

Durham Energy Institute initial response to Energy White paper

Durham Energy Institute (DEI)¹ welcomes the [Energy White paper](#) released by the UK government on 14th December 2020 and its focus on clean energy, green jobs and affordable energy. It is a significant step forward in providing a clear national ambition and strategy for achieving a low-carbon and resilient energy sector for the UK.

We believe that Durham Energy Institute alongside its academic and industrial partners has a significant role to play in supporting and exceeding the UK government's net zero ambitions. We educate, engage and inspire our students to be at the forefront of the green recovery and use our world-class research in offshore wind, hydrogen, deployment of CCS, large-scale decarbonisation of heating, delivery of new energy materials, and the social and environmental contexts of these technologies to ensure we fairly achieve net zero before 2050 and meet society's demand for affordable, secure and sustainable energy provision.

Below we outline some initial overview responses to the White Paper drawing from our research and partnership working. In the coming weeks DEI will host discussions and publish more detailed analysis on the key themes of the White Paper, offering support and initiatives on key statements made. DEI are leading on a wide range of decarbonisation and net zero initiatives and are keen to support the Government and associated inquiries and Taskforces in developing the detailed roadmaps emerging from this White paper.

Key points include:

- **Offshore wind:** We believe the targets for growth in this sector are ambitious but necessary and achievable. Our partnership work and research is ensuring the sector is efficient, cost-effective and capitalising on opportunities to innovate and grow.
- **Hydrogen:** We welcome the commitment to developing hydrogen for heating, storage and transport and are leading national research and activity to accelerate these developments.
- **CCS:** We welcome the renewed commitment to CCS and to designing a new commercial framework. Given previous commitments were withdrawn it is essential to ensure that this support and financing is followed-through.
- **Decarbonising Heat:** We welcome the range of initiatives outlined for tackling this key issue and the recognition of the role that heat networks can have. We urge the government to support use of direct heat sources, such as geothermal or captured waste heat, in these networks where possible.

¹ Durham Energy Institute (DEI) is the hub of energy research at Durham University. We unlock research synergies between different disciplines and sectors to tackle the energy demands of the future, produce world class research for understanding energy decarbonisation issues across science and society, and deliver integrated solutions for the climate emergency. www.durham.ac.uk/dei/

This response was coordinated by Evelyn Tehrani with inputs from Professor Jon Gluyas, Professor Tony Roskilly, Professor Simone Abram, Professor Gavin Bridge, Professor Karen Johnson, Professor Sandra Bell and Dr Douglas Halliday.

- **Oil and Gas Transition:** We recognise that many of the skills, infrastructure, workforce, and other assets from the oil and gas sector can be refocused towards the green economy. We are working with industry, policy and research organisations to enable this transition.
- **Biomass:** We welcome the Government will now consider the role biomass can play in delivering our wider environmental targets, including on air quality, and low-carbon transitions however we urge them to review implications for soil health of all policy options considered.
- **Solar PV:** Significant untapped potential still remains in solar PV in the UK, however growth has stalled over recent years and therefore further stimulus is needed to see continued growth.
- **Modelling:** We welcome the focus on energy modelling and on uncertainty. However, we urge BEIS to also recognise the limitations to modelling which are partial reflections of reality and to ensure insights from social science are incorporated into policy.
- **Energy Affordability:** We strongly welcome the focus on tackling fuel poverty and ensuring the most vulnerable are not excluded from the net zero transition. We recommend that schemes be co-designed with users, and the implementation of a comprehensive communication and support strategy to help households navigate the low-carbon transformations.

Offshore Wind

The huge role that offshore wind can play in helping the UK energy transition to a low-carbon future is properly recognised in this White Paper². This is consistent with the policies of UK governments in the 21st century, whose support for the Sector has been rewarded by the cost of wind energy dropping rapidly to the current highly competitive level within our energy mix. The planned increase in capacity to 2030 and beyond, combined with other measures, will ensure that the UK is on track to decarbonise electricity generation. This will also support the decarbonisation of a substantial portion of the transport system through the transitioning to electric and hydrogen fuel-cell vehicles. Our work with our strategic partners Ørsted, the Energi Coast and Aura Offshore Wind Clusters and the Offshore Renewable Energy Catapult will ensure that the DEI plays its part in ensuring that the UK achieves 40GW of offshore wind installed capacity by 2030, and exports this technology and expertise globally.

