

Cynulliad Cenedlaethol Cymru | National Assembly for Wales
Y Pwyllgor Newid Hinsawdd, Amgylchedd a Materion Gwledig | Climate Change,
Environment and Rural Affairs Committee
Cyllideb Ddrafft Llywodraeth Cymru 2019-20 – Barn Rhanddeiliaid y Pwyllgor
Newid Hinsawdd, yr Amgylchedd a Materion Gwledig | Welsh Government draft
Budget 2019-20 – CCERA Stakeholder Views
Bud 07

Ymateb gan : SPECIFIC
Evidence from : SPECIFIC

**Re: Welsh Government draft Budget 2019 – 20: The National Assembly for Wales Climate Change,
Environment and Rural Affairs Committee consultation for views**

Thank you for the opportunity to respond with our comments to the Welsh Government draft Budget 2019 –20.

1. About SPECIFIC

SPECIFIC is a national Innovation and Knowledge Centre (IKC), led by Swansea University with strategic industrial partners, Tata Steel, AkzoNobel, NSG Pilkington, and Cardiff University and more than 50 other partners from academia and industry. SPECIFIC's vision is to transform the world of energy by creating "Active Buildings" that can generate, store and release solar energy. It is the only UK centre that is developing building-integrated solutions combining solar thermal and heat storage with photovoltaics and electrical storage. SPECIFIC and its partners support the commercialisation of disruptive technologies by taking the concept from research through to full scale demonstration. SPECIFIC is funded by the Engineering and Physical Sciences Research Council (EPSRC), Innovate UK and the European Regional Development Fund, through the Welsh Government.

2. Our Response

We are concerned about the budgetary approach taken because:

- i. We don't believe the Welsh Ministers are restricted in their powers to make long-term budget plans, especially because this financial budget is of immense strategic importance.
- ii. The current approach taken is short-sighted and does not plan sufficiently for the long-term reflecting the need to align the carbon budget trajectory as a prerequisite in its forecasting.
- iii. It is essential as part of the preventative spend process (4.102) that it uses the five ways of working and the sustainable development principle of the Well-being of Future Generation Act 2015 to urgently implement an approach that utilises its greater controls for Welsh Government and councils to influence policy and outcomes.
- iv. The funding allocated for decarbonisation is insufficient. The UK leaving the EU will have a tremendous effect on Welsh Carbon targets and how Wales decarbonizes, therefore preparing for the 2050 target.
- v. The development of the Welsh economy is paramount against the background of Brexit, the reliance on UK government funds, UK trade performance, ongoing financial uncertainty (1.20) and the threat of academic isolation.
- vi. Active Buildings, smart disruptive materials and technologies have the potential to transform markets, alleviate energy poverty, enabling a transition from carbon intensive industries to low carbon ones. Building regulations, planning and carbon budgeting policy levers and public procurement standards could be used to allocate resources more coherently.

**Re: Welsh Government draft Budget 2019 – 20: The National Assembly for Wales Climate Change,
Environment and Rural Affairs Committee consultation for views**

We believe, under ministerial remits and those of the National Assembly, there is a great opportunity for Wales to take greater leadership, to seize this golden, once in a century opportunity to set out its long-term ambitions; taking a lead role in the UK to protect future generations from the impacts of climate change. Therefore, as part of the budgets scrutiny, we would be grateful, if the committee could raise our concerns (overleaf in our response) with the Cabinet Secretary for Economy and Transport, the Minister for the Environment and the Cabinet Secretary for Energy, Planning and Rural Affairs, to scrutinize expenditure, administration and policy matters, encompassing: climate change; energy; natural resources management and planning.

Active Buildings¹, smart disruptive materials and technologies have the potential to transform markets, alleviate energy poverty, enabling a transition from carbon intensive industries to low carbon ones. Building regulations, planning and carbon budgeting policy levers and public procurement standards could be used to allocate resources more effectively and coherently

Earlier this year, you may also recall, the committee visited some of SPECIFIC's demonstrator projects. Since then, we have completed the construction of the Active Office and, The Chancellor of the Exchequer, Philip Hammond, and Secretary of State for Wales, Alun Cairns, have recently announced UK government funding of £36 million to develop clean energy innovation at Swansea University, to create the new Active Building Centre; seeking to remove barriers and accelerate market adoption of new solar-powered building design. Therefore, we would be delighted to host another visit for the committee to witness progress and for you to see even more innovation in action.

