



Helpu Cymru i leihau
ei Hôl Troed Carbon
Help Wales reduce
its Carbon Footprint



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

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A Low Carbon Revolution –
**The Welsh Assembly Government
Energy Policy Statement**

March 2010





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Cabinet foreword

Climate change is the greatest environmental, economic and social challenge facing the planet. Unless the global emissions of carbon dioxide and other greenhouse gases from energy generation and other human activities peak by around 2015 and then rapidly diminish, the world will probably see a global temperature rise of 4°C by around 2060 resulting in famine and droughts in many parts of the world, significant sea level rises, and an increasing risk of further catastrophic climate changes.¹

Our future well-being, both material and social, will be dependent on achieving sufficient supplies of affordable low carbon energy. This move to a low carbon economy is an essential part of our commitment as a Government to sustainable development. Done successfully it will strengthen our economic well-being, improve the environment and help to address key social issues such as fuel poverty.

There is already the potential in Wales for some £50 billion of investments in large renewables and other low-carbon electricity projects alone over the next 10-15 years. We will also be investing heavily over the next years in domestic energy efficiency, community-scale renewables and alleviating fuel poverty with the prospect of attracting further significant investment into Wales through the new Wales Strategic Energy Performance Investment Programme, *arbed*. All this will bring opportunities for new jobs and skills across Wales and will strengthen the steps we are already taking to regenerate communities and improve housing.

In this policy statement, we set out our ambitions for low carbon energy in Wales. The statement builds on the results of our consultations over the last year on the Renewable Energy Route Map and the Bioenergy Action Plan for Wales. It draws on the work of the Wales Climate Change Strategy, the National Energy Efficiency and Savings Plan, the Green Jobs Strategy and the Ministerial Advisory Group on Economy and Transport's report on "The Energy Sector". This statement also reflects the UK policy position, the work of the UK Climate Change Commission and the UK National Policy Statements on Energy and Renewables.

Wales once led the world in carbon-based energy. Our goal now is to do the same for low carbon energy. This is a challenging but exciting and vital agenda. We are committed to work with all sectors and across all aspects of the Assembly Government's responsibilities within a very strong sustainable development framework in order to make it a reality.

Welsh Assembly Government Cabinet

March 2010

¹ Global carbon dioxide gas concentration is already at more than 387 ppm compared to 280 ppm 200 years ago at the start of the industrial revolution. See <http://www.occ.gov.uk>



The Welsh Assembly Government Energy Policy Statement

1. Overview

Throughout the 19th century, it could be argued that Wales did more than any other country to give momentum to the industrial revolution through its steel operations and coal mines. A century ago, the price of world coal was set in Cardiff. Wales has strongly participated in many energy transformations over the last 100 years including those associated with coal and gas (both in south and north Wales), with oil (with focal points ports in Milford Haven and Liverpool Bay) with two nuclear power stations in north Wales and with Europe's largest pumped storage station at Dinorwig. These transformations have given us secure, resilient and diverse sources of energy and a strong heavy industrial sector providing high added value employment and fostering considerable expertise in our colleges.

Yet as the world has developed, carbon dioxide and other greenhouse gases emitted by mankind's activities have dramatically increased the concentration of greenhouse gases in our planet's atmosphere leading to significant global warming. If the world continues on its present trajectory for the use of fossil fuel, with more and more of the world's six, soon to be nine, billion inhabitants seeking a reasonable standard of living, those greenhouse gas concentrations will continue to increase at an alarming rate.

These activities, which have enabled a growing prosperity, have seen a typical person in Wales, as in the rest of the UK, consume around 125 kilowatt hours per day per person (kWh/d/p) of energy, with approximately one third of this on transport, one third on heat and one third on electricity – with the domestic transport element alone doubling over the last 40 years.

Globally we have already seen around a 1°C rise in average global temperature, but the latest climate change science indicates that unless we quickly reduce our emissions of greenhouse gases, the world will probably be another 3°C hotter by 2060 and there will be much higher risks of catastrophic global climate changes.

At the same time, supplies of fossil fuels are under growing pressure, with the prospect of higher energy prices and increasing concerns about the security of supply of energy.

There is therefore both a moral and a practical imperative to move rapidly to a situation where we are much less dependent on fossil fuels – a low carbon economy.

This Assembly Government statement explains what we will do and what we want others to do to make our ambition for low carbon energy a reality.

First, we will maximise energy savings and energy efficiency in order to make producing the majority of the energy we need from low carbon sources more feasible and less costly.

Second, our energy needs in a modern society will remain considerable, and must be met securely from low carbon sources. We will move to resilient low carbon energy production via indigenous (and thus secure) renewables, on both a centralised and localised basis.

