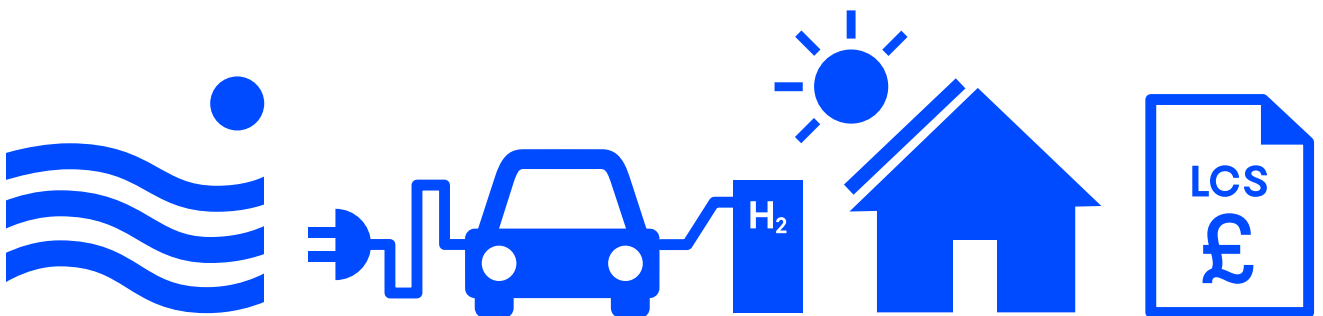




Re-energising Wales

A Framework for Action:
Next steps for Regulatory and
Policy Powers over Energy in Wales



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The Author would also like to thank the IWA, particularly Shea Buckland-Jones and Rhea Stevens for their enthusiastic, robust and engaging support throughout, which has helped make a success of the approach.

About Re-energising Wales

The Institute of Welsh Affairs' [‘Re-energising Wales’](#) project is a three year project (April 2016-April 2019) that will deliver a plan to enable Wales to meet its projected energy demands entirely from renewable sources by 2035.

This report considers what powers are required for a new renewable energy regime to be implemented effectively in Wales. It is the fifth of a series of reports published as part of ‘Re-energising Wales’.

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 will be applied across Wales.

3 Setting the economic parameters

Building on the above Swansea Bay City Region report, we have **outlined the economic opportunity** that arises with a truly transformative approach to energy generation and domestic refurbishment in the Swansea Bay City Region. We will also be assessing the economic costs and benefits of renewable energy transition in Wales.

4 Social and Community Issues

We will assess the values behind community engagement in energy saving and generation, and how to overcome the barriers to increasing local ownership of renewable energy assets.

5 Regulatory and political challenges

This report **assesses what powers are required** for a new renewable energy regime to be implemented well.

6 A delivery plan

We will create a detailed, timed, and costed action plan for developing a credible renewable energy programme for Wales which brings together findings from the project.

There have also been two policy papers, the first focused on ‘*Funding Renewable Energy Projects in Wales*’, while the second looked at ‘*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.



Foreword

The nature of Wales' powers over regulatory and policy matters relating to energy, and critically how they are deployed, will make a huge contribution to Wales' success in meeting its projected energy demands entirely from renewable sources by 2035. By 2035, Wales has the potential to develop an intelligible, integrated energy regime that is decarbonised, decentralised and diversely owned to deliver wide benefits to people in Wales and the Welsh economy.

We are at a crucial point in time in trying to ensure that our energy system is fit for purpose for future generations. Action within the energy sector has considerable potential to contribute to overcoming pressing concerns relating to health, the economy, climate change and equality. Energy has a massive impact on the way we plan our lives. Despite agreement on the important contribution that energy can make to Wales' future prosperity and sustainability, there are divergent opinions on which interventions to pursue.

To produce this report and its recommendations, we have used the IWA's convening power to bring together diverse opinions and expertise to develop an informed perspective on how the energy sector in Wales can be improved for future generations. The Welsh Government and UK Government are currently developing a number of energy policy updates, and we hope this report will contribute to their consideration of these issues and to their plans for renewed action. We also hope this report will contribute to the plans of a number of other key actors, including local authorities and Ofgem in particular. This report sets out a number of clear recommendations that, if implemented, will significantly and positively impact Wales' energy sector.

We would like to thank Hywel Lloyd for his work conducting this research and preparing a thorough, compelling, evidence-based vision for energy in Wales.

We would also like to extend our thanks to all those individuals and organisations who have participated in interviews that have helped develop this contribution to the debate.

Shea Buckland-Jones
Re-energising Wales Project Coordinator

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1 Executive Summary

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, 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 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.

Over the past twenty years, legislation, policy and political commitments at the EU, UK and Wales tiers of governance have all played a part in setting out, developing and strengthening the framework for decarbonised energy.

Much of the early legislation and policy was EU led. This has resulted in the decline in coal fired power stations, increased efficiency of energy use, as well as the growth of renewable energy supply across the UK and in Wales, such that Wales currently has a confident ambition to secure 70 per cent of Welsh electricity use from renewables by 2030.

Across the globe more and more governments, from nations such as New Zealand, to states and local governments such as California and Greater Manchester, are setting higher and higher ambitions for the deployment of renewable energy. The Re-energising Wales project has a higher ambition: **that Wales is able to meet 100 per cent of its projected energy demands entirely from renewable sources by 2035.**

Evidence from the Intergovernmental Panel on Climate Change reminds us of the urgency of addressing climate breakdown, and the UK and Wales Governments have asked the Committee on Climate Change to advise on a net zero emissions target by 2050. Alongside this urgency, the shadow of Brexit threatens to disrupt the Welsh economy, and the opportunities that go with it, for many people living and working in Wales.

Working with a wide range of practitioners across all sectors we have explored the policy and legislative framework for energy in and for Wales. Their collective insights have led us to conclude that Wales is entering a period when it will soon have its own intelligible, integrated energy regime.

That regime will be made up of powers and policy that govern planning, onshore and offshore infrastructure, the built environment, fuel poverty and other elements of the energy system, such as the Marine Plan and the National Development Framework, along with new measures resulting from the Wales Act 2017 as they come into being.

Wales has many of the tools it needs to make swift progress. Wales does not need further powers to act in the immediate future.

The time for greater action is now, in this Assembly, and from this Welsh Government, not the next, or one after that. It is now that Wales needs to show its can-do attitude.

In the short term, with the challenges of Brexit, it is difficult to see a more positive UK policy environment in this field. **We believe Wales can make substantial progress and should take immediate increased action in the areas where it has existing powers.**

A new First Minister that drives an agenda of a wholly renewable Wales would put them and their government on the right side of these opportunities for Wales. A strategic shift to renewables will deliver considerable co-benefits and fulfill many of Wales' well-being goals under the Well-being of Future Generations (Wales) Act 2015:

- with the right development and ownership, renewable deployment will bring and retain prosperity to Wales **and** the people of Wales
- a renewable approach tends to be a decentralised and distributed approach, which can offer greater resilience
- reduced demand for energy, particularly for heat, would be good for prosperity and health if it reflects properly insulated homes that are also power stations
- community and local ownership of energy generation can contribute to cohesion and thriving communities
- greater renewables deployment, displacing fossil fuel use, helps Wales contribute as a globally responsible nation.

Together with our participants, we identified a key requirement to have a **singular low carbon economic plan**, if we are to enable Wales to meet its projected energy demands entirely from renewable sources by 2035. While revisions to *Prosperity for All: economic action plan* (EAP) will emerge over time, we propose a much more urgent **Low Carbon Stimulus** to the Welsh economy focused on:

- much greater Welsh ownership of the energy system, including more local/diverse ownership
- securing energy wealth in Wales through a whole house, every house **homes as power stations** scheme
- wide-spread and accessible provision of electric vehicle charging/ hydrogen refuelling points by 2025
- making marine and hydrogen a Welsh niche in terms of energy endeavours.

The **Low Carbon Stimulus** is required both to ramp up renewable deployment within Welsh powers, and counter the Brexit downturn.

This should be supported by a new Welsh Government Cabinet Portfolio **which unites energy, home, place and community**, so as to 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 – building community and local ownership.

Within our recommendations we focus on the key building blocks that would support the Low Carbon Stimulus, including the setting of **interim targets** to guide all those involved in delivery and benchmark progress en route; while also ensuring mechanisms of delivery are aligned to this ambition, not least making the most of all the relevant powers that arrive with the Wales Act 2017.

The establishment of four regional economic collaborations emerged clearly as a route 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.

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. We note the rural nature and the existing energy infrastructure of mid Wales, for example, as 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**.

Action focused beyond 2021 should then concentrate on changing the energy framework to best suit Welsh ambitions.

That would include joining efforts with the other devolved nations, and devolved localities of England, in lobbying for changes to energy (system) regulation to secure the transition to a decentralised renewable energy system that will benefit Wales, with the expectation that this would lead to primary legislation in the UK Parliament after 2022.

By then a revised Welsh Government *Economic Action Plan*¹ should seek to make the most of the economic potential of energy in and for Wales. Looking further ahead, a UK commitment to a ‘net-zero’ emissions reduction target by 2050, up from the current 80 per cent, would have consequences for the carbon budgets set for Wales, and most likely raise the challenge to be faced in the third and subsequent budgets (given the first and second Welsh carbon budgets will be published in spring 2019).

This report offers a collective vision to deliver 100 per cent renewable energy for Wales by 2035. It sets out steps that could and should happen. Following on from this report, within the final Re-energising Wales report (due in spring 2019), the Institute of Welsh Affairs will develop a delivery plan which will bring together all elements of the programme of work and show how it can be delivered to secure the 100 per cent ambition, its co-benefits, and delivery of the enhanced interim targets we propose.

1 Welsh Government, *Prosperity for All: economic action plan*, December 2017

Key Recommendations

In order to achieve 100 per cent of energy demand in Wales entirely met from renewable sources by 2035, we recommend:

1. A Low Carbon Stimulus

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 Stimulus. This would both ramp up Welsh action on renewable energy and energy efficiency, and boost the Welsh economy through the Brexit period.

Energy is at least a similar order of magnitude of 'enabling' to the Welsh economy as is transport, and the scale of the Low Carbon Stimulus should be proportionate to the support proposed for transport, for example the South Wales Metro or M4 equivalent. Our work suggests the Low Carbon 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.

2. A Welsh Government Cabinet Portfolio uniting energy, home, place and community

As collective Welsh ambition and opportunity to deploy the Welsh energy framework grows, supported by the Stimulus, delivery will benefit from the continued presence of energy in a Welsh Government Cabinet Portfolio. To maximise the benefits to Wales for the rest of this Assembly, to 2021, our work suggests a portfolio that strengthens the relationship between energy, home, place and community, as the powers in the Welsh energy framework are primarily about building scale, local and smaller scale energy deployments.

3. Interim targets

As a part of the development of the new portfolio we propose a number of interim ambitions to guide delivery and practice, as follows:

- a revised renewable electricity target of 100 per cent by 2030
- a next step ownership target for local and community energy of 1.5 GW by 2035
- a target of 600,000 homes built, or upgraded, to a **'homes as power stations'** standard by 2030
- 50 per cent geographical coverage across Wales of non-fossil fuel refuelling facilities, in both rural and urban areas, by 2025
- an updated marine energy target (from 2011) as part of the Marine Plan
- a hydrogen production target for 2025, in light of the findings of the Committee on Climate Change Hydrogen report (due November 2018).

4. Aligning the delivery tools

The new Welsh Government Cabinet Portfolio can also be instrumental in ensuring the delivery mechanisms are aligned with the 100 per cent renewable ambition, which would include strengthening the tools that Wales already has at its disposal, including the following:

- **Sufficient capacity:** The Welsh Government to ensure there is sufficient implementation capacity in place in the regional collaborations, in Natural Resources Wales and other relevant public bodies, either by direct support or a greater priority for energy in their work.
- **Ramping up new build standards:** The Welsh Government to use existing Welsh powers to raise building standards at a faster rate to achieve 'prosumer' standards by 2022 (that is, while all buildings consume energy this would be a building that also produces energy, to the benefit to the householder)
- **Raising standards of new builds:** The Welsh Government, Welsh Local Government Association and industry bodies should work together to create enhanced capacity and capability in the building sector. This should include promotion of best practice, whilst ensuring that building control carry out improved building standards enforcement across Wales as part of the quality control process. This would need to be a workforce that can go beyond current basic enforcement, and prepare them 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.
- **A purposeful planning regime:** The Welsh Government to ensure that the emerging planning regime (Marine and the National Development Framework) robustly supports the 100 per cent ambition:
 - at the local and regional tier supporting 'prosumer' based new developments, and offering place by place flexibility
 - followed by onshore and offshore developments, acknowledging the implications of existing energy infrastructure in each region
 - is in place and settled by 2020.

5. Making the most of the Wales Act

The Welsh Government Cabinet, across all portfolios, can ensure that the impact of the powers of the Wales Act 2017 are optimised. This could apply to many of the measures in the Act, such as by using capital borrowing powers to focus on local renewable deployment, or using speed limit powers to reduce fossil fuel use by establishing a 20mph limit in urban Wales. Our deliberations have highlighted two specific recommendations in which Wales can firm up a number of remaining tools needed to achieve the 100% ambition:

- **Determining the end of fossil fuel generation in Wales:** Welsh Government should use the consenting powers for energy generation to end fossil fuel power generation in Wales, initially by a moratorium on new consents for fossil fuel stations under 350MW. It could also explore further action to convert existing stations to non-fossil fuel gas.
- **Getting the best RIIO-2 deal for Wales:** RIIO-2 will be the next price controls for the network companies running the gas and electricity transmission and distribution networks. 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 enhanced RIIO-2 outcomes for Wales. This should include a dedicated team in Welsh Government who work with Ofgem. This needs to align with the Welsh Government commitment to set up a future energy networks group, which should be tasked in developing a proactive improvement plan to future proof the grid for Wales so that it can be utilised to respond to Wales' specific energy aspirations.

6. Preparing for 2021-26

The next four years must be action and delivery orientated, both to combat the Brexit slow down and to address the urgency of decarbonisation and the Welsh opportunity. Towards the end of the Fifth Assembly we believe that two further steps will significantly help to progress the Re-energising Wales ambition of 100 per cent renewables:

- **Making the most of Wales' economic potential of energy:** The Welsh Government should seek to make the most of the economic potential of energy in and for Wales. This would reflect the carbon budgets and low carbon delivery plans that will emerge over the coming months, as well as the different energy futures of the four regional economic collaborations in Wales. We believe that energy should be recognised in a future Economic Action Plan as a primary Call to Action, and consideration be given to its inclusion as the fifth Foundation Sector of the Welsh economy.
- **Securing the transition to a UK decentralised energy framework:** The Welsh Government should join with other devolved nations, combined and local authorities of the UK, to help create a future energy governance and regulatory framework that reflects the decentralised needs of Wales. This would be to ensure the primary legislation required to create what might be RIIO-3, for the later 2020s, is much better at responding to the needs of places, as the energy transition beyond carbon continues at pace.