We look forward to continuing to work with Welsh Government and the National Assembly in support of Wales' ambition to create its low carbon future and discussing our response and recommendations in greater detail in due course with the committee.

Yours sincerely

G M Kelleher

Gill Kelleher
Policy and Engagement Manager

¹ A working definition of Active Buildings has been provided by the Industrial Strategy Challenge Fund: "a building which integrates solar generation and storage technologies for both electricity and heat within its construction, rather than being heated by gas, and which is controlled by an intelligent system to optimise energy management and comfort for inhabitants. Active Buildings aim to be net energy generators, and have the potential to utilise the surplus energy to trade" energy with the grid, surrounding buildings and electric vehicles."

OVERALL RESPONSE TO QUESTIONS

Question 1: What are your views on the draft Budget as it relates to the Committee remit?

Question 2: What are your views on the funding allocated to decarbonisation following its inclusion as a sixth key priority area for cross-government working in Prosperity for All?

Question 3: Do you have any concerns you wish to draw to the Committee's attention?

Welsh Government draft Budget 2019 – 20: Consultation

PROSPERITY FOR ALL: PROPOSED EXPENDITURE, ADMINISTRATION, POLICY CONCERNS AND OPPORTUNITIES

1. CLIMATE CHANGE

We are concerned about the budgetary approach taken because:

- i. We don't believe the Welsh Ministers are restricted in their powers to make long-term budget plans, especially because this financial budget is of immense strategic importance.
- ii. The current approach taken is short-sighted and does not plan sufficiently for the long-term reflecting the need to align the carbon budget trajectory as a prerequisite in its forecasting.
- iii. It is essential as part of the preventative spend process (4.102) that it uses the five ways of working and the sustainable development principle of the Well-being of Future Generation Act 2015 to urgently implement an approach that utilises its greater controls for Welsh Government and councils to influence policy and outcomes.
- iv. The funding allocated for decarbonisation is insufficient. The UK leaving the EU will have a tremendous effect on Welsh Carbon targets and how Wales decarbonizes, therefore preparing for the 2050 target.
- v. The development of the Welsh economy is paramount against the background of Brexit, the reliance on UK government funds, UK trade performance, ongoing financial uncertainty (1.20) and the threat of academic isolation.
- vi. Active Buildings, smart disruptive materials and technologies have the potential to transform markets, alleviate energy poverty, enabling a transition from carbon intensive industries to low carbon ones. Building regulations, planning and carbon budgeting policy levers and public procurement standards could be used to allocate resources more coherently.

We believe, under ministerial remits and those of the National Assembly there is a great opportunity for Wales to take greater leadership, to seize this golden, once in a century opportunity to set out its long-term ambitions; taking a lead role in the UK to protect future generations from the impacts of climate change.

Active Buildings², smart disruptive materials and technologies have the potential to transform markets, alleviate energy poverty, enabling a transition from carbon intensive industries to low carbon ones. Building regulations, planning and carbon budgeting policy levers and public procurement standards could be used to allocate resources more effectively and coherently.

1.1 Future Generations (Wales) Act 2015

The funding allocated for decarbonisation is insufficient, inadequately preparing Wales to tackle the critical threats Wales faces from climate change, energy security, the financial uncertainty of Brexit, its reliance on UK government spending, how it builds capacity to ensure Wales' future prosperity, health and resilience. The global decarbonisation trajectory has been set, creating clarity and certainty to drive investments and with it, enormous economic opportunity for Wales³.

Wales is required by law to reduce its carbon emissions by at least 80% in 2050 whilst protecting its future generations from the impacts of climate change. Critical challenges need to be addressed; cost of energy, consumer protection and security of supply whilst delivering clean smart flexible power, decarbonizing heat in buildings and most industrial processes; reducing industry emissions and localized pollution.