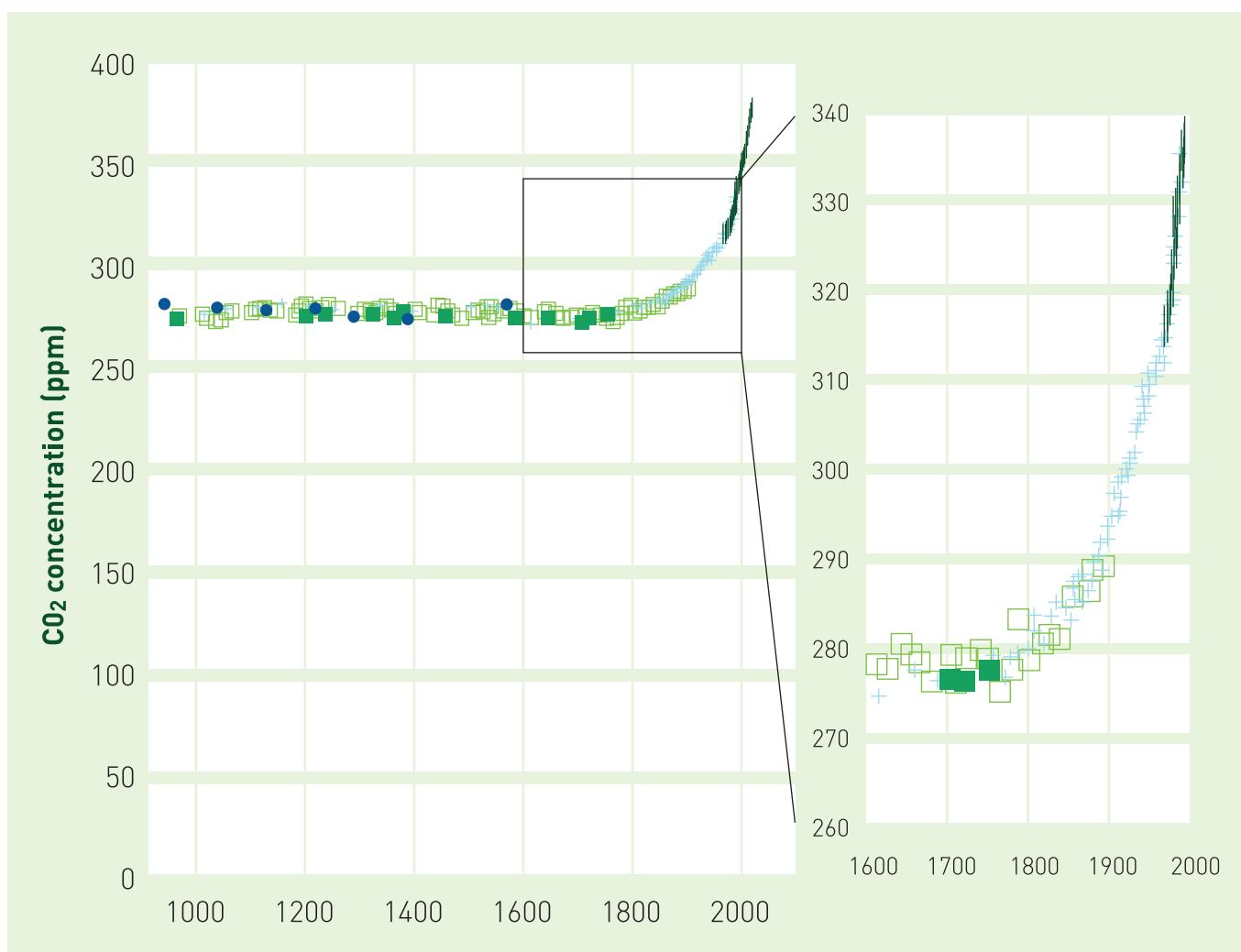
Third, we will ensure that this transition to low carbon maximises the economic renewal opportunities for practical jobs and skills, strengthens and engages our research and development sectors, promotes personal and community engagement and helps to tackle deprivation and improve quality of life.

Based on Wales' natural advantages in areas such as wind and marine renewable resources, our **aim** will be to renewably generate up to twice as much electricity annually by 2025 as we use today and by 2050, at the latest, be in a position where almost all of our local energy needs, whether for heat, electrical power or vehicle transport, can be met by low carbon electricity production.

1.1 The challenge

Our Climate Change Strategy² has set out the huge challenges the planet faces in avoiding catastrophic climate change. Figure 1 provides a reminder of the scale of impact currently projected for greenhouse gases in the atmosphere.

Figure 1: Carbon dioxide (CO₂) concentrations (in parts per million) for the last 1000 years³



In addition to the threat posed by climate change, we also face increasing uncertainty about the future availability of fossil fuels as more countries compete for them and when a number of the remaining reserves face significant geopolitical issues. The United Nations Framework Convention on Climate Change Fifteenth Conference of Parties took place in Copenhagen from 7 to 18 December 2009. Although the final declaration did not produce the fair, ambitious and legally binding deal that the world needs, we must regard it as a starting point and focus positively on the next steps towards

² http://wales.gov.uk/topics/environmentcountryside/climate_change/tacklingchange/strategy/walesstrategy/?lang=en

³ David J.C. Mackay. *Sustainable Energy – without the hot air*. UIT Cambridge, 2008. ISBN 978-0-9544529-3-3. Available free online from www.withouthotair.com. p.6.