Looking further ahead, a UK commitment to a 'net-zero' emissions reduction target by 2050, up from the current 80 per cent, would have consequences for the carbon budgets set for Wales, and most likely raise the challenge to be faced in the third and subsequent budgets (given the first and second Welsh carbon budgets will be published in the spring in 2019).

2

Introduction

2 Introduction

2.1 Re-energising Wales project overview

The Institute of Welsh Affairs' (IWA) Re-energising Wales project brings together representatives from industry, regional stakeholders, policy makers and academia that have an interest in the future development and transformation of energy in Wales.

The project stems from an earlier IWA report '*An Economic Strategy for Wales?*'² It looked at how best to secure the step change in Welsh economic fortunes that would shift Wales towards a parity with that of England, that is from approximately 70 per cent GVA to nearer 90 per cent GVA. Among a number of examples of actions that could deliver such a step change was the proposal for a '*Large scale programme of multiple low carbon and energy savings projects to make Wales 'renewable energy' self-sufficient.*'

This report builds on earlier reports of the Re-energising Wales project, and considers the legal and policy framework within which energy is used and generated across Wales, so as to address the overall aim of the project: to provide an ambitious and practical plan to enable Wales to meet its **projected energy demands entirely from renewable sources by 2035**.

When considering the policy and legislative framework it is important to be clear about the terms of the ambition, to show how success will be defined and to be able to describe where our focus for impact lies.

Our work focuses on renewable supply, including sources such as wind, solar, wave, tidal, hydro, biomass, green gas, and hydrogen. Clearly 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 delivering the 100 per cent ambition for Wales.

There are then three further elements of the challenge to consider when examining the policy and legal framework:

- the time period over which we measure demand being met
- the place from which energy demands are met
- the relationship between 'enabling Wales to meet' the targets and Welsh ownership of the means.

The IWA ambition is to meet energy demand entirely from renewables by 2035. That is intended to mean both all-annual demand by 2035, and all demand day-to-day, week-to-week and season-to-season.

Yet the ambition does not require that demand be met purely by real time supply; as is currently the case, stored energy has an important part to play. That brings into play technologies and fuels such as fuel cells, batteries, and hydrogen as well as a continued role for energy storage mechanisms such as pumped storage.

2 Institute of Welsh Affairs, *An economic strategy for Wales?*, March 2015

This ambition must also mean the removal of fossil fuels from all of the energy supply chains serving Wales, be they those in Wales, or as currently the case for much of the fuels for heat and transport, those supplying to Wales. The nature of existing energy supply chains leads us to the question of where supply will be based.

Given the genesis of the project as a means to step change the Welsh economy, the ambition must support a much greater indigenous supply of energy than is currently the case. And to achieve the greatest benefit it must also mean a much greater Welsh ownership of the future energy system than is currently the case.

We note that the next elections to the National Assembly for Wales are scheduled for May 2021, while the Fixed-term Parliaments Act 2011 indicates the next UK election would be due in May 2022.

The project's ambition to 'enable Wales' is a reminder of the economic roots of the project, and that as much of the opportunity of new renewable supply should be in Wales and of Wales.

2.2 Methodology

As the recent IWA 'Our *Smart* Region' report³ highlights, in this age of digital and connectivity it is fundamental that policy and action follows from involving people in decision making.

With that in mind this report has been developed with, and in light of, the contributions of over 45 stakeholders and practitioners from across Wales, the UK and the different parts of the energy system that serves Wales today. The contributors have included those studying the energy system, its governance, operations and finance, as well as those involved in delivering services today while planning and developing the services of tomorrow.

We have engaged with officials in different parts of Welsh public service, and also those who plan, develop and build energy infrastructure, be they community, public or private organisations. We have also spoken to individuals from the major political parties of Wales with an interest in this area of policy, and the benefits it can bring to Wales.

In our engagement we have worked to ensure that the 'whole system' and the various functions within it are represented in our deliberations, for example we spoke to representatives of, or experts in:

- energy generation (be they established, emergent, or innovative)
- system operation and connectivity
- governance and ownership models
- regulation
- planning (energy and of land use)
- consumers and community voices
- local and public sectors/place based users and management
- integrators in a place, for example those who are able to take a view of energy use and supply, reflecting the need for warmth, power and mobility.

3 Institute of Welsh Affairs, Our *Smart* Region, September 2018

Six individuals kindly contributed further through their participation in our reference group, which helped frame the task and potential solutions.

They and a number of the contributors also took part in a workshop to consider the solutions proposed, and the trade-offs that inevitably occur between different elements of solutions to a challenge. In three groups, participants framed three packages of measures intended to help achieve 100 per cent renewables in good time for 2035, while securing positive co-benefits and avoiding unforeseen consequences. Comparing and contrasting those packages helped identify a number of measures with wide-ranging support.

These have been further tested with a number of the contributors, representing elements of the governance and operation of the energy system, so as to explore how they would impact on ongoing energy transition measures and practices.

This report is a qualitative assessment of the nature of the powers and policies that Wales will need to meet its **projected energy demands entirely from renewable sources by 2035**. By the timing and nature of our approach, this work is not exhaustive in its coverage of all of the possible elements of the legislative and policy framework for energy.

Given the range and expertise of those whom have contributed, we consider this a valuable contribution to the Welsh energy and economy debate. It offers a clear way forward for Wales and our impending new First Minister.

A full list of individuals interviewed or otherwise contributing is provided within Appendix One.

3

Context: The energy system of Wales

3 Context: The energy system of Wales

In this section we consider the state of the energy infrastructure currently serving Wales, to appreciate the energy assets in play which could, in turn, support the 100 per cent ambition.

We consider the existing policy and regulatory frameworks for energy in Wales: both those elements that directly affect the deployment of renewable energy; and indirect measures that either affect renewables deployment or the ability of Wales to meet the 100 per cent ambition, for example those related to alternative energy supplies or the nature of energy demand. In both cases, we provide reflections on the roles of the EU, the UK and the Welsh governments to date.

We also identify the ambitions for renewable deployment held by each of these tiers of governance, and compare them to some of the most ambitious plans being proposed by non-EU countries.

3.1 The existing energy system infrastructure

We need to understand existing infrastructure, particularly for distributing and supplying energy, whether as gas, electricity or fuels for transport, before we can plan a way forward that helps deliver the 100 per cent target.

Here we note the 2016 capacity for generating electricity⁴ in Wales, by primary fuel:

— Gas	- 6,143 MW (61 projects)
— Renewables, in total	- 2,853 MW (67,021 projects)
— Pumped Storage	- 2,088 MW (two projects)
— Coal	- 1,586 MW (Aberthaw B)
— Battery storage	- 0.5 MW (50 projects)
— Diesel	- 202 MW (10 projects)

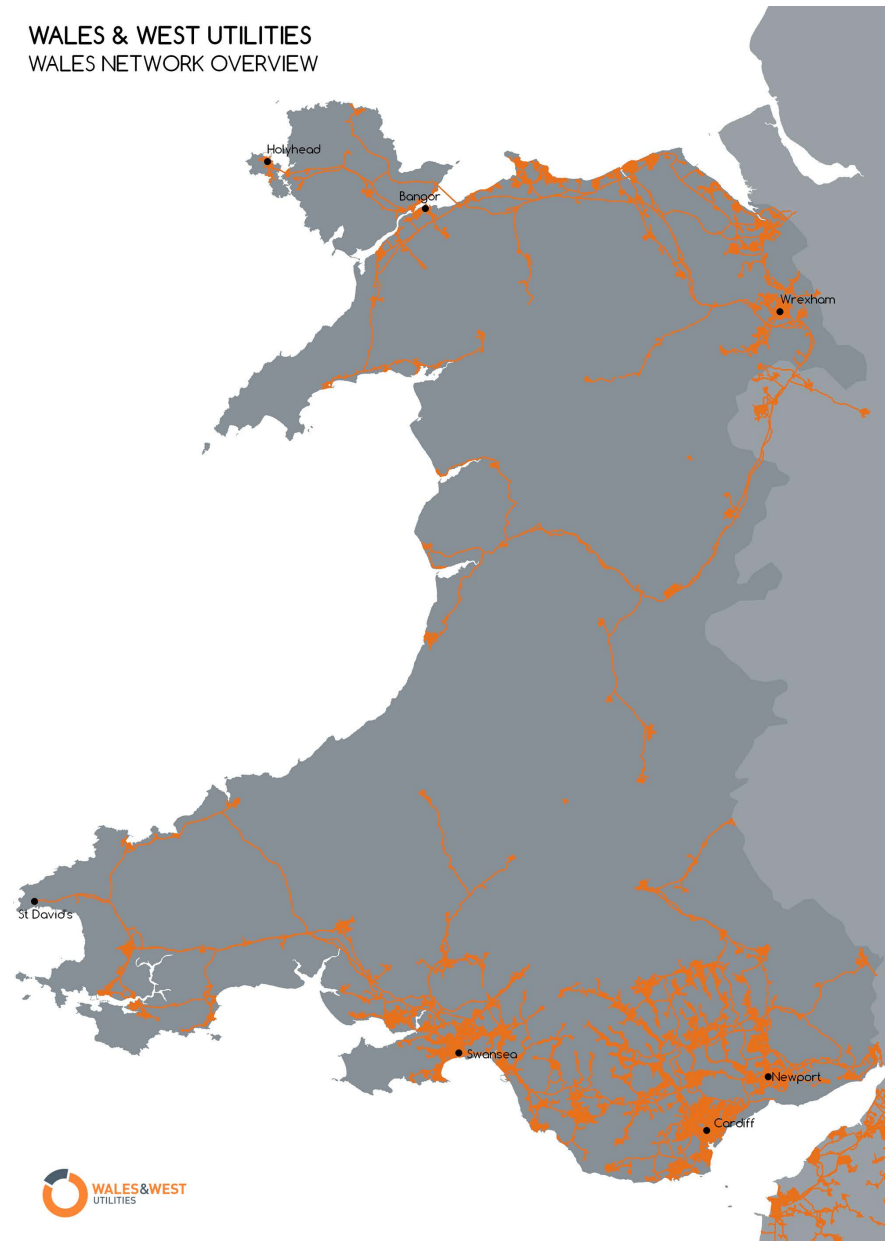
These components add up to a total capacity in 2016 of 12,873 MW, of which just over 22 per cent are renewable projects. Wales has one oil refinery capable of processing some 270,000 barrels of oil a day, with about 44 per cent of its output being petroleum fuels for vehicles.

4 Welsh Government, *Energy Generation in Wales*, December 2017

The energy infrastructure of Wales is intimately connected to that of England, for example the gas network serving Wales, illustrated in Figure One.

Figure One:

An overview of the gas network supplying Wales⁵



The gas network connects approximately 1m of the 1.35 million homes in Wales. Clearly significant areas of Wales are off the gas grid, or 'off-grid'.

For motor vehicles, there are 527 conventional (i.e. fossil fuel) vehicle refueling stations across Wales. These are broadly speaking supplied and operated by a similar profile of companies that supply England: independent operators, supermarket chains and the oil majors.

5 Wales & West Utilities gas network map, accessed October 2018

The electricity grid servicing Wales is made up of both the transmission grid and the distribution grid. The former consists of high voltage lines that link major power generators to a UK wide transmission grid. There are two distinct distribution networks in Wales, reflecting geographical conditions. 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.

In Wales, two different companies operate each of the distribution grids, and a third the transmission grid. Ofgem oversees the Codes that govern the day-to-day operation of the grids, as well as other Codes that affect the operation of the system.

As a final part of the infrastructure equation we also note the Committee on Climate Change's advice on the Welsh Carbon Budget⁶ that highlights the higher proportions of off-gas grid and solid wall homes in Wales (respectively six and two per cent higher than UK), among the 1.35m homes in Wales⁷.

This infrastructure provides us with the fuels to heat our homes and other buildings, to power our labour saving and life enhancing devices and to provide us with mobility by a variety of means.

As the energy transition, from high, to low and no carbon fuels continues, there is a growing appreciation of the opportunities to integrate the systems that provide the fuels, as decarbonisation and digitization create opportunities to fuel our benefits of warmth, power and mobility differently. For example, there are now vehicles that are fueled by electricity or hydrogen, rather than fossil fuels. This will open up questions of the energy infrastructure we will require to fuel our homes and vehicles.

While we have not assumed the solutions to decarbonising fuels all necessarily lie in the electrification of all energy uses, it is instructive to compare the nature of current energy uses to Wales' current ability to fuel itself renewably.

Welsh energy use is an integral part of the energy use of the UK. Drawing out robust and accurate figures for consumption, fuel types and the changing profile of renewable generation for Wales from a UK picture is not an exact science. Levels of generation and consumption on either side of the border vary by weather and contractual conditions. We note that previously statistical reports have mis-allocated generating assets to England when they were, and are based in Wales, though this has since been corrected⁸. All of these factors have implications for the data and its analysis when we come to judge progress against the achievement of 100 per cent renewables by 2035.

6 Committee on Climate Change: *Building a low-carbon economy in Wales - Setting Welsh carbon targets*, December 2017. Compared to the UK housing stock, Wales has higher proportions of solid-wall homes (29% as against 27% for the UK) and properties off the gas grid (21% as against 15% for the UK).

7 Welsh Government, *Household estimates for Wales, mid-2017*, September 2018

8 UK Government, *Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2013 to 2016*, December 2017

Having explored the detail across a number of statistical releases,^{9,10,11} covering 2010-17 we can say:

- renewable capacity in Wales is growing
- the proportion of electricity generated in Wales from renewables is also growing
- Wales generates much more electricity that it uses, with the ‘surplus’ used in England
- overall energy consumption in Wales is of the order of 90,000GWh¹² per annum (+/- three per cent), and is slowly declining
- electricity consumption approximates to 17 per cent (+/- three per cent) of all Welsh energy use, that is a sixth of total energy demand.

In the **Senedd Short Debate**¹³ on ‘Meeting our climate commitments – a 100 per cent renewable Wales’ that took place on 17 October 2018, the Cabinet Secretary for Energy, Planning and Rural Affairs said in reference to the levels of renewable electricity generated in Wales, for Wales, ‘... indications are this has risen further to 48 per cent in 2017’.¹⁴

Progress is being made on generating and supplying renewable electricity. Action is beginning to address the challenge of renewable heat. Renewable transport fuels have the biggest challenge, both in terms of infrastructure and scale of primary energy use, with petroleum product use at 2.5 times the total energy consumption of electricity (2012 figures), albeit that a proportion of those fossil fuels used for heat and transport will be inefficiently put to use.

3.2 Direct measures affecting renewables deployment

For Wales to meet its projected energy demands entirely from renewable sources by 2035, we recognise the existing legislative and policy framework that supports the growth of the renewables sector has elements that derive from the EU, UK and Wales tiers of government. Key measures have been highlighted below, however please note this is not intended to be an exhaustive list of legislation or policy measures.

European Union

In the later 2000s the EU developed a three-pronged strategy that looked to reduce GHG emissions, improve energy efficiency, and increase the deployment of renewables, with each metric to be improved by 20 per cent.

