

Impact Case Studies

2019-2024

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Contents

Introduction	2
Electricity Market Design for the Short and Long Term	3
COP26 and the Green Grids Initiative	5
UK Gas Security	6
Network Infrastructure and Investment	8
Decarbonisation of Dispersed Industrial Sites	9
The Climate Change Mitigation Impacts of 'Active Travel'	11
Mapping the Research Ecosystem of UK Energy Models	12
Spatial and Temporal Heat Demand for Decarbonisation Pathways	13
GB Policy and Investment for Local Energy Systems	14
Energy System Modelling for Net Zero	15
Promoting Equality, Diversity and Inclusion in Energy Research	16
Supporting Open Data	18
Quantifying Biodiversity at Solar Farms	19
Transforming Public Engagement with Energy and Climate Change	20
Academic impact	22
Endnotes	23

Introduction

UKERC has a strong track record in achieving impact, a track record which has been built upon in each of our four funding phases, which now span 20 years.

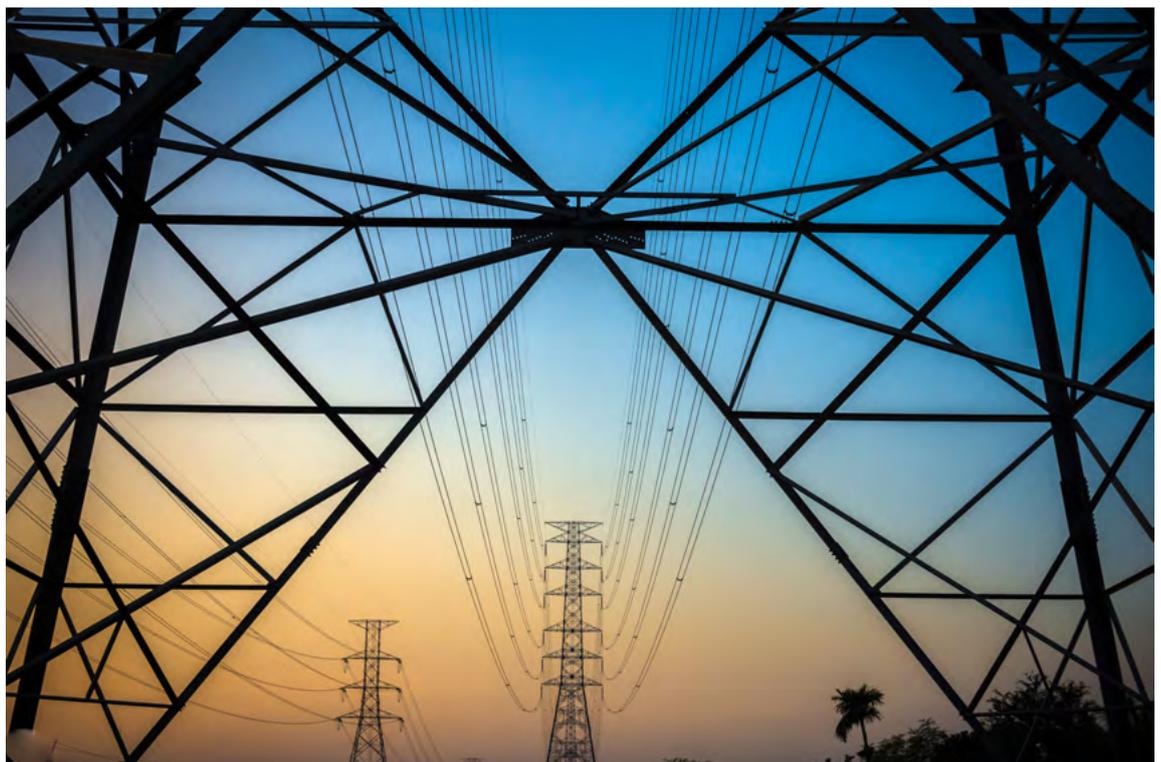
Over successive phases UKERC has achieved high levels of impact by delivering interdisciplinary whole systems energy research to inform and underpin decision making by policy, industry and civil society.

In our current funding period (Phase 4, 2019-2024) we have continued to build upon this, delivering research that has real and measurable impact on the UK energy landscape and beyond. This has been a particular priority in our current funding period, during which we have sought to help respond to security and equity concerns arising from the energy crisis.

In this publication we outline a series of case studies that show how we have made a difference to UK energy research and policy. We explain why each one is important, what the UKERC impacts are, and provide underpinning evidence.

These case studies illustrate the breadth and depth of UKERC's impact. This ranges geographically from global initiatives, through national policy making, to the regional/local levels. UKERC's impact also encompasses all key stakeholder groups from government and industry to international organisations and community groups.

UKERC's research evidence and iterative impact is co-produced through active consultation with key research users and stakeholders in variety of ways. This interactive approach and close working relationships with practitioners is key to the high levels of impact we currently enjoy.



Electricity Market Design for the Short and Long Term

Rob Gross, UKERC Director and Keith Bell, University of Strathclyde

Why it is important

Electricity system investments totalling £30-40bn per year¹ will largely determine the success of the transition to net zero. The delivery of investment is strongly dependent on market and policy conditions, which also affect system operation. For this reason, BEIS (now DESNZ) launched a Review of Electricity Market Arrangements in 2022. The energy price crisis of winter 2021/22 also led to increased attention to the role of gas prices in forming electricity prices. As gas prices increased 5-fold electricity prices followed, despite the UK securing around 60% of electricity from non-fossil sources.

UKERC impacts

UKERC research highlighted the potential to reduce bills by bringing older renewables under a fixed price scheme available to newer renewables, the Contracts for Difference. In 2022 the ground-breaking UKERC 'pot zero' paper² showed this could save up to £300 per household per year, £22bn per year economy wide. Over the summer of 2022 UKERC was invited to brief on our analysis at official and ministerial levels of government. The work informed policy at the highest levels in government and industry, after it was endorsed by trade body Energy UK. Legislation to enable a 'legacy' CfD scheme was brought forward under then PM Lizz Truss's response to the energy crisis. However, ultimately the government brought forward a windfall tax on excess profits (electricity generator levy) instead.