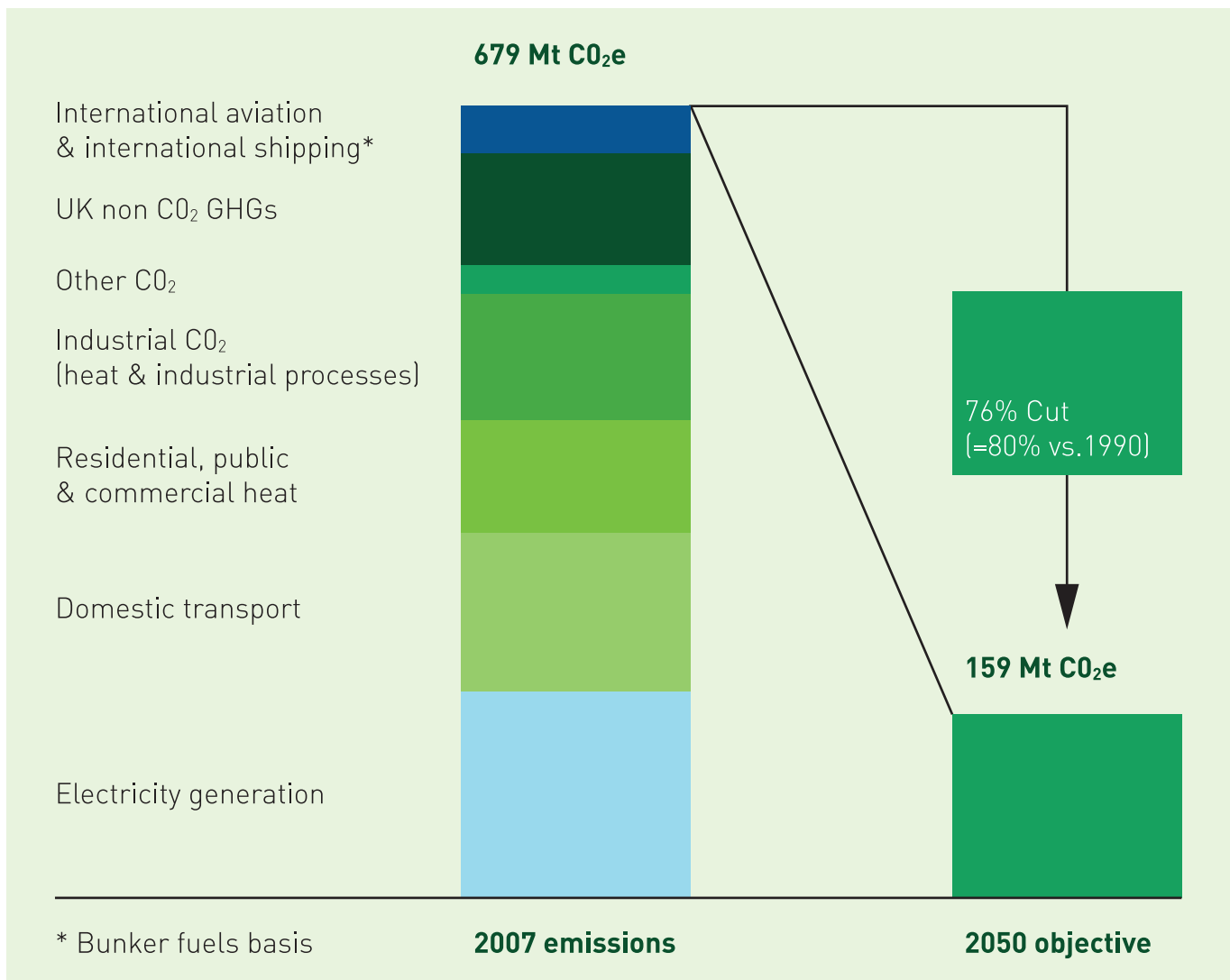


securing a strong deal and continue to take ambitious action to tackle climate change. Our commitment to action on climate change here in Wales is based on a scientific imperative to act urgently to reduce emissions.

That scientific imperative remains and the absence of an international agreement should not deflect us from being as ambitious as possible. Indeed, the importance of demonstrating continued leadership on climate change is perhaps greater than ever.

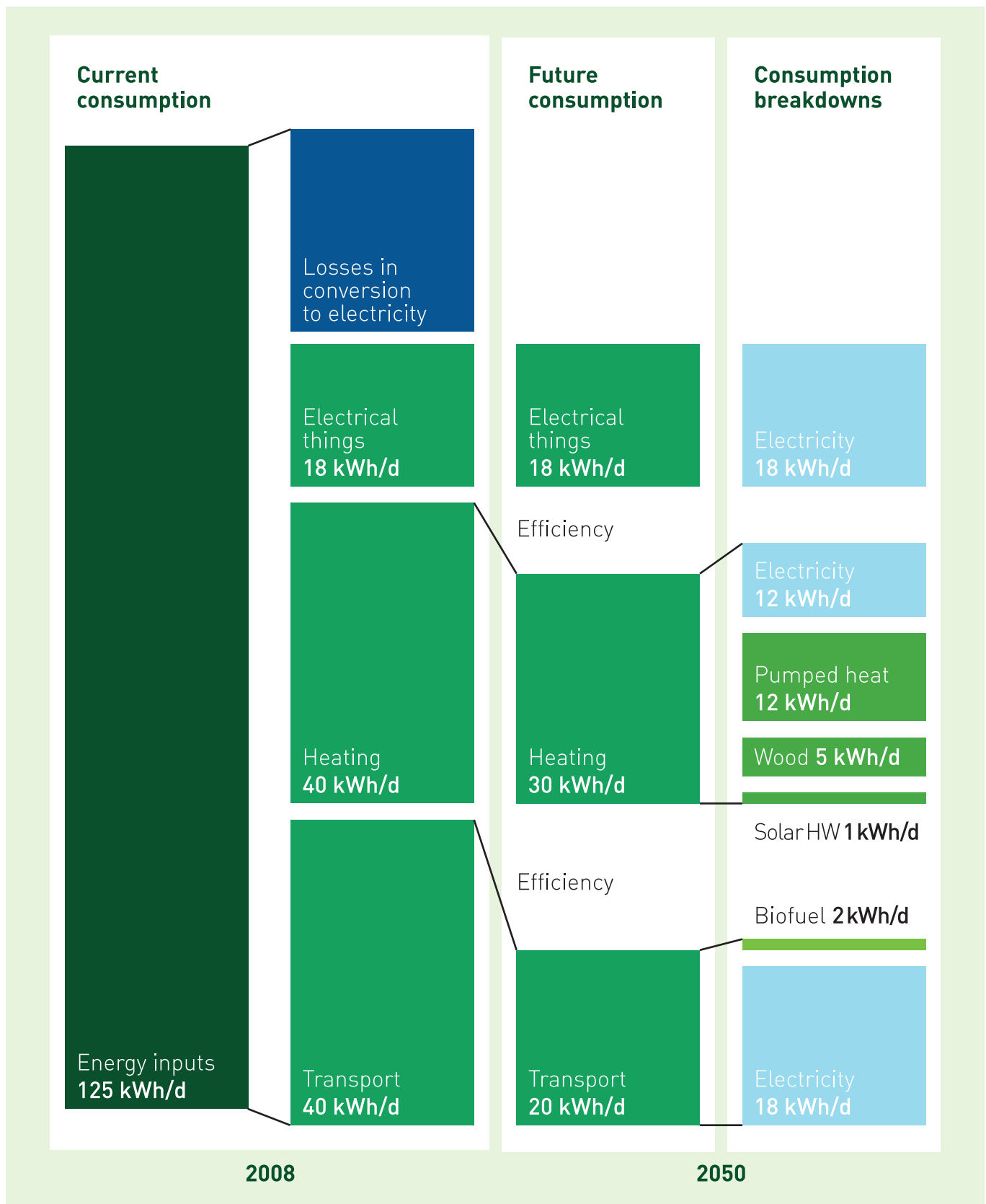
To address climate change, the UK Government and the international community have set a number of targets, with the goal of reducing emissions by at least 80% by 2050. What this means in practice is illustrated below (Figure 2).

Figure 2: UK Climate Change Committee analysis of the UK's current and maximum 2050 carbon emissions by energy uses



From a personal consumption perspective, Figure 3 overleaf illustrates the current position and what a predominantly electrical energy based system could look like in 2050.