We agree a key consideration is how we can act now to help prevent issues arising, getting worse or occurring in the future; improving the economic, social, environmental and cultural well-being of Wales in line with the sustainable development principle (4.101). However, there is no budgetary evidence demonstrating action to optimise clean energy resources effectively across Welsh Government's main expenditure groups. How these benefits are monetised over the long term to avoid carbon leakage, ensure energy security and achieve the best outcomes for Wales.

There needs to be a step change in how carbon budgeting and financial forecasts are set with the two being designed, set and created as one. Such an approach would enable cross-government attention to protect those in fuel poverty, improve health and wellbeing whilst remove critical decarbonisation market barriers, making funds available and equip local government with the tools to model the best economic outcomes for its regions to mitigate risks from climate change and protect jobs.

It is essential as part of the preventative spend process (4.102) that it uses the five ways of working and the sustainable development principle of the Well-being of Future Generation Act 2015 to urgently implement an approach that utilises its greater controls for Welsh Government and councils to influence policy and outcomes. Inadvertently, the Welsh financial budgetary regime does not apply the same ambition and make good use of the permissions and legal obligation to improve the social, cultural, environmental and economic well-being it is afforded under the Well-being of Future Generation Act 2015.

Clearly, greater clarity and simplicity is needed to understand, evaluate and make better use of these legislative powers to support long term investment decisions. We agree the Well-being of Future Generation Act needs to play a fundamental role in guiding the budget process to ensure the government thinks about the long term; works with people and communities; taking a preventative approach to try and stop problems happening in the first place and has a more joined-up, cross government and public sector approach to addressing issues (4.2). It is fundamental the final budget reflects investing for the long term, putting decarbonisation at the heart of its expenditure proposals.

² A working definition of Active Buildings has been provided by the Industrial Strategy Challenge Fund: "a building which integrates solar generation and storage technologies for both electricity and heat within its construction, rather than being heated by gas, and which is controlled by an intelligent system to optimise energy management and comfort for inhabitants. Active Buildings aim to be net energy generators, and have the potential to utilise the surplus energy to trade" energy with the grid, surrounding buildings and electric vehicles."

³ The IEA estimates 13.5 trillion dollars of public and private investment in the global energy sector alone will be required between 2015 – 2030 if the Paris agreement are to meet their national targets.

1.2 Mitigating Risks to Public Health Risk

Air quality management is a public health priority. Acting to improve the air quality for everyone in Wales is one of the key challenges we face in managing health costs, meeting our objectives under current environmental legislation and aspirations for the well-being of future generations. It is estimated that the population health impacts would be over £1bn per annum by 2020 and nearly £2.5bn annually to 2030 (Defra/Public Health England)⁴. Given the transboundary nature of air pollution, close partnership-working between the nations of the UK is essential. Therefore, proposals under Wales' Clean Air Zones need to be strengthened and expenditure realigned to quantify social economic benefits of deploying Active Buildings and other innovative measures across its regions to be able to demonstrate the impacts for health and wellbeing to bring about significant reduction in exposure to harmful pollutants.

1.3 BREXIT

The development of the Welsh economy is paramount against the background of Brexit, the reliance on UK government funds, UK trade performance, ongoing financial uncertainty (1.20) and the threat of academic isolation. More importantly, the UK leaving the EU will have a tremendous effect on Welsh Carbon targets and how Wales decarbonizes, therefore preparing for the 2050 target must be based on the developing UK industrial strategy. The only way to achieve progress is by collaboration and international cooperation, therefore, it is essential for Wales to work in solidarity with UK Government, European and global partners in developing its greenhouse gas (GHG) schemes to reduce emissions; mitigating major funding shortfalls currently accessed through the European Investment Bank (EIB). Therefore, we do not agree that the Welsh Government's ability to plan beyond the short-term is restricted (1.15). The financial implications of leaving the EU are stark for Wales – greater than any other part of the UK, because Wales is a net beneficiary of EU membership. Wales receives around £680m in EU funding annually. Wales must not lose out. It is not acceptable to plan budgets in the short-term because there are many unanswered questions surrounding the future of UK outside of the EU (1.5). Brexit threatens divergence of policies leading to duplication of efforts at full cost to UK government and its devolved administrations.