UKERC research on investment risk in electricity markets³ also indicated that policy design could reduce cost of capital (finance costs) in renewable energy by up to a third (around £5bn per year).

This work was co-funded by SSE and informed by industry, the finance sector, and policy stakeholders. UKERC was invited to run workshops to help inform (then) BEIS officials about the complexities involved in electricity market reform. We continue to have strong engagement with DESNZ and other key institutions in the REMA debate, including Scottish Government, Ofgem and the Energy System Operator (ESO). Close engagement with key policymakers and institutions continues to feed in independent and impartial evidence to the policy-making process on REMA.

In its 2nd National Infrastructure Assessment, the National Infrastructure Commission cited UKERC research in outlining the need for the right mix of electricity system resources to ensure that demand for electrical energy can be met sufficiently reliably and the system can remain stable.⁴ In early 2024, UKERC researchers were also invited to brief officials on questions around locational marginal pricing.⁵

Supporting evidence

UKERC's policy and industry engagement on this issue starts with a UKERC response⁶ to a BEIS call for evidence on enabling a high renewable, net zero electricity system. BEIS officials described this submission as one of the most informative sources of evidence available and invited UKERC to discuss market reform options. UKERC undertook additional analysis of risk and market design issues, with co-funding from SSE Plc. Full findings were published during COP26. At BEIS' invitation, UKERC organised a series of four workshops in early 2022 to help define the terms of the REMA consultation.



UKERC is involved in related work with other institutions, including through the Ofgem Academic Advisory Council and Electricity Systems Operator (ESO) Markets Advisory Council. UKERC work featured in multiple media outlets including the BBC, The Guardian and the FT, with Rob Gross appearing on BBC Panorama in their 2022 programme 'The Electricity Crisis, Who's Cashing In'.⁷ The BBC producer described the pot zero paper as essential for understanding the issue.

In 2022 Rachel Cary, Head of Policy for REMA provided the following testimonial:

'During early scoping work by BEIS officials on GB electricity market reform, UKERC brought together leading experts from the UK and overseas specialising in electricity market design to identify options for wholesale market reform. UKERC's uniquely interdisciplinary expertise and wide ranging, whole systems convening power helped BEIS staff formulate ideas and discuss key issues in the complex domain of wholesale electricity market reform. We particularly value UKERC's

impartiality given the wide range of views on market design being advocated by academia and industry.'

Writing in 2022 a senior official in the No 10 Policy Unit commented

'UKERC is widely respected across government as a source of impartial analysis and advice, as well as new ideas that tackle contemporary problems. One example of this is UKERC's discussion paper on 'pot zero' CfD published in 2022. This thoughtful paper clearly articulates some of the challenges associated with high gas prices feeding through into very high wholesale electricity market prices, and describes a possible solution that overcomes some of the shortcomings the options adopted by comparable countries have pursued. More widely UKERC's ideas have helped inform government thinking at the highest levels, and we expect to continue to engage with UKERC's experts as BEIS, No. 10 and Treasury officials consider options to help households and business with the energy price crisis caused by the war in Ukraine'.

COP26 and the Green Grids Initiative

Will Blyth, Oxford Energy Associates

Why it's important

Coal-fired power generation is still the biggest global source of CO₂ emissions. Many countries are still building new coal plant, despite the cost-competitiveness of renewables. Key to changing this is the ability to reliably integrate large volumes of renewables which requires grids to be strengthened and expanded. This raises important technical, financial and political issues which the Green Grids Initiative (GGI) aims to help countries solve.

UKERC impacts

UKERC researcher Will Blyth was seconded into the UK government COP26 Energy Campaign Team using UKERC funding and whilst continuing to contribute to wider UKERC research. The Energy Campaign enabled key countries to signal an acceleration in the transition from coal, with text on coal phase-down included in the final Glasgow Climate Pact,⁸ a first for international climate negotiations. Will was responsible for the development and launch of the Green Grids Initiative (GGI)⁹ by India and UK PMs Modi and Johnson, which aims to accelerate investment in the grid infrastructure needed to deliver high penetration of renewables. He was also closely involved in setting up the Energy Transition Council¹⁰ which helped support countries with rapid and detailed analysis of alternative energy options.

UKERC's whole systems thinking continues to provide the theoretical and conceptual underpinning to the GGI. GGI balances a high-level climate mitigation investment and technical view with a wider systems viewpoint, emphasising the role of grids in integrating these technologies together. GGI is building an ecosystem of partners who can help countries address technical, regulatory, financial, and political barriers to the development of reliable

and secure renewables-driven power systems, starting with a suite of pilot projects in Africa and S.E. Asia.

Supporting evidence

COP26 energy campaign Deputy Director Simon Sharpe described UKERC's role thus: 'UKERC's contribution gave the COP26 Energy Transition campaign a crucial grounding in expert knowledge. This was critical to shaping the campaign's proposals for initiatives including the Energy Transition Council and the Green Grids Initiative, and to building international confidence in these processes such that they gained widespread support and made a substantial difference to global progress in the coal to clean power transition at COP26.'



UK Gas Security

Mike Bradshaw, Warwick Business School

Why it's important

In 2021 natural gas accounted for 42.8% of total energy consumption and 39.8% of power generation. Imports met 57% of demand with the majority coming by pipeline from Norway (63%), followed by LNG (28%) and pipeline imports via interconnectors to Belgium and the Netherlands (9%). Historically, the BEIS/Ofgem security of supply assessment focused on whether the UK has sufficient infrastructure to deliver the gas from a diversity of sources; however, we rely on market forces to ensure that sufficient gas comes to the UK. For the most part this reliance on the market delivered secure and affordable gas supplies; but that changed dramatically in 2022 as a consequence of Russia's invasion of Ukraine. In August 2022 the gas price reached a record high, prices have since declined significantly, but are still higher than pre-crisis levels. The UK Government has spent over £100 billion protecting consumers. The UK's gas import infrastructure has proved remarkably resilient and the UK's LNG import terminals and interconnectors played a critical role as a 'gas bridge to Europe' helping to compensate for the 80% decline in Russian pipeline gas supply to Europe.

