



## Welsh Government Consultation: Achieving our low-carbon pathway to 2030

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## Introduction to UKERC

The UK Energy Research Centre (UKERC) carries out world-class, interdisciplinary research into sustainable future energy systems.

It is a focal point of UK energy research and a gateway between the UK and the international energy research communities.

Our whole systems research informs UK policy development and research strategy. UKERC is funded by The Research Councils UK Energy Programme.

Within Wales UKERC research and policy activity is currently located at Cardiff University in its School of Engineering and in the Understanding Risk Research Group in the School of Psychology.



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# Introduction

The Welsh Government's consultation on the potential actions required to reduce emissions to 2030 are welcome, particularly in the international context of decarbonising the economy and the challenges posed by climate change.

We recognise the actions proposed have the potential to bring economic and social advantages, however it is important to recognise the scale and pace of change required to deliver against these actions and the associated costs. Investing in energy efficiency and supporting technological innovations will be critical to minimising costs to consumers.

The consultation document is right to highlight the differences between Wales and the UK as a whole, as these differences will present both challenges and opportunities. Wales is dominated by heavy industry, with a higher share of homes off the gas grid, and typically older less efficient vehicle stock. These latter two characteristics also provide opportunities to target actions and achieve significant emissions reductions.

We welcome the proposal to conduct gap analysis to inform future innovation policy priorities. This needs to be informed by a thorough analysis of the Welsh and UK energy innovation systems, and their relationship with global drivers of energy innovation. In particular, it is important to ensure that the gap analysis does not only focus on the 'technology push' component of innovation systems which includes the potential for Welsh government to support energy R&D and technology demonstrations. It also needs to include the extent to which Welsh government can develop, influence or implement the market creation policies that will be required to bring down the costs of new technologies and systems, and to ensure that they are commercialised effectively.

Whilst the consultation recognizes the need to involve citizens in the energy transition, the focus appears mainly to be on behavioural change, and with very little detail provided on how this change in practice might be achieved. Here UKERC would recommend a broader strategy which also includes citizen engagement, enabling communities to play a central role in the low carbon transition. Welsh Government should consider adopting a longer-term strategy here. We note, for example, the Scottish Government's recently launched Just Transitions Commission. This will advise Scottish Government on its decarbonisation plans, considering how they can deliver fair work and tackle inequalities as the industrial landscape that is currently dependent upon the oil and gas industry evolves towards a low carbon economy through a "sustainable and inclusive labour market". Given Wales' current dependence in some locations upon high-carbon industries, some of which will see significant changes between now and 2030, the assessment of wider issues that arise here for affected Welsh communities would seem desirable.

Finally consideration of the priority areas for Wales should take place against a recognition of the interdependencies between Wales and the UK, and the limited policy levers available to Welsh Government, with many policies and regulations implemented currently at a UK or EU level. That being said we urge the Welsh Government to make a high-level commitment to a 'whole systems' approach to the energy transition and low carbon future within Wales. This approach is central to UKERC's energy research and policy advice. It considers all components of the energy system and their interactions - including supply, networks and demand. It also

considers the relationships between the technical, economic, policy, social and environmental dimensions of energy system change in an integrated way.

An important example of the importance of systems framing is the integration of intermittent renewables in electricity systems. UKERC research has highlighted how the contribution of intermittent renewables in energy system change can only be understood by reference to the wider energy system context, and the capacity of the wider system to absorb intermittency through storage, demand management and response, and interconnection (Heptonstall et al, 2017)<sup>1</sup>. In practice, whole systems analysis and policymaking are both highly challenging, particularly at a time of high technical, economic and political change and uncertainty. In the context of devolution it should also not be forgotten that in an integrated UK energy system, widespread measures which are wholly or in part devolved to the Welsh Government (e.g. some energy efficiency measures coupled with growth of local energy generation) will have knock-on implications for those which are not (e.g. provision of grid connection and balancing services, major energy supply infrastructures etc.). For this, some level of whole systems analysis is essential.

## Responses to specific consultation questions:

**3. Overall, to what extent do you agree with the potential actions for reducing emissions set out in this document? (1=completely agree, 5=completely disagree)**

2

Whilst the consultation document is concerned with developing actions to 2030, this sits within the context of an 80% carbon reduction target by 2050, we would therefore like to see greater ambition in plans laying the groundwork to reaching this target. The 2015 Paris Agreement effectively commits the UK to stricter long-term targets, in effect to reach net-zero emissions by the second half of the Century. In so far as many decisions taken now will have consequences well beyond 2030, the emergence of this long-term target should not be lost when making assessments of the ambition of action in Wales.

