow proportionate and timely consent to 'deploy and monitor' in support of renewable pilots.

Our *Re-energising Wales* evidence estimated a potential of at least 4,000 MW of renewable electricity from the tidal range, tidal stream, wave and floating wind sectors alone in Wales up to 2035. Based on this 4,000MW figure Wales could see:

- investment of nearly £6bn in Wales in the tidal range, tidal stream and wave sectors alone over a notional 'construction plus 15 years operation' period up to 2035
- at least 5,200 annual full-time equivalent (FTE) jobs in Wales in the tidal range, tidal stream and wave sectors alone up to 2035
- nearly £3bn of gross value added in Wales across the development and operational period in the tidal range, tidal stream and wave sectors alone up to 2035
- a first commercial 100MW floating wind array in Pembrokeshire, leading to further 'multi-GW' roll out.

Activity represented here represents (even with mid-2020s costs) high value and labour-intense proof of concept and early-stage deployment phases, to secure intellectual property and a manufacturing base. Analysis by the Offshore Renewable Energy Catapult shows that costs will fall dramatically for any significant scale of commercial development.

9

Harness the potential of bioenergy: enabling Wales to create a world class circular economy

The issue

To fully decarbonise our energy system, heat remains the biggest challenge. Electricity consumption accounts for approximately 14.6 TWh of total energy consumption in Wales, with the remaining 84% of energy being used for heat and transport. The vast majority of heating comes from natural gas. Up to the end of 2017, renewable heat capacity only made up 16% of total renewable energy capacity in Wales.

The UK as a whole has so far failed to deliver significant decarbonisation of heat. Although over 65,000 installations have been delivered under the Renewable Heat Incentive (RHI) since 2014, the rate of growth of RHI accreditations has been disappointing. Accreditation for the renewable heat incentive is currently too complex and its future is uncertain. Incentives such as Feed in Tariffs and 'embedded benefits' have, in the past, resulted in biogas being used to generate electricity rather than for gas injection to decarbonise heat. The incentives are too weak to have an impact at scale.

Wales & West Utilities now have 19 biomethane schemes with grid injection across their network, although it is noticeable that the majority of these schemes are in the south west of England. These schemes are small scale but biogas production through farm-based anaerobic digestion is becoming a significant opportunity for the rural economy. Heat from anaerobic digestion is largely being wasted. The Five Fords plant just outside Wrexham is the first and only operational biomethane to grid plant in Wales currently on the Wales & West Utilities network.

Up to the end of 2017, renewable heat capacity only made up 16% of total renewable energy capacity in Wales

The solution

Whilst challenging, the decarbonisation of heat will create opportunities for Wales to develop new capabilities and accelerate its transition to a thriving low carbon economy. As a primary action, accreditation for the renewable heat incentive needs to be less complex and more certain.

Re-energising Wales' evidence shows that heat decarbonisation strategies need to include:

- energy efficiency measures to reduce heat demand
- better use of renewable energy for heat, with a principle focus on the deployment of ground source heat pumps; air source heat pumps which use renewable electricity when available; and hybrid heat pump system technology, which may include the electrification of heat or decarbonised gas
- the decarbonisation of gas through injection into the mains network of 'green gases' such as biomethane and hydrogen
- direct delivery of renewable heat energy from sources such as biogas and biomass
- and the delivery of heat through district heat networks which could then in turn be decarbonised.

In the Swansea Bay City Region alone, our evidence shows that over 42% of heat can be delivered from decarbonised sources (including electricity and the decarbonised element of mains gas) by 2035, with an overall carbon emission saving of 41%.

Whilst there are a range of exciting opportunities, air source, ground source and hybrid heat pumps alongside the commercial exploitation of bioenergy (biomethane, bioSNG and biomass) offer the greatest overall immediate opportunity.

Sustainable bioenergy production would enable Wales to create a world class circular economy that fully utilises local waste and residual resources from industry, agriculture and domestic households. As well as energy benefits, sustainable bioenergy would also create value for the rural economy through the use of agricultural waste, energy crops and a massive increase in the tree planting that would sustain forestry industries. Wales has the potential to deliver up to 9 TWh of heat energy from sustainable bioenergy production via mains gas injection, district heat networks and combined heat and power (CHP) plants by 2035. Wales needs to fully quantify and assess its bioenergy potential. We suggest that a study to look in more detail at available feedstocks is needed.

As for heat pump technologies, our evidence shows that around 14% of properties in the SBCR region would need over 50,000 heat pumps by 2035 (over 21,000 air source heat pumps, over 6,000 ground source heat pumps and over 23,000 hybrid heat pumps). Extrapolated to a Wales level this would represent over 170,000 heat pumps. In the SBCR, 500 GWh (12% of heat demand) of energy would be delivered by air, ground and hybrid heat pumps by 2035.