UKERC impacts

Longstanding UKERC research on gas security provides essential context for understanding the recent crisis and the challenges beyond. The UKERC-2 project on the 'UK's Global Gas Challenge'¹¹ explored the consequences of growing import dependence and advocated a supply chain approach to managing gas security. In UKERC-3 the focus changed to the changing role of gas in the UK energy system and the need to manage the future decline in gas demand, what we called 'gas by design.' A 2018 report¹² assessed UK gas security and the potential impact of Brexit. In 2020, in collaboration with the NERC-ESRC Unconventional Hydrocarbon in the UK Energy System programme, we assessed the potential

role that shale gas might play in UK gas security.¹³ A final report in that project looked at events over the summer of 2022 in terms of the short-lived shale revival under the equally short-lived Truss Government. In UKERC-4 questions relating to gas security have figured in the annual policy review and a report, in collaboration with OIES, on the role of LNG in UK energy security has been published.¹⁴ A related piece of work in Theme 1 is modelling the impact of a Russia gas pivot to Asia on global gas markets.

In May 2023 a daylong workshop,¹⁵ as part of UKERC's integration activities, was held at the Shard in London to look at the dual challenges of security of supply and transition risk. This is now being written up as a gas security briefing to be published in later this year. This deploys the supply chain approach previously developed by UKERC to assess upstream security of supply issues, the reliance and adequacy of the mid-stream infrastructure and the downstream challenges in terms of the drivers of future demand. This involves colleagues in the Gas Programme at the OIES, as well as researchers across UKERC working on the challenges that will impact future gas demand - power, domestic heat and industry. The emphasis is on identifying the energy security challenges and transition risks that the UK is likely to face in the coming decade and that must be addressed in any future 'Gas Transition Strategy.'

Supporting evidence

UKERC has provided expert evidence to parliamentary committees, including the BEIS Select Committee hearing on UK energy security and the House of Lords Economic Affairs Committee enquiry on energy security. We have also provided insight into policy discussions in relation to gas security with the National Audit Office, the Cabinet Office, FCDO and BEIS and most recently with various experts in DESNZ. Engagement with industry has been consolidated in a



two-year secondment to the Shell Scenarios team and continued participation in the Westminster Energy Forum. We have also worked with colleagues at Chatham House on a series of UKERC-funded events. There has been substantial engagement with the media - in the UK and abroad - to improve public understanding of the causes and consequences of the current gas crisis and the challenges of the energy transition, such as the

2022 opinion piece Mike Bradshaw wrote for the Guardian 'The UK's reliance on gas imports leaves us vulnerable to unpredictable prices,'¹⁶ and a similar piece in the New Stateman. A series of articles have been published in The Conversation, most recently on the impact of the LNG pause in the US.¹⁷ This work continues to involve interviews with the press, TV and radio, podcasts, involvement in webinars and the writing of blogs.

Network Infrastructure and Investment

Keith Bell, University of Strathclyde and Jan Webb, University of Edinburgh

Why it's important

The energy networks are critical enablers of both security and decarbonisation of gas and electricity supply. As such, innovation in the planning and operation of energy networks is critical to ensure the reduction of greenhouse gas emissions from energy.

UKERC impacts

In May 2020, UKERC's submission on innovation within the RII0-2 price control framework¹⁸ was critical to the Ofgem's decision to provide more innovation funding to the sector –£450 million via the Strategic Innovation Fund (SIF) and more than £200 million via the Network Innovation Allowance.

Work on energy network innovation and input to Ofgem was initiated in Phase 3, with iterative engagement of key UKERC personnel – Profs Bell and Webb – continuing through to the setting of the themes for the Strategic Innovation Fund (SIF).

Supporting evidence

Akshay Kaul, Ofgem's Deputy Director Network said 'UKERC's arguments were instrumental in persuading the Gas and Electricity Markets Authority (GEMA) to make a £600 million package of innovation funding available to the sector'. Moreover, it was confirmed by Ofgem that further innovation funding would be part of the RII0-ED2 settlement in 2022 for the electricity distribution network operators. UKERC Co-Director Jan Webb is a member of the SIF Whole Systems Integration Expert Panel, which advises Ofgem on the themes, and assesses the subsequent bids. Prof Keith Bell was also a member of the Electricity Networks Commissioner's advisory group, helping to guide the Commissioner's recommendations published in August 2023 on reforms to accelerate the development of electricity transmission network capacity. He had also been invited by a number of media outlets to comment on electricity network needs and resilience.



Decarbonisation of Dispersed Industrial Sites

Peter Taylor, Ahmed Gailani, Imogen Rattle, University of Leeds and Sam Cooper, Stephen Allen, University of Bath

Why it's important

UK Government focus to date has been mostly on decarbonising large industrial clusters through support from the Industrial Decarbonisation Challenge and other policy initiatives and funding. However, just over half of industrial emissions come from so-called 'dispersed sites' located more than 25 km away from the nearest cluster. Government is now working to decide its approach to these sites, helped by evidence from UKERC research and technical advice from UKERC researchers.