9 UK Government, *Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2013 to 2016*, December 2017

10 UK Government, *Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2017*, September 2018

11 Welsh Government, *Energy generation and consumption for Wales, 2013*, February 2015

12 GWh - a measure of energy use over time i.e. a Giga (a thousand million) Watts per hour

13 National Assembly for Wales, *Plenary*, October 2018

14 National Assembly for Wales, *Plenary*, October 2018

The **Renewable Energy Directive 2009**¹⁵ mandated that 20 per cent of the energy consumed within the European Union should be renewable. Each member state has its own subsidiary target, with the UK committing to a 2020 target of 15 per cent. The UK approach was set out in the *National Renewable Energy Action Plan for the United Kingdom*.¹⁶

The **Energy Efficiency Directive 2012**¹⁷ mandated a 20 per cent improvement in energy efficiency across the EU (since updated to 30 per cent by 2030¹⁸). Each member state produced a National Energy Efficiency Action Plan (NEEAP) to set out the measures it would take to achieve the relevant national target; which for the UK was an 18 per cent reduction by 2020¹⁹.

In 2014 the EU agreed a **framework to 2030**²⁰ that included a renewables target of at least 27 per cent share of energy consumed (with a similar 27 per cent ambition for energy savings). By 2018 the EU Council had revised this renewable target to 32 per cent, with scope for raising the target in 2023²¹.

The **Habitats Directive**²² is intended to protect habitats for conservation for particular species of flora and fauna and the environments in which they thrive. As such it can have a direct impact in affecting which sites can or cannot be used for deployment of renewables, particularly in the marine environment.

With the uncertainty of the UK's future relationship with the EU undiminished, the UK Parliament (**House of Commons**²³ and **House of Lords**²⁴) and Government have published **guidance papers**²⁵. Of these, the latter considered the implications for renewables in most detail, albeit concerned with how existing certification and trading arrangements may change in light of 'no deal'. Renewables are otherwise barely mentioned in these guidance papers, with the focus instead on climate change policy, the future of the European Union Emissions Trading System²⁶ and other pan EU arrangements, which are not specific to renewable energy generation or deployment.

- 15 European Commission, *Renewable energy directive*, April 2009
- 16 Department of Energy & Climate Change, *National Renewable Energy Action Plan for the United Kingdom*, July 2010
- 17 EUR-Lex, *Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance*, October 2012
- 18 European Commission, *2030 Energy Strategy*, 2014
- 19 Department of Energy and Climate Change, *UK National Energy Efficiency Action Plan*, April 2014
- 20 European Commission, *2030 climate & energy framework*, 2014
- 21 European Commission, *Europe leads the global clean energy transition: Commission welcomes ambitious agreement on further renewable energy development in the EU*, June 2018
- 22 European Commission, *The Habitats Directive*, 1992
- 23 House of Commons Library, *Brexit: energy and climate change*, September 2018
- 24 House of Lords Library, *Leaving the European Union: UK Climate Change Policy*, June 2017
- 25 Department for Business, *Energy and Industrial Strategy. Generating low-carbon electricity if there's no Brexit deal*, September 2018
- 26 EU-ETS: the EU Emissions Trading Scheme, a cap and trade system covering industrial plants with significant amounts of CO2 emissions

United Kingdom

The governments of the UK, Wales, Scotland and Northern Ireland committed to an updated delivery plan to meet the 2020 targets, and go beyond them, in the 2011 *UK Renewable Energy Road Map*²⁷.

Commitments made at this point included support for a range of renewable sectors and specific policies including:

- Electricity Market Reform to transition from the Renewables Obligation approach, noting that *'Reform will ensure that low-carbon electricity from a diverse range of sources - not just renewables - becomes a more attractive choice for investors'*
- support and investment to reduce offshore wind costs
- support for innovation in marine (tidal and wave technology)
- proposals for a UK Bioenergy Strategy to support biofuels (especially wood) uses
- the introduction of the Renewable Heat Incentive (RHI) and the Renewable Heat Premium Payment (RHPP) to support biomass heat, biogas injection, and heat pump deployment
- focused attention on the route map to achieve the renewable transport fuels 'sub-target' (of 10 per cent).

This plan set out the mechanisms that would help the UK achieve the 15 per cent renewable energy overall target, and within that the sub-targets of renewable electricity at 30 per cent, renewable heat at 12 per cent and renewable transport fuels at 10 per cent. These targets for renewable energy for 2020 are not disaggregated further to identify or allocate a target for each of the devolved nations of the UK, though each nation did set their own ambitions within the road map. The Scottish Government committed to deliver 100% renewable electricity by 2020; while the Northern Ireland Assembly committed to deliver 40% renewable electricity and 10% renewable heat by 2020. Welsh 2011 ambition is explored below.

The associated **Article Four submission**²⁸ lists 51 legislative measures that were considered relevant to the *'... authorisation, certification, licensing procedures and spatial planning applied to plants and associated transmission and distribution network infrastructure'* for Wales; England and Wales; England, Wales and Scotland; or the UK in 2011.

Subsequent revisions to the actions noted in the road map include:

- Energy Market Reform to create the Contracts for Difference (CfD) approach, with specific support focused on renewable supply, e.g. for offshore wind
- increasing the Renewable Transport Fuel Obligation level to 9.75% in 2020, rising to 12.4% in 2032²⁹

27 Department of Energy and Climate Change, *UK Renewable Energy Roadmap*, July 2011

28 Department of Energy & Climate Change, *National Renewable Energy Action Plan for the United Kingdom*, July 2010

29 Department for Transport, *Renewable Transport Fuel Obligation: proposed changes for 2017*, September 2017

- the *Clean Growth Strategy*³⁰, with measures including:
 - reform to the Renewable Heat Incentive to focus on long-term decarbonisation through technologies such as heat-pumps and bio-gas
 - a sector deal for offshore wind, with further funds for Pot 2 CfD and wind innovation
 - a commitment to set specific requirements for the provision of EV charge points or hydrogen refuelling infrastructure at motorway service stations and large fuel retailers, as well as ensuring that charge points are convenient to access and work seamlessly right across the UK.

Wales

In the 2011 *UK Renewable Energy Road Map*³¹, the devolved governments also set out their own ambitions, which included a commitment from the Welsh Government, stating ‘*The potential to produce twice the amount of electricity it currently uses from renewable sources by 2025, and deliver 4GW of this from marine energy*’.

In 2010 1,731GWh of renewable electricity was generated in Wales. This increased to 2,330GWh in 2011³² suggesting a target of ‘twice the amount’ would be of the order of 4-5,000GWh by 2025. It has been suggested the 4GW target was primarily derived from the potential energy generation of tidal lagoons³³; and it would appear that much of this overall ambition was predicated on delivering tidal lagoon power in Wales.

In 2016 the Cabinet Secretary for the Environment and Rural Affairs, Lesley Griffiths, committed to ensuring that from April 2017 all electricity purchased via the National Procurement Service would be 100 per cent renewable, with 50 per cent of that secured from Welsh generation³⁴.

More recently a commitment has been made to a higher renewable electricity target for Wales. In September 2017 Lesley Griffiths then committed Wales to a renewable electricity generation target of 70 per cent of (electricity) consumption, by 2030³⁵.

At the same time, the Cabinet Secretary also committed to an absolute target of 1GW of renewable energy to be locally owned in Wales by 2030, with a wider ambition for local ownership, ‘... *I expect new renewable energy projects to have at least an element of local ownership by 2020*’. Given 2016 figures for generating capacity in Wales, noted earlier at 12.8GW, a total of 1GW approximates to ownership of eight per cent of that capacity.

While neither are statutory targets, they do help set a direction of travel and level of intent, be that in relative or absolute terms. Wales does not currently have a statutory renewable energy supply target.

30 Department for Business, Energy and Industrial Strategy, *The Clean Growth Strategy*, October 2017

31 Department of Energy & Climate Change, *UK Renewable Energy Roadmap*, July 2011

32 Welsh Government, *Energy generation and consumption for Wales, 2013*, February 2015

33 Tidal Lagoon Power, *Key Statistics*, accessed October 2018

34 Welsh Government, *Welsh Government announces 100% renewable electricity for public services ahead of COP22*, November 2016

35 Welsh Government, *Lesley Griffiths high on ambition for clean energy*, September 2017

3.3 Global renewable ambition

The EU and its member states are not alone in seeking to grow their renewable energy sector. Many countries have proposed ambitions of their own for renewables deployment, including New Zealand, California and Iceland, as detailed below.

New Zealand

The recently elected Labour government of New Zealand has proposed an ambition of 100 per cent renewable electricity to be reached by 2035.

The electricity system of New Zealand is already significantly renewable, with over 80 per cent of its electricity generated from hydropower, geothermal and wind, one of the highest in the OECD. This ambition is caveated by the assumption of the output being based on a 'normal hydrological year' as hydropower is a significant element of the electricity generation mix³⁶.

California

Earlier in 2018 the State Governor of California committed the state to achieving 100 per cent clean electricity by 2045³⁷, by executive order that speeds up the time table of renewables deployment as specified in the California Renewables Portfolio Standard Program³⁸.

As with the New Zealand case, the commitment is only for electricity and it should be noted that 'clean electricity' here is taken to mean, or mandate, that at least 60 per cent would be renewably sourced; allowing for 'clean' energy to also be part of the mix, e.g. nuclear, power carbon capture and storage³⁹.

Iceland

The geological setting of Iceland provides the opportunity to harness significant amounts of renewable energy, primarily from geothermal and hydro, totaling almost 85 per cent of primary energy in 2016⁴⁰. The availability of renewable energy is so significant that Iceland is the world's highest per capita producer and user of green energy. Overall, almost all electricity and over 80 per cent of heating are renewably supplied.

While Iceland is closing in on the achievement of being perhaps the first net renewable country, being almost completely independent for power and heat, it is also almost

36 Michael Bloch, *100% Renewable Energy For New Zealand By 2035*, October 2017

37 California Legislative Information, *An act to amend Sections 399.11, 399.15, and 399.30 of, and to add Section 454.53 to, the Public Utilities Code, relating to energy*, October 2018

38 California Energy Commission, *California Renewable Energy Overview and Programs*, accessed October 2018

39 Marlowe HOOD, *California commits to 100% clean electricity by 2045*, October 2018

40 Government Offices of Iceland, *Energy*, accessed October 2018

completely dependent on imported, primarily fossil fuel transport fuels⁴¹, prompting early investment in hydrogen technologies.

For Iceland the energy transition is primarily about bridging the transport fuels ‘gap’, setting targets for the renewable energy portion of on-land fuels at 10 per cent by 2020 (and 40 per cent 2040), and for the fisheries sector to reach 10 per cent by 2030⁴².

Commitments elsewhere in the United Kingdom

Closer to home an increasing number of parts of the UK are making renewable energy commitments, building on the 2011 *UK Renewable Energy Road Map*⁴³ through the changing devolutionary settlement of the UK.

Scotland then committed to achieving 100 per cent renewable electricity by 2020. In the recent *Scottish Energy Strategy*⁴⁴ they set out the ambition for 50 per cent of energy consumption (of electricity, transport and heat uses) to be renewably sourced by 2030, while noting that approximately 54 per cent of electricity was renewable in 2016.

For England, the Clean Growth Strategy set out intentions to:

- explore how the £200 million package of Growth Programme and Countryside Productivity offers support to renewable energy projects
- allocate an additional £80 million to support charging infrastructure deployment, alongside £15 million from Highways England to ensure rapid charge points every 20 miles across 95 per cent of England’s Strategic Roads.

Within England the new combined authorities and associated Mayors have made a variety of commitments to clean or green energy including:

- The West Midlands Combined Authority is exploring energy innovation zones as a part of its devolution deal. It includes the Energy Capital project⁴⁵ which seeks to support the smart clean energy transition, backed by a Mayoral commitment to achieve 100 per cent clean energy by 2050.⁴⁶
- The Tees Valley Combined Authority hosts a range of renewable energy resources, not least in bio-fuels, and is a Centre for Offshore Renewable Engineering.⁴⁷
- The Cambridgeshire and Peterborough Combined Authority has supported the development of the *Local Energy East Strategy*⁴⁸ (with its neighbouring LEP areas), which

41 Askja Energy, *Iceland is the world largest energy consumer (per capita)*, November 2014

42 Orkustofnun: National Energy Authority, *Parliamentary resolution on energy transition*, May 2017

43 Department of Energy and Climate Change, *UK Renewable Energy Roadmap*, July 2011

44 Scottish Government, *Scottish Energy Strategy: The future of energy in Scotland*, December 2017

45 Energy Capital, *Projects*, accessed October 2018

46 Sustainability West Midlands, *West Midlands Combined Authority – Sustainability Support Programme*, accessed October 2018

47 Tees Valley Mayor, *Energy & Renewable*, accessed October 2018

sets out to support renewable energy and storage deployment, technology innovation; with a focus on supply chain and business development.

- Liverpool City Region has a *Sustainable Energy Action Plan*⁴⁹ setting out the case for action, including energy and master planning. The action plan has organisational support for a range of renewable deployments ranging from offshore wind, Mersey tidal through to domestic micro-renewables. The Mayor's 100 day plan⁵⁰ included the creation of the Mersey Tidal Commission.
- The Greater Manchester Combined Authority includes a Green City portfolio, a Low Carbon Hub, ambitions to achieve carbon neutrality by at least 2040, and a climate change and low emissions implementation plan that includes an ambition to expand the local low carbon economy (including local renewables) more quickly than the Greater Manchester base rate of economic growth, while diverting spend away from fossil fuels.⁵¹ Most of the Greater Manchester local authorities have already committed to eliminating fossil fuels by 2050 as part of a 100% clean energy pledge.
- The Greater London Authority and the Mayor of London have recently approved the *2018 Environment Strategy*.⁵² That includes an ambition for greater renewable supply in and for London, including a commitment to 'increase clean energy generation with a London-wide ambition for there to be 1 GW of installed solar capacity by 2030, with at least 100 MW more solar installed, through the Mayor's programmes alone ...'

Meanwhile local authorities are also stepping up to the renewable opportunity, with over 90 from across the UK having committed to 100 per cent clean energy for their communities before 2050, as part of the UK100 network of local and combined authorities (including the six Welsh authorities Torfaen, Swansea, Rhondda Cynon Taf, Newport, Caerphilly and Bridgend)⁵³.

As we can see there is increasing ambition for renewable energy supply, and while that is typically electricity led, some national and devolved political leaders are making commitments to renewable supply targets for overall energy use.

48 Local Energy East Network, *Local Energy East Strategy: An Energy Strategy for the Tri-LEP Area*, May 2018

49 Arup, Climate Change Local Area Support Programme, Liverpool City Region Local Enterprise Partnership, Merseyside Environmental Advisory Service, *Liverpool City Region Sustainable Energy Action Plan*, July 2012

50 Liverpool City Region Combined Authority, *Mayoral Combined Authority 100 Day Plan*, accessed October 2018

51 Great Manchester Low Carbon Hub, *Climate Change and Low Emission Strategies' Whole Place Implementation Plan for Greater Manchester (2016-2020)*, October 2016

52 London Assembly, *London Environment Strategy*, May 2018

53 UK:100, *Members*, accessed October 2018

3.4 Indirect measures supporting renewables deployment

Contributors to this report recognised that the challenge of meeting all demand renewably is linked to the nature and efficiency of energy use, as well as how or what energy is supplied to meet those uses. Using energy more efficiently for a given purpose, and thus reducing the overall demand for energy, can be important to the transition to 100 per cent renewables and so demand side policy areas should be examined as part of our consideration. These include:

- transport policies, from the fuels needed for different vehicles, to the routes available for different journeys
- policies related to the built environment, including building standards and domestic energy related equipment
- environmental policies, including air quality, land use, habitats that either support renewables, or level the playing field for fossil fuel uses.