Domestic smart controlled hybrid heat pump systems provide the option of operating using either a gas boiler or an air source heat pump which uses electricity to create heat. Advantages include switching between both appliances to avoid using the heat pump at certain times to provide valuable whole-system flexibility and the ability to use the gas boiler during very cold weather. This could reduce peak demand periods on the electricity network, avoid high carbon power generation and achieve potential savings in energy costs with the ability to switch away from peak energy prices as smart use of the system can help maximise the most carbon friendly energy source available at the time. The system can also be plumbed into existing gas boiler systems and avoid the disruption of a deep in-home fabric retrofit. Whilst hybrid heating systems have a number of advantages, it is essential that their disadvantages be minimised, such as the current market cost and limited qualified installers and maintenance contractors. Policy support to densely target initial deployment in Wales, plus the emergence of heat and energy services, could help to overcome these issues.

10

Decarbonise transport: through a comprehensive 'Transport Decarbonisation Plan' co-produced by key public bodies and the transport sector, backed up by a national travel survey

The issue

Wales is required by its own Environment (Wales) Act 2016 to reduce carbon emissions by at least 80% by 2050. Transport accounts for 13% of Wales' emissions. In the 2008 Climate Change Strategy, Wales set out how it intended to cut transport Emissions. That strategy has failed to achieve any significant reduction – emissions from transport are flatlining. Wales needs a radical new approach to transport if it is to achieve its target.

Credit:
Andrew Gook, unsplash

Public Health Wales estimates that air pollution contributes to 2,000 deaths a year in Wales (6% of total deaths) and 30,000-40,000 across the UK (6-7%)

Most emissions emanate from the private car. Transport in Wales is dominated by the car, more than in any other region or nation in the UK. The car is also a key barrier to more people using the less polluting and more sustainable modes: active travel and public transport. Bus services in Wales are in serious long-term decline. Rail serves only a very small part of the country and, whilst growing, has less than a fifth of the passenger journeys of buses. Despite the Active Travel (Wales) Act 2013, walking and cycling levels are generally static or declining.

Public Health Wales estimates that air pollution contributes to 2,000 deaths a year in Wales (6% of total deaths) and 30,000-40,000 across the UK (6-7%). The same figures also show that, each year, an equivalent of around 1,600 avoidable deaths in Wales are due to particulate matter (PM2.5 and PM10), and 1,100 due to nitrogen dioxide (NO2) exposure. The primary source of both NO2, and particulate matter pollutants is vehicle emissions, especially those from diesel powered vehicles.

Any attempt to change the way Wales travels is severely hampered by the lack of statistics on how and why people travel. The UK Department for Transport's National Travel Survey, which interviews a large sample of the population about their travel habits, withdrew from Wales in 2013 and Welsh Government have not filled the gap.

The solution ▶

10

The solution

Welsh Government needs a long term comprehensive 'Transport Decarbonisation Plan' to wean our transport system away from its over-reliance on the car and towards much greater use of active travel and public transport. The plan should be co-produced with local authorities, regional transport authorities and organisations representing the planning profession, pedestrians, cyclists, the bus and rail industries, power distribution companies and the automotive industry. To make the progress required, the plan should be in place by the end of 2020, in line with Welsh Government's 'Low Carbon Delivery Plan' which is being developed as part of the carbon budgeting process as required by the Environment (Wales) Act 2016.

Only by having a comprehensive 'Transport Decarbonisation Plan' can Welsh Government lead the transformation in Wales' transport system that is required if we are to meet the multiple challenges set by the Well-being of Future Generations (Wales) Act 2015. Ultimately, the plan must be radical both in its origination – co-production is essential – and in the thoroughness of its implementation. It must go far beyond the scope of past Welsh Transport Strategies, working across the public sector to encompass the full impact of transport on the economic, social, environmental and cultural life of Wales.

This plan should reconfigure governance over transport and as part of this, Welsh Government should clearly set out its long-term plans for Transport for Wales, working with local authorities to allocate future transport roles.

Welsh Government should also urgently commission a national transport survey with a sufficiently large sample to collect high quality transport data which would allow accurate analysis down to local authority level in assessing transport trends in Wales. Data from this survey should be used to help develop the 'Transport Decarbonisation Plan'. If Welsh Government introduced a national transport survey with a sufficiently large sample assessing transport trends in Wales down to local authority level, we would be able to quantify a number of outcomes from data such as the length of people's journeys. Such data could then be used, for example, to work out how much carbon could be saved per km if people were to switch mode from a car to a bicycle.

nextbikes, Cardiff
Credit: Shea Buckland-Jones

A number of further key actions are also required. Firstly, we believe transport should feature in the National Indicators drawn up to monitor progress on the well-being goals as part of the Well-being of Future Generations (Wales) Act 2015. Transport gets no mention in the current 46 indicators.

Secondly, the lack of capacity in local planning departments will seriously blunt the effectiveness of Planning Policy Wales Edition 10, so strengthening the capacity of local planning departments to ensure more sustainable development should be a priority.

Thirdly, electric cars clearly have a role to play, particularly in rural areas, but they must not be seen as the default solution across Wales. Priority should be given to lower carbon modes that also reduce congestion, improve health and tackle inequalities. In any electric vehicle programme, priority should be given to schemes that promote shared ownership. As we have seen with buses, the other fuel that offers the potential of zero emissions is hydrogen. Wales already has a stake in the development of hydrogen fuelled cars with the Riversimple project based in Llandrindod Wells.

