UK Energy Research Centre

Environmental Audit Committee inquiry into Green Jobs - call for evidence

UK Energy Research Centre Response

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Introduction to UKERC

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

UKERC is a consortium of top universities and provides a focal point for 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 UK Research and Innovation Energy Programme.

Currently in its fourth phase running from 2019-2024, UKERC delivers an ambitious programme of research on the challenges and opportunities for delivering the transition to a net zero energy system and economy. The programme brings together engineers, natural scientists and social scientists to generate evidence that informs real-world decisions.

Our research programme encompasses major themes on global energy challenges and their implications for the UK; the role of local and regional energy systems; interdependencies between energy systems and the environment; decarbonisation of specific sectors including transport, heat and industry; and transitions in energy infrastructures.

The programme is complemented by a set of national capabilities. These carry out systematic evidence reviews, host and curate energy data, map and monitor public engagement with energy systems, and improve the transparency and understanding of energy models. UKERC also supports the wider energy research community in the UK by promoting engagement with other stakeholders, supporting career development and capacity building, and enhancing international collaboration.

Overview

The UK Energy Research Centre (UKERC) has provided independent research and analysis across the whole energy system since 2004, with funding provided by the Research Councils through a succession of five-year phases.

UKERC has a long track record of engaging with parliamentary committees and we would be very happy to provide follow up information or to assist the Committee Secretariat in working through these substantial topics.

In response to the COVID-19 pandemic and in anticipation of recovery and stimulus packages, UKERC has initiated a significant new systematic review of the evidence on 'green jobs'. This research is still underway but we have completed a preliminary scoping review[1]. In what follows we provide a summary of some initial insights and a list of studies (Table 1). We would be happy to provide additional information or to brief the Committee directly on this work.

In this submission we address five of the inquiry questions (Q1, Q2, Q3, Q9 and Q10) where evidence and analysis provide us with relevant insights. We draw upon UKERC research and outputs and wider literature in order to provide evidence-based answers to this subset of the Committee's questions.

Key points include:

- **There is a need for meta-analysis of published estimates of jobs required to meet net zero in the UK, and greater transparency in their explanation.** These job creation estimates are difficult to compare due to considerable variation in definitions, metrics, methodologies, sectoral focus and timescales.

- **The longer-term macroeconomic consequences of supporting labour intensive options need to be considered.** A focus on numbers of jobs created in low carbon sectors may be desirable in the short term in the context of high unemployment and seeking to recover from the economic impact of the Covid-19 pandemic.

- **A strong economic case can be made to boost investment in all those areas where we know we will need to build infrastructure and capacity in order to meet decarbonisation objectives.** This is particularly true where there are co-benefits such as improved air-quality, more comfortable homes, resilient energy supplies, or reduced congestion. Irrespective of the immediate employment impacts it makes sense to invest in electricity system infrastructure to enable electrification in heat and transport, expanding renewable energy and

[1] Hanna, R, Heptonstall, P, Gross, R. (2020). Green Jobs II Project. UKERC project scoping note. Access here. The current research builds upon earlier research published in 2014 (Blyth, W., Gross, R., Speirs, J., Sorrell, S., Nicholls, J., Dorgan, A, and Hughes, N. (2014). The evidence for net job creation from policy support for energy efficiency and renewable energy. A report by the UKERC Technology & Policy Assessment function). Access here

other low carbon power sources, as well as ambitious energy efficiency improvements.

- **Energy efficiency and heat system retrofit in buildings offers an immediate 'triple-win'** in terms of economic stimulus, societal benefits and environmental goals. Multiple studies highlight the potential for job creation in household retrofitting in relation to energy efficiency and low carbon heat.

- **The UK workforce does not currently have the skills and capacity to deliver energy retrofitting at the scale and standard needed to alleviate fuel poverty and meet climate targets.** Investing in skills for retrofitting buildings will stimulate economic activity, increase jobs, and create distributed work in regions most affected by unemployment. Delivering these new skills will require a rapid shift in the UK's provision of vocational qualifications, and the creation of high quality apprenticeships and training programmes.

- **Clear long-term targets and programmes that run over a longer time frame are crucial to support the development of skills and capacity.** Legislating building standards through both medium- and long-term targets will provide certainty to suppliers that there will be market growth in building energy retrofitting and thus encourage their participation.