While we have considered energy and planning policies for renewables, there will also be policy in these areas that act indirectly, for example:

- energy policies, including those that incentivise decarbonisation and fuel switching, or the reduction of fossil fuel uses
- planning policies, that support distributed energy.

For each of these policy areas there are again aspects that are determined or governed by the Welsh Government, the UK Government, or the EU. Our contributors identified a number that they considered to have particular relevance, as set out below.

The European Union

There are a number of EU directives that have the potential to indirectly affect renewables deployment. During the course of this, work contributors have explicitly noted the impact of the following directives.

The **Industrial Emissions Directive**⁵⁴ (Directive 2010/75/EU, since superseding the Large Combustion Plant Directive) governs emissions of a group of pollutants (including sulphur dioxide and particulates) from large plants, typically fuelled by fossil fuels, though some renewable fuels such as biomass could produce such emissions. In doing so the directive can require plants to fit emissions control equipment to meet the stringent limits or limit the operating hours of such power stations on an annual basis. Clearly this can restrict the operation or lifespan of fossil fuel power stations.

The **Air Quality Directive**⁵⁵ (2008/50/EG) limits average Nitrogen Oxide (NO₂) emissions on an hourly and annual basis from 2010. While various countries including the UK have regularly failed to meet the requirements of the directive it is gaining greater traction through growing awareness of the impact of poor air quality, and recent legal challenges. Many of the policy measures proposed to meet the directive look to change the fuels of road vehicles, and in some cases gas boilers, from fossil fuels to non-fossil fuel sources, which should support renewable deployment and fuel use.

United Kingdom

Over the past ten years, in addition to the adoption of EU directives, at the UK tier of governance we have seen the creation of a number of UK legislative and policy steps to address the challenge of climate breakdown. These include the Climate Change Act 2008⁵⁶, and the creation of carbon budgets, the *Low Carbon Industrial Strategy* (2009)⁵⁷, and more recently the *Clean Growth Strategy* (2017)⁵⁸ and the *Industrial Strategy: Building a Britain fit for the future* (2017)⁵⁹.

Specific announcements have also included:

- the intention to regulate the closure of unabated power generation units by 2025 (by setting an emissions intensity limit of 450 gCO₂/kWh, from 1st October 2025)⁶⁰
- a ban on the sale of new conventional petrol and diesel cars and vans by 2040 (with *The Road to Zero* (2018)⁶¹ reaffirming this ambition while adding that the UK government expects that almost every car and van will be zero emission by 2050⁶²).

Some of these steps have led to the emergence of institutions and mechanisms intended to identify, quantify, assess and advise on aspects of the best way forward for UK climate and related policy, such as on energy, transport, heat and infrastructure more broadly. These include the Committee on Climate Change (CCC) and the National Infrastructure Commission (NIC). In some cases there will soon be a specific Welsh element, including Welsh carbon budgets and the National Infrastructure Commission for Wales.

While the National Infrastructure Commission for Wales is being established, in 2017 the CCC reported on *Setting Welsh carbon targets*⁶³. In that report they noted:

- Wales already produces more electricity than it uses, being a net exporter to England.
- the coal fired plant at Aberthaw produced 25 per cent of Welsh electricity generated in 2015 (compared to 16 per cent from renewables).

55 European Commission, *New Air Quality Directive*, September 2017

56 Legislation Government, *Climate Change Act 2008*, October 2018

57 HM Government, *Low Carbon Industrial Strategy: A vision*, April 2009

58 Department for Business, Energy and Industrial Strategy, *The Clean Growth Strategy*, October 2017

59 HM Government, *Industrial Strategy. Building a Britain fit for the future*, November 2017

60 Department for Business, Energy and Industrial Strategy, *Implementing the end of unabated coal by 2025*, January 2018

61 HM Government, *The Road to Zero*, July 2018

62 HM Government, *The Road to Zero*, July 2018

63 Committee on Climate Change, *Building a low-carbon economy in Wales*, December 2017

- Wales should use its devolved powers on building standards to set high standards and avoid carbon lock in and retrofit costs.
- within limited powers Wales could develop a strategy of decarbonising heat, and a strategy to shift transport demand away from fossil fuels.
- Wales can encourage renewables through procurement, planning and appropriate lobbying for onshore wind and solar support.
- compared to the UK, Wales has a disproportionate presence of power plants generating electricity from gas at present.

Wales

There are four legislative Acts that Wales has recently introduced that have the capacity to influence the extent of renewables in Wales, for Wales.

The *Well-being of Future Generations (Wales) Act 2015*⁶⁴ establishes the need for public bodies to think of the future impact of their work, across the seven well-being goals. In establishing Public Service Boards the Act provides a platform for local agencies to take a strategic approach to achieving the well-being goals locally, and delivering on their sustainable development duty.

The ambition of the Well-being of Future Generations (Wales) Act 2015 also includes the five ways of working needed of public bodies. These are to:

- take a long-term perspective
- prevent rather than just cure
- consider well-being in an integrated way
- involve people in achieving their well-being goals
- collaborate where that adds to the beneficial outcomes for the people and communities of Wales.

The Act also created the role of the Future Generations Commissioner for Wales, and requires Welsh Ministers to develop a suite of *National Indicators for Wales*⁶⁵, which they report against annually. Of these 46 indicators, one is directly relevant to renewable deployment, while others are indirectly so:

- capacity (in MW) of renewable energy equipment installed
- levels of nitrogen dioxide (NO₂) pollution in the air
- percentage of dwellings with adequate energy performance
- emissions of greenhouse gases within Wales
- emissions of greenhouse gases attributed to the consumption of global goods and services in Wales.

64 Welsh Government, *Well-being of Future Generations (Wales) Act 2015*, May 2015

65 Welsh Government, *How to measure a nation's progress? National Indicators for Wales*, March 2016

Within 12 months of an Assembly election, Ministers must publish a *Future Trends report*⁶⁶. In 2017 the first such report noted in the economy and infrastructure section that ‘*Wales has great untapped growth potential to generate energy, including from renewable sources. There is currently significant growth in the community level low carbon energy sector in Wales.*’

The Environment (Wales) Act 2016⁶⁷ includes powers for Welsh Ministers to put in place statutory greenhouse gas (GHG) emission reduction targets, by at least 80 per cent, with associated carbon budgets.

The Planning (Wales) Act 2015⁶⁸ includes powers to direct local planning authorities to work together or to merge, supports greater engagement in pre-application stages of development, provides the basis for a National Development Framework and for Strategic Development Plans, for areas of more than a single local authority, where required.

The Welsh Government sets out the relationship between the three Acts⁶⁹ as:

‘For Wales to develop sustainably, we need to change the law to put in place the key elements that will enable it to happen:

- A clear idea of what we are aiming for and an undertaking of the key principles that guide us;*
- A clear picture of the natural resources we have, the risks they face and the opportunities they provide; and,*
- An efficient process that ensures the right development is located in the right place to make it happen.’*

The Welsh Government envisage the following timelines⁷⁰ for the three Acts:

- full Local Development Plan (LDP) coverage by 2018
- carbon budgets for the periods 2016/20 and 2022/5 to be set in 2018
- National Development Framework (NDF) to be published in 2019
- a low carbon delivery plan early in 2019
- a (National) Biodiversity report to be published in June 2019
- a Second State of Natural Resource Report to be published in 2020 with:
 - annual well-being progress reports (indicators and progress)
 - annual PSB well-being progress reports.

66 Welsh Government, *The Future Trends Report 2017*, May 2017

67 Legislation Government, *Environment (Wales) Act 2016*, March 2016

68 Welsh Government, *Planning (Wales) Act 2015*, July 2015

69 Welsh Government, *Legislation for sustainable development to secure the long term well-being of Wales*, February 2016

70 Welsh Government, *Links to legislation – Environment Act 2016, Well-being of Future Generations Act 2015 and Planning Act 2015*, accessed October 2018

Finally the **Wales Act (2017)**⁷¹ provides a further suite of powers that have the potential to support renewables deployment, including:

- increased capital borrowing powers
- devolved responsibility to Welsh Ministers for marine licensing and conservation, including:
 - energy consents in the Welsh offshore region
 - extending responsibility for building regulations to include excepted energy buildings
- devolved powers over the licensing of onshore oil and gas extraction
- requiring the Secretary of State to consult with Welsh Ministers on renewable energy incentive schemes that apply in Wales (though not levy elements)
- financial assistance for inland waterways and sea freight
- licensing of coal-mining operations in Wales
- devolved responsibility for:
 - aspects of Ports policy, for example the planning and provision of loans
 - speed limits
 - bus registration
 - taxi regulation
 - consenting energy generation up to 350MW
 - consenting for 132Kv power lines
 - duties on Ofgem with regard to the National Assembly for Wales.

The passage into law of the **Wales Act 2017**⁷² suggests that while the basic practices in law for England and Wales, for example law of contract, will remain as parts of a common legal system, there is scope for Welsh law to diverge where there is a meaningful place based aspect to the policy. Common law between England and Wales could then be considered place agnostic.

As we expect a future unified yet highly devolved energy system across Wales and England, then this distinction could then mean divergence over:

- planning consent
- standards of build or new development
- local energy planning, and integration between fuel supplies, that is gas, electricity, petroleum products (notwithstanding the standards below).

71 Legislation Government, *Wales Act 2017*, January 2017

72 Legislation Government, *Wales Act 2017*, January 2017

While place agnostic elements might be considered to include:

- system conditions, such as the system voltage in electricity, or gas quality and calorific value
- system availability and reliability to consumers.

The four Acts provide a robust platform for sustainable development in Wales, and in many respects a robust platform for renewables deployment, once the substance of the Acts has been worked through and the relevant policy, guidance and plans put in place.

In addition, over the past three years the Cabinet Secretary for Energy, Planning and Rural Affairs, Lesley Griffiths, has identified a number of other indirect measures that could help renewable deployment in Wales, including:

- a carbon neutral public sector by 2030, set in in July 2017⁷³
- a moratorium on fracking in Wales
- convening a group to work with Welsh Government to develop a network to ‘support future energy systems’.

Summary

This context gives us the state of play and commitments at different tiers of government, concluding with the observation that we can see that much of the world, a significant part of Europe and the UK are all set on significant and growing deployments of renewables.

Clearly the logic of demand management and demand reduction applies in Wales as it does across the EU or the UK; and in turn reduces the absolute target for renewables deployment to be achieved by 2035.

Wales is not alone in seeking to have a much great presence of renewables in the energy mix, be that for power, warmth or mobility. These global ambitions can help deliver Welsh ambition. Yet we should be aware of the wider context of who benefits as we explore the right approach to the future deployment of renewables for Welsh use.

4

The Re-energising Wales opportunity

4 The Re-energising Wales opportunity

The wider Re-energising Wales project has considered the nature of the demand for energy in the built environment (within our report *Building a Picture of Energy Demand in Wales*⁷⁴) and, separately, the potential for renewable supply across a Welsh ‘region’ (within the *Swansea Bay City Region : A Renewable Energy Future* report⁷⁵) that is a mirror of the whole Wales case.

Clearly supply and demand are only part of the answer to the question of achieving 100 per cent renewable energy provision. The nature of costs and benefits are important, as is the engagement and involvement of civic, local and community actors who can support, or constrain, the greater deployment of renewable energy.

Here we highlight the conclusions and relevant recommendations of the work packages to date, as a set of prompts towards the legislative powers and policy we might need for 100 per cent renewables by 2035.

4.1 *Policy Paper -* Funding renewable energy projects in Wales

‘Overcoming some of the barriers to investment in renewable projects, and exploring some options to facilitate more, could allow Wales to move beyond the rhetoric and really deliver on its ambitions. The purpose of this paper is to highlight opportunities that could lead to the development of more investment in renewable energy projects in Wales.’

The report⁷⁶ highlighted opportunities that could lead to the development of more investment in renewable energy projects in Wales, including options to directly raise capital from within Wales itself to fund schemes so that wider economic and social benefits are retained locally.

The report had 18 recommendations in total. Relevant recommendations for this paper include:

- Welsh Government, non-governmental organisations and other parties should strongly explore the need to devolve a range of powers over renewable energy subsidy setting to Wales.
- Welsh Government should lobby the UK Government for future access to the CfD mechanism for onshore wind to enable further deployment of this technology in Wales.
- Welsh Government should develop a sustainable energy strategy, which maps out timing, capacity needs and location for new renewable energy assets. This should include

74 Cardiff University for Institute of Welsh Affairs, *Building a Picture of Energy Demand in Wales*, April 2018

75 Regen for the Institute of Welsh Affairs, *Swansea Bay City Region: A Renewable Energy Future*, April 2018

76 Institute of Welsh Affairs, *Funding renewable energy projects in Wales*, March 2017

deployment targets and technology specific considerations. This should include an analysis, in collaboration with the National Grid, Distribution Network Operators and others of how existing as well as new grid infrastructure in Wales (north, mid and south) can be utilised to respond to Wales' particular energy aspirations.

- Welsh Government should support the development of a new cooperative, charitable or not for profit body that has a clear brand and supports investment in Welsh renewable energy projects, with an aim to establish the body by the end of 2019.

4.2 **Work Strand One:** **Building a Picture of Energy Demand in Wales**

'This research provides a clear, data-based picture of the nature, timing and location of half-hourly energy demands of buildings in Wales over the period of a year. The headline figures for Wales show that buildings consume about 28 Terawatt-hour (TWh) of the approximately 89 TWh of energy used annually in Wales for all purposes, nearly a third of the total energy used in Wales.'

The *report*⁷⁷ makes publicly available information at this level of detail for the first time. This new information could be used in a number of ways. It could, for example, help calculate what is required in terms of reducing energy demand, increasing renewable supply or increasing energy storage systems, and then identify what is required for a 100% renewable energy supply system for buildings in a given area over a given time period.

The report highlights the demand from the domestic sector in 2016:

- electricity - a minimum of 200 MW, a maximum of about 2,000 MW
- heating and Domestic Hot Water (DHW) between 10,000 - 15,000 MW.

Annual non-domestic buildings demand is:

- peak power demand of between 300 - 450 MW
- peak heat demand of at least 1,500 MW.

Of particular relevance to this work strand are the following observations:

- data set needs further active development and refinement
- Ordnance Survey building type data tables need to be updated, revised, corrected.

These observations highlight the importance of understanding the building stock of Wales at the right level of detail and type. Given that there are a number of particular building types and uses (for instance Wales has 13,000 residential care homes) it may be that these prompt a particular approach to renewables deployment, or demand management measures to suit their specific circumstances.