2. DECARBONISING BUILDINGS, POWER, TRANSPORT and HEAT

2.1 Energy Performance of Buildings Directive (EU) 2018/844 (EPBD)

The revision of the Energy Performance of Buildings Directive is an important and concrete delivery of the Clean Energy for All Europeans package and it sends a strong signal as the building sector has a vast potential to contribute to a carbon-neutral and competitive economy. The new rules will create a clear path towards a low and zero emission building stock in the EU by 2050 underpinned by national roadmaps to decarbonise buildings; encouraging the use of ICT to make buildings smarter, supports rollout of infrastructure for e-mobility in all buildings and introduces a "smart readiness indicator" which will measure the buildings capacity to use new technologies.

Combined with an increased share of renewable electricity production, electric vehicles produce fewer carbon emissions resulting in better air quality. Electric vehicles constitute an important component of a clean energy transition based on energy efficiency measures, alternative fuels, renewable energy and innovative solutions for the management of energy flexibility.

⁴Industrial emissions are still responsible for a significant proportion of total UK emissions – 35% of nitrogen oxides, 65% of sulfur dioxides, 27% of particulate matter and 53% of volatile organic (Defra, Clean Air Strategy)

2.1.1 Active Buildings and Active Travel: Electric Vehicles and Charging Infrastructure

SPECIFIC has demonstrated, Innovation and new technology make it possible for buildings to support the overall decarbonisation of the economy, including the transport sector. For example, buildings can be leveraged for the development of the infrastructure necessary for the smart charging of electric vehicles and also offer ways, if Wales choose to, use a variety of ways to generate, store and release power. Building standards can be effectively used to introduce targeted requirements to support the deployment of recharging infrastructure in car parks of residential and non-residential buildings. For example, the Active Office⁵ and Active Classroom have dedicated recharging points to support its extensive fleet of electric vehicles and to pilot ways to simplify the deployment of recharging infrastructure with a view to provide robust scientific evidence, addressing barriers such as split incentives and administrative complications being encountered when trying to install recharging points⁶.

Active Buildings⁵, smart disruptive materials and technologies have the potential to transform markets, alleviate energy poverty, whilst enabling a transition from carbon intensive industries to low carbon ones. In the face of significant challenges for the construction, energy and transport sectors, the approach of SPECIFIC and the new Active Building Centre, is to link up these areas through the provision and stimulation of “Active Buildings” which use integrated solar energy and storage technologies to provide useful heat, power and transport at the point of use. This approach allows a flexible, smart infrastructure approach to be taken, where groups of buildings and vehicles can exchange energy to support balancing of the wider electrical system. This approach has significant benefits in terms of potential economic growth as well as enabling a transition to localized, low carbon energy system, that are less reliant on large centralized power generators. Building regulations and public procurement standards could be used as policy levers to drive this transition.

Therefore, we feel it well within the remit of Welsh government to implement a radical overhaul of planning, public procurement processes using Active Buildings to remove many barriers of the barriers local government and Public Sector Boards face when creating the business case to leverage capital funds to effectively design, plan and deliver long term well-being plans. The technology to create energy positive buildings is available and is effective. When designed correctly, the minimal additional cost of such an approach is quickly recovered through energy savings and additional revenues; accelerating a shift to low carbon buildings and transport, in turn supporting capacity building for associated jobs and skills.

Welsh government should sponsor the development of a Publicly Available Specification for Active Buildings. Ensuring all new publicly funded buildings in Wales are “Active Buildings”, providing a fast-track standardization process – cutting through market, regional and regulatory complexities; excelling in implementation of the EPBD.

⁵ <http://specific.eu.com/blogging-the-active-office-build/>

⁶ Official Journal of the European Union; Energy Performance of Buildings Directive (EU) 2018/844; amending Directive 2010/2031/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency

2.2 Energy policy

Energy policy is undergoing significant review at a GB level, albeit in a piecemeal fashion. High impact items include: the establishment of RIIO-2; the Significant Code Review; review of capacity markets; decarbonization of heat, electricity and transport. These developments, as in the past, may introduce market distortions that are extremely unhelpful for energy development in Wales.