Consideration of the priority areas for Wales should take place against a recognition of the interdependencies between Wales and the UK, and the limited policy levers available to Welsh Government with many policies and regulations implemented at a UK or EU level. Because of this, there is a large emphasis on planning and co-ordination in the document to reduce emissions. In our view there are more opportunities to be exploited to reduce energy demand in Wales through energy efficiency, whilst increasing the use of local sources of supply where that makes economic sense.

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<sup>1</sup> Heptonstall, P., Gross, R. and Steiner, F. (2017) 'The costs and impacts of intermittency – 2016 update: A systematic review of the evidence on the costs and impacts of intermittent electricity generation technologies' UKERC, London. Available from: <http://www.ukerc.ac.uk/programmes/technology-and-policy-assessment/the-costs-and-impacts-of-intermittency-ii.html>

#### 4. Please tell us if you have any ideas for how we should deliver the potential actions for reducing emissions.

##### Industry

The dominance of heavy industry in parts of Wales – in particular steel production and petrochemicals - means that 60% of industrial emissions come from large point sources that fall within the EU Emissions Trading System (EU ETS), this is compared to 29% of emissions for the UK as a whole (Welsh Government, 2018)<sup>2</sup>. Tackling industrial emissions will be integral to meaningful reduction of Welsh emissions; however many of the relevant powers for decarbonisation policies for industry are largely reserved to the UK Government.

As outlined in the consultation document, the commission of an independent economic and technical feasibility study on carbon capture use and storage (CCUS) is welcome. However there is a risk that this could simply represent a displacement activity. Whilst credibly seen as a key part of the least cost path to economy-wide UK decarbonisation, carbon capture and storage (CCS) has been the subject of many feasibility studies and policy reviews already (Oxburgh 2016)<sup>3</sup>. The main challenge is to put in place the policy frameworks to enable full-scale deployment – a challenge the UK shares with many other countries. There are still too few full scale CCS installations in operation (Ekins et al, 2017)<sup>4</sup>. We recognise that this is primarily a UK-level issue, and that there is likely to be limited scope for the Welsh Government to sponsor development. One of the issues highlighted is the lack of CO<sub>2</sub> storage sites in south Wales, though it should be noted that if suitable sites were identified elsewhere, CO<sub>2</sub> could be transported to storage sites. Proposed technologies for carbon capture and utilization (CCU) for conversion into industrial and other chemical feed-products are typically at a far less mature stage of development, and recent modelling suggests that their contribution to achieving global climate targets might ultimately be quite small (MacDowell et al, 2017)<sup>5</sup>. However, exploring this as one option for Wales does make good sense in relation to the existing industrial cluster in South Wales (CCUS Task Force Report, 2018)<sup>6</sup>.

Further significant industrial decarbonisation will require both R&D investment in the UK and internationally and the implementation of stronger incentives for technology deployment. The establishment of an industry-led working group on decarbonisation is therefore welcome. This should engage with analysis undertaken by the CCC and other key working groups, in the development of decarbonisation pathways and industrial emissions reduction options.

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<sup>2</sup> Welsh Government. (2018) Consultation Document: Achieving our low-carbon pathway to 2030

<sup>3</sup> Oxburgh. (2016) Lowest Cost Decarbonisation for the UK: the critical role of CCS. Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage (CCS)

<sup>4</sup> Ekins, P., Hughes, N., Pye, S., Winning, M., Macrory, R., Milligan, B., Haszeldine, S. and Watson, J. (2017) The role of CCS in meeting climate policy targets. *Global CCS Institute*.

<sup>5</sup> MacDowell, N., Fennell, P.S., Shah, N. & Maitland, G. (2017) The role of CO<sub>2</sub> capture and utilization in mitigating climate change. *Nature Climate Change*, 7, 243-249

<sup>6</sup> CCUS Task Force (2018). *Delivering Clean Growth: CCUS Cost Challenge Task Force Report*. London: BEIS

In this context, public engagement and a forum similar to the Scottish Just Transitions Commission (described above) might be utilized to explore the wider economic / industrial challenges - and to consider how to support the industries and communities negatively impacted by the shift to a low carbon economy and industries within Wales.

## **Buildings**

Welsh buildings are characterized by a high proportion of solid wall homes, with a higher share of properties off the gas grid than in the UK<sup>2</sup>. The consultation plans to develop a long-term residential retrofit programme. This is very welcome and should be to the highest standard, ensuring utilization of all the regulatory powers available, with high standards set and subsequently enforced. Policies will need to be ambitious and combine building and technology regulation, taxation and incentives, and should apply to every building.