Professor Simon Hogg, Ørsted Professor of Renewable Energy and Chair of the Energi Coast Innovation Group³ said: *“The target to quadruple offshore wind installed capacity to 40GW by 2030, which will produce enough electricity to power every UK home, is ambitious but achievable. An increased focus on energy storage is essential for the integration of the planned expansion in offshore wind into our energy system. Hydrogen and CCS have much to offer here as enabling technologies for storage. Their inclusion in the 10-point plan and Energy White Paper alongside offshore wind opens the door to supercharging our transition to a zero-carbon future. Bringing the same commitment to these areas and an emphasis on regional-clusters to support economic growth from the Sector Deal, will benefit the whole of the UK and make a significant contribution to the Governments ‘Levelling-Up’ agenda.”*

Hydrogen

² DEI response to the Prime Minister’s 10 point plan (19 November 2020)

<https://www.durham.ac.uk/resources/dei/DEIresponsetoGov10pointplanNov2020-FINAL.pdf>

³ Durham Energy Institute is an academic leader in offshore wind. www.durham.ac.uk/dei/research/wind/ We have a long-term strategic partnership with Ørsted which is spearheading global development and deployment of offshore wind. We are also key partners in two of the leading Offshore Wind Regional clusters – Aura in Humberside and Energi Coast in North East of England. See DEI response to BEIS Committee inquiry on Post-pandemic economic recovery (Oct 2020) <https://committees.parliament.uk/writtenevidence/10011/pdf/>

The commitment to developing hydrogen for heating, storage and transport is welcome. The DEI is leading on advancing UK hydrogen research and infrastructure development to support the Government's plans for hydrogen. This includes our leading roles in the National Network for Hydrogen Fuelled Transportation and Decarbonisation of Heating and Cooling, and our work in support of decarbonising the Teesside industrial cluster. We are also supporting Northern Gas Networks, National Grid Gas Transmission and others in their work to understand the challenges of distributing hydrogen through our national gas network and using it safely in a wide range of transport, buildings and industrial applications⁴.

Commenting on the investment into hydrogen, Professor Tony Roskilly⁵ said: *"This is a very positive and encouraging announcement made by the Government. For all scenarios to decarbonise UK domestic, commercial and industrial heating by 2050, hydrogen is set to play an important role. There is also the opportunity to decarbonise road, rail, air and sea transport modes through the use of hydrogen and hydrogen carriers, such as ammonia and synthetic liquid fuels. Coupling this with potential use of offshore wind and other renewable power to produce green hydrogen not only supports decarbonisation but could provide crucial energy system resilience and security of supply. The government commitment to hydrogen will accelerate developments and will stimulate the additional financial and commercial investment required to make this a reality."*

Carbon Capture and Storage

Equally, the commitment to Carbon Capture and Storage is very welcome and necessary. This will directly support our targets to reduce greenhouse gas emissions and, at least for the near future, substantial generation of hydrogen will also be reliant on parallel development of carbon capture and storage. We have previously raised concerns that current business models and carbon pricing do not encourage investment by industry in carbon and waste-heat capture technologies. We therefore strongly support the plan to design and implement a new commercial framework by 2022 to provide revenue support and improve companies' confidence for investing in these solutions.

It is essential to ensure that this support and financing is followed-through. Recent UK governments have broken manifesto promise after promise when it comes to CCS. If original commitments had been met when first promised, we would have been far closer to meeting our emission reduction targets now.

Decarbonising Heat

⁴ News Durham research supports £12.7m National Grid hydrogen research facility
<https://www.durham.ac.uk/dei/news/?itemno=43308>

⁵ Professor Tony Roskilly and his research team are leading national research networks for Hydrogen Fuelled Transportation – Network-H2 and Decarbonising Heating and Cooling. <http://www.net-zero-research.co.uk/> They are developing hydrogen fuelled transport powertrains, CHP and integrated energy hubs, as well as research on the utilisation of captured CO2. He is the Academic Lead for the Teesside Industrial Cluster which is at the forefront of demonstrating hydrogen and CCS development. Tees Valley have ambitious plans to decarbonise industry and transport by exploiting the benefits of hydrogen and CCUS. This includes the Net Zero Teesside CCUS project⁵ and establishing the National Hydrogen Transport Hub and the Tees Valley Net Zero Innovation Centre. We are working with Tees Valley Combined Authority, NEPIC, PD Ports, MPI, TWI, Northern Gas Networks, Teesside University and other regional stakeholders to support all the decarbonisation and clean growth agenda.

The decarbonisation of heat is critical to the UK's and global net zero journey and is the area that has been the most difficult to tackle. We therefore fully support Government targets for replacing natural gas boilers with alternative technology to enable heating from renewable energy, along with tighter energy efficiency measures for existing and new builds, and the proposed clean heat and Green Heat Network Funds.