In addition, the role out, or coverage, of Energy Performance Certificates (EPC) is an important element of the data-set and it may be that Wales could work to secure greater coverage and/or an improved EPC methodology to inform Welsh energy management.

4.3 *Work Strand Two:* **Swansea Bay City Region: A Renewable Energy Future**

This *report*⁷⁸ highlighted the Swansea Bay City Region (SBCR) as a case study exemplar, showcasing a vision for how the SBCR can maximise the size and location of its renewable energy resources in order to meet its projected energy demands by 2035. The vision contributes to Wales' decarbonisation targets, makes best use of local generation and renewable energy assets, and accelerates the transition of Wales to an energy efficient, smart and clean energy system.

Although the ambition and objectives set out in the vision will be challenging, the reports highlights that radical change also brings significant opportunity. The transformation of our energy system will bring a myriad of opportunities for innovation and investment, for energy consumers, businesses and for Welsh communities. The findings are clear **that greater ambition and immediate, practical action are required to realise the vision for 100% renewable energy.**

The report identified the greatest opportunities for SBCR (and Wales) as:

- creating an exemplar Welsh building efficiency and local power generation sector
- harnessing offshore wind & marine energy
- maximising the commercial potential of bioenergy
- smart, flexible and local energy
- leading the transport revolution.

4.4 *Work Strand Three:* **The Economic Impact of Energy Transition in Wales: A Renewable Energy System Vision for Swansea Bay City Region**

Building on the *Swansea Bay City Region: A Renewable Energy Future*⁷⁹ report, the *Economic Impact of Energy Transition in Wales*⁸⁰ report outlines the economic opportunity that arises from a truly transformative approach to energy generation and domestic refurbishment in the SBCR.

This report highlights that the SBCR stands to make significant economic gains from renewable energy projects. However, unless Wales finds ways to make the investments, we will miss out on the majority of economic benefits.

78 Regen for the Institute of Welsh Affairs, *Swansea Bay City Region: A Renewable Energy Future*, April 2018
79 Regen for the Institute of Welsh Affairs, *Swansea Bay City Region: A Renewable Energy Future*, April 2018
80 Cardiff Business School for Institute of Welsh Affairs, *A Renewable Energy System Vision for Swansea Bay City Region*, September 2018

The report warns that there is almost no Welsh capital ownership in the energy sector at present. In the past, Wales has only proved able to capture a small portion of the total economic benefit from renewable energy booms, usually that related to local labour, some professional services and rental, sales or lease of landscape.

The report shows that £4.6bn of investment in renewable electricity generation, plus £1.2bn in domestic energy efficiency interventions (the types of investments needed to meet the SBCR vision highlighted in the *Swansea Bay City Region: A Renewable Energy Future*⁸¹ report above), could support some 4,500 jobs across Wales during a 15-year investment period, adding £1.66bn to Welsh GVA. It reports that around 60-70% of this Welsh economic potential could be captured within the SBCR, around 3,200 full-time jobs.

In order to capture the significant opportunities in the region, the Welsh economic offer will have to change – and rapidly – to encompass investment capital, truly Welsh research and innovation, more high value services and perhaps even in some cases fabrication and manufacturing. There is particular local advantage on energy efficiency investments, through the specialism in innovative domestic energy systems in the **‘homes as power stations’** project led by SPECIFIC at Swansea University⁸².

Relevant recommendations for this paper include:

- new financing mechanisms
- the need to take an energy led regeneration approach
- supply chain development in good time, to capture benefits.

The report states *‘On a different but related point, a key element in an energy system transformation will be the buy-in of local populations as:*

- *Owners, via direct, pension fund or community investments;*
- *Partners, in the refurbishment of their homes & their choice of transport;*
- *Customers of a very different energy supply.*

Perhaps the new city-region level will be a more suitable level at which to co-create a new, future-proof, decentralised & globally responsible approach to energy use’.

81 Regen for the Institute of Welsh Affairs, *Swansea Bay City Region: A Renewable Energy Future*, April 2018

82 SPECIFIC, *Low carbon at low cost*, accessed October 2018

4.5 *Policy Paper - Decarbonising Transport in Wales*

*Decarbonising Transport in Wales*⁸³ reports that Wales is more reliant on the car than any other region or nation in the UK. It also reports that 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.

Wales risks failing to meet its own targets on carbon emissions unless it changes its over-reliance on the car.

Despite the *Active Travel (Wales) Act 2013*⁸⁴, walking and cycling levels are generally static or declining. Given that the sale of new petrol and diesel cars is to be banned from 2040, there is a clear need for managed change in Wales' transport system. The report highlights a number of practical steps that can be taken to overcome Wales' challenges.

The report states: *'Decarbonising transport will make a huge contribution to Wales' success in meeting its projected energy demands entirely from renewable sources by 2035. The transport sector has considerable potential to address pressing concerns relating to health, the economy, climate change and equality. Transport also has a massive impact on the way we plan our lives; more sustainable choices could be our route to a healthier and happier lifestyle'.*

The report has 22 recommendations in total. Relevant recommendations for this report include:

- 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.
- Welsh Government should accelerate the development of Regional Transport Authorities (RTA).
- Welsh Government should review the capacity of local planning authorities to enforce planning policies effectively.
- the new edition of Planning Policy Wales should ensure that provision of sustainable transport infrastructure is a fundamental requirement of new housing developments, not just a desirable outcome.
- Welsh Government should actively consider how it could introduce expiry or review dates for large scale planning permissions.
- Welsh Government should bring all bus, taxi and coach commissioning together under a single administration.
- Welsh Government, Transport for Wales and local authorities (or RTAs), in partnership with the bus industry, should agree steps to decarbonise the bus fleet with the utmost urgency.
- Welsh Government should introduce the legislation required to allow a system of bus franchising to be developed in Wales.
- Welsh Government should impose a default 20mph limit in urban areas, allowing local authorities discretion in exempting routes where justified.

We note that some recommendations, such as the action on buses, taxis and speed limits, are recommendations that seek to deploy the powers of the Wales Act 2017.

83 Institute of Welsh Affairs, *Decarbonising Transport in Wales*, June 2018

84 Legislation Government, *Active Travel (Wales) Act 2013*, November 2013

4.6 *Work Strand Four:* Factors influencing local and community engagement in renewable energy

This report captures the experiences of community and local renewable energy projects across different geographical locations in Wales.

The reports assessment considers the values behind community engagement in energy saving and generation, and the barriers to increased participation including perceived community and local reluctance to embrace existing (and new) technologies.

Relevant findings for this paper will be published after this current report.

4.7 An overview of the Re-energising Wales evidence to date

As the energy system's digital transition progresses, greater monitoring, wider deployment of sensors and smart meters will all support a greater capacity for real time and localised management of the energy system. This digitisation will provide increasingly more reliable data about how energy is used in Wales, particularly by domestic and smaller commercial users.

Being better able to understand demand offers the opportunity to 'predict and prevent'⁸⁵ inefficient and unnecessary energy use. Upgraded and more accurate energy use with locational data can inform day-to-day management and longer term plans for the development of the energy system.

It will be in Wales' interest to ensure measures to improve energy data gathering and management in Wales are prioritised in the work of network operators, developers and others engaged in the energy transition. This would include smart meter roll out, coverage of EPCs and detailed data collection of energy use across the domestic, commercial, industrial and transport sectors.

Improved data will also affect opportunities for new and better Welsh base renewable supply, as highlighted by the *Swansea Bay City Region: A Renewable Energy Future*⁸⁶ report above. That work helps highlight the particular opportunities available to Wales, and the need to focus on this particular delivery. Some of this depends upon changes to the planning regime within Wales, some on the focused support Welsh Government puts into place to bring forward the right action and investment.

The *Funding renewable energy projects in Wales*⁸⁷ policy paper highlights the need for Wales to have greater access to, or control over, the renewable incentive schemes that operate UK wide. It provides examples of where capital expenditure for projects can be raised in Wales,

85 Susan Owens, *From 'predict and provide' to 'predict and prevent'?: Pricing and planning in transport policy*, January 1995

86 Regen for the Institute of Welsh Affairs, *Swansea Bay City Region: A Renewable Energy Future*, April 2018

87 Institute of Welsh Affairs, *Funding renewable energy projects in Wales*, March 2017

such as via Welsh Local Government Pension Funds. The *Economic Impact of Energy Transition in Wales: A Renewable Energy System Vision for Swansea Bay City Region*⁸⁸ report provided a cost benefit analysis for the SBCR energy vision. This report highlighted the importance of considering energy investment in the wider context of regeneration and economic development, with supply chain development and Welsh ownership both being key elements to maximising the benefits to Wales of a step up in renewables deployment.

The *Decarbonising Transport in Wales*⁸⁹ policy paper highlights the importance of getting the right governance in place to support the energy (and fuels) transition, given the decentralising nature of many of the solutions. Sub-national or local measures are needed to support the transition, typically a more explicit role for local governance entities (such as regional transport authorities). This current report highlights the need for the Ofgem regime to move away from a place agnostic approach, while the *Decarbonising Transport in Wales* policy paper calls for one specific piece of legislation (in Wales) to create a system of bus franchises.

Finally, we should note the framing of the potential for 100 per cent renewables deployment in and for the SBCR, in the *Swansea Bay City Region: A Renewable Energy Future*⁹⁰ report. That report highlights the potential to supply the equivalent of 100 per cent renewable electricity on an annual basis, albeit with imports to the SBCR 'system' at a few limited points of the year. While setting out a robust approach to maximising the renewables potential of the SBCR area, that plan was also caveated by deployment expectations including:

- only 40 per cent of heat supply from decarbonized heat supply sources (which we might assume is renewable)
- growth in electric vehicles to 30 per cent of all cars being electric by 2035 (which may increase renewable deployment)
- all public transport vehicles to be Ultra Low Emission Vehicles by 2035 (that is, some will be renewable but not all).

As global examples show, an ambition to achieve 100 per cent (net) target for all energy is a further step up, given that only a few nations have committed to 100 per cent electricity any time before 2050, let alone all energy well before 2050, as we propose.

88 Cardiff Business School for Institute of Welsh Affairs, *A Renewable Energy System Vision for Swansea Bay City Region*, September 2018

89 Institute of Welsh Affairs, *Decarbonising Transport in Wales*, June 2018

90 Regen for the Institute of Welsh Affairs, *Swansea Bay City Region: A Renewable Energy Future*, April 2018

5

Meeting the challenge

5 Meeting the challenge

When considering the future policy and legislative framework for renewable deployment and use, we recognise that any framework is, by definition, ‘out of date’, as much of what governs renewable energy deployment today will be based on law, policy and practice stretching back years, if not decades or more.

In this section, and working with our contributors, we have sought to both define success for a framework for 2035, and draw out the barriers of the existing framework that may hinder either getting to 2035 or the transition between the existing framework and a more appropriate future one.

5.1 Success criteria

At its first meeting the reference group for this report were asked to consider what success would look like, from which it developed a description of the change required described in broad times as:

By 2035, Wales has an intelligible, integrated energy regime in which Wales has sufficient powers, and there is a positive UK policy environment, so that energy in Wales is decarbonised, decentralised and diversely owned to deliver wide benefits to people in Wales and the Welsh economy.

And the following success criteria:

- reaching 100 per cent renewables by 2035
- offering co-benefits beyond the target, and also to take note of unintended consequences
- target and benefits secured and actioned in good time.

In exploring the co-benefits we note the emphasis on a Welsh energy system that is decarbonised, decentralised and diversely owned.

5.2 The barriers to address, or to avoid

Interviewees, participants and the wider work of the Re-energising Wales project have all helped identify barriers to the achievement of the 100 per cent vision. They have been broadly grouped and presented as reported to us below. This represents the range of views of those who spoke to us, and reflects both higher-level strategic issues, and more detailed issues where they have been clearly identified.

Political

- energy and renewables have been a low political priority
- Ministers have yet to be that interested in energy as a Welsh endeavour
- a fear of first mover disadvantage what if we get it wrong?
- politics of Westminster and Wales, intergovernmental relations
- confusion over powers
- a lack of a clear UK view on the future of renewables
- a contradictory UK view on lagoons
- a lack of champions for renewable energy in Wales

Attitudes

- a lack of ambition in Welsh Government
- a lack of confidence in 'Energy for Wales' as an idea or approach
- a lack of ability to recognise global opportunities
- insufficient knowhow and resources in terms of energy in Welsh Government
- Wales is one of many areas competing for investment
- uncertainty over who leads: Wales, the UK, the market, the developers?
- a lack of a holistic Welsh energy strategy, single minister/budget etc

Urgency

- delivering by 2035 will need massive front loading, how will we do that?
- need to take account of climate impacts, solutions will need to be resilient
- how to benefit from EU and UK support and other measures?
- how can we stop lagging and phase out old stuff faster?

Policy

- lack of a strong, clear and robust policy statement / contradictions between carbon and economic messages
- less grasp of energy as an industrial sector with scope for technology export
- the nuclear question is not fully resolved
- how will the National Infrastructure Commission for Wales function: what will the impact of research and recommendations be?
- heat (the Cinderella issue) is yet to be properly addressed
- who has control over transport policy for Wales?
- need to have a buses mindset (local and widespread) rather than a HS2 mindset (big projects)?
- where are the incentives, or penalties, compared say with the Welsh waste regime?
- not enough done to recognise or respect Wales' energy assets

Regulatory regime

- there is a confusing consenting regime
- the network regime is geography-blind
- the same marine licensing hurdles exist for a small pilot project as for an oil-rig
- market led solutions create losers and left-behinds
- the Contracts for Difference (CfD) mechanism does not necessarily help deployment of Welsh renewables as it is unsophisticated and cost-led
- what are the limits on inject-ability of green gas or hydrogen?

Delivery

- insufficient influence over Ofgem with regards to Welsh opportunities
- powers or expertise: a chicken-and-egg dilemma
- Welsh Government has yet to fully equip itself for its expanding energy powers and responsibilities
- Welsh Government has yet to optimise the gas and electricity networks in support of Welsh energy opportunities

Investment

- appears to be an old school economic model/view in Welsh Government
- what is Welsh Government's role in minimising investment risk?
- excessively cautious approach to public procurement regulation in Wales
- paucity of incentives for Welsh Government to develop energy
- Wales limited ability to subsidise renewable energy development?
- over reliance on Feed in Tariffs (FITs)

Infrastructure

- electric vehicle charging is limited in extent and coverage
- unknown opportunities for storage in Wales
- there are grid constraints, who is going to address them?
- capacity is poor in many local authorities
- there are boundary / border issues, for Wales and within Wales

Industry

- lack of indigenous suppliers and supply chain
- an adversarial culture in industry
- market pressures aren't helping at the moment
- lack of certainty for project developers

Location

- mid Wales is different, given existing infrastructure
- the lie of the land is important to what works where
- there are significant rural and off-grid needs to be addressed

While we have not sought to prioritise or weight the barriers, we can see that some highlight gaps or unanswered questions that need to be addressed, whilst others highlight an uncertain environment in which to work on renewables. Both of which make working in the renewables sector a challenge. Furthermore, other parts of the UK may be considered to have clearer or more definitive arrangements, such as Scotland.