An analysis of the reasons for this would be quite lengthy but for this purpose, an example serves to illustrate one of the issues as follows. Consider the impact of planting or retrofitting a significant number of future buildings in Wales with the capability of energy self-sufficiency to the extent that they obviate the need for large quantities of network reinforcements and power stations. Within the current energy market regulatory arrangements, a considerable portion of the benefits liberated by these actions would not be captured by those who invested in the buildings but would be spread across all network users. In other words, some of the benefits would be socialized.

Electricity network cost socialization is viewed very differently by different market players. At some risk of presenting caricatures of the arguments, they might be summarized as follows. Large power companies argue (coincidentally with their shareholders' interests) that the incentive to build large generation plant is reduced if they also have to pay in proportion to their use of networks. Ofgem would argue that wealthier people who can afford to generate their own renewable energy should have to pay for networks even if they reduce the need for them, because otherwise it would increase the burden on poorer users. Smaller generators, renewable producers and smart technology developers and other energy insurgents argue that the reduction of network requirements should be reflected by a reduction of their costs in proportion to the offset of both network and centralized power station requirements they bring over the long term. We agree with the last of these arguments because the application of socialization principles at a stage in the market which leads to the dampening of incentives for new technology carries the risk of distorting and muting innovation and entrepreneurship, which are vital components to development. Instead, if the guaranteed income for monopoly suppliers is to be spread out over consumers, it should be applied at a different stage whilst allowing the market itself to give more accurate signals to investors.

To address this, either it is necessary to reverse the flawed and contentious application of socialization (a very difficult task which would require successful opposition to Ofgem and large power companies), or to find another approach and preferably one over which the Welsh Government has significant control. In relation to the built environment, as being demonstrated by SPECIFIC's Active Buildings approach, higher building standards can be put in place that would have the effect of driving innovation, supply chains and cost reductions, thereby delivering outcomes that would have occurred but for the distortions introduced by energy market regulations. For example,

- i. Active Buildings at scale has the potential to reduce carbon emissions and be an integral part of Wales's future smart energy infrastructure. To investigate potential cost savings of the Active Homes Neath project⁷ at scale, an independent study (Bankovskis 2017)⁸ scaled up the potential savings that could be made if the technology and approach were applied to a million homes. It found the average saving per household could be at least £600 (a cut of more than 60%, with a decrease in carbon dioxide emissions of nearly 80 million tonnes over 40 years and a reduction of 3,000 megawatts in peak generating capacity – equivalent to the output of a very large power station.

⁷ <https://www.poblgroup.co.uk/news/pobl-story-july-2017/affordable-housing-concept-will-actively-generate-store-release-energy/>

⁸ http://www.specific.eu.com/assets/downloads/Indicative_Energy_and_CO2_Savings_of_Buildings_as_Power_Stations_Homes.pdf

- ii. The recent Institute of Welsh Affairs report: A Renewable Energy System Vision⁹ for Swansea Bay City Region, gives credit to SPECIFIC’s specialism in innovative energy systems; linking through energy efficiency, storage and electrified transport, and involving both the higher education sector and the largest social housing provider in Wales. However economic benefits cannot be fully quantified without significant regulatory reforms and a mechanism to equate these financial benefits.
- iii. As the energy regulator, Ofgem¹⁰ has concluded there is a strong case for considering fundamental reforms to the supplier hub model, and for evaluating how alternative arrangements are to be priced and might operate in practice, making sure that any future retail market design can unlock the full potential for innovation and competition, over the longer term.

2.3 Carbon Budget, Carbon Powers and Obligations

2.3.1 The Climate Change Act, 2008 as amended (“CCA 2008”) and the Environment (Wales) Act 2016 (“EWA 2016”)

This lays the legal framework for carbon budgets in Wales. The EWA covers a wide scope of powers and obligations as follows:

- **Carbon targets**
- **Carbon budgets**
- **Statutory consultations**
- **Specific greenhouse gases**
- **Committee on Climate Change**
- **Trading schemes**
- **Reporting on the impact of climate change**
- **Devolved Welsh functions**

We are mindful that, in relation to Carbon Budgets, the detail in the EWA suggests that the Welsh Ministers have duties imposed upon them by Westminster to administer regulations, rather than to decide what those regulations should be. These are more akin to obligations to administer rather than true devolved powers. For example, Regulation 28 (1) of the EWA 2016 states: “*The purpose of this Part is **to require** the Welsh Ministers to meet targets for reducing emissions of greenhouse gases from Wales.*” We would suggest that the Welsh Government ensures that the costs of administering this obligation, in the absence of any discretion regarding the obligation itself, **should be recovered from central Government in full, as the EWA 2016 appears silent on this.**