Figure 3: Current consumption per person in 2008 (left two columns), and a future consumption plan, along with a possible breakdown of fuels (right two columns)⁴



⁴ David J.C. Mackay. *Sustainable Energy – without the hot air*. UIT Cambridge, 2008. ISBN 978-0-9544529-3-3. Available free online from www.withouthotair.com. P204



The UK Climate Change Committee has recommended that the best way to reduce greenhouse gas emissions would be to reduce our energy needs wherever possible through energy efficiency action, significantly increase our use of renewable heat and most importantly from the carbon emission reduction perspective, provide much more of our energy needs through electricity, including for transport and heat, and meet that electricity demand through low-carbon electricity systems. This is the basis for the approach set out in this policy statement.

What will meeting the UK carbon budgets mean for the average person by 2020?

Currently, in the UK the average person's daily energy consumption (excluding energy related to food and imported goods) is around 125 kilowatt hours per day per person (kWh/d/p).

Of this 125 kWh/d/p, after taking into account conversion losses, we use a third for heating, a third for transport and a third for electrical power. The average electrical power consumption per person per day in Wales is approximately 22 kWh/d/p, (slightly higher than the UK average of 18 kWh/d/p, see figure 3). To put this into context this is equivalent to every person in Wales leaving twenty-two 40-watt light bulbs on for 24 hours every day.

Meeting carbon budgets in 2020 will require a reduction in average per person emissions from the current level of nine tonnes of carbon dioxide (CO₂) to six tonnes of CO₂.

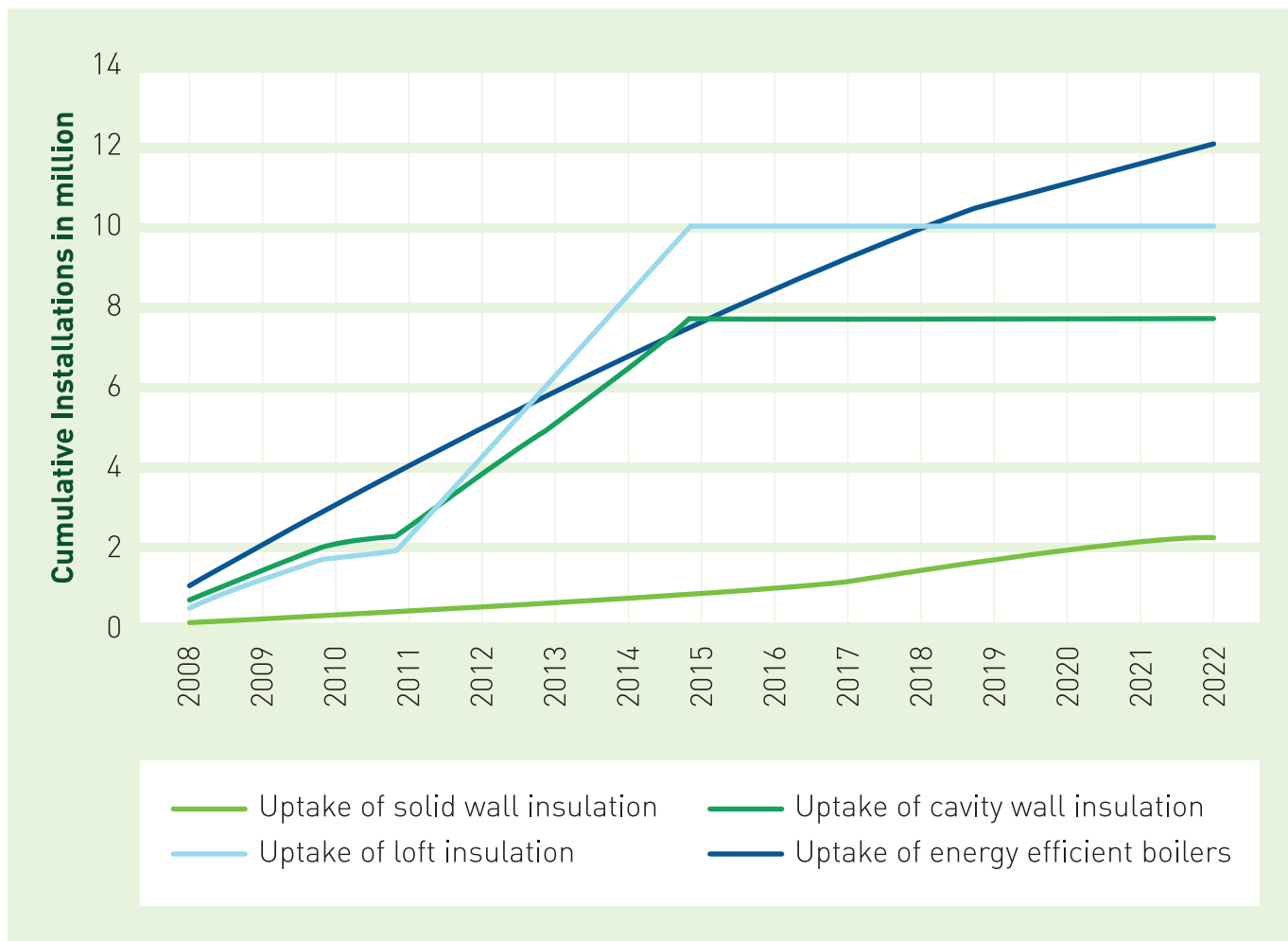
In a world where we are on the way to significant carbon emission reductions, the typical person would:

- Meet more of their energy needs from low-carbon power.
- Live in well-insulated homes with efficient boilers and advanced heating controls.
- Purchase energy-efficient appliances and use these on low-carbon cycles (e.g. low temperature washing and dishwashing).
- Work in energy-efficient offices with power and heating from low carbon sources.
- Drive more carbon-efficient cars, including hybrids, electric cars or plug-in hybrids with charging infrastructure at home, at work and in public places.
- Drive in an eco-friendly manner (e.g. not carrying excess weight in the car) and within the existing speed limit.
- Plan journeys better and use public transport more, with the latter increasingly powered by low carbon fuels.