Some of the barriers speak to how engaged or interested different people and organisations are, or are not. Some point to a situation where the mutual benefit connection has yet to be made, such as between renewable deployment and the Welsh economy, or insulated homes and health. Some touch on the challenge of working in a UK system, where Welsh interests and geography might require a different balance of considerations to deliver a Welsh set of outcomes. Finally, some touch on the need for collective Welsh leadership, and the right investment in capacity across Wales to take the opportunities that present themselves.

5.3 Approaches to the challenge

As we take these barriers into account we should note that the challenge is not solely a technical or energy related one. The report that instigated this programme of work, *An Economic Strategy for Wales?*⁹¹, was clear, as has been the Reference Group for this work, that there are wider co-benefits of a strategic shift to renewables, including fulfilment of many of the well-being goals of the Well-being of Future Generations (Wales) Act 2015:

- with the right development and ownership, renewable deployment will bring and retain prosperity to Wales and the people of Wales.
- a renewable approach tends to be a decentralised and distributed approach, which can offer greater resilience.
- reduced demand for energy, particularly for heat, would be good for prosperity and health if it reflects properly insulated homes that are also power stations.
- community and local ownership of energy generation can contribute to cohesion and thriving communities.
- greater renewables deployment, displacing fossil fuel use, helps Wales contribute as a globally responsible nation.

It is important to note that almost all of our discussions on the achievement of the 100 per cent ambition reflect this holistic view.

Any policy implementation involving physical infrastructure involves a multitude of activities and actors related to local engagement and buy in, land and buildings use, planning, financing construction, operations and other issues. It is also true that, in seeking to move our means of powering, heating and mobilising ourselves to wholly renewable sources of energy, we will be affecting a complex array of existing actors and infrastructures, as well as less tangible elements such as business models, ownership structures and community well-being.

Our discussions with interviewees and participants included the following questions:

1. Which existing policy or regulation that already contributes to the 100 per cent ambition should remain in use?
2. Which existing policy or regulatory levers are under-utilized, or need to be changed in some way?
3. What is missing from the current policy and regulatory regime that should be added?

All of our interviewees and participants offered potential solutions covering a wide range of measures, reflecting some or all of the barriers that they and the wider group had identified. This engagement generated over 100 different potential solutions, a list of which is available on request from the IWA. Examples of the suggested proposals are presented here to show the range and variety of proposed solutions, and the different means to their implementation:

- primary legislation by the UK or Welsh Governments, for example ‘creating a separate energy regulator for Wales’
- adaptations to secondary legislation, for example ‘changes to building regulations to create homes as power-stations’
- new policies or commitments (that may or may not require related legislation), for example ‘Wales to plan to have 100 per cent electric vehicle/hydrogen refuelling coverage by 2025’, or ‘Wales to set building energy standards to meet the (EU) energy performance building directive’, in other words be ready for smart grids and electric vehicles (EVs)
- new capacity or resources, for example ‘creating a dedicated Energy Minister’, or ‘Welsh Government ensuring sufficiency implementation capacity in local government, Natural Resources Wales (NRW) and other bodies’
- specific expectations of particular actors and their functions, for example ‘Dwr Cymru to be engaged in optimising renewable deployment on its estate’, or ‘National Resources Wales to wholly own energy projects on ‘their’ land’
- expectations of collective action, through the emerging regional partnerships or city deals, or new fora, for example ‘a Stakeholder Forum’
- the creation of new agencies or organizations, for example ‘a Welsh Energy Agency’, or ‘Welsh Energy Service Companies (ESCOs)’.

It is worth noting that few suggestions were made regarding specific legislative changes, and that many proposed solutions would not require legislation or devolution of powers to be implemented. Rather the solutions identified lie in the behaviours and actions of the various actors involved, behaviour that may not always be directable, predictably or otherwise, by law or policy.

5.4 Developing a package of measures

A workshop brought together the reference group and a cross section of interviewees. They were asked to consider how to use any or all of the proposed solutions, or introduce further potential solutions, so as to create a package of measures that would meet the three criteria:

- reaching 100 per cent renewables
- offering co-benefits beyond that target, and also to take note of unintended consequences
- target and benefits secured and actioned in good time.

Participants worked in three groups that brought together practitioners, Welsh institutions, academics, and reference group members. They created three packages of measures, as well as a number of further measures. Two groups suggested the creation of a carbon tax, while other additions included:

- particular support for storage and off-gas solutions for Wales
- drive forward district heating especially for new settlements
- additional communication of developments, in the sector (e.g. knowledge transfer), and also for the public as the energy transition has a greater impact on day-to-day living
- greater emphasis, tools or requirements to procure Welsh renewables.

The first group highlighted a cluster of measures around demand management and improved building stock, highlighting Welsh scope for action (focused on powers and tools held in Wales), as well as social scope, i.e. interventions that would add value that went beyond a basic economic calculation. They expected to see new actors focused on addressing climate breakdown locally with greater accountability across the system (with fines, as in waste management, if necessary). They felt Welsh Government should focus on local solutions, including storage, to accelerate infrastructure change.

The second group highlighted the opportunities to design out fuel poverty, and to secure a 100 per cent electric vehicle/hydrogen refuelling for Wales. Their Welsh Government had a role in incentivising action, and supporting better enforcement, for example through local building standards, to drive performance. They also recognised energy should have a continued voice at the Welsh Government Cabinet table. They identified a need for a single low carbon economy plan, and felt Ofgem had a clear role in supporting this, for example by helping to match local supply and demand.

The third group took a five to 20 year view, and wanted their Welsh Government to have a vision to match that, with a single integrated low carbon prosperity for Wales plan, the support of a dedicated minister, and an investment bank. This group wanted Wales to be ready to seize the opportunities Brexit may present.

Comparing their approaches, the following overall observations can be drawn from the work and discussion of the participants:

- There is a strong emphasis and focus on the local, the built environment and new opportunities which offers greater co-benefits, rather than big, national (and UK serving) options, for achieving the 100 per cent ambition.
- There is no obvious silver bullet, many solutions need to be enacted.
- We should generally avoid creating further organisations or entities than we have at present, rather we must influence the design, establishment and early action of those entities that are emerging, helping to bake energy into their agendas, for example focusing on the National Infrastructure Commission for Wales and the four regional collaborations (see below).
- We should seek to demonstrate Welsh methods and approaches that are more effective, as far as existing frameworks allow, for example in how Wales engages Ofgem in affecting how the Well-being of Future Generations (Wales) Act 2015 influences and changes the approach of energy bodies operating in Wales.

- How Wales can finance, or secure finance for, a distinct Welsh approach is a key issue, including the role and use of public borrowing, and incentives or penalties.
- How we can focus on those things that are the ‘propellants of action’ in and for Wales, for example, how collaboration between Welsh public bodies can create impacts and catalyse wider benefits.
- Clarity of purpose is required, to inform both what Wales should then pay little further attention to at this time, and to provide a focus on specific Welsh issues or opportunities, which would probably include:
 - building fabric, new builds and retrofit of existing homes
 - uses of heat, particularly fuel poverty and heat transition
 - off-grid homes and transport, which would provide greater benefits to Wales given the greater proportion of off-grid and car dependency
 - new fuels and vectors, particularly energy storage and hydrogen (new fuels and vectors)
 - Wales needs to have a single, and what can only be a low carbon, energy and industrial /economic strategy.

The ‘regions’ of Wales

In focusing on the establishment of emerging entities as a route to action, there was a particular reference to the National Infrastructure Commission for Wales, and the four regional economic collaborations.

The group adopted a four regions approach in part because of the IWA's earlier work with and on the SBRC (see the *Swansea Bay City Region: A Renewable Energy Future*⁹² report). That has confirmed a growing realisation from contributors, and the Re-energising Wales Steering Group, that the existing energy infrastructure of mid Wales clearly indicates a different potential energy future (for example, all electric) to that of the SBRC, and organising for four areas would give each their best chance of flourishing. This would give the following regional focus:

- North Wales Economic Ambition Board (NWEA)
- Growing Mid Wales (GMW)
- Swansea Bay City Region (SBCR)
- Cardiff Capital Region (CCR).

Being focused on this ‘tier’ approach benefits from sufficient scale as to take a strategic view of the energy opportunities 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.

Summary

The workshop and reference group participants concluded that the way forward for Wales, towards 100 per cent renewable energy by 2035, would be built on the following four building blocks:

- 1. Set out this agenda and ambition in a singular low carbon economic strategy**

- 2. Focus on a few key elements to that ambition**

- 3. Deploy the tools it has to achieve this ambition**

- 4. Firm up any remaining tools it may need to achieve this ambition.**

6

Towards a wholly renewable future for Wales

6 Towards a wholly renewable future for Wales

While any future framework does not necessarily have to address all the barriers of the old system, as it can avoid or negate their affect, it is worth us touching on how the four building blocks proposed relate to the barriers, before drawing our conclusions and recommendations for the way forward.

The first building block clearly seeks to address the question of leadership by Welsh politicians and the machinery of the Welsh state. This and the second building block contribute to certainty and clarity of what should, or should not, be the focus for attention. A overarching low carbon economic plan would also help surface the mutual and co-benefits, while the third and fourth elements focus on making the most of the tools that Wales has, or can deploy. While there may be further tools to come, Wales can act with those it already has.

We note the strong emphasis and focus from many interviewees and participants in the workshop on the local, the built environment and new opportunities, as opposed to large scale, national (and UK serving) options for greater renewable deployment to achieve the 100 per cent ambition. One way of describing this, reflecting the nature of the electricity system, is that this is much more about activity at the distribution scale than at the transmission scale.

In part this emphasis was based on the greater co-benefits a house-by-house, community-by-community, car-by-car approach might take, from localized wealth generation through **homes as power stations**, to cleaner air through 100 per cent fossil free transport.

While this does not rule out bigger projects, as they will still be needed to achieve the ambition, it does highlight a challenge for the Welsh Government: how to better balance its resources and action in the years ahead. We have taken that emphasis to lie with the locally owned, deployed and run, which has implications explored below, with suggestions for measures Wales should adopt going forward.

Ownership

As we noted in the introduction there is an important question to consider: the relationship between 'enabling Wales to meet' the targets and Welsh ownership of the means. From our discussions it is clear that there are three perspectives to the realisation of the 100 per cent renewables ambition.

The first is made up of those things that will happen in Wales because of the framework established by the UK Government; and the corresponding response of developers and other actors to that framework – a framework in which the Welsh state is largely passive. That approach might be best described as one that will tend to be about renewables, at scale, with UK market conditions being the primary arbiter of whether and what renewables are deployed where.

The second perspective is an active approach to the UK framework from the Welsh state and public bodies. That would include making the most of the UK framework for Wales, while acknowledging the approach would not unduly change the nature of the framework. In this context Wales would seek to get a fair or larger share of renewable development, with greater ownership by Welsh based entities, for example maximising access to Feed-In-Tariffs (FIT), recognising the framework would still tend towards (global) market based solutions. We note that other devolved parts of the UK have taken this approach.

The third is what happens in Wales because of the framework established by the Welsh Government. That framework is one that could make the most of local and regional energy assets, that could deliver homes that are power stations, and see widespread local, community and home ownership of renewable generation. While elements of this range in scale from the house to the neighbourhood, the potential reach of such an approach is such that it could engage, involve and benefit every household in Wales.

From a choice of three approaches above, which we have coined passive Wales, active Wales, Welsh Wales, the emphasis of the workshop discussion was a clear preference for a Welsh Wales approach.

That would suggest using building blocks that are focused on elements of renewable deployment that are more local, more bottom up and potentially more likely to be a consideration for the distribution network than the transmission network; and as part of an approach that benefits the whole of Wales. Here we explore how to deliver on the building blocks.

6.1 How to get to a singular low carbon economic strategy?

The *Prosperity for All: economic action plan*⁹³ for Wales is the obvious end point for a singular low carbon economic strategy; and since its publication in 2017, the Welsh Government has promoted two key interventions that will change the nature of future economic success in Wales, specifically:

- the creation of carbon budgets for Wales, with an imminent low carbon delivery plan to 2020 and future independent Committee on Climate Change assessments of progress
- the Welsh and UK Government's request to the Committee on Climate Change for advice on achieving net-zero emissions before 2050⁹⁴.

A further reframing moment comes with the election of a new First Minister for Wales before the end of 2018. They can be expected to recast a number of existing policies to reflect their political and policy agenda. Clearly a First Minister that owned an agenda of a wholly renewable Wales would be a powerful force, putting themselves and their government on the right side of these opportunities for Wales.

93 Welsh Government, *Prosperity for All: economic action plan*, December 2017

94 Scottish Government, UK Government and Welsh Government, *letter to Lord Deben*, October 2018

In the current *Prosperity for All: economic action plan*⁹⁵ energy is expressed as an enabler with observations on the need for energy efficiency most prevalent. Even if local renewable deployment is simply considered an enabler of the Welsh economy, it requires and deserves greater resourcing and government application. This ought to be at least of the order of the south Wales metro or the proposed M4 relief road, given it would reach more people and have greater sustainable economic effect than either, if supported to a similar level of investment and organisational application.

Yet the scale of the Re-energising Wales ambition and the shadow of Brexit demand a more urgent course of action than an ‘in due course’ revision to the EAP might allow. We therefore recommend the new First Minister creates a Low Carbon Stimulus, resourced to a proportionate level as transport.

The potential scope of the Low Carbon Stimulus is explored further below. We recognise the Welsh Government will soon publish a low carbon delivery plan. As that is a specific response to the first carbon budget it would not be appropriate for the delivery plan to become the Low Carbon Stimulus, nor vice versa; though we would expect the ongoing work on the delivery plan to inform the Stimulus.

Future development of the Economic Action Plan

We would argue that local renewable energy deployment is actually much more than just an enabler of the economy, and has a key role in enhancing the Economic Action Plan’s⁹⁶ ability to affect spatial inequalities and raise prosperity. We note the observations of a number of contributors, and our own estimates (for 2016), which suggest the value of energy consumed in Wales is as much as £10bn per annum⁹⁷, with much of the value potentially leaving Wales.

Welsh renewable deployment is an excellent means through which to address special inequalities and raise prosperity. Therefore, in the next revision of the Economic Action Plan renewable deployment, we believe that energy should be recognised as a **primary Call to Action**, and consideration be given to its inclusion as the **fifth Foundation Sector** of the Welsh economy. It would also be appropriate for a future Economic Action Plan to distinguish the fourth region of Mid Wales, given the different energy, and economic futures of Mid Wales and SBCR.

6.2 How to focus on a few key elements?

Given the proposals with greatest support were grouped around the following elements, we can see a clear emphasis on the local, the built environment, and whole Wales benefits:

- much greater Welsh ownership of the energy system, including more local/diverse ownership
- securing energy wealth in Wales through a whole house, every house, **‘homes as power stations’** scheme, and thereby also abolish fuel poverty

95 Welsh Government, *Prosperity for All: economic action plan*, December 2017

96 Welsh Government, *Prosperity for All: economic action plan*, December 2017

97 Author’s calculations derived from Energy Consumption in the UK data tables, Department for Business, Energy & Industrial Strategy, *Energy consumption in the UK*, July 2018

- widespread and accessible provision of electric vehicle charging/hydrogen refuelling points by 2025
- making both marine and hydrogen a Welsh niche in terms of energy endeavours.