UKERC impacts

Through a mixture of quantitative and qualitative approaches, plus ongoing dialogue with DESNZ (and previously BEIS), the Climate Change Committee (CCC) and industrial stakeholders, UKERC has been developing an evidence base around approaches to decarbonising the whole of UK industry. Examples of this evidence include providing BEIS and the CCC with results from our sensitivity analysis of net zero pathways for UK industry¹⁹ and giving DESNZ early insights into our review to identify the main decarbonisation options for industry and their emission abatement potentials for use in a government consultation.²⁰ Our research on the current barriers facing dispersed industrial sites on their path to decarbonisation²¹ and our work on how the costs of decarbonising UK industry would impact prices to consumers²² have also helped shape government thinking on policy approaches. We have also been directly supporting both DESNZ and the CCC as they develop their evidence base on industry to inform the Seventh Carbon Budget, including through a part-time secondment to the CCC.

We will continue our research on industrial decarbonisation, focusing particularly on dispersed sites. This will include exploring the activities stimulated by the recently announced funding for Local Industrial Decarbonisation Plans²³ and identifying the electricity, hydrogen and CCS infrastructure that is required to support industrial decarbonisation.

Supporting evidence

DESNZ and CCC officials have provided the following testimonials on the impact of our research and the value of our technical support.

DESNZ: *'Policy officials in DESNZ (and its predecessor, BEIS) are developing strategic thinking on a range of issues relating to industrial decarbonisation, including how to promote electrification of industry and how to decarbonise sites outside of the main industrial clusters (dispersed sites). Conversations with UKERC have been very helpful in the process of generating and testing ideas and they have produced two journal papers which provided important inputs to our work. The first paper looked at technological options for decarbonisation at different sites. Data from this was cited in our Call for Evidence 'Enabling Industrial Electrification', and it has informed more general qualitative research on the technological options available at different categories of site, contributing to thinking about policy options. The data is particularly helpful as we explore what kind of network development is required to ensure dispersed sites have access to decarbonisation options. The second paper looked at engagement with local stakeholders, governance and different analytical approaches to the decarbonisation of dispersed sites (by sector, place and technology).'*



This has helped us in our thinking about the place-based barriers to industrial decarbonisation and what forms of local governance may be required: the Local Industrial Decarbonisation Plans competition is designed to overcome these place-based barriers.'

CCC: 'UKERC provided a secondee to the Industry team at the Climate Change Committee between July 2023 and March 2024. During the secondment the UKERC

researcher became a full and valued member of the Industry team, participating in all aspects of our work. Their in-depth understanding of our industry model was invaluable to our work for the Seventh Carbon Budget. Their contributions involved updating the model and helping CCC colleagues understand its complexities, as well as contributing advice and evidence that informed our decision-making for industrial decarbonisation pathways.'

The Climate Change Mitigation Impacts of ‘Active Travel’

Christian Brand, University of Oxford

Why it's important

Reducing carbon emissions from transport remains a significant challenge for the UK if it wants to meet its net zero target. Focusing solely on electric vehicles may be slowing down the race to zero emissions, as it pulls investment and planning away from viable alternatives such as public transport, shared mobility, and walking and cycling.

UKERC impacts

UKERC's research²⁴ showed how ‘active travel’, such as walking, cycling and e-biking, can reduce mobility-related carbon emissions and help tackle the climate emergency earlier than technology substitution via electrification. Specifically, it helped secure a ‘last-minute recognition’ of active travel and public transport in the official COP26 ‘Transport Declaration’.²⁵ Besides shaping the agenda of decision-makers, UKERC's research increased awareness amongst citizens – across the globe – on the active role they can play to mitigate climate change.

We are building on relationships with key policymakers at the World Health Organization in Geneva (health) and Bonn (climate) as well as the World Bank and World Resources Institute in Washington DC to provide the evidence needed to drive the urban transport decarbonisation agendas not just in Europe but also in the Americas, Sub Saharan Africa and South East Asia.

Supporting evidence

Key findings from UKERC research were used by the European Cyclists' Federation in their open letter to governments and world leaders²⁶ in the lead-up to COP26. Importantly, European Commission Executive Vice-President quoted key research findings²⁷ during a keynote address at Velo-city 2021, saying ‘Recent studies show that cyclists have a 84% lower CO₂ emission life cycle than non-cyclists.’ The research has been referenced in high-profile policy reports, including by the UN Intergovernmental Panel on Climate Change,²⁸ the World Health Organization²⁹ and the World Bank.³⁰ It is also used as evidence by national and international NGOs, including the World Resources Institute³¹ and Greenpeace.³² Finally, the story was reported in more than 100 online and printed media across the globe.



Mapping the Research Ecosystem of UK Energy Models

Neil Strachan, University College London

Why it's important

Energy models provide underpinning support for UK policy and industrial decision makers to meet the challenges of the energy transition. The insights from this ecosystem of models are nothing without decision makers being able to link different models, and to have openness and trust in how they work.