- **Judicious management of the energy transition could maximise the economic and ecological co-benefits of energy system decarbonisation**, alleviating pressures on natural resources, and providing long-term societal and economic resilience. Achieving net zero and ensuring a green recovery post Covid-19 will require wide-ranging institutional, societal, and environmental changes and a holistic approach will be necessary to ensure that the jobs and other benefits of a low-carbon energy transition are not outweighed by negatives.

Q1. What estimates are there for the jobs required to meet the pathway to net zero emissions, by sector, and other environmental and biodiversity commitments?

As highlighted above, UKERC has initiated a significant new systematic review of the evidence on 'green jobs'. This research is still underway but we have completed a preliminary scoping review[1]. In what follows we provide a summary of some initial insights and a list of studies (Table 1).

There is a wide range of estimates in recently published reports on how many jobs could be created or would be needed in order to achieve decarbonisation and meet the UK's net zero target. Table 1 shows a range of job creation estimates in forward-looking studies focusing on the UK, which have been drawn from our initial review of the green jobs literature. Multiple studies highlight the potential for job creation in household retrofitting in relation to energy efficiency and low carbon heat (see response to Q10 below). These estimates vary in terms of timescales and the sectors

they apply to, and may or may not include energy efficiency, low carbon heating, energy systems upgrades or industrial decarbonisation and CCS. There is also considerable variation in the way in which metrics of job creation are defined, such as whether they apply to truly additional jobs, jobs created directly by an investment or more widely in the supply chain. It is therefore difficult to compare such job creation estimates, which may be generated by 'input-output', general equilibrium or econometric models, or derived from employment surveys and other literature, or a combination of all of these. Details of methodologies used in different studies are provided inconsistently in the literature and in some reports are absent or vague. For a discussion of terminology and the different methodologies used to estimate job creation see Blyth et al (2014).

Table 1. Examples of recent job creation estimates under decarbonisation and net zero pathways

Study	Methods used	Estimated number of additional jobs created	Geography	Sector(s)	Time period
BEIS (2019)	Business opportunities assessment including analysis of the potential for innovation to increase UK competitiveness, GVA, and jobs	500,000 jobs (not all will be additional).	UK	'Energy Innovation Needs Assessment' for a clean energy system	2019 - 2050
BEIS (2020)	N/A	Up to 250,000 jobs	UK	Green Industrial Revolution	2020 - 2030
CCC (2020)	Based on Construction Industry Training Board (CITB) modelling (unspecified)	Over 200,000 FTE jobs	UK	Energy efficiency / low-carbon heat housing retrofit programme	Late 2020s – 2050
LGA (2020)	Based on other sources and unspecified modelling	997,000 direct jobs	England	Low-carbon and renewable energy economy	2018 - 2050
Element Energy (2019)	Macroeconomic model – using inputs on the demand of goods and services and statistical data to generate UK domestic output, imports, GVA and jobs	43,000 (13,700 direct jobs, 9,000 in operation of newly built facilities, and over 20,000 indirect, supply chain jobs)	UK	Industry decarbonisation using CCS and hydrogen	2020 - 2050
Energy Efficiency Infrastructure Group (2020)	Based on investment needed to deliver EPC C for all homes by 2030	Over 150,000 skilled and semi-skilled FTE jobs	UK	Energy efficiency	2020 - 2030

Table 1, continued

IPPR (2020a)	Based on other sources	Over 325,000 jobs	UK	Energy efficiency and low-carbon heat	2020 - 2035
IPPR (2020b)	Based on other sources	More than 560,000 jobs	UK	Energy efficiency, low-carbon heat and zero carbon social homebuilding	2020 - 2030
IPPR North (2020)	Based on other sources including input-output modelling	77,000 direct jobs in the North and 111,000 indirect jobs across the UK	North of England and UK	Household heating, energy efficiency and decarbonisation	2020 - 2035
National Grid (2020)	Estimates generated by Development Economic analysis based on multiple data sources	260,000 new workforce jobs (including self-employment) plus 140,000 replacing those who have left the workforce	UK	Upgrading and operating energy generation, transmission and distribution network infrastructure to meet net zero	2020 - 2050

Note to Table 1: This is drawn from a preliminary review of literature and analysis carried out for the (ongoing) UKERC Technology and Policy Assessment on low carbon job creation. For further information, see https://ukerc.ac.uk/project/green-jobs/

A focus on numbers of jobs created in low carbon sectors may be desirable in the short term in the context of high unemployment and seeking to recover from the economic impact of the Covid-19 pandemic. However, longer-term macroeconomic consequences of supporting labour intensive options also need to be considered, and we return to this point in our response to Q9.