1.2 The Opportunity

Wales' housing stock currently has a relatively poor energy performance. There are a large number of solid wall homes and many rural properties are dependent on oil or liquefied petroleum gas (LPG) for central heating. Tackling this backlog of hard-to-heat homes will create jobs, encourage skills, improve local areas and directly reduce fuel poverty. Energy efficiency investment has one of the highest coefficients of employment to spend of any area. Figure 4 provides detailed trajectories for implementation of insulation measures within the UK that together with other residential sector measures would reduce emissions by around 50 million tonnes of carbon across the UK.

Figure 4: Uptake of main residential building measures within the UK 2008-2022



In the area of low carbon energy generation, Wales enjoys an abundance of wind and marine renewable resources that give it an advantage in moving to a low carbon economy. Wales' long coastline and deep ports are also suited to the development of the future large low carbon power plants that are likely to form part of the UK's overall energy mix. A number of our communities are already active in developing local renewable resources to local benefit. The energy generation sector is robust, a significant future employer and source of regular income that should be attractive to investors.

Wales already benefits from a number of energy-based industries and research institutes. Building on this could make Wales a leader in low carbon economic development and form an increasingly important part of our future research and technology base.

1.3. The Welsh Assembly Government's role

Although the planning and regulatory responsibilities for major energy supply are retained by the UK Government, the Welsh Assembly Government will use all its range of powers – including planning, transport, economic development, environmental protection and housing powers – to support this policy statement and will work closely with the UK Government and the regulator, OFGEM, to ensure it is reflected in their decisions.



Figure 5 provides a table of current consent bodies for energy projects in Wales, and the proposed consenting bodies from 1 April 2010 on the establishment of the Infrastructure Planning Commission. Further information on consenting powers for energy installations in Wales is presented in the technical annexes which are available online at:

<http://wales.gov.uk/topics/environmentcountryside/energy/>

Figure 5: Current and proposed consent bodies for electricity installations

| Installation size | Current consent body | Future consent body |
|-------------------|---|--|
| >50 MW onshore | Secretary of State for Energy & Climate Change | Infrastructure Planning Commission |
| <50 MW onshore | Local authorities | Local authorities |
| >1 MW offshore | Secretary of State for Energy & Climate Change | Infrastructure Planning Commission |
| | Welsh Assembly Government (Under Transport & Works Act) | Marine Management Organisation & Welsh Assembly Government |
| <1 MW offshore | Welsh Assembly Government | Marine Management Organisation & Welsh Assembly Government |

While we continue to believe it is anomalous that consents for large power stations are executively devolved to Scotland and not to Wales, we will work positively with the future Infrastructure Planning Commission and others to facilitate appropriate energy development in Wales in accordance with this statement. In particular we will support projects that meet sound sustainable development criteria (ref: Technical Annex 5) – recognising that for some technologies, such as nuclear power and large tidal range projects such as those under consideration for the Severn Estuary, what constitutes sustainable development is matter of considerable debate

This statement draws on the results of consultation on our Renewable Energy Route Map, our Bioenergy Action Plan and our Ministerial Marine Energy Policy Statement and reflects the latest UK Government policy position, the Economy and Transport Ministerial Advisory Group Report and UK Climate Change Committee and Wales Climate Change Commission deliberations.

These policies will be implemented through a rolling programme of sector actions and through strong public communication initiatives as part of our climate change programme. Further information about the devolved legal powers of the Welsh Assembly Government can be found in Technical Annex 3.



Main actions

2. Action on energy efficiency and small scale renewables

2.1 Our first local aim is:

a step-change in the energy efficiency performance of all housing stock in Wales

We will deliver this through:

- a revised Home Energy Efficiency Scheme aimed at tackling the hardest to heat homes and those most at risk of fuel poverty; more than 3,000 households improved every year;
- the development of *arbed*, the Wales Strategic Energy Performance Investment Programme, in order to stimulate £350m investment into the energy performance of Welsh homes – with an initial focus on vulnerable households in Wales' Strategic Regeneration Areas; this will include, but not be limited to, an initial £30m Assembly Government investment which will help to secure significant additional private sector funding for whole house assessments and improvements to more than 10,000 homes;
- concerted information campaigns and support to local groups to encourage action by individuals and communities in Wales;
- full use of the newly available EU funding for domestic energy efficiency;
- working closely with the energy supply companies and the regulator to ensure Wales achieves maximum benefits from UK-wide energy efficiency investment programmes;
- progressively increasing the standards for new-build housing towards zero-carbon aspirations, through the introduction of higher Building Regulations requirements, through our investment programmes in social housing and through planning policy and guidance such as in Technical Advice Note 22 "Planning for Sustainable Buildings"⁵;
- progressively seeking reform of energy tariffs which encourage reductions in energy consumption while protecting vulnerable groups;
- supporting the roll-out of an extensive smart meter installation programme.

Our second local aim is:

a significant proportion of our energy to be generated locally or domestically

We will deliver this through:

- an initial £15m EU funding programme to support 22 community energy projects across Wales;
- working in partnership with DECC to deliver a two year research programme, supporting 20 communities in England, Wales and Northern Ireland; of which four are from Wales, to deliver community led, low carbon initiatives from which others across the UK can learn;
- further reducing the need for planning permission for installing domestic low carbon energy efficiency equipment;
- maximising the significant benefits of providing domestic heat through renewable means in all our programmes;
- supporting the early introduction of a UK renewable heat incentive scheme;

⁵ <http://wales.gov.uk/consultations/planning/drafttan22/?lang=en>



- working with stakeholders in Wales to encourage the take-up of renewable energy financial incentives from micro- to macro-scale projects;
- championing the potential benefits of feed-in tariffs for community renewable energy projects;
- encouraging the piloting of smart-grid technology in Wales;
- working with the Distribution Network Operators in Wales (Western Power Distribution and Scottish Power/Manweb) to promote uptake in Wales of the £500m Ofgem UK low carbon networks fund⁶;
- supporting small-scale renewables developments through the planning system in Wales;
- providing domestic renewables as part of our Home Energy Efficiency Scheme and other energy efficiency programmes, and offering individual householders the opportunity to 'buy in' to programmes in their area to reduce the costs of technologies;
- promoting local energy generation, including as part of public sector schemes and procurements;
- promoting 'whole house' integrated energy efficiency and micro-generation investments, including in our zero carbon demonstration developments.

Full details of our energy efficiency and local energy proposals will be set out in the final National Energy Efficiency and Savings Plan.