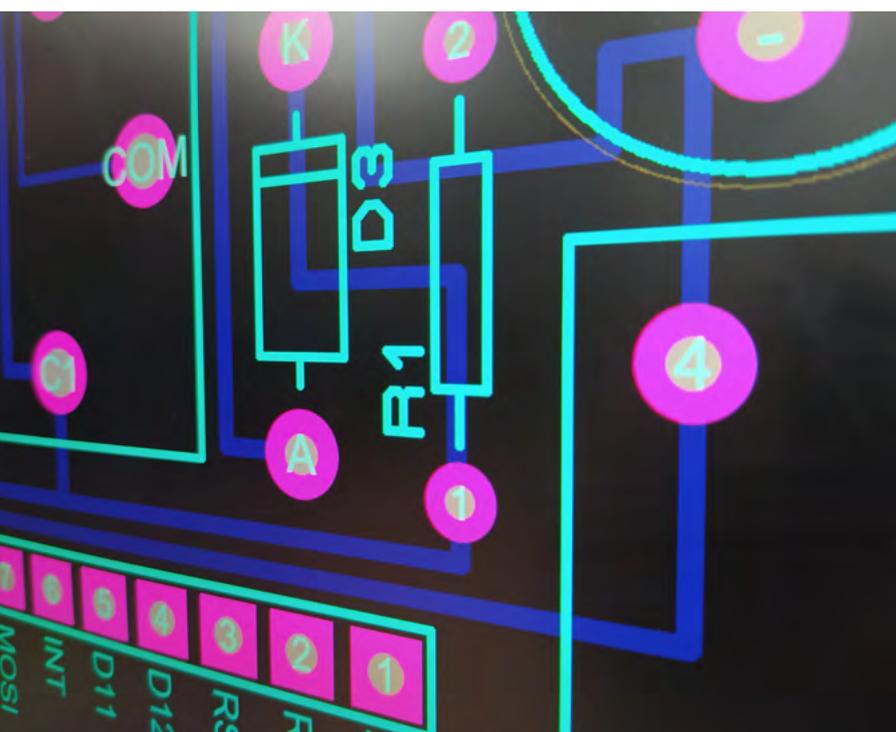
UKERC impacts

The Modelling Hub ran a ground-breaking survey across the landscape of UK energy models, collating 76 models. Working with a high-profile stakeholder steering group (including BEIS, CCC, the devolved governments) this major survey delivered an unprecedented contribution to the evidence base that industrial and policy decisions are informed by. UKERC is the only UK academic consortium with the ability and breadth to undertake this activity.

Model development and application has been central to successive UKERC integrating projects – all the way back to the hugely influential series of outputs from the Energy 2050 project³³ in Phase 1, which first demonstrated the feasibility of long-term emissions reduction targets. Looking forward, UKERC is leveraging its past work on the research ecosystem of UK energy models to investigate the question: Are UK energy models fit for purpose for the emerging challenges of implementing the energy transition? Key stakeholders have co-created an 'energy model atlas' that visualises and communicates the strengths, weaknesses, and linkages between UK energy models, while also identifying where the right tools to support policy-makers exist and vice versa. We intend the energy model atlas to be formalized into a national capability to identify go-to providers and new innovative providers of modelling approaches and insights.

Supporting evidence

With ongoing support from its steering group, the modelling survey underwent a hugely successful dissemination process, pushing new insights on the strengths, gaps, applications and construction of UK energy models.³⁴ This extensive reach included blogs, online videos, invited presentations and four high-profile UKERC briefing papers. As one member of the Steering group (Joanna Campbell, when at the National Infrastructure Commission) put it: 'The model survey has shown how policy makers rely on models from others – academic, government and consultancies. We will keep pushing for as much transparency as possible and welcome the efforts made by the modelling community to publish information on their methodologies and data.'



Spatial and Temporal Heat Demand for Decarbonisation Pathways

Jianzhong Wu and Meysam Qadrdan, Cardiff University

Why it's important

The decarbonisation of residential heating is vital to achieve the net zero target. Transparency of the methodology for estimating heat demand profiles enables production of credible and acceptable decarbonisation pathways for national and local areas, production of estimates for peak energy demand, and allows the study of heating technologies such as district heating schemes and heat pumps.

UKERC impacts

UKERC's research on spatial and temporal heat demand estimation for a range of decarbonisation pathways has had an extensive impact in academia, industry, and government. First, by publishing an open access database,³⁵ UKERC has enabled the research community to further research heat demand profile and energy consumption for heating across England and Wales. Moreover, we applied this methodology in an innovation project named 'Zero 2050',³⁶ which played a key role in shaping the Welsh Government's strategy to achieve net zero in Wales, supported by network companies and energy stakeholders in South Wales, with detailed assessment of heat decarbonisation on energy demand and infrastructure changes. Furthermore, the learning has informed the establishment of the future requirements for the Welsh energy grid through the Future Energy Grid for Wales (FEW) project.³⁷

The open-access database and underlying methodology, published by Nature Scientific Data and publicly accessible through the UKERC Energy Data Centre,³⁸ will be instrumental for the research community,



industrial practitioners and network companies in Wales and England, to enable detailed assessment of the impacts of heat decarbonisation on energy demand and energy supply infrastructure.

Supporting evidence

News releases from the project³⁹ outlined how 'If all recommended energy efficiency measures in Energy Performance Certificates (EPCs) for homes were to be implemented, annual heat demand would decrease on average by 30% in Cardiff and Newport and 32% in Swansea'. Commenting on the report, Julie James, Minister for Climate Change at Welsh Government said: 'I congratulate National Grid and Cardiff University (UKERC) on this complex and impressive work(..) This report is a further piece of evidence for change'.

GB Policy and Investment for Local Energy Systems

Jan Webb and Jess Britton, University of Edinburgh

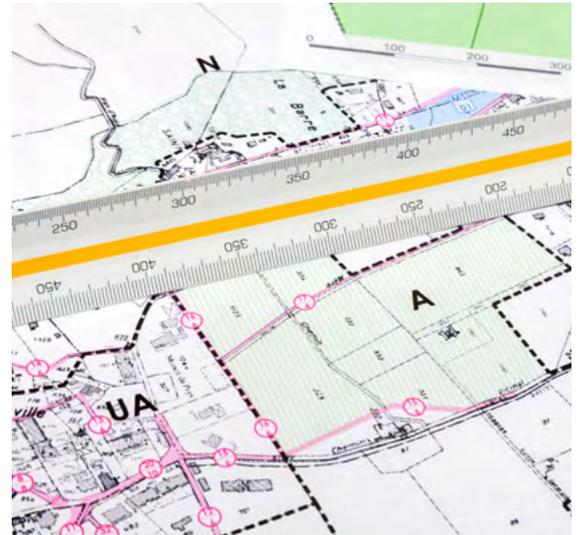
Why it's important

Local scale integration of heat, power and transport, combined with demand side flexibility, new technologies and new business models, could greatly improve the whole system economics and sustainability of a decarbonised energy system. There are also potential local economic and social co-benefits of more locally integrated systems.