References to Q1:

UKERC research

Blyth, W., Gross, R., Speirs, J., Sorrell, S., Nicholls, J., Dorgan, A, and Hughes, N. (2014). The evidence for net job creation from policy support for energy efficiency and renewable energy. A report by the UKERC Technology & Policy Assessment function. Access here

Hanna, R., Heptonstall, P., Gross, R. (2020). Green Jobs II Project. UKERC project scoping note. Access here

Other references

BEIS (2019). Energy Innovation Needs Assessment. Vivid Economics for the Department for Business, Energy and Industrial Strategy. Access here

BEIS (2020). Energy White Paper: Powering our net zero future. Access here

CCC (2020). The Sixth Carbon Budget: The UK's path to Net Zero. Access here

LGA (2020). Local green jobs – accelerating a sustainable economic recovery. An Ecuity Consulting report for the Local Government Association. Access here

Element Energy (2019). Hy-Impact Series Study 1: Hydrogen for economic growth. Access here

Energy Efficiency Infrastructure Group (2020). Energy efficiency's offer for a net zero compatible stimulus and recovery. Access here

IPPR (2020a). All hands to the pump: A home improvement plan for England. Access here

IPPR (2020b). Transforming the economy after Covid–19: A clean, fair and resilient recovery. Access here

IPPR North (2020). Northern powerhomes: A green recovery plan to decarbonise homes in the North. Access here

National Grid (2020) Building the Net Zero Energy Workforce. Access here

Q2. Does the UK workforce have the skills and capacity needed to deliver the green jobs required to meet our net zero target and other environmental ambitions (including in the 25-year environment plan)?

The UK workforce does not currently have the skills and capacity to deliver energy retrofitting at the scale and standard needed to alleviate fuel poverty and meet climate targets. Investing in skills for retrofitting buildings will stimulate economic activity, increase jobs, and create distributed work in regions most affected by unemployment. Each Home Counts (Bonfield, 2016) identified specific roles for successful retrofitting, including: training and accreditation; advising; assessment; installing; coordination or design; inspection and enforcement; and consumer protection. All of these must be developed.

Delivering these new skills will require a rapid shift in the UK's provision of vocational qualifications. Existing trades have in-depth technical knowledge of installation and safety for specific technologies, but general energy literacy is not a core part of their training and subsequent work (Wade et al., 2016). The complex processes involved in energy retrofitting require energy literacy across all roles (Clarke et al., 2017). Reformed training structures must include energy advocacy (Killip, 2020), alongside understandings of 'whole house' needs.

In addition, specific skills gaps have been identified. In the UK, the number of first year Further Education trainees fell from roughly 13,750 to 4,500 in the wood trades, and 9,000 to 2,350 in bricklaying between 2007 and 2015 (ConstructionSkills, 2015). Additional regional skills gaps have been identified. For example, shortages of bricklayers, joiners and painter & decorators have been identified in Scotland (Scottish Government, 2019). A key near-term (2020-2025) skills gap is in the design, specification and installation of heat pumps (LGA, 2020). There is an immediate need to establish high quality apprenticeships and training programmes to fill these gaps. In addition, specific consideration needs to be put to how people will be recruited into assessment and accreditation roles, and pre-requisites for their involvement (for example, prior knowledge of buildings and energy performance).

References to Q2:

UKERC research

Killip, G. (2020). A reform agenda for UK construction education and practice. *Buildings and Cities*, *1*(1), 525–537. Access here

Other references

Bonfield, P. (2016). Each Home Counts: An independent review. Access here

Clarke, L., Gleeson, C., & Winch, C. (2017). What kind of expertise is needed for low energy construction? *Construction Management and Economics*, 35(3): 78-89.

ConstructionSkills (2015). Training and the built environment 2014. Bircham Newton: CITB.

LGA. (2020). Local green jobs – accelerating a sustainable economic recovery. An Ecuity Consulting report for the Local Government Association. Access here

Scottish Government (2019). New housing and future construction skills: adapting and modernising for growth. Access here

Wade, F., Hitchings, R. & Shipworth, M. (2016) Understanding the missing middlemen of domestic heating: installers as a community of professional practice in the United Kingdom. *Energy Research & Social Science*, 19: 39-47.

Q3. What needs to be done to ensure that these skills and capacity are developed in time to meet our environmental targets?