The consultation recommends setting higher energy efficiency standards for new builds through reviewing Building Regulations Part L (Conservation of Fuel and Power). Taking the view to 2030 and beyond and the impacts this would have upon the energy system as a whole, UKERC endorses the view of the CCC in its call for a tightening of building regulations within Wales such that all new builds achieve high efficiency standards – something which is within devolved competence<sup>2</sup>. We also note that important and innovative building technology developments that could be game-changing at the UK and international level are currently located primarily within Wales. These include the SPECIFIC project to develop ‘buildings as power station’ technology led by Swansea University, and the new Active Building Centre recently announced by RCUK and the Industrial Strategy Challenge Fund. Aside from the future business opportunities that these technologies might bring to Wales, this programme seems particularly significant in terms of both new build and retrofit for the many off-gas-grid locations in Wales that would be likely to have to rely upon oil-based heating.

## **Transport**

Welsh transport is characterized by older, less efficient vehicle stock, with many journeys being the harder to replace longer journeys, dominated by cars and light trucks<sup>2</sup>. Large incremental savings could be achieved if people were to switch to lower emission vehicles, therefore supporting uptake will be crucial to achieving the savings required in this sector. Welsh government should push for stronger market incentives for the adoption of electric vehicles (EVs) at the UK level, as well as using its own powers to accelerate the deployment of better charging infrastructure to facilitate this transition. We support the proposed action to ‘Develop a charging network that encourages early take-up of EVs and explore the merits of other measures, including access to bus lanes and free municipal parking’. Working with the Distribution Network Operators on the development of charging infrastructure will be integral to ensuring growth at sufficient levels to effect change. However, we recognize the present lack of clarity of how the charging of electric vehicles and the implementation of infrastructure will evolve.

There are many benefits associated with the proposal to encourage active transport in urban areas, with associated investment in the infrastructure to encourage cycling and public transport necessary to tackle commuting. The proposal to double the number of adults

travelling by bicycle, and to increase the number of people walking is welcome. However, in relation to the scale of the urban decarbonisation challenge, and potential co-benefits in terms of healthier, more connected communities, these ambitions appear far too limited. The health benefits of a more active lifestyle and the role active mobility can play are well established. Research has shown that urban environments with high levels of walking and cycling for travel typically offer a combination of many factors that help promote these modes (Forsyth and Krizek, 2010)<sup>7</sup>. The most compelling argument, particularly for cycling, is that only an integrated range of built environmental features (including infrastructure and facility improvements), pricing policies, and education programmes will result in substantive changes in uptake.

## Power sector

We strongly encourage Welsh Government to continue working with UK Government to find ways to deploy onshore wind energy in Wales, as this is one of cheapest forms of power generation. Incentives for local communities to support developments, combined with the action proposed to ‘Accelerate the deployment of renewable generation whilst encouraging local ownership’ could accelerate a transition to increased ownership of generation and greater opportunities for local, low carbon energy systems.

Caution should be exercised regarding optimism that small modular reactors will deliver any time soon, or particularly in time to deliver against the 4<sup>th</sup> and 5<sup>th</sup> carbon budgets. There are many unknowns surrounding their performance and economics – and these will not be resolved until there is significant real-world experience of their deployment. The proposed new nuclear power station Wylfa-B on Anglesey will be based on more established technologies, but the timescales for deployment are likely to be very long. Experience of nuclear power suggests that there are significant risks that both timescales and budgets will overrun considerably.

Overall, the consultation is moving in the right direction with regards to the power sector – utilising planning policy to discourage fossil fuel development and encourage renewables. However this will need work particularly with the DNOs to harness opportunities for investment and demonstration of smarter electricity systems if the main focus is to be renewables expansion in the short to medium term. In particular there will be a need to encourage appropriate grid connection, energy storage and flexible capacity with associated business models, to provide the necessary grid balancing, demand-supply flexibility, and system resilience for Wales.

Some of the innovations in power systems that the UK as a whole will require in 2030 and beyond are currently untested at scale. In our view Wales has a number of locations where nationally (i.e. UK) significant ‘demonstrator’ projects for power system innovation could proceed, and Welsh Government should be seeking to capitalize upon such opportunities. In particular, we would encourage support for further energy systems demonstrators that include power, heat and transport rather than demonstrations of single technologies.

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<sup>7</sup> Forsyth, A. and Krizek, K.J. (2010) Promoting walking and bicycling: assessing the evidence to assist planners. *Built Environment*, 36(4): p. 429-446.