3. Action to produce low carbon electricity on a large scale

3.1 Low carbon renewables

Appendix 1 provides a tabulated breakdown of Wales 'sustainable' renewable energy potential to 2020/2025.

a). Marine

i) Offshore wind

Our aim is:

to promote the optimum use of offshore wind around the coast of Wales in order to deliver a further 15 kWh/d/p of capacity by 2015/16

We will do this by:

- providing information to assist decisions as to the effects on local wildlife and habitats and impacts of visibility from the coast (especially if the farms are less than 12 nautical miles offshore);
- working with the regulator and grid company to address the need for additional offshore and onshore electrical grid connections;
- working with the Crown Estates and others to ensure an appropriate designation of zones for development under the Crown Estates round 3 leasing programme⁷ – the UK programme for the delivery of new offshore windfarm sites by 2020;
- promoting appropriate opportunities for deep sea wind farms;
- reflecting these considerations in drawing up our future Marine Spatial Plan and marine designations.

⁶ <http://www.ofgem.gov.uk/Sustainability/Environment/Policy/EnvAdvGrp/Documents1/Anna%20Rossington%20DPCR5%20Innovation.pdf>

⁷ http://www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy/round3.htm



ii) Tidal range

Our aim is:

to test the appropriateness and cost effectiveness of steps to exploit the tidal range of the Severn estuary

We will do this by:

- from a total sustainable development perspective, continuing to support the major study of the Severn estuary being led by DECC;
- ensuring both the costs and benefits of any project are fully understood and explained;
- supporting further research or development as appropriate in the light of the study and, in particular, where new technology ideas look to have potential and could be developed within Wales;
- considering the applicability of tidal range technologies elsewhere in Wales as appropriate.

iii) Tidal stream and wave energy

Our aim is:

to capture at least 10% (8 kWh/d/p) of the potential tidal stream and wave energy off the Welsh coastline by 2025

We will do this by:

- working closely with UK bodies such as DECC, Crown Estates, Carbon Trust, Energy Technologies Institute and the UK Technology Strategy Board to assist the technology development and cost reductions which will be necessary if these are to become mainstream renewable technologies;
- building on the work of the Wales low carbon research institute and the recommendations of the WAG Ministerial Advisory Group on Economy and Transport;
- retaining the option of using EU convergence funding for new marine technology;
- supporting the prospects for a 'tidal stream' nursery test/demonstration site for commercial scale developments off West Wales;
- gathering environmental data to inform future decisions and Strategic Environmental Assessments;
- promoting Wales as a UK low carbon economic area for tidal energy.

b). Onshore wind

Our aim is:

to have 4.5 kWh/d/p of installed onshore wind generation capacity by 2015/2017

We will do this by:

- optimising the use of the existing strategic search areas set out in Technical Advice Note (TAN) 8 on Planning for Renewable Energy⁸ and keeping the TAN under review in the light of progress towards these targets;
- ensuring that windfarms fully deliver wider community benefits, through our Forestry Commission-based schemes and through the planning system;

⁸ <http://wales.gov.uk/topics/planning/policy/tans/tan8/?lang=en>



- addressing any transportation concerns associated with larger wind turbines;
- working closely with the grid company and the regulator to ensure that new grid connections are provided sensitively, including seeking that connections should run underground where they would otherwise impact on protected landscapes;
- promoting further use of brownfield or local sites for smaller-scale projects appropriate to their locations;
- supporting local authorities in dealing with applications.

c). Hydro-power and geothermal

Our aim is:

to support small scale hydro and geothermal schemes where they are environmentally acceptable in order to generate at least 1 kWh/d/p

We will do this by:

- supporting community schemes through our EU co-funded programme;
- considering serious developer proposals for further opportunities including potential pumped storage.

d). Bio-energy/Waste

Our aim is:

to deliver by 2020 up to 6 kWh/d/p in Wales of electricity from biomass – 50% indigenous/ 50% imported – and a heat potential of 2-2.5 kWh/d/p in Wales

We will do this by:

- expanding anaerobic digestion capacity across Wales to capture energy from waste foods, farms and sewage as part of our ambitious waste strategy proposals and through the development of the *Glastir* scheme for farms which, from 2012 will provide £5m per annum for the installation of renewable energy and energy efficiency on farms in Wales;
- ensuring through the Environment Agency that proposed plants comply fully with regulatory requirements, including the Waste Incineration Directive (WID) requirements;
- promoting the use of waste woods and local supply of biomass rather than very large-scale new planting of commercial biomass in order to prevent negative impacts on the environment or food security;
- keeping the position under review in the light of the new Woodlands for Wales Strategy and further research including the development of second generation vehicle bio-fuels-on which the IBERS institute at Aberystwyth University is actively working;
- requiring that any larger scale plant can demonstrate that it is supplied by fuel from sustainable sources;
- promoting the £17m next phase of the Wood Energy Business Scheme (WEBS2) which will grant-aid wood fuel heating schemes, small scale wood fuel electricity generation, including combined heat and power (CHP), and fuel supply business developments.



Other low carbon energy production

3.2. Low carbon nuclear generation of electricity

Weighing the advantages and disadvantages of nuclear power presents a formidable challenge for any government. On the one hand, nuclear generation presents a reliable, proven source of low carbon electricity and can reduce dependence on international energy markets. In a system with a high proportion of intermittent or periodic renewables, it can be an important source of firm low-carbon baseload power that would be valuable as the use of electricity increases in future.

On the other hand, nuclear power produces hazardous radioactive wastes from spent fuel and decommissioning for which, even though a final disposal route has been identified, it has yet to be put in place and will create burdens on future generations. Nuclear installations present a variety of safety and environmental risks. Nuclear projects have a history of cost-overruns including projects still under construction, and the long-term nature of nuclear liabilities means total final costs are unknown, but become unavoidable for future generations. An international response to climate change that involves major nuclear developments may increase risks of nuclear weapons proliferation. The UK Government has considered these trade-offs in formulating its National Policy Statement on Nuclear Power and has proposed that a further nuclear station could be constructed on the Wylfa site in Anglesey and at other sites close to Wales, in particular at Hinkley Point and Oldbury.