We are also happy to see the recognition of heat networks and a commitment to deliver new low-carbon heat networks. We urge the government to support use of direct heat sources, such as geothermal, solar or recover surplus heat, and their integration with these networks where possible. Geothermal heat is secure and sustainable, moreover its use would massively improve energy efficiency over the use of electric heating as well as easing demand on the National Grid. The case study outlined of Seaham Garden Village which is being developed between the Coal Authority, Durham County Council and Tolent Construction is an excellent example which DEI helped facilitate through our research and partnership working on Geothermal Energy⁶. Professor Jon Gluyas who has driven forward the mine-energy initiatives in the NE with the Coal Authority said, "to see Seaham Garden Village in development is a huge fillip for the work we have pioneered on mine-energy". We believe there is potential for similar projects across the UK which would particularly benefit deprived former mining communities. Reuse of former mines plays well into the circular economy and sustainable development initiatives."

Supporting North Sea oil and gas transition

We welcome this focus and the White Paper's recognition that 'business as usual is no longer an option' on the UK Continental Shelf focus. We recognise that many of the skills, infrastructure, workforce, and other assets from the oil and gas sector can be refocused towards the green economy, including support for offshore wind, CCUS and hydrogen.

DEI are working closely with the North Sea Industry in Aberdeen on a series of ambitious plans to decarbonise the petroleum sector and through *SHIFT* geothermal will roll out geothermal power generation from current waste water production, capture heat and CO₂, replace gas turbines with geothermal generated power and ensure Maximum Energy Recovery from infrastructure, thus extending field life, deferring abandonment and at the same time massively lowering emissions. The same *SHIFT* geothermal initiative is also planning to make CO₂ storage sites into CO₂ driven, carbon-negative power stations. Industrial scale use of captured CO₂ in closed-loop power stations would then see clean power (electricity) exported to shore from offshore to onshore and be the first significant monetisation of hitherto waste CO₂ produced from combustion. We are also currently undertaking research into the evolving strategic position of the UK within global oil networks, as a result of global shifts in consumption and low-carbon transition. This research uses social science methods and an innovative research design to analyse the trajectories, processes and consequences of this transformation.⁷

Biomass

We welcome that the Government will now consider the role biomass can play in delivering our wider environmental targets, including on air quality, and low-carbon transitions but note that soil health is not mentioned. Bioenergy and specifically the Government-incentivised anaerobic

⁶ See www.durham.ac.uk/dei/geothermal/

⁷ The Fraying Ties project is a three-year programme of research funded by UK Research and Innovation led by Professor Gavin Bridge at Durham University <https://gtr.ukri.org/projects?ref=ES/S011080/1>

digestion has significant negative implications for soil health because it results in less carbon being returned to soil. Returning carbon to the land is essential to maintain soil health and the ecosystem services it provides such as flood resilience and carbon storage. In 2014, in the UK, we were only returning 70% of our organic waste streams to the soil (House of Lords, 2014). Although the figures are unknown, the rise of both industry and local authorities adopting Anaerobic Digestion (AD) as a way of achieving net zero by generating renewable energy, we will now be returning even less. This is because AD residues contain less carbon than composted wastes. However, emphasising biomass use in AD for hydrogen production could preserve carbon in the wastes that are returned to land and this is an active area of research within DEI. We look forward to contributing to the planned call for evidence: 'Biomass for net zero', to inform the development of the Government's new Biomass strategy and ensuring the implications for soil health are properly considered⁸.

Solar Photovoltaics

The white paper rightly recognises that a future low carbon electricity generation mix is likely to be composed predominantly of wind and solar. Significant untapped potential still remains in solar PV in the UK, however further stimulus is needed to see continued growth. The UK currently has an installed capacity of 13.4 GW⁹, however after the successes of past incentive schemes growth of installed solar PV capacity has slowed to a rate of 1.5% for the last three years. Solar PV systems provide predictable electricity on scales from kW to multi MW. This flexibility coupled with storage and smart energy systems enables distributed electricity solutions to be developed which can readily integrate and enhance existing networks. According to the IEA Renewables 2019 report¹⁰ "Of all renewable technologies, additional growth potential is highest for distributed PV because consumer adoption can be very rapid once the economics become attractive." The UK is currently recognised as a global leader in research on PV materials and research is being undertaken on thin-film materials which are even more efficient for UK low solar illumination conditions^{11,12}. This research will further support the growth of solar PV in the UK.