We must also take a more ambitious approach to sustainable transport; key actions, amongst others, include increasing funding for bus priority routes and more ambitious active travel targets in a new long-term Active Travel Action Plan, which is fully integrated with the 'Transport Decarbonisation Plan'.

A forward look

Climate change is accelerating. The Intergovernmental Panel on Climate Change's October 2018 *Special Report on Global Warming* reminds us that time is short and urgent action is needed if we are to avoid the worst impacts of climate breakdown. Maintaining the status quo is not an option. Urgent action is needed alongside an immediate UK commitment to a 'net zero' emissions reduction target well before 2050. A new 'net zero' emissions reduction target would have consequences for the carbon budgets set for Wales, and most likely raise the challenge to be faced.

A sustainable energy system is key for tackling climate change, as well as for delivering a Wales that is prosperous, resilient, healthier and more equal. Energy therefore needs to be a shared priority across government, across the housing, health, transport, the economy and infrastructure, education, environment and rural affairs portfolios. Operational delivery should be coordinated to deliver a shared vision.

Re-energising Wales has investigated the issues involved in transitioning from a system that produces 100% of Wales' annual average territorial electricity requirements to one where renewable electricity provides power all year around – a key difference. Whilst we have explored a wide range of factors in Wales' energy future as part of this project, there are a number of issues the project has not yet fully considered. Our priority actions get us a long way but challenges still need to be overcome, particularly to decarbonise heat and transport fully.

Key areas for further exploration include:

- how infrastructure might evolve through micro grids;
- emerging long term policy drivers such as new Carbon Emissions Tax post Brexit, and
- further carbon pricing policy such as a future Emissions Trading System.

There are options for standalone Welsh policies in the future to tackle these issues. Welsh tax powers such as the Land Transaction Tax can also play a role in driving clean energy developments.

We have noted the need for Welsh research and innovation, and the potential to establish the comparative advantage of hydrogen and marine energy as niche Welsh services in the wider UK and global economies. There is also a need to continue research

and innovation into other renewable technologies such as solar photovoltaics (PV). Continuing to develop new projects for more established technologies such as solar PV and onshore wind is vital for our future energy system. Monitoring the performance of existing renewable schemes to maximise output is also vital.

Re-energising Wales has been influenced by the increasing ambition for renewable energy supply worldwide with our research mostly focusing on New Zealand, California and Iceland. While ambition is typically electricity-led, some national and devolved political leaders are making commitments to renewable supply targets for overall energy use.

All of our discussions on the achievement of the 100 per cent ambition take a holistic view of the benefits. There is a clear distinction between an approach that maximises renewable deployment, and one that maximises Welsh benefits from renewable deployment. There is no single silver bullet, as action is required by many actors on many elements of the energy system as it transitions.

Very few of the challenges and opportunities identified in this report can be fully realised by Welsh regions, local authorities and communities working in isolation or without a very strong degree of national policy support. Greater granularity and focus is required to cascade policy targets down to action at a regional and local level. Engagement with local communities and stakeholders, including industry, is crucial to garner support, support practical action and to ensure that decarbonisation strategies make the best use of local resources to deliver the maximum benefit to Welsh communities.

The energy system of the 2010s shows the signs of a framework fraying at the edges, trying to decarbonise, accommodate decentralisation and smart technology. The energy framework of 2035 will be one that is citizen-led, that recognises and responds to the different needs of the citizens of Cardiff, Ceredigion and Colwyn Bay.

In the short term, with the challenges of Brexit, it is unlikely that a more positive UK policy environment will emerge in this field. Yet Wales can make substantial progress on renewable energy, and should take immediate increased action in the areas where it has existing powers.

There is no time to waste. We have shown what the path to Wales' energy future looks like. Now is the time for action.

Appendix 1: List of steering group members

Name	Organisation
Professor Gerald Holtham	Sir Julian Hodge Visiting Professor of Regional Economy, Cardiff Metropolitan University
Professor Calvin Jones	Cardiff Business School, Cardiff University
Professor Phil Jones	Welsh School of Architecture, Cardiff University
Professor Ian Knight	Welsh School of Architecture, Cardiff University
Robert Procter	Community Energy Wales
Hywel Lloyd	Facilitating the Future Ltd
Jeremy Smith	innogy
Shea Buckland-Jones	IWA
Auriol Miller	IWA
Rhea Stevens	IWA
Professor Gareth Wyn-Jones	IWA *Re-energising Wales* Project
Sade Adenola	National Grid
Keith Jones	National Trust (Wales)
Rachel Shorney	SP Energy Networks
Professor Stuart Irvine	College of Engineering, Swansea University
Professor Ian Masters	College of Engineering, Swansea University
Grazia Todeschini	College of Engineering, Swansea University
Chris Blake	The Green Valleys
Bridget Rosewell	Volterra
Steven Edwards	Wales & West Utilities
Bethan Winter	Wales & West Utilities
Chris Clarke	Wales & West Utilities
Neville Rookes	Welsh Local Government Association
Nigel Turvey	Western Power Distribution
Professor Judith Marquand	WISERD, Cardiff University

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