## Waste (in particular materials efficiency and the so-called 'Circular Economy')

There is an increasing realization that our operational emissions (from power generation, heating our buildings and homes, and from transportation) form only one part of the decarbonisation story. Many aspects of household carbon emissions are embodied when making the products that we all use and own. While it is absolutely right to focus upon cost-effective carbon savings in relation to operational emissions, decreasing embodied carbon is also important as this will eventually represent a higher share of remaining emissions. Already, evidence for the UK as a whole shows that energy demand driven by household and government expenditure for materials and products is greater than domestic energy demand (CIE-MAP, 2017)<sup>8</sup>. However, due to the international nature of many supply chains, some of this energy demand will occur outside Wales and the UK. It is therefore more difficult for the Welsh Government to implement actions to improve the energy efficiency of these supply chains.

In the consultation document, resource efficiency and the Circular Economy are discussed as aspects of waste policy. However, achieving changes to upstream resource and materials efficiency sets a much more fundamental challenge than one of simple downstream waste management. We would therefore recommend that Welsh Government maintains a clear distinction between its policies on waste management and those on materials efficiency, making materials efficiency and associated new regulatory frameworks and business models a priority for new policy thinking and development over the coming decade. Indeed there is a case to make improved resource efficiency a core goal of Welsh economic policy. UKERC endorses the evidence that resource efficiency measures can reduce energy use emissions while also improving economic productivity (Green Alliance and CIE-MAP, 2018<sup>9</sup>). Put simply if we can make Welsh industry and businesses more resource efficient this should cut their costs and make them more competitive on the international stage. Research, some conducted within Wales, also shows that many strategies for resource efficiency would find high levels of public support (Cherry et al, 2018)<sup>10</sup>.

## 5. What other ideas do you have for reducing emissions between now and 2030?

We would encourage incentives for deployment of low carbon technologies, including CCS and CCSU (noted above). Whilst there may be scope for Welsh government to provide some incentives for CCS, this is likely to require a collaborative approach with UK government due to the scale of resources and extent of policy changes required. Additionally, land use change and agricultural policy is an important area, and one where (post-BREXIT) devolved powers could be deployed to significant effect in relation to carbon sequestration.

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<sup>8</sup> CIE-MAP (2017) 'Why energy, materials and products?' Available at: <http://ciemap.leeds.ac.uk/index.php/why-energy-materials-and-products/>

<sup>9</sup> Green Alliance and CIE-MAP (2018) *Less In, More Out: Using Resource Efficiency to Cut Carbon and Benefit the Economy*. London: Green Alliance.

<sup>10</sup> Cherry, C.E., Scott, K., Barrett, J. and Pidgeon, N.F. (2018) Public acceptance of resource efficiency strategies to mitigate climate change. *Nature Climate Change*, in press.

The CCC has already recommend a significant acceleration in the rate of tree planting across Wales – something which could be combined with regulation or support to facilitate greater use of local-sourced timber in construction. A recent report by the Royal Society (2018)<sup>11</sup> discusses other methods of enhanced sequestration including using bioenergy with carbon capture and storage (BECCS), enhanced forest management, peatland and coastal habitat restoration, soil carbon sequestration, and enhanced terrestrial weathering. The CCC advice discounts the impact of BECCS in Wales (again noting the lack of accessible CO<sub>2</sub> storage sites), while also citing this as one reason why it will be particularly difficult to fully decarbonise Wales. While this may be strictly correct if budgets are calculated solely at a devolved level, the Welsh Government might want to review whether Welsh agriculture could nonetheless contribute to BECCS deployment at a UK-system level, or whether other forms of enhanced sequestration might prove more feasible for Wales. While avoiding the flawed assumption that enhanced sequestration could ever be deployed as a simple substitute for the aggressive carbon reduction that Wales must embark upon across all sectors, some of these approaches could be suited to Wales’ particular circumstance of a large agricultural sector coupled with hard-to-decarbonize energy intensive industries. Here we recommend that more work is done to evaluate their short and long-term potential for Wales and the UK as a whole, and whether enhanced sequestration through land use changes could ultimately help Wales to meet its carbon targets while also retaining a significant heavy industrial base.

Regarding heat policy, Wales has large point sources of heat that are currently not used e.g. at Tata Steel in Port Talbot. Likewise, the proposed Wylfa-B nuclear station will reject more than 5 Gigawatts (GWth) of heat when operating. It would be desirable if at least some of the heat from these large sources was utilized.

## **10. How do you think the potential actions to reduce emissions might contribute to achieving the national well-being goals?**

Wales leads the UK and the world in adopting its Well-Being of Future Generations Act as an overarching framework for all policy and action. In the main, the goal of decarbonising Wales is fully aligned with these aspirations, in terms of providing a better environment for future generations as compared to business as usual, as are many of the co-benefits that come with acting effectively on climate change (far healthier and warmer homes, less polluted urban air, more connected communities, prosperity from a more resource efficient economy).