Our approach to nuclear power in Wales is:

- We remain of the view that the high level of interest in exploiting the huge potential for renewable energy reduces the need for other, more hazardous, forms of low carbon energy and obviates the need for new nuclear power stations.
- We have a way to go in justifying to the public what must be done in dealing with future nuclear waste. We therefore support the call for a public inquiry on dealing with the waste arising from new nuclear build on the grounds of concern over the safety and security of its management. This carries with it the implication that any proposed new nuclear power station must contain credible plans for nuclear waste management.
- Maximise energy savings from energy efficiency and low-carbon energy production from renewables in Wales.

The decision as to whether a new nuclear power station is built on the existing Wylfa site is a matter for the UK government and the IPC planning process. Should a decision be made to proceed with building a new nuclear power station on the Wylfa site, the Welsh Assembly Government will engage with all stakeholders to ensure the maximum local and regional benefit from the building and operating of the new station, including the provision of skills, and supply chain opportunities.

3.3. Low carbon large scale fossil fuel power generation with carbon capture and storage (CCS)

Our aim is:

that any new fossil fuel plants should be carbon capture ready with fully developed plans for carbon capture and storage; and that these plants maximise efficiency through use of waste heat and co-firing where appropriate

We will do this by:

- exploring Wales' specific CCS options with site owners and technology developers, maintaining a watching brief on CCS pilot activities on the east coast of the UK;



- supporting relevant R&D, including the storage of carbon in deep coal seams, in the Wales Low Carbon Research Institute and its industrial partners;
- keeping under review the need for fossil fuel plants as part of overall security of supply during the transition to a low carbon energy system;
- considering the local employment and skill implications of a progressive move away from older fossil fuel plants over the next generation;
- exploring sea-based transport as part of CCS to minimise the exposure of populations to high pressure gas storage or pipelines.


4. Capturing the Benefits

Our aim is:

to maximise the short and long-term benefits for Wales' economy and society of the move to a low carbon energy system

We will do this by:

- prioritising energy efficiency/renewable energy skills enhancement within the Assembly Government's economic development and lifelong learning programmes;
- capturing the local job benefits of new investments and promoting local job opportunities and training connected to our major investments in energy efficiency and local energy generation;
- providing focussed vehicles (as in the British Gas Ebbw Vale academy) for associated business and skills developments;
- promoting supply chains within Wales to meet demands for the new technologies and large scale energy investments identified in this statement;
- supporting the potential for our major ports and surrounding areas to provide logistics and host manufacturing/assembly facilities;
- supporting business investment in low carbon through the Carbon Trust and the FS4B business support service;
- encouraging businesses to take advantage of the opportunities offered by the feed in tariff and renewable heat incentive to invest in low carbon energy;
- assisting industries to respond, such as through the Low Carbon Hub for construction and work with the energy intensive industries in Wales;
- working closely with industry and other interests through a new Wales Energy Forum;
- promoting commercialisation of new technologies including through work in the Wales low carbon research institute and the Technium incubators;
- promoting research and development opportunities across a range of renewable options and in novel low carbon developments;
- development of a Low Carbon Economy Area based on infrastructure along the M4 corridor for the testing and practical deployment of vehicles running on hydrogen, natural gas or electricity, with the expectation, in the not too distant future, of much of the electricity and hydrogen being generated from renewable sources, and the use of biogas to supplement natural gas;

- 
- liaising closely with DECC, BIS, UKTI and the UK Technology Strategy Board in international technology work, participating in the UK Energy Research Partnership⁹ and building on our links abroad;
 - using Assembly Government sites and premises as exemplars for a low carbon future;
 - further supporting the growth of renewable companies located in Wales – with companies such as Infinigy, Windpower Wales, Quiet Revolution, Dulas and ECO2 already showing the way;
 - promoting Wales' position as a low carbon nation with greater resilience against fuel supply interruptions or price increases;
 - working with local authorities to deliver the low carbon agenda in the exercise of their responsibilities;
 - linking investments to community renewal and regeneration allowing individuals and communities to be more self-supporting;
 - tackling fuel poverty at its roots through our major investment programmes;
 - underpinning all this through the Wales Spatial Plan low carbon regions project.

The potential economic benefits of being at the forefront of transition to low carbon has already been flagged in the Wales Green Jobs Strategy consultation¹⁰, the new Whitehall Low Carbon Industrial Strategy¹¹ and in the WAG Ministerial Advisory Group on Economy and Transport's recent energy and transport sector development reports.

⁹ <http://www.energyresearchpartnership.org.uk/>

¹⁰ <http://wales.gov.uk/topics/businessandconomy/publications/greenjobs>

¹¹ <http://interactive.bis.gov.uk/lowcarbon/2009/07/low-carbon-industrial-strategy>



Appendix 1: Wales' 'sustainable' renewable energy potential to 2020/2025

| Technology | Capacity either operational or consented (GW)* | Total capacity (GW) | Load factor (%) | Annual energy output (TWhr) | Deliverable in main by | kWh/d/p in Wales |
|--|--|---------------------|-----------------|---|------------------------|----------------------------|
| Onshore wind | 0.7 | 2 | 30 | 5 | 2015/17 | 4.5 |
| Offshore wind | 0.9 | 6 | 40 | 21 (Of which 20% is shared with England) | 2015/16 | 15.5 |
| Biomass (electricity) | 0.5 | 1 | 75 | 7 | 2020 | 3 imports and 3 indigenous |
| Tidal range | 0 | 8.5 | 25 | 18 (Of which 50% is shared with England) | 2022 | 8 |
| Tidal stream/ Wave | 0 | 4 | 25 | 9 | 2025 | 8 |
| Local electricity generation (mainly PV/ wind/hydro) | Data currently not available | 1 | 10 | 1 | 2020 | 1 |
| Electricity subtotals in Wales | 2 GW | 22.5GW | - | 48 | | 43 |

NB. Wales' current annual electricity consumption is around 23 TWhr

* Capacity either operational or consented as of 1 October 2009



Online resources to accompany the energy policy statement

Technical Annexes

The following technical annexes are available online:

1. Wales Electricity Generating Capacity
2. Wales Energy Flows Summary
3. Devolved Legal Powers
4. EU, UK, Welsh and International Energy Targets.
5. Relevant Sustainable Development Considerations

Case Studies

A number of case studies are also available online at the energy pages of the Welsh Assembly Government's website:

<http://wales.gov.uk/topics/environmentcountryside/energy/>

Glossary of terms

Anaerobic digestion (AD) – A treatment process breaking down biodegradable, particularly waste, material in the absence of oxygen. Produces a methane-rich biogas that can be used as a substitute for fossil fuels.