⁹ <https://www.iwa.wales/news/2018/09/re-energising-wales-economic-impact-of-energy-transition-in-wales-a-renewable-energy-system-vision-for-swanea-bay-city-region-report>

¹⁰ Based on extensive engagement and Ofgem’s review and others evidence concluded, given the scale of the challenge that current supplier hub arrangements are not going to be fit for purpose for energy consumers over the longer term.

2.3.2 Climate Change Act 2008; Regulations 44 and 45

In other matters related to carbon, however, we would recall that Welsh Government has very substantial powers under the Climate Change Act 2008. In particular, Regulations 44 and 45 under this Act confer substantial powers to the Welsh Government to institute trading schemesⁱ. There are a number of ways that these powers could be activated in order to achieve the joint objectives of:

- Incentivising low carbon choices in chosen economic sectors; and
- Using existing platforms (such as Ofgem certificate registers) to gather robust information in any particular sector covered by a trading scheme.

The key point for this purpose is that we suggest combining the obligations upon Welsh Government to set carbon budgets with discretionary powers that allow the Welsh Government to set carbon policy, such as incentivization schemes, planning powers and the setting of building standards. Existing carbon budgets methodologies and future energy scenario models do not capture the savings and impacts from disruptive innovations such as the concept of using Active Buildings¹⁰ developed by SPECIFIC as part of a long term pathway for decarbonisation. Whilst a variety of formal schemes have been designed to manage specific aspects of carbon mitigation¹¹. These UK and international schemes are set at a very high level and cover very broad sectors but do not of themselves lead to any actual vision regarding implementation, only functional outcomes.

We do not elaborate further in this consultation how such schemes might be structured or what sectors they might cover, (although we are happy to make concrete suggestions), but we stress that understanding the role innovation and technological advancements of future energy infrastructure investment, advanced power, heat and cooling developments will be critical in setting and meeting carbon budgets and allocating financial expenditure.

However, as part of our response to the low carbon pathway for Wales, we have set out our key recommendations for action (see annex one) and also put forward a suggestion for a sub-budget scheme using the Active Buildings principles, which we would be happy to discuss in greater detail with the committee.

¹¹ These schemes include: EU ETS, Renewables Obligation, FiTs, CfDs, CRC Energy Efficiency, Climate Change Levy, Climate Change Agreements

2.4 Decarbonisation of Heat

Wales already has an emerging critical mass of innovation on heat. Ofgem's statutory role is limited to gas and electricity, but does not include heat from other sources. More evidence is needed to evaluate the impacts from heat innovations at scale. The UK CCC and others have identified gaps in the modelling of future heat technologies and this suggests revisiting old problems with new technology solutions.

New homes and buildings constructed in line with SPECIFIC's vision to turn buildings into "Active Buildings" provides an ambitious change to the way millions of people can heat their homes and businesses as well as helping to address fuel poverty, significantly reducing the cost of reinforcing the electricity grid whilst demonstrating low carbon heating technologies requiring no gas; which could be applied to the retrofit market. Many support initiatives are hampered by pre-conceptions of the need for heat networks (thereby perpetuating natural monopolies and expensive infrastructure) or hydrogen injection into gas networks (which have potentially very low resource efficiency and high marginal cost characteristics and which could lead to the need for more networks rather than less) whereas SPECIFIC has demonstrated that there are potential alternatives that answer these criticisms. For example, SPECIFIC is investigating the scope to recover waste heat from industrial processes which could include low grade heat capture from thermal power stations, and its transport to other points of use for space and water heating. Therefore, being able to test and trial new innovations, business models in a de-risked environment whilst protecting consumers will be critical.

Moreover, these are solutions that can be developed in Wales with export potential. It is imperative, therefore that heat schemes do not discriminate against these alternatives and that evaluation criteria as suggested above are included to take account of underlying physics rather than imperfect economic theory and modelling alone. Wales has it within its powers, the capability to create a robust least-worst regret heat decarbonisation pathway with corresponding policies, considering explicitly a full range of technologies and system uncertainties needs to be created.