A major UKERC research project has investigated public attitudes to UK energy systems change, included a significant proportion of fieldwork conducted in Wales (Parkhill et al, 2013<sup>12</sup>). Here we found a surprising consistency of view – and a clear social mandate for the sorts of changes to the energy system represented in the consultation document, with people desiring a move away from finite fossil fuels and a reduction in wasted energy, and for governments to develop a long-term strategy to do this. This study also identified a set of values thought to be important by the public when deciding on the desirability of future low-carbon energy systems (including developing the most efficient and safe energy systems,

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<sup>11</sup> Royal Society (2018) *Greenhouse Gas Removal*. London: The Royal Society.

<sup>12</sup> Parkhill, K. A., Demski, C. C., Butler, C., Spence, A. and Pidgeon, N. (2013) *Transforming the UK Energy System: Public Values, Attitudes and Acceptability – Synthesis Report*. UKERC, London.

protecting the environment, and ensuring justice and fairness for people in transition), many of which are fully in line with the objectives of the Act. Fulfilling these aspirations for a low carbon energy system should almost by definition also meet the well-being goals.

That all being said, not all changes will always contribute positively towards the objectives of the Act, or equally across Welsh society. Here we have already mentioned the potential for unintended effects in some communities as transitions in Welsh heavy industry occur, but equally one can argue that not all low-income families in Wales will automatically access or benefit from the newer, smarter energy technologies currently being proposed for people's homes. These are issues which deserve some closer examination, again possibly through a mechanism similar to that of the Scottish Government's Just Transitions Commission.

An important intention of the Act is the involvement of the Welsh public, in all its diversity, in supporting the well-being goals. UKERC endorses this proposal, and has commissioned research to show how public engagement can support the low-carbon energy transition. Engagement has many forms, and can be achieved through working with selected groups of the general public (as in the UKERC Public Attitudes study described in the paragraphs above) or can evolve through the direct action of citizens. Other UKERC research has shown the sheer diversity of ways that people are already engaging with the shift to a low carbon energy system: from investing in energy cooperatives to major field trials of smarter networks; and from developing low carbon solutions in Transition Towns to new forms of political mobilization.<sup>13</sup> That study identified 33 distinctive cases of energy engagement in Wales over the period 2011-2015, plus others where this had formed part of UK-wide initiatives. The consultation does not discuss strategies for public engagement in any detail (unlike the recent Scottish Energy Plan<sup>14</sup>) and we believe that this represents a serious omission.

## 11. Do you have any other comments about this consultation?

The consultation says relatively little about the human dimension to tackling emissions, and in particular the potential that changes to behaviours and social practices undoubtedly hold for meeting the carbon budgets<sup>15</sup>. All sectors of UK and devolved governments could be criticized for paying insufficient attention to this issue. It is clear that any realistic decarbonisation pathway to 2030 and beyond will require significant changes to how we live and work - how else will we achieve increases in active travel, changed diets in Wales, adoption and effective use of smart energy technologies, and organisations which achieve step changes in their resource efficiency? There is extensive evidence on how people currently relate to and understand energy in their everyday lives<sup>16</sup>, and many lessons can also

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<sup>13</sup> Pallett, H., Chilvers, J. and Hargreaves, T. (2016) *Mapping energy participation: A systematic review of diverse practices of participation in UK energy transitions, 2010-2015*. London: UKERC.

<sup>14</sup> Scottish Government (2017) *Scottish Energy Strategy*. Edinburgh.

<sup>15</sup> Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C. & Vandenbergh, M. P. (2009) Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences* 106, 18452-18456.

<sup>16</sup> Henwood, K.L. et al, (2016) *Energy Biographies*. Cardiff University <http://energybiographies.org/>

be learned from the extensive literature on behaviour and practice change<sup>17</sup>. If Wales and the Welsh Government is to achieve an effective low-carbon transition it must take full account of this human dimension alongside the deployment of new technologies.

UKERC would welcome the opportunity to further strengthen our research and policy links with the Welsh Government, stakeholders and the wider community in Wales – and to offer our expertise to help inform the development and implementation of measures to meet the Wales carbon targets.

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<sup>17</sup> House of Lords Science and Technology Committee Report (2011) *Behaviour Change*. London: HMSO; also Sims, A. (2018) *Climate Change and Rapid Behavioural Change: What do we Know So Far*. Sussex University: STEPS Centre.