UKERC impacts

UKERC research has informed UK and Scottish Government policy for integrated local energy systems by demonstrating investment value, building capacity, and providing real-time evaluation research. For example, experts from UKERC helped develop a business case for the BEIS (now DESNZ) and Treasury (HMT) for investment in integrated local energy system demonstrators and designs, the resulting bid (which relied on evidence from UKERC's research findings) secured £102.5 million public investment in the Prospering from the Energy Revolution (PFER) challenge.

Evidence gathered as part of UKERC 3 underpinned industrial strategy investment in local energy systems integration and innovation (PFER), which is now providing further learning on the benefits and challenges of localised, place-specific business models. Ongoing UKERC 4 research is providing evidence on how existing policy and institutional frameworks are shaping the implementation of local energy systems, including the role of local energy planning, and informing the development of Ofgem's proposed Regional Energy Strategic Planner role.



Supporting evidence

The UKRI Challenge Director for Prospering from the Energy Revolution, said 'The most important and timely work that helped secure confidence in local authorities' appetite for developing activities in local energy was research developed by ETI/UKERC which set out which areas were engaged in the agenda to what degree, and enabled the case to be made that there were a significant number of authorities 'running hard' to develop local energy projects.' Additionally, UKERC research was a key component of evidence⁴⁰ contributing to inclusion of low carbon principles in the remit of the Infrastructure Commission for Scotland, with Prof. Webb of UKERC appointed to the Commission⁴¹ as a low carbon infrastructure expert; the Commission's recommendations for a socially inclusive 30-year strategy were incorporated in the £33 billion Scottish Infrastructure Investment Plan 2021-26,⁴² including a commitment to systematic local planning for heat and transport decarbonisation, informed by UKERC research. UKERC researchers are also contributing to Ofgem working groups to inform the development of the Regional Energy Strategic Planner role.

Energy System Modelling for Net Zero

Paul Dodds, University College London

Why it's important

UK TIMES as a high-profile energy systems optimisation model has been repeatedly used to support policymakers to draw insights about the relative importance of different technologies, costs and policies in divergent long-term energy system scenarios.

UKERC impacts

UK TIMES is now embedded as the central long-term energy system pathway model used for policy analysis within DESNZ. The development of a regionalised model in UKERC Phase 4 is designed to support the UK, Scottish, Welsh and Northern Irish Governments to explore differing regional scenarios and the implications of various policy approaches across different scales. The role of UKERC researchers in developing the model is explicitly referenced in government papers.⁴³

Supporting evidence

Evidence of the policy Impact of UKERC's work to integrate UK TIMES into policymaking includes UK TIMES referenced in the Government Energy White Paper 2021 and also the Net Zero Strategy which recognises our role in developing their 'long term energy systems model'. The ongoing work to regionalize the model includes working with Ulster University and the Northern Ireland Executive (Department of the Economy) to develop their energy modelling skills and develop the Northern Ireland section of the model.

Further evidence of UKERC's impact on policy is provided by Paul March, Deputy Director, Central Energy and Emissions Modelling at DESNZ, who testified: 'UCL and UKERC provide access to knowledge and expertise of the energy system and of modelling that is otherwise harder to obtain. As academic partners, their contributions provide credibility and independence, particularly because they will challenge institutional and stakeholder thinking where appropriate.'



Promoting Equality, Diversity and Inclusion in Energy Research

Jessica Bays, UKERC

Why it's important

To meet the challenge of rapidly decarbonising our energy system, the UK energy research community needs to harness 100% of its available talent. Yet, according to the latest HESA statistics,⁴⁴ women make up 58% of postgraduate students in the UK but only 30% of professors, and the proportion of female principal investigators remains low. Alongside gender disparities, some ethnic groups are also underrepresented in senior positions – of academic staff with known ethnicity, 20% were from minority ethnic backgrounds, dropping to 12% when considering professors. Uncovering and understanding data on gender and wider diversity in energy research should be amongst the priorities of universities and organisations working in the sector.

UKERC impacts

The success of the Whole Systems Networking Fund (WSNF), which focused on gender parity in Phase 3, led it to become an integrated part of the consortium in Phase 4. The focus was also broadened to encompass all aspects of diversity, with activities including efforts to gather equity, diversity and inclusion (EDI) data for the UKERC consortium, and the pool of WSNF applicants, to measure the impact of the programme and use the data to influence future interventions.

The programme funded seven projects, the impact of which has been felt far and wide with multiple national and international activities delivered, encompassing conferences, workshops, reports, blogs and videos.



In March 2024 a report was published⁴⁵ including project summaries and data highlighting the WSNF's success at attracting a more diverse pool of applicants than in the wider UKERC consortium, and its continued success at attracting applicants that are women. The data analysis did not find a difference in reported disability, indicating that that further efforts need to be made in this area in the future.