RECOMMENDATIONS: The National Assembly for Wales Climate Change, Environment and Rural Affairs Committee: Welsh Government draft Budget 2019 – 20

- 1) One long term low carbon plan and budget for Wales is required, with capital expenditure directly linked to carbon budgets and target setting, based on the assumption Brexit will happen. A step change in investment for preventative approaches based on robust data and evidence is required;
- 2) The Welsh Government should consider instituting collaborative and collegiate relationships with a small number of selected countries within the European Union in order to share ideas, methods and best practices as well as to ensure that post-Brexit, there remains a strong alignment between Wales and the EU and that Wales can be competitive, engaged and high profile in an international context.
- 3) The public sector must take greater leadership to enable energy resilient communities to test new flexible energy market-based approaches maximizing resource efficiently using Active Buildings and low carbon transport as key enablers to change actions, protect jobs and improve health and well-being;
 - a. Public Procurement funds, national and regional infrastructure planning, building regulations should be reformed to remove critical barriers to empower communities to access resources and invest in sustainable infrastructure.
 - b. Capital borrowing powers and funding must be used to invest for the long term in low carbon, renewable energy infrastructure; allocating expenditure to develop capacity for disruptive technologies, like those being developed at SPECIFIC and others to take advantage of global markets for low carbon products and services.
 - c. Create a clean air brand for Wales. Broaden its definition of electric vehicles to include e-bicycles and e-mopeds, and invest in infrastructure.
- 4) Consider using the substantial discretionary powers available to the Welsh Government to put in place carbon policies that link to budgets. These include trading schemes, planning powers and the setting of building standards.
 - a. Ensure all publicly funded buildings in Wales are designed and built as “Active Buildings” as defined by a Publicly Available Specification (PAS) to allow the basis for primary energy factor calculations to measure the lifecycle impacts from renewables and other low carbon heating solutions.
 - b. Prioritize innovation funding for the decarbonisation of heat in a manner that does not discriminate against new, emerging technologies, such as inter-seasonal heat storage.
 - c. Introduce criteria of ‘Low Marginal Cost Technology’ and ‘Resource Efficiency’ as a strategy to promote the simultaneous development of technologies that are low carbon but which also contribute to overall economic competitiveness and resilience to economic shocks.
- 5) If not already provided for and to the extent that carbon budget obligations are imposed by Parliament with no Welsh Government discretion, we suggest that Welsh Government seeks to recover the costs of administering the imposed obligations in full from Central Government.
- 6) Capital borrowing powers and funding must be used to invest for the long term in low carbon, renewable energy infrastructure; allocating expenditure to develop capacity for disruptive technologies, like those being developed at SPECIFIC and others to take advantage of global markets for low carbon products and services.

ⁱ Regulation 44 Trading Schemes:

(1) The relevant national authority may make provision by regulations for trading schemes relating to greenhouse gas emissions.

(2) A “trading scheme” is a scheme that operates by—

(a) limiting or encouraging the limitation of activities that consist of the emission of greenhouse gas or that cause or contribute, directly or indirectly, to such emissions, or

(b) encouraging activities that consist of, or that cause or contribute, directly or indirectly, to reductions in greenhouse gas emissions or the removal of greenhouse gas from the atmosphere.

Regulation 45 Activities to which Trading Schemes may Apply

(1) For the purposes of this Part activities are regarded as indirectly causing or contributing to greenhouse gas emissions if they involve, in particular—

(a) the consumption of energy,

(b) the use of materials in whose production energy was consumed,

(c) the disposal otherwise than for recycling of materials in whose production energy was consumed, or

Climate Change Act 2008 (c. 27) Part 3 — Trading schemes 25

(d) the production or supply of anything whose subsequent use directly causes or contributes to greenhouse gas emissions.

(2) Correspondingly, for the purposes of this Part activities are regarded as indirectly causing or contributing to the reduction of greenhouse gas emissions if they involve a reduction under any of those heads.

(3) This Part applies to activities carried on in the United Kingdom, regardless of where the related emissions, reductions or removals of greenhouse gas occur.