To support the acceleration, there would need to be expanded and subsidised training for skills in the sector. Quality Assurance guidelines and procedures, including enforcement, also need to be agreed and put in place immediately. In particular, ensuring improvements in supply chains will require either the development of a robust, independent enforcement agency, with necessary powers and penalties, or extending the roles of existing agencies such as GasSafe and the National Inspection Council for Electrical Installation Contracting (NICEIC). Any enforcement powers need to be separate from supply chain actors, including clients, designers and contractors.

Tradespeople, particularly Small and Medium Enterprises (SMEs), have strong affiliations to their professional communities and trade bodies (Wade et al., 2016). These affiliations can be used as a route to advertise and promote engagement with any national retrofitting programmes and funding schemes, and any necessary upskilling and accreditation that will be required. Raising awareness amongst industry professionals will be critical to supporting their involvement.

In addition, the pipeline for works needs to be as secure and predictable as possible. Clear long-term targets and programmes that run over a longer time frame are crucial to support the development of skills and capacity. Legislating building standards through both medium- and long-term targets will provide certainty to suppliers that there will be market growth in this area and thus encourage their participation. In line with this, existing short-term schemes like the Green Homes Grant are insufficient for encouraging participation from tradespeople. It is time consuming and expensive to undertake additional training and accreditation to take part in such schemes, when market stimulation (through grants) will only be available for two years. Long term schemes (20 years +) are needed to provide the certainty that tradespeople and supply chains need to invest in additional accreditation and training.

References to Q3:

Wade, F., Hitchings, R. & Shipworth, M. (2016) Understanding the missing middlemen of domestic heating: installers as a community of professional practice in the United Kingdom. *Energy Research & Social Science*, 19: 39-47. Access here

Q9. What impact can green jobs have on the wider UK economy?

Previous UKERC work has reviewed the pros and cons of methodologies used to estimate job impacts across the economy (Blyth et al., 2014), and this work is currently being updated (Hanna et al., 2020). Studies often include the wider ripple-through indirect effects of increased demand in the supply chain, as well as the induced effect of higher spending potential for those households that have benefitted from the higher employment rates. Whilst the evidence reviewed by UKERC for the 2014 work seems reasonably robust that renewables and energy efficiency are in general more labour-intensive than fossil fuels, this does not automatically mean that preferential investment in these technologies will lead to higher employment in the whole economy in the long-term. In a depressed economy in which aggregate demand is low compared to potential supply of goods and services (creating a so-called 'Keynesian output gap'), then stimulating additional employment in particular sectors is very likely to lead to higher overall employment, and it makes sense to focus such efforts on more labour-intensive options. This finding has clear relevance to Q10 below, given that the UK economy is likely to have higher levels of unemployment following Covid-19.

However, policies have economic and societal impacts beyond their initial stimulus impacts. This is particularly true for decisions that concern long-lived strategic infrastructure. In these cases, it is important to assess the balance of costs and benefits to the economy in terms of the impact on growth potential. When designing stimulus programmes, it makes sense to support technologies and projects that support technological progress in the long-term, because if they have a persistent impact on the economy beyond the timeframe of the direct stimulus effects, they should also help contribute to long-term growth. In this longer-term context, labour intensity is not in and of itself economically advantageous. If it implies lower levels of labour productivity (economic output per worker), then it could adversely affect prospects for long-term economic growth. Therefore, the employment characteristics that matter in the long run are not jobs per unit of investment, but whether the investment contributes to an economically efficient transition towards the country's strategic goals, taking account of environmental impacts and energy security considerations. Since the UK has far reaching ambitions to create a net zero carbon economy it makes sense to look beyond short-term job creation to consider the options that will provide affordable and resilient energy services.

A strong economic case can be made to boost investment in all those areas where we know we will need to build infrastructure and capacity in order to meet decarbonisation objectives. This is particularly true where there are co-benefits such as improved air-quality, more comfortable homes, resilient energy supplies, or reduced congestion. As the UK pursues a more active industrial strategy this can also help create new industrial sectors with export potential, particularly if this can be done in less-prosperous regions or where fossil fuel supply chains could be partially repurposed (for example in the North Sea). Hence, irrespective of the immediate employment impacts it makes sense to invest in electricity system infrastructure to enable electrification in heat and transport, expanding renewable energy and other low carbon power sources, as well as ambitious energy efficiency improvements. Ambition needs to go well beyond the aim to decarbonise one (or even all) of the UK's industrial clusters. Decarbonising all of industry will require research, development and demonstration support for breakthrough technologies and wider low-carbon infrastructure; market creation for products made via low carbon production processes; and promotion of resource efficiency and circular economy approaches.