Each should feature as a theme of the Low Carbon Stimulus.

Over time these priorities will become embedded parts of future Economic Action Plans, given the link between the co-benefits and the wider well-being objectives. For example, upgrading homes would also support the health and care sectors, by reducing ill health caused by damp and poor heating; while 100 per cent electric and hydrogen refuelling would support the Tourism and Food foundation sectors, by ensuring those with non-fossil fuel vehicles can access every part of Wales with confidence they can get home.

The Low Carbon Stimulus

Given any Brexit outcome will have short term negative impacts for Wales the new First Minister should pump prime the Welsh economy with the low carbon action its medium-term future requires. This would provide urgency, in response to Brexit, while pump priming renewables deployment over the next 18 months, e.g. to mid 2020.

Such a plan would build on the framework and ways of working of the Economic Action Plan with the focus provided by this report, and could include elements such as the following indicative proposals:

- additional funding for greater capacity in Community Energy Wales
- match funding for community energy projects
- ramped up support for the development of additional demonstrator sites for SPECIFIC homes (at least one site in each region)
- roof 'scrappage' schemes to convert existing roofs, and loft spaces into insulated rooms and solar or green roofs (with potential to be modular off-site construction)
- ramped up funding and capacity for the Welsh Government Energy Service
- support to the four regions to secure renewable energy resource mapping before 2020
- match funding at 50:50 to grants from the BEIS Heat Deployment Unit to secure studies for heat schemes in the major urban areas of Wales
- match funding to hydrogen and electric re-fuelling roll out, particularly to the Welsh National Parks
- create an innovation competition with Innovate UK to explore hydrogen powered gas turbine electricity generation, to be piloted with one of the CCGT units in Wales.

A further incentive for such a Stimulus would be the concern, expressed by a number of participants, is that the UK renewable pipeline of major projects is ebbing. While larger, transmission connected projects will still come forward, given they are as much supported by the UK regulatory regime as any powers held in Wales, now is a good time for Wales to step up regional opportunities for local delivery and build **homes as power stations**.

A Welsh Low Carbon Stimulus allows Wales to take action whatever the pipeline of large projects.

6.3 How to deploy the tools it has to achieve this ambition

A Low Carbon Stimulus building on the Economic Action Plan and delivering against the low carbon delivery plan would require drive and accountability. The creation of carbon budgets for Wales, with oversight from the Committee on Climate Change, will create a new mechanism for accountability that the Welsh Government will need to take into account and be able to respond to.

A new Welsh Government Cabinet portfolio uniting energy, home, place and community

would help reinforce the case for a robust presence for renewable energy around the Welsh Government table. While a proposal for a dedicated Energy for Wales Minister was suggested, when it was considered the group concluded energy needed to remain, if not be strengthened at the Welsh Government Cabinet table. We note that while planning and rural affairs are relevant combinations they are not necessarily those required going forward. A growing Welsh emphasis on local area energy mapping, combined with the energy interest of the four regions suggests a different approach.

As Welsh renewable ambition ramps up, and as new powers and policy come into being, with the Low Carbon Stimulus to drive it, we propose the new First Minister considers revised portfolios around the delivery of this ambition.

The most obvious option would be to link the role more explicitly with the economy and transport, for example Energy, Economy and Transport. This reinforces the whole economy nature of energy, though it potentially risks an unduly big projects approach to what is delivered, and some have already suggested this would be too broad a portfolio.

With our primary focus of local opportunities and the built environment in mind, we propose an alternative approach that really ties energy to those that use it most: people, in homes, in places and communities. This will reinforce the link between the benefits of energy deployment and thriving places, communities, and the built environment.

The emphasis on local, on the built environment and on local ownership from our contributors suggests this much closer link to community and local government action, building on local government's role in planning, housing growth, building standards and delivery, regeneration and retrofit; helping deliver energy positive homes: building wealth and reducing net demand.

Aligning the delivery tools

Creating such a portfolio would offer the new First Minister a real opportunity to raise the profile of energy for Wales, helping Welsh Government take greater ownership, and drive greater alignment and activity across all the levers it can deploy, not least the Low Carbon Stimulus, and encouraging other community, private or public bodies.

As some elements of the policy and guidance that follow from the 'Four Acts' are still to be finalised, for example the Marine Plan and the National Development Framework, we would encourage those responsible to consider how their formulations support a much greater, faster deployment of renewables that also brings the co-benefits we have touched upon. Noting that spatial inequalities and place are important drivers of success, the following tools should be strengthened:

- ensuring sufficient implementation capacity in the regional collaborations of local government, in Natural Resources Wales and other relevant public bodies. This should include support for energy planning across each region before 2020
- using Welsh (devolved) powers to raise building standards at a faster rate to achieve prosumer standards by 2022

- ensuring enhanced capacity and capability in the building sector via the promotion of best practice, whilst ensuring improved building standards enforcement across Wales as part of the quality control process
- ensuring a planning regime that robustly supports⁹⁸ these ambitions:
 - locally and regionally, for example to support prosumers in new developments, and offering place by place flexibility
 - followed by onshore and offshore developments, acknowledging the implications of existing energy infrastructure in each region
 - is in place and settled by 2020
- acknowledging the implications of existing energy infrastructure in each region
- further maximising the impact of the powers of the Wales Act 2017, which could also include using:
 - capital borrowing to focus on local renewable deployment
 - marine licensing to proportionately support renewable pilots
 - ports policy to incentivise, or support renewables deployment in and for port uses
 - speed limits to reduce fossil fuel use, for example 20mph across urban Wales
 - bus registration and taxi regulation to support their transition from fossil fuels
 - renewable energy incentive scheme consultations, to improve, extend or expand their deployment
 - financial assistance for inland waterways and sea freight, to incentivise or support the deployment of renewable fuels
 - licensing of coal-mining operations in Wales, to end coal-mining operations in Wales
 - consenting energy generation up to 350MW and for 132Kv power lines
- to secure a distribution grid that serves Welsh prosumers and renewable deployment (explored further below)
 - duties on Ofgem with regard to the National Assembly to develop an energy framework and infrastructure fit for Wales 2035 (explored further below).

A revised Welsh Government Cabinet Portfolio deploying the powers of the four Acts, coupled with relevant Welsh innovations such as the prosuming homes designed by the SPECIFIC project, can have an immediate effect on our ability to reach the 100 per cent ambition.

Beyond retrofit - homes as power stations

The SPECIFIC project⁹⁹ led by Swansea University is developing homes that go beyond reduced energy demand and beyond low carbon to be homes that are energy generating homes. With the dual challenge of fuel poverty and decarbonising energy, especially heat, the nature of the homes we build and inhabit will be a key determinant of success.

⁹⁸ noting some participants would include a presumption in favour of renewable development

⁹⁹ SPECIFIC, [Home](#), accessed October 2018

For too long the UK has allowed the building of homes that are not fit for a low, let alone zero carbon future, and has used energy bills as a partial means to make up this deficiency with the Energy Company Obligation (ECO) and previous energy bill levies. Those levy costs are regressive, falling on those least able to pay them, are insufficient to meet the overall retrofit challenge, and are particularly bad for rural bill payers who see little or no benefit¹⁰⁰.

We note powers regarding fuel poverty are devolved. With devolved powers over building regulations and the deployment of domestic retrofit measures the Welsh Government can and should seek to end this poor deal for existing householders by providing an enhanced scheme that aims to deliver a whole house, energy positive upgrade. Welsh (devolved) powers should be used to raise building standards at a faster rate to achieve 'prosumer' standards by 2022.

If every existing Welsh household has the opportunity to be a 'prosuming' household, that would give Wales the opportunity to design and improve out fuel poverty, and rebalance the economy with benefits to all householders. A 'prosuming' household is one that would both produce and consume energy, with scope to also export energy at times of surplus/when not topping up their own energy storage. This can support all tenures, and 'prosuming' can become an everyday occurrence for everyone¹⁰¹.

Such an approach would also require a planning regime that robustly supports these ambitions, through both Local Development Plans and the forthcoming National Development Framework, in place and settled by 2020. This would mean higher standards of new build than currently in place to support 'prosuming' developments, and to design out fuel poverty.

Across Wales there are thousands of planning permissions for new homes, and many of our participants were concerned that they had been offered a standard of house build that would, sooner rather than later, require retrofitting to be fully energy efficient, or better still be able to produce some of their own energy.

Our work reached the view that we need to avoid building even more homes that would require future retrofit. Being able to raise build standards further, faster, would have a meaningful impact on future energy use, future levels of fuel poverty, and new jobs in the construction sector.

Building Standards

While there is an urgent need to upgrade our new home standards there is an even more urgent need to ensure what is being and about to be built meets the standards required of them. With an emphasis on energy in the built environment there is a particular need to ensure that existing and future building standards are fully regulated on site. That will require work across Wales to invest in a dedicated building standards enforcement workforce.

The Welsh Government, Welsh Local Government Association and industry bodies should work together to create enhanced capacity and capability in the building sector. This should include promotion of best practice, whilst ensuring that building control carry out improved building standards enforcement across Wales as part of the quality control process. This would need to be a workforce that can go beyond current basic enforcement, and prepare them 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.

100 Institute for Public Policy Research, *Beyond Eco The Future of Fuel Poverty Support*, June 2018

101 Dr Nikki Fox, *A distributed energy future for the UK: An essay collection*, August 2018

6.4 Firm up the tools it might need to achieve the ambition

There is also a need to ensure a number of specific activities receive attention, those being:

- engaging with Ofgem to enhance RIIO-2¹⁰² for Wales
- ending fossil fuel electricity generation in Wales
- being prepared for:
 - a UK Net Zero 2050 emissions target
 - a new regulatory framework for energy in the 2020s.

Ofgem's role in and for Wales

*'Ofgem is the Office of Gas and Electricity Markets. We are a non-ministerial government department and an independent National Regulatory Authority, recognised by EU Directives. Our principal objective when carrying out our functions is to protect the interests of existing and future electricity and gas consumers.'*¹⁰³

The framework that Ofgem regulates is set by the UK Government primarily through the Department for Business, Energy and Industrial Strategy (BEIS).

During the course of this work observations have been made about the role of Ofgem, and elements of the energy system that it regulates throughout our engagement. These include issues of grid capacity and connectivity, the cost of 'access', the ease of connection, the constraints of the grid, and the availability of 'support', as well as the challenges of maintaining reliable supply, ensuring standards are met and broadly ensuring anyone connected to either gas or electricity grid gets the same service. Everything from a new Welsh energy regulator to carbon taxes and Welsh powers to set energy subsidies, or move beyond 'subsidy' have been proposed during our research.

In the short term we both recognise the limitations our contributors have noted and look to take opportunities to secure better benefits for Wales, before RIIO-2¹⁰⁴ sets the scene for the forthcoming price control period, governing investment and maintenance for much of the 2020s.

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 enhanced RIIO-2 outcomes for Wales; this should include a dedicated team in Welsh Government who work with Ofgem.

With 2019 seeing the submission of network company business plans for the 2020s to Ofgem, 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-2¹⁰⁵

102 Ofgem, [What is the RIIO-2 price control?](#), July 2018 RIIO-2 is the shorthand for the second price review for energy network operators, overseen by Ofgem, where RIIO refers to this 'formula' - Revenue = Incentives + Innovation + Outputs

103 Ofgem, [Who are we](#), accessed October 2018

104 Ofgem, [What is the RIIO-2 price control?](#), July 2018

105 Ofgem, [What is the RIIO-2 price control?](#), July 2018

settlement for Wales. Getting the best for Wales should be framed at least by the declared 2030 goals of the Cabinet Secretary for Energy, Planning and Rural Affairs, i.e. to ensure that 1GW of renewable electricity capacity is to be locally owned by 2030 and 70% of Wales' electricity consumption is to be generated from renewable sources by 2030.

This would build on commitments recently made by the Cabinet Secretary for Energy, Planning and Rural Affairs to convene a future networks group¹⁰⁶, which should involve all three fuel networks (petroleum, gas and electricity supply) so as to understand the opportunities for supply integration or beneficial enhancement in different geographical settings. We have already noted the future energy system solution for Growing Mid-Wales may not be the same as for other regions of Wales. Having a representative from each of the regions would also enhance the ability of the group to secure appropriate benefits region by region.

The convened group should develop a collective understanding of:

- a proactive grid improvement plan to future proof the grid for Wales so that it can be utilised to respond to Wales' specific energy aspirations, noting the need to:
 - support a continued growth of embedded renewables that support prosuming
 - consider the opportunities for and of local networks for off-grid communities
 - ensure 100 per cent Wales coverage of EV and hydrogen refuelling centres
 - in turn secure larger scale renewable deployments
- future opportunities under Network Innovation Competitions¹⁰⁷
- an effective planning and consenting regime to deliver the above (for 132Kv lines and below)
- where, in light of these plans, connection in 'advance of need' could be an appropriate investment by region or from the Welsh Government
- whether the network companies, working with the regions, should apply for derogations¹⁰⁸ or a 'sandbox' approach¹⁰⁹ (opportunities to vary the application of a Code or standard), to develop an innovative approach appropriate to a local energy system issue.

Electricity grids in particular need to be 'future proofed' for decarbonisation when considering the electrification of heating and electric vehicle rollout and the need for electric vehicle charging points in such areas. We need to address the availability of grid issues across the whole of Wales in order to both aid the rollout of electric vehicles and also allow Wales to connect more renewable energy schemes to hit renewable energy targets.

The pan-Wales future networks group could then create a planned and regionally engaged plan for the networks in a holistic and future proofed way, moving on from some of the historic issues of grid connectivity to a way of using RIIO-2 to give Wales the networks it requires for 'prosumers', **homes as power stations**, universal fossil free vehicles re-fuelling, much expanded marine and hydrogen deployments, as well as reflecting regional priorities.

106 Welsh Government, *Transforming energy in Wales keynote address Lesley Griffiths AM, Cabinet Secretary for Energy, Planning and Rural Affairs, Welsh Government*, September 2018

107 Ofgem, *Network innovation*, accessed October 2018

108 Ofgem, *Derogations from standards*, accessed October 2018

109 Ofgem, *What is a regulatory sandbox?*, September 2018

Ending fossil fuel generation

Electricity generation in Wales is significantly higher than electricity use in Wales, with electricity 'exported' to England. As we have explored earlier, there is a growing proportion of renewable generation that is approaching 50 per cent of Welsh electricity demand, as well as seven power stations that burn coal (one) or natural gas (six) to produce electricity. The development of Welsh carbon budgets highlights a disproportionate amount of gas generation for Wales, compared to the UK. The Committee on Climate Change has also identified planning permission for three further natural gas CCGT¹¹⁰ power stations in Wales, all at 299MW.