Annex One:

Carbon Budgeting: Fundamental Criteria to Evaluate Areas for Welsh Government Support in Energy and Built Environment

As budgets are developed, it is necessary to recognize the limitations and very high-level nature of the modelling work carried out by or on behalf of the Climate Change Committee. This work cannot reliably forecast cost, innovation and technology developments, the outcome of competitive forces as they develop in the economy, the impact on businesses or human behaviour. Moreover, it is difficult and unwise to place too much reliance on modelling if it is not fully open and exposed to scrutiny. (For the avoidance of doubt, we do not think such scrutiny, except by independent experts, would be helpful). The key point is that whilst the modelling provides useful indicators at a GB level, Welsh Government has the responsibility and opportunity to observe and manage its carbon impact at a much more granular and realistic level and to do so much more transparently. This is part of the rationale for carbon sub-budgets and locally tailored incentive schemes and standards. In developing these, we believe that additional information in setting budgets and schemes to manage their evolution would be useful. This additional information should relate to the longer term impact on the Welsh economy and should provide the Welsh Government the ability to tailor schemes in a more holistic and robust manner. Below, we suggest two categories of information that are profoundly important in measuring the long term impact of budgets and schemes in a way that is independent of the distorting lens of current policies, regulations and market distortions. These are marginal costs of energy technologies and resource efficiency.

Low Marginal Costs

Wales seeks to be sustainable across all its dimensions. The most fundamental of these is competitiveness in global markets because without this, business in Wales cannot be expected to flourish. Currently, focus is often placed on the capital cost of investments, but the Welsh Government should also think in terms of marginal and operating costs of low carbon and energy technologies which it chooses to support as a decision criterion. The very low operating and marginal costs of low carbon energy technologies (such as wind, solar, marine, energy efficiency, energy storage and smart systems) confer advantages which the Welsh Government should consider alongside the capital costs in order to make more informed judgements. To illustrate the critical importance of this, consider the relative contributions to international economic competitiveness in manufactured goods of privately-owned energy infrastructure with alternatively high (e.g. generation from fracked gas) or low marginal operating costs (such as solar plus storage).

Manufactured goods (as well as other aspects of economic activity) require an energy input, the cost of which may vary depending on fuel prices in energy markets. The economic sustainability of this cost is dependent on the cost of competitors' energy costs. If, for example, competitors' energy costs fall, low marginal cost sources of energy can follow downwards while continuing to generate, whereas high marginal costs sources (such as gas) are subject to a floor price based on the international price of gas and carbon (the "spark spread"). Manufacturers relying on high marginal cost energy could be structurally uncompetitive with competitors having access to low margin cost energy inputs. (Hypothetically, therefore, a steel works dependent on high marginal cost fossil fuel prices in the UK may therefore become structurally uncompetitive with a similar plant, powered by low marginal cost nuclear plant in France). In an extreme case, such as an economic shock scenario, falling energy prices may result in private companies which own energy assets becoming insolvent as they may be unable to pay off their loan finance costs. In this event, the assets with low marginal costs would be instantly recyclable in the economy in the hands of a new owner and the assets would continue to operate in new ownership, having been freed of its pre-insolvency debts. By contrast, a high marginal cost generator might remain financially stranded and unable to provide energy at competitive prices. It is arguable, therefore, that low marginal costs lead to a more competitive economy that is highly resilient in the face of economic shocks. As it happens, the technologies that offer low marginal costs are generally associated with low carbon and other emissions as well.

Resource Efficiency

A related fundamental criterion is energy resource efficiency. For example, an electricity storage system having a round trip efficiency of, say 75% wastes more operational energy than one having a round trip efficiency of 85%. The strategic advantage of energy resource efficiency is that it reduces economic sensitivity to changes in energy prices and availability. This is also an example of a strategic criterion that considers longer term aspects when evaluating areas that might qualify for Welsh Government support, and one that is frequently overlooked. The case for focusing on energy resource efficiency is founded primarily on the fact that the fundamental resource is the energy itself. It is easy to lose sight of this because most evaluations primarily consider financial implications (i.e. cash flows taking account of taxes, financial support schemes, cost of finance, market prices, current regulatory arrangements and so on), which do not necessarily correspond well with the underlying physics or economics.