Biomass – Biological material that can be used as fuel or for industrial production. Includes solid biomass such as wood and plant and animal products, gases and liquids derived from biomass, industrial waste and municipal waste.

BIS – The UK Government's Department for Business, Innovation and Skills.

Carbon Capture and Storage (CCS) – Technology which involves capturing the carbon dioxide emitted from burning fossil fuels, transporting it and storing it in secure spaces such as geological formations, including old oil and gas fields and aquifers under the seabed.

Carbon dioxide equivalent (CO₂e) concentration – The concentration of carbon dioxide that would give rise to the same level of radiative forcing as a given mixture of greenhouse gases.

Carbon dioxide equivalent (CO₂e) emission – The amount of carbon dioxide emission that would give rise to the same level of radiative forcing, integrated over a given time period, as a given amount of well-mixed greenhouse gas emission. For an individual greenhouse gas species, carbon dioxide equivalent is calculated by multiplying the mass emitted by the Global Warming Potential over the given time period for that species. Standard international reporting processes use the time period of 100 years.

CCW – Countryside Council for Wales.

Combined heat and power (CHP) – The simultaneous generation of heat and power, putting to use heat that would normally be wasted. This results in a highly efficient way to use both fossil and renewable fuels. Technologies range from small units similar to domestic gas boilers, to large scale CCGT or biomass plants which supply heat for major industrial processes.

Conversion losses – Energy lost from input during generation of electricity.

DCLG – The UK Government's Department of Communities and Local Government.



DECC – The UK Government’s Department of Energy & Climate Change.

DEFRA – The UK Government’s Department for Environment, Food and Rural Affairs.

Energy efficiency – Using less energy to provide the same level of service.

EU – European Union.

Feed-in tariffs – A type of support scheme for electricity generation, whereby renewable generators obtain a long-term guaranteed price for the output they deliver to the grid.

FEPA – Food and Environment Protection Act.

Fossil fuels – Coal, oil and gas.

FS4B – Flexible Support for Business.

Fuel poverty – When the cost of maintaining temperatures warm enough for health and comfort exceeds 10% of household income.

Global warming – An increase in average global temperatures.

Global Warming Potential (GWP) – A metric for comparing the climate effect of different greenhouse gases, all of which have different lifetimes in the atmosphere and differing abilities to absorb radiation. The GWP is calculated as the integrated radiative forcing of a given gas over a given time period, relative to that of carbon dioxide. Standard international reporting processes use a time period of 100 years.

Greenhouse gas (GHG) – Any atmospheric gas (either natural or anthropogenic in origin) which absorbs thermal radiation emitted by the Earth’s surface. This traps heat in the atmosphere and keeps the surface at a warmer temperature than would otherwise be possible, hence it is commonly called the Greenhouse Effect.

GWh (Gigawatt hour) – A measure of energy equal to 1000 MWh.

Heat pumps – Can be an air source or ground source heat pump to provide heating for buildings. Working like a ‘fridge in reverse’, heat pumps use compression and expansion of gases or liquid to draw heat from the natural energy stored in the ground or air.

IBERS – Institute of Biological, Environmental and Rural Sciences.

ICT – Information and communication technologies.

kWh (kilowatt hour) – A measure of energy equal to 1000 watt hours. A convenient unit for consumption at the household level.

kWh/d/p – Kilowatt hours per day per person (based on a population of 3 million).

LA – Local authority.

Low carbon economy – An economy which has a minimal output of greenhouse gas emissions.

Low carbon energy – Energy which emits little or no carbon during generation.

LPA – Local Planning Authority.

LPG – Liquefied petroleum gas.

Mt CO₂ – Million tonnes of carbon dioxide.



Renewable energy – Energy generated from natural resources which are naturally replenished.

Sustainable development – Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

SFI – Science Foundation Ireland.

Tidal range – A form of renewable electricity generation which uses the difference in water height between low and high tide; for example by impounding water at high tide in barrages or lagoons, and then releasing it through turbines at lower tide levels.

Tidal stream – A form of renewable electricity generation which harnesses the energy contained in fast-flowing tidal currents.

TWh (Terawatt hour) – A measure of energy equal to 1000 GWh or 1 billion kWh. Suitable for measuring very large quantities of energy – e.g. annual UK electricity generation.

t CO₂ – tonnes of carbon dioxide.

UKTI – UK Trade and Investment.

WAG – Welsh Assembly Government.

WEFO – Welsh European Funding Office.



List of footnotes

1. Global carbon dioxide gas concentration is already at more than 387 ppm compared to 280 ppm 200 years ago at the start of the industrial revolution. See <http://www.occ.gov.uk>
2. David J.C. Mackay. Sustainable Energy – without the hot air. UIT Cambridge, 2008. ISBN 978-0-9544529-3-3. Available free online from www.withouthotair.com. p.6
3. http://wales.gov.uk/topics/environmentcountryside/climate_change/tacklingchange/strategy/walesstrategy/?lang=en
4. David J.C. Mackay. Sustainable Energy – without the hot air. UIT Cambridge, 2008. ISBN 978-0-9544529-3-3. Available free online from www.withouthotair.com. p.204
5. <http://wales.gov.uk/consultations/planning/drafttan22/?lang=en>
6. <http://www.ofgem.gov.uk/Sustainability/Environment/Policy/EnvAdvGrp/Documents1/Anna%20Rossington%20DPCR5%20Innovation.pdf>
7. http://www.thecrownstate.co.uk/our_portfolio/marine/offshore_wind_energy/round3.htm
8. <http://wales.gov.uk/topics/planning/policy/tans/tan8/?lang=en>
9. <http://www.energyresearchpartnership.org.uk/>
10. <http://wales.gov.uk/topics/businessandeconomy/publications/greenjobs>
11. <http://interactive.bis.gov.uk/lowcarbon/2009/07/low-carbon-industrial-strategy>