Energy modelling

We welcome the focus on energy modelling and its focus on uncertainty. However, we urge BEIS to focus also on the limitations to modelling, and the recognised inability of digital and quantitative models to acknowledge or incorporate important social science and humanities expertise on energy systems. We note the NAO's well-founded critique of government use of modelling, and urge their findings to be addressed. Statistical and digital models cannot provide all of the necessary information to ensure that energy policy is both just and effective, and while quantitative uncertainty modelling can be a useful way of indicating the reliability of a model in its own terms, it remains a crude method to address the diverse and qualitative different issues that make models only very partial reflections of reality. We urge BEIS to pay attention to projects such as SHAPE Energy and ENERGY SHIFT, and to including social science and related knowledge in all aspects of

⁸ In 2016, Professor Karen Johnson gave oral evidence to the Government's Environmental Audit Committee's Inquiry into Soil Health find out more at

<https://www.durham.ac.uk/research/directory/staff/?mode=staff&id=2208>

⁹ <https://www.gov.uk/government/statistics/solar-photovoltaics-deployment>

¹⁰ <https://www.iea.org/reports/renewables-2019/distributed-solar-pv>

¹¹ <https://research.ncl.ac.uk/necem/>

¹² DEI Perspectives: Thin-film solar cells: a quiet technological revolution (Aug 2019) Dr Budhika Mendis <https://www.durham.ac.uk/resources/dei/DEIPerspectivesissue3SolarmaterialsFINAL.pdf>

‘decision-support’. The significance of this issue has been an important finding in the National Centre for Energy Systems Integration (CESI)¹³ in which Durham Energy Institute has been a key partner. We look forward to working with government to ensure that the rich and diverse social science and humanities research on energy systems is incorporated into government policy and planning.

Energy Affordability and Fuel Poverty

We welcome the focus on tackling fuel poverty and ensuring the most vulnerable are not excluded from the net zero transition through measures to tackle the ‘loyalty penalty’, extend the Warm Home Discount, the focus on efficiency standards and decarbonisations in the social rented sector and ensuring the costs of moving to clean energy over the long-term are fairly distributed. These are all crucial areas that need addressing.

We eagerly await further information on the consultation into projects and options for auto switching supplier to the best deal. Auto switching will benefit all consumers but is even more important for vulnerable households who are least able to research and identify lower cost supplier options. However more attention is needed on energy citizenship and the different roles and relationships of people to energy, rather than the current language of consumers. We would also welcome discussion on alternative systems of energy supply with citizen rights and Justice at its core.

Allocating extra support for low-income households is welcome, but the mechanisms by which this is managed require close examination. Recent government schemes have not achieved the spending required, through lack of engagement with those facing energy vulnerabilities. **We recommend that schemes be co-designed with users**, on the advice of ground-level organisations including National Energy Action¹⁴ and local authorities in affected areas. The form of implementation is crucial to these schemes, since low-income households are often extremely sensitive to disruption, may be in insecure housing tenancies, and may experience secondary disadvantages (eg where rents are increased when housing quality is improved, counter-acting the benefits of reduced energy bills).

We would also recommend implementation of a comprehensive communication and support strategy, including peer-to-peer support and a network of advice services at the local level.

With the range of new low-carbon technologies and smart energy options being made available in government plans it will be essential to ensure there is also effective support and advice for households at the local level. Engagement and education play a vital role in improving energy efficiency, speeding up the acceptance of any new technologies or retrofit measures, and building trust. The community or third sector has a crucial role in providing advice and support as ‘trusted friends’ with local knowledge, but they require adequate long-term funding to carry out this support.

The ambitions for a UK transition to Net Zero and the strategies laid-out in the energy white paper will mean significant changes for households and citizens in the UK. It is essential that people are supported to navigate these transformations so that no one is disproportionately adversely affected.

¹³ Centre for Energy Systems Integration <https://www.durham.ac.uk/dei/projects/cesi/>

¹⁴ National Energy Action www.nea.org.uk

Our work with [Haringey Borough Council to develop their Affordable Warmth Strategy¹⁵](#) provided a holistic people-centred tool for the abatement of fuel poverty which recognises the multiple causes of fuel poverty and the value of providing a peer advice network of Energy Friends and Energy Advice One Stop Shop services.

At Durham Energy Institute (DEI) we always consider the societal impacts of policy and our research. We will continue to support local and national government on the just and fair transition, working towards an end to fuel poverty alongside achieving Net Zero.

In the coming weeks DEI will provide a more detailed analysis of the White Paper and offer support and initiatives on each of the key statements made in the White Paper with the aim of helping the UK Government and industry deliver secure, equitable and sustainable energy for its peoples.

¹⁵ DEI worked with Haringey Borough Council to developing a new strategy to tackle energy vulnerability and affordable warmth <http://www.durham.ac.uk/dei/projects/haringeystategy/>