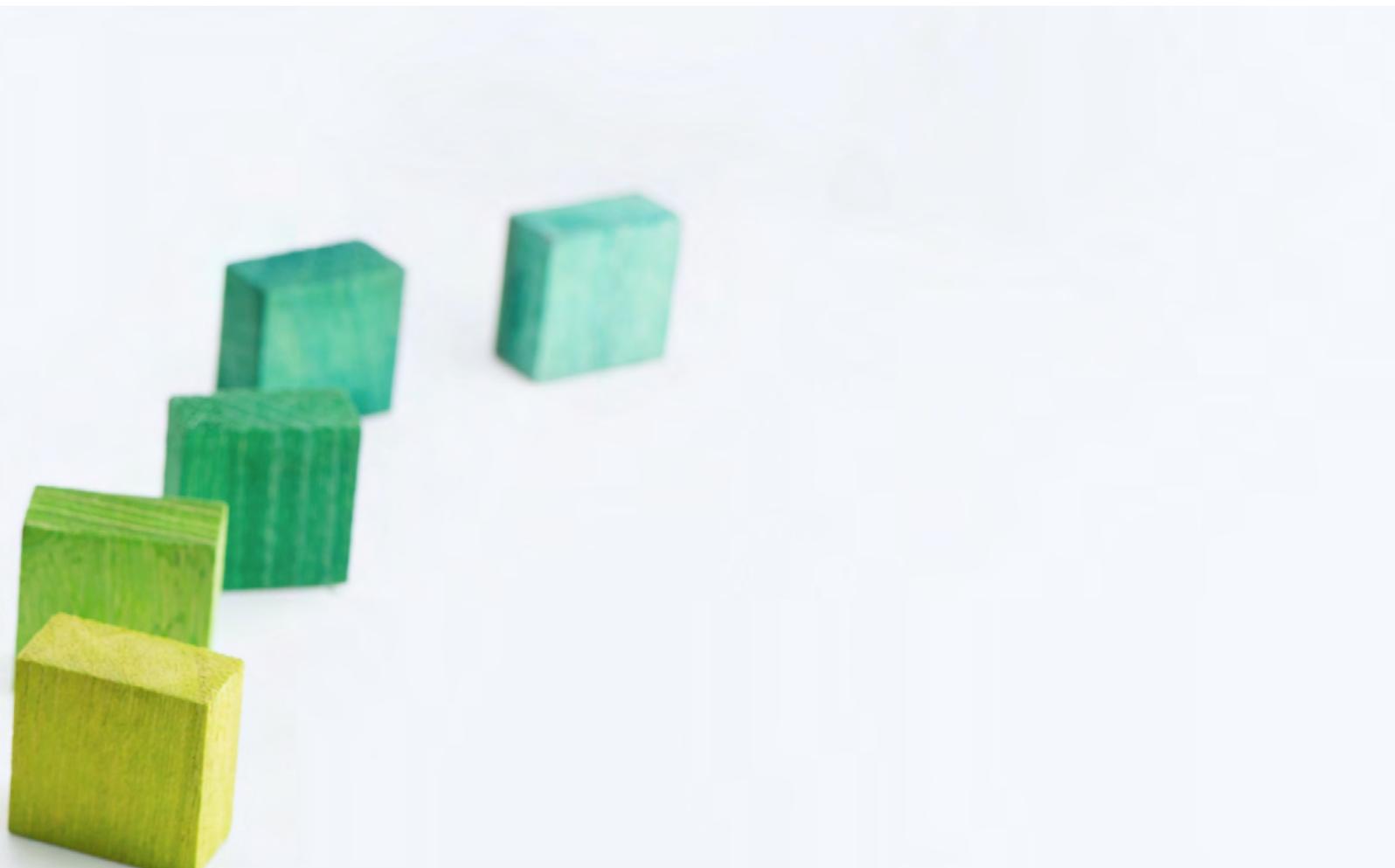
In 2019 one of the UKERC 3 projects published 'Power Shift',⁴⁶ a report on gender balance in UK energy research which included recommendations for funders and higher education institutions. Dissemination of its findings continued through Phase 4, including providing advice to Innovate UK, and one of the project leads, Jess Britton, meeting the Minister of State for Energy, Clean Growth and Climate Change and senior members of BEIS (now DESNZ) to discuss how to improve gender balance on expert panels.

Supporting evidence

One of the current projects 'Energy SHINES', which delivered training, networking events and work placements for women in social science and humanities disciplines, was one of only two UK finalists in the Diversity, Equity & Inclusion in Sustainability category of the Green Gown Awards for 2023.⁴⁷

The 2024 data analysis of applicant and wider consortium EDI data demonstrated that the fund successfully reached a more ethnically diverse group of individuals than those represented in the UKERC consortium, with 16% of individuals selecting minority ethnic groups in the UKERC survey, increasing to 52% for WSNF applicants. Whilst 63% of WSNF applicants identified as a woman as compared to 42% in the UKERC survey

UKERC's 'Powershift' report was also the only research cited in the 2022 EPSRC funding call⁴⁸ for a research network on equality, diversity and inclusion.



Supporting Open Data

Catherine Jones and Jim Halliday, Science and Technology Facilities Council



UKERC impacts

The Energy Data Centre (EDC) has contributed to the open data agenda in two ways. For the energy industry by contributing to, and advising, the Energy Data Taskforce (a joint activity between OFGEM, BEIS and Innovate UK) to set domain wide metadata standards to assist in wider data sharing within UK energy companies. The Recommendations of the Taskforce⁴⁹ have formed the basis of further open data projects in the energy sector. For academic researchers by providing the well-managed EDC portal to curate data and provide guidance on good research practices to make project outputs open and FAIR.

The experience of running the Energy Data Centre through the UKERC phases enabled our data description and discovery expertise to help kickstart the Energy Data Taskforce. As a new initiative for Phase 4 the integrated data management process demonstrated its worth, as data is deposited in the most relevant repository for the subject matter, with the EDC holding metadata-only records to aid discovery of all UKERC's research data outputs.

Why it's important

Open data supports researchers to use and re-use data regardless of whether it is generated commercially or through academic projects. Data standards underpin the ability to understand, share and combine data. For all publicly funded researchers there is an increased UKRI focus on research reproducibility and integrity to make research data FAIR (findable, accessible, inter-operable and re-usable).

Supporting evidence

The Energy Data Taskforce produced a Strategy for a modern digitalised energy system,⁵⁰ where EDC/UKERC is cited as an open data hosting service.

EDC-led data management planning has supported 36 UKERC projects. 70% of UKERC research data will be openly available in Phase 4, this is greater than previous phases. More broadly, datasets currently available from the EDC have been accessed by 1254 users in the four years of Phase 4 to date, compared with 297 throughout Phase 3.

Quantifying Biodiversity at Solar Farms

Alona Armstrong, Lancaster University

Why it's important

To date understanding of the impact of solar parks on the ecosystem has been largely hypothesised or based on studies focusing on one or two sites. Given policy trends, there is an increasing need to quantify outcomes for individual sites. UKERC's work aims to draw general insights on the impacts of management and location decisions.