Such permissions are clearly under the 300MW threshold for future fossil fuelled power stations to be carbon capture ready.¹¹¹ In the absence of deployable carbon capture in Wales, this highlights a risk of further fossil fuel plants being proposed at this scale of generation. As powers in the Wales Act (2017) devolve planning consent to Welsh Ministers for generation up to 350MW, the Welsh Government should explore one of these options:

- a moratorium on future fossil-fuel generation in Wales under 350MW
- the scope to consent future thermal generating plants powered solely by hydrogen or other fossil free renewable gas (produced in Wales)
- the scope to retrofit existing fossil-fuel thermal plants to use hydrogen fuel instead of natural gas.

The later options would create a new market for, and enhance, short to medium renewable gas production, and support wider Welsh measures to create a hydrogen niche opportunity, as one key step in that is expanding hydrogen demand.¹¹²

Being Prepared

While it is difficult to predict the impact of the outcomes of Brexit for the 100 per cent ambition, Wales can at least prepare for, if not take a first mover approach towards, two changes to the UK energy framework that can be considered highly probable. We believe that addressing these two changes to the UK framework will significantly help to progress the Re-energising Wales ambition of 100 per cent renewables.

First, in a submission to the UN climate agency (2018) the UK confirmed: *'The UK will need to legislate for a net-zero emissions target at an appropriate point in the future to provide legal certainty on where the UK is heading'*.¹¹³

As part of Green Great Britain week 2018, the Scottish, Welsh and UK governments¹¹⁴ jointly requested the Committee on Climate Change update their 2016 advice, so as to *'... inform consideration of the UK's long term targets, and should include options for the date by which the UK should achieve a) a net zero greenhouse gas target and/or b) a net zero carbon target ...'*

- 110 CCGT - Closed Cycle Gas Turbine, used in more recent power station developments as the means to convert gas to electricity
- 111 Department of Energy and Climate Change, *Carbon Capture Readiness*, November 2009
- 112 Policy Exchange, *Fuelling the Future*, September 2018
- 113 HM Government, *submission to the UN climate agency*, 2018
- 114 Scottish Government, UK Government and Welsh Government, *letter to Lord Deben*, October 2018

A UK commitment to a 'net-zero' emissions reduction target by 2050, up from the current 80 per cent, would have consequences for the carbon budgets set for Wales, and most likely raise the challenge to be faced in the third and subsequent budgets (given the first and second Welsh carbon budgets will be published in the spring in 2019).

Second, and in parallel with the work to secure the best RIIO-2 settlement, Wales should be preparing for future changes to the legislative framework for energy regulation. This can be expected because of the greater challenge of the net zero challenge, and a growing understanding, expressed by a number of contributors, that the current framework is sub-optimal.

While the current regime, and much of Ofgem's practice, is market-led and place agnostic, a number of contributors suggested a growing recognition that this may not be delivering the most customer friendly or cost effective outcomes generally for the UK, or specifically place by place.

The current framework can be considered suboptimal because it has a limited ability to reflect the different current or future needs of customers in Cardiff, Caerphilly or Colwyn Bay. The challenge of 80 per cent, let alone net zero, means a more holistic approach is required to energy markets, as solutions are emerging that are both local and integrated between energy supplies and energy uses. It makes sense for any future regime to encourage gas, power and fuel systems to work together to support the best local solutions for heat, power and mobility; solutions that will vary by local geography and legacy.

In doing so the Welsh Government will want to ensure a framework that delivers for Wales, specifically one that offers greater recognition of decentralised energy (electricity and for heat) supply. The Welsh Government should join with other devolved nations, combined and local authorities of the UK, to help create a future energy governance and regulatory framework that reflects the decentralised needs of Wales. This would be to ensure the primary legislation required to create what might be RIIO-3, for the later 2020s, is much better at responding to the needs of places, as the energy transition beyond carbon continues at pace.

While much of the next four years must be concentrated on immediate action and the Low Carbon Stimulus, a nod to the mid-term should see greater engagement with Ofgem and the network companies to build a grid fit for Wales's ambitions, to ensure any new build is of the highest standards of build possible and to consider what else needs to be done to address net zero emissions, including phasing out fossil fuel electricity use in Wales.

7

Conclusions and recommendations

7 Conclusions and recommendations

The work of this report was drawing to a conclusion just as the October 2018 Special Report on Global Warming of 1.5°C¹¹⁵ of the Intergovernmental Panel on Climate Change (IPCC) was published. It reminds the nations of the world that time is short and urgent action is needed, if we are to avoid the worst impacts of climate breakdown. They predict that

‘the average global temperature will hit the crucial threshold of 1.5 degrees Centigrade above pre-industrial levels by 2030.’

The time for increased Welsh action is now, in this Assembly, and from this Welsh Government, not the next, or the one after that.

With a ‘globally responsible’ well-being goal, Wales has a direct commitment and ambition to act in response to the challenges of climate breakdown. Yet for some this challenge is both too big and too distant, when faced with daily challenges of low incomes, greater costs of living, poor housing, or long hours, a challenging commute, or fragile demand for their work, or the goods and services they help provide.

Thankfully there are solutions that both address the global challenge and deliver a Wales that is prosperous, resilient, healthier and more equal – by creating a sustainable energy system that delivers for Wales. In exploring this opportunity, we note that:

- almost all of our discussions on the achievement of the 100 per cent ambition recognise this holistic view of the benefits
- many solutions will be in the behaviours of the various actors involved
- there is a clear distinction between an approach that maximises renewable deployment, and one that maximises Welsh benefits from renewable deployment
- that there are no singular silver bullets, as action is required by many actors on many elements of the energy system as it transitions.

Success

With our ambition set, our reference group described success as:

- 100 per cent renewables by 2035
- offering co-benefits beyond that target, and also to take note of unintended consequences
- target secured and actioned in good time.

With the change they wished to see described as:

Wales has an intelligible, integrated energy regime in which Wales has sufficient powers and there is a positive UK policy environment, so that energy in Wales is decarbonised, decentralised and diversely owned to deliver wide benefits to people in Wales and the Welsh economy.

7.1 The framework to 2021-2

With an urgent focus on this Welsh Assembly period we identify **the key steps** that need to be taken to deliver on the 100 per cent ambition.

Wales has many of the tools it needs to make swift progress. Wales does not need further powers to act in the immediate future.

The time for greater action is now, in this Assembly, and it must come from this Welsh Government, not the next, or one after that. Tools to reduce and better manage our demand for energy, coupled with the tools to deploy more renewables, are already ours. Wales now needs to release its can-do attitude.

In the short term, with the challenges of Brexit, it is difficult to see a more positive UK policy environment in this field. We believe Wales can make substantial progress, and should take immediate increased action in the areas where it has existing powers. **Wales must progress what it has the power to progress with the urgency of a Low Carbon Stimulus.**

Our contributors suggest that, as the Wales Act 2017 is implemented, in concert with the detailed policy and guidance of the trio of Acts that preceded it, Wales has the tools it needs to act. **Wales has the potential to close in on an intelligible, integrated energy regime of its own.**

Finally securing such a regime will be enhanced by **a Low Carbon Stimulus**, a continued presence for energy around the Welsh Government Cabinet table, and a dedicated team in Welsh Government to work with Ofgem in Wales to secure Welsh benefits from RIIO-2.

Our work suggests that the Low Carbon Stimulus and the revised Economic Action Plan to follow in due course, 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, and thereby abolish fuel poverty

- 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.

A **Welsh Government Cabinet Portfolio** that strengthens the relationship between energy, home, place and community (as the powers in the Welsh energy framework are primarily about building scale, local and smaller scale energy deployments), should be accompanied by a number of interim ambitions to guide delivery and practice, as follows:

- a revised renewable electricity target of 100 per cent by 2030, up from 70 per cent (same basis)
- a next step ownership target for local and community energy of 1.5 GW for 2035 (approximately 12 per cent of 2016 capacity)
- a target of 600,000 homes built, or upgraded to **'homes as power stations'** by 2030
- 50 per cent geographical coverage across Wales of non-fossil fuel refuelling facilities, in both rural and urban areas, by 2025
- an updated marine energy target (from 2011) as part of the Marine Plan
- a hydrogen production target for 2025, in light of the findings of the CCC Hydrogen report (due November 2018).

For the rest of this Assembly term **the Welsh Government should future align the delivery mechanisms it has** to make maximum progress by:

- ensuring sufficient implementation capacity is in place in the regional collaborations, in Natural Resources Wales and other relevant public bodies, either by direct support or a greater priority for energy in their work. This should include support for energy planning across each region before 2020.
- using existing Welsh powers to raise building standards at a faster rate to achieve prosumer standards by 2022 (i.e. while all buildings 'consume' energy this would be a building that also produces energy, to the benefit to the householder).
- working with the Welsh Local Government Association and industry bodies to create enhanced capacity and capability in the building sector, including promotion of best practice, whilst ensuring that building control carry out improved building standards enforcement across Wales as part of the quality control process.
- ensuring a planning regime that robustly supports the 100 per cent ambition, for example to support 'prosumers' in new developments, and offering place by place flexibility, followed by onshore and offshore developments, and is in place and settled by 2020.

The Welsh Government Cabinet, across all portfolios, can ensure that the impact of the powers of the Wales Act 2017 are optimised, with examples including, but not limited to:

- capital borrowing to focus on local renewable deployment
- marine licensing to proportionately support renewable pilots

- consenting energy generation to 350MW and 132Kv power lines:
 - to end fossil fuel power generation in Wales,
 - to secure a distribution grid that serves Welsh ‘prosumers’ and is future proofed so that it can be utilised to respond to Wales’ specific energy aspirations around renewable deployment
- duties on Ofgem with regard to the National Assembly to develop an energy framework and infrastructure fit for Wales 2035
 - engaging with Ofgem to get the best RII0-2 deal for Wales
 - being prepared for a UK Net Zero 2050 emissions target and, related, a new regulatory framework for energy 2020s.

7.2 Being Prepared: beyond 2021

Immediate activity should form 80 per cent of the agenda, with only 20 per cent of the action of the Welsh Government and/or public bodies focused beyond 2021, a new Assembly period for Wales, with 2022 as the date for a UK general election under the Fixed Term Parliaments Act.

Action focused beyond 2021 should concentrate on changing the energy framework to best suit Welsh ambitions.

That would include a revised Welsh Government Economic Action Plan that should seek to make the most of the economic potential of energy in and for Wales, with energy being recognised as a primary Call to Action, and consideration be given to its inclusion as the fifth Foundation Sector of the Welsh economy.

It will also include Wales joining efforts with the other devolved nations, and devolved localities of England, in lobbying for changes to energy (system) to help create a future energy governance and regulatory framework that reflects a decentralised renewable energy system that will benefit Wales, with the expectation that this would lead to primary legislation in the UK Parliament after 2022, and provide a new framework for what would be considered to be RII0-3 in the mid to late 2020s.

Looking further ahead, a UK commitment to a ‘net zero’ emissions reduction target by 2050, up from the current 80 per cent, would have consequences for the carbon budgets set for Wales, and most likely raise the challenge to be faced in the third and subsequent budgets (given the first and second Welsh carbon budgets will be published in spring 2019).

While the energy system of the 2010s shows the signs of a framework fraying at the edges, trying to decarbonise, accommodate decentralisation and go digital when designed for a centralised era, the energy framework of 2035 is one that is citizen-led, recognises and responds to the different needs of the citizens of Cardiff, Caerphilly and Colwyn Bay.

As we in 2018 consider the future of Wales, we might think for a moment of the energy system as a vehicle on a journey. Wales once provided much of the fuel for that vehicle. As the vehicle became an increasingly GB vehicle, Wales became a passenger, going where it was taken, on a journey and at a speed decided by others.

Looking forward, Wales now has a choice. It can remain a passenger, or it can jump into the front seat and decide some of the route, and the speed of travel.

Being the navigator brings benefits of setting out the route, seeing the sights and having some say in where and when.

Being the driver offers more excitement and opportunity, albeit with greater risk in a world where some of the corners may be sharp and the hills blind.

It is time for Wales, its government, people and businesses, to choose their seat in a vehicle better suited to the journey.

This report offers a collective vision to deliver 100 per cent renewable energy for Wales by 2035. It sets out steps that could and should happen.

Following this report, within the final Re-energising Wales report (due in spring 2019), the IWA will develop a delivery plan which will bring together all the elements of the programme of work and show how it can be delivered to secure the 100 per cent ambition, its co-benefits, and delivery of these enhanced interim targets.

Appendix One: Contributors

Appendix 1 - Contributors

Over the six months of the project research we sought to engage a wide range of interests to reflect different perspectives on the route to achieving the 100 per cent ambition. We managed to involve all those listed below in some way, while recognising there are still other voices to be heard.

Interviewees and participants

David Clubb	RenewableUK Cymru (Reference Group)
Dr Richard Cowell	Cardiff University (RG)
Dr Jane Davidson	University of Wales, Trinity Saint David (RG)
Jane Forshaw	Local Partnerships (RG)
Mathew Kidwell	Blake Morgan (RG)
Ben Lewis	Barton Willmore (RG)
Syed Ahmed	Energy for London
Kalpana Balakrishnam	Cyfoeth Naturiol Cymru/NRW (Energy)
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Shea Buckland-Jones	Institute of Welsh Affairs
Lyn Cadwallader	One Voice Wales
Gideon Carpenter	Cyfoeth Naturiol Cymru/NRW (Hydro)
Chris Clarke	Wales & West Utilities
Andrew RT Davies AM	Welsh Conservatives
Prys Davies	Welsh Government (Decarbonisation and energy)
Andrew Dixon	Dŵr Cymru
James Greenhalgh	National Grid ESO
Llyr Gruffydd AM	Plaid Cymru
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Prof Calvin Jones	Cardiff Business School / Re-energising Wales Work Strand Three Author
David Jones	Marine Energy Wales
Gill Kelleher	SPECIFIC, Swansea University

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Prof Judith Marquand	WISERD and Work Strand Four Author
Prof Ian Masters	Swansea University
Prof Laura McAllister	Wales Governance Centre
David Melding AM	Welsh Conservatives
Alex Meredith	Innogy /Bright Green Dragon
Jonathan Oates	Welsh Government (Clean Growth)
Lisa Phillips	Cyfoeth Naturiol Cymru/NRW (Marine Regulation)
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Jennifer Pride	Welsh Government (Decarbonisation and energy)
Robert Proctor	Community Energy Wales
Alex Rawlin	Special Adviser to the Cabinet Secretary for Energy, Planning and Rural Affairs
Andrew Regan	OFGEM
Chris Roberts	Transport Policy Paper Author
Neville Rookes	Welsh Local Government Association
Laura Sandys	Challenging Ideas
Jasmine Sharp	Cyfoeth Naturiol Cymru/NRW (Marine Regulation)
Karl Shepherd	Cyfoeth Naturiol Cymru/NRW (Industry Regulation)
Rachel Shorney	Scottish Power/MANWEB Networks
Joe Simpson	The Leadership Centre
Jeremy Smith	innogy Renewables UK
Rhea Stevens	Institute of Welsh Affairs
Jackie Walters	Cyfoeth Naturiol Cymru/NRW (Planning)
Bethan Williams	Wales & West Utilities
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Steve Richards	Wales & West Utilities
Dr Alan Whitehead MP	Shadow Minister for Energy and Climate Change