References to Q9:

UKERC research

Blyth, W., Gross, R., Speirs, J., Sorrell, S., Nicholls, J., Dorgan, A, and Hughes, N. (2014). The evidence for net job creation from policy support for energy efficiency and renewable energy. A report by the UKERC Technology & Policy Assessment function. Access here

Hanna, R., Heptonstall, P., Gross, R. (2020). Green Jobs II Project. UKERC project scoping note. Access here

Q10. What contribution can green jobs make to the UK's economic recovery from Covid-19?

Energy efficiency and heat system retrofit in buildings offers an immediate 'triple-win' in terms of economic stimulus, societal benefits and environmental goals. A strong long-term economic case can also be made to boost investment in all those areas where the UK will need to build infrastructure and capacity in order to meet decarbonisation objectives. This also links to our point relating to an 'output gap' in the response to Q9 above, in that the UK is likely to have higher levels of unemployment following Covid-19.

There are good reasons to prioritise energy efficient refurbishment. The UK has one of the oldest, most poorly insulated and draughty housing stocks in Europe (ACE, 2015). Space and water heating in buildings contributes around 40% of UK energy consumption and 20% of UK greenhouse gas emissions (CCC, 2016). Several reports have been published recently, for example by the Energy Efficiency Infrastructure Group (EEIG, 2020) and the Institute for Public Policy Research (IPPR, 2020), which make a strong case for the co-benefits of investing in home energy refurbishments. Properly insulating UK homes and replacing fossil fuel boilers with heat pumps can help to alleviate fuel poverty, meet the UK's longer-term net zero climate target, and support a just transition. It can also create jobs in a distributed way around the country, including 'levelling up' in regions most affected by unemployment and lack of investment.

Achieving net zero and ensuring a green recovery post Covid-19 will require a continuation and strengthening of the recent progress in decarbonising parts of the UK energy system. However, a note of caution is required because achieving net zero will involve wide-ranging institutional, societal, and environmental changes and a holistic approach will be necessary to ensure that the jobs and other benefits of a low-carbon energy transition are not outweighed with negatives (Armstrong et al., 2014), including exchanging the climate crisis for alternate environmental crises (Papathanasopoulou et al., 2015). For example, the development of renewable energy is a key action in achieving net zero, necessitating expansive land, river and marine use change, but also risks biodiversity loss (Holland et al., 2019) and land degradation (UKERC, 2019). Equally, decisions that we make have international implications and what may offer environmental benefits in the UK could result in substantial overseas impacts for the environment and society (Holland et al., 2015; Holland et al., 2019).

UKERC research demonstrates the importance of linking climate and wider environmental issues in energy system scenarios in order to ensure a more resilient and sustainable energy future (Hooper et al., 2018). Judicious management of the energy transition could maximise the economic and ecological co-benefits of energy system decarbonisation, alleviating pressures on natural resources, and providing long-term societal and economic resilience.

References to Q10:

UKERC research

Holland, R.A., Scott, K., Agnolucci, P., Rapti, C., Eigenbrod, F., Taylor, G. The influence of the global electric power system on terrestrial biodiversity (2019). Proceedings of the National Academy of Sciences. PNAS December 17, 2019 116 (51) 26078-26084. Access here

Hooper, T., Austen, M.C., Beaumont, N., Heptonstall, P., Holland, R.A., Ketsopoulou, I., Taylor, G., Watson, J., Winskel, M. (2018). Do energy scenarios pay sufficient attention to the environment? Lessons from the UK to support improved policy outcomes. Energy Policy, 115, 397–408. Access here

UKERC (2019). Review of Energy Policy. Access here

Other references

Armstrong, A., Waldron, S., Whitaker, J., Ostle, N.J. (2014). Wind farm and solar park effects on plant-soil carbon cycling: uncertain impacts of changes in ground-level microclimate. Global Change Biology 20, 1699-1706. Access here

Association for the Conservation of Energy (2015). The cold man of Europe – 2015.

CCC (2016). Next Steps for UK Heat Policy. Access here

Energy Efficiency Infrastructure Group (2020). Energy efficiency's offer for a net zero compatible stimulus and recovery. Access here

IPPR (2020). Transforming the economy after Covid–19. Access here

Papathanasopoulou, E., Beaumont, N.J., Hooper, T.L., Nunes, J., Queiros, A.M. (2015). Energy systems and their impacts on marine ecosystem services. Renewable and Sustainable Energy Reviews, 52. 917-926. Access here