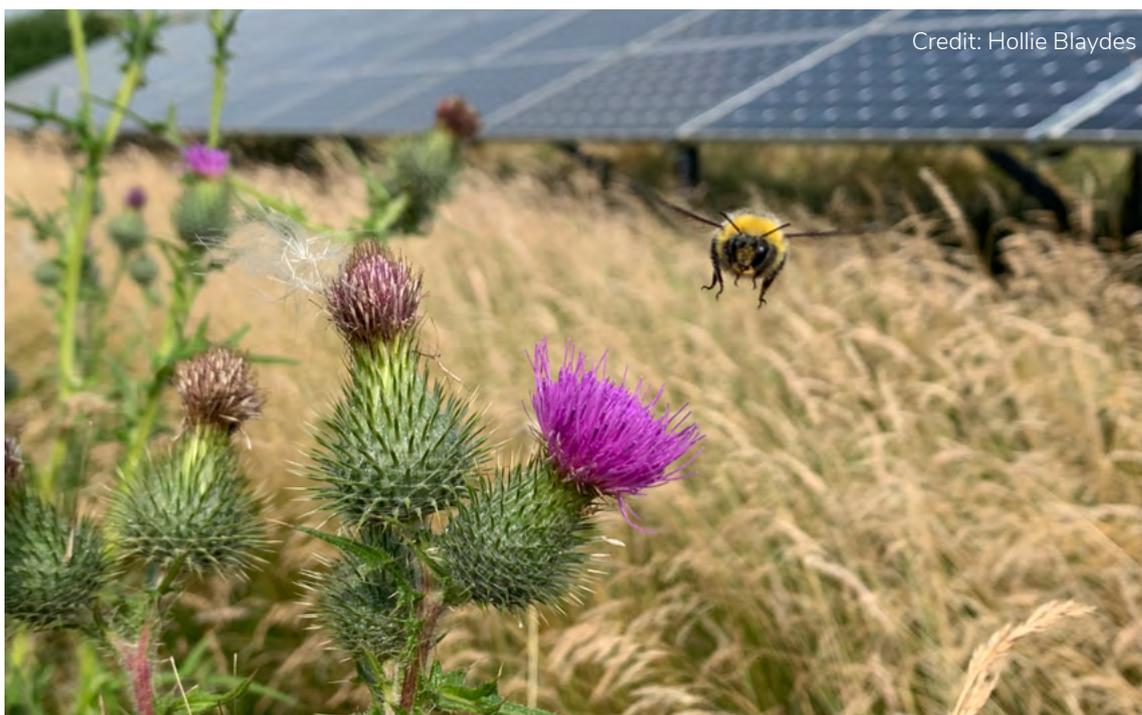
UKERC impacts

UKERC researchers co-created a standardised approach to monitoring biodiversity at solar farms.⁵¹ The approach is underpinned by a peer reviewed journal article⁵² that proposes a standardised protocol for natural capital and ecosystem services, along with the expertise of Solar Energy UK,⁵³ Clarkson & Woods,⁵⁴ and Wychwood Biodiversity.⁵⁵ The information gathered using the standardised approach is used by Solar Energy UK to publish an annual

Solar Habitats report which summarises species found on solar parks, with reports released in 2023⁵⁶ and 2024⁵⁷ to date. As the dataset grows, the aim is to analyse the data to identify trends through time and the role of site characteristics.

Supporting evidence

The datasets and analysis will be used to inform public policies, for example Biodiversity Net Gain, the post Brexit Agricultural Bill and in the longer-term Net Environmental Gain, as well as industry best practice. Given the global spread of solar parks, there has already been international interest in the protocol, evidenced by a presentation request by the US Department of Energy InSPIRE project,⁵⁸ and National Energy⁵⁹ funding a variant suitable for Greece. The UKERC Energy, Environment and Landscapes theme⁶⁰ are also pursuing funding to enable development of a similar protocol for other renewable energy technologies.





from 2010 to the present day⁶⁴. These methods and new forms of evidence have been taken up by a range of public, private and third sector organisations. Deeper impacts have been achieved through a series of collaborative experiments with partner organisations – including DESNZ, the Climate Change Committee, Anglian Water and the Dutch Government – demonstrating the difference novel approaches to mapping public engagement can make to policy-making, innovations, and in shaping new forms of participation.

Supporting evidence

Through these partnerships the Observatory has played an important role in enhancing a citizens' panel on home energy decarbonisation for the Climate Change Committee⁶⁵, in shaping the responsible innovation of new hydrogen technologies in wastewater management developed by Anglian Water⁶⁶, and in contributing to government policy-making and engagement strategies for the Dutch Ministry of Economic Affairs and Climate Policy⁶⁷ and DESNZ. Research underpinning the Observatory's approach has been extensively drawn on in Defra's Review of Public Engagement in 2022⁶⁸. The Observatory's novel mapping participation method has been adopted and applied by others, for example in a regional mapping of public engagement with energy in South West England⁶⁹, and forms the centrepiece of a Public Engagement Laboratory for Nature and Society developed within Natural England.

Academic impact

In addition to informing the energy debate across different sectors in the UK, UKERC is a research organisation actively participating in academic discourse. Peer reviewed outputs are the gold-standard for academic quality, so this section is focused on journal papers during Phase 4. At the time of writing, a total of 185 peer-reviewed academic papers have been published in the current phase. This includes publications from projects that are either fully or partly funded under UKERC's research programme.

The type of journals is wide-ranging, covering social science (e.g. Energy Research and Social Science), engineering (e.g. Applied Energy), transport studies (e.g. Transportation Research) and environmental science (e.g. GCB Bioenergy), as well as interdisciplinary journals, such as Nature, Nature Energy, Energy Policy and Renewable and Sustainable

Energy Reviews. The wide range of journals is a reflection of UKERC's whole-system and interdisciplinary approach. The volume and quality of academic output also demonstrates that the non-academic outputs described earlier in this section is fully underpinned by high-quality academic analysis.



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About UKERC

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