



UKERC Flexible Fund call 2

**Delivering the green industrial
revolution: Challenges for the
energy sector from Net Zero and
Covid-19 recovery**

Closing date: 4th June 2021, 4pm

March 2021





Introduction to UKERC

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

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

Our whole systems research informs UK policy development and research strategy.

UKERC is funded by the UK Research and Innovation, Energy Programme.



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1. Introduction

The UK Energy Research Centre (UKERC) was established by the UK Research Councils in 2004. During UKERC's current phase (2019-2024) part of our research funding is allocated through a Flexible Fund. Under this arrangement, specific projects are commissioned, on a competitive basis, from the wider research community. The aims of the Fund are:

- To allow the research programme to develop flexibility in the light of new scientific insights or external developments;
- To bring a wider range of researchers and disciplines into UKERC's research programme, including researchers from outside the 'traditional' energy community;
- To promote integration in the UKERC research programme, and to fill gaps where needed;
- To build collaborations between the UKERC research community and other research communities – including other energy researchers, groups and centres; and
- To scope and develop new research agendas in partnership with funders, the research community and other stakeholders.

Details of the UKERC research programme can be found on the UKERC [website](#). The Flexible Fund will support research that is an important part of the overall research programme, and will complement research projects that are already underway or planned by members of UKERC's core consortium.

The total value of the Flexible Fund allocated to new research is approximately £3m (valued at 80% FEC). The first Call for Proposals was issued in May 2020. All Research Fund projects must be completed by the end of UKERC Phase 4 on 30th April 2024.

2. The purpose of this call – UKERC research on Net Zero and Covid-19 recovery

UKERC is running a call focused on three key research topic areas that are important to understanding the effectiveness and impacts of policies directed at meeting the UK net zero target and the '[green industrial revolution](#)' envisaged by the UK Government as part of its response to Covid-19.

UK policymakers face many challenges as they seek to combine meeting the exacting requirements of the Net Zero Target under the Climate Change Act with creating economic growth in clean technologies. The range of potential topics is very large and some of the relevant issues are already under investigation through UKERC's existing research or in other research centres. UKERC is therefore issuing a carefully targeted call for proposals under the UKERC Flexible Fund. The topic areas seek to



complement existing UKERC research, reflecting changes that have emerged through the policy response to Covid-19 and links to Net Zero, notably the 10 Point Plan¹ launched by the Prime Minister in November 2020, Energy White Paper² published in December 2020 and the Industrial Decarbonisation Strategy³ published in March 2021. The research call seeks to evaluate policies needed to meet recent targets and/or to explore their impacts on wider society and environment. It forms part of UKERC's independent appraisal of and engagement with policy and a core objective is to deliver research with impacts on policy formation and assessment.

Through this call UKERC is seeking new research on specific topics that add value to existing research and help to both evaluate policies and provide information on policy effectiveness. The new research topics have been chosen to align with and enhance existing UKERC research activities and have been designed and specified to try to ensure timely delivery of high impact outputs. For these reasons the call for proposals focuses on a small number of relatively narrow topics – delivering investment in offshore wind, the economic impacts of decarbonising heat and environmental co-benefits. For this call UKERC is operating a 'one stage' process that seeks to commission new research swiftly. In order to secure impact it is important that research starts as soon as possible and new projects to start work by the autumn of 2021.

3. Call themes

3.1 Delivering a 40 GW offshore wind target: Securing investment and ensuring efficient price signals.

The first point of the UK government's 10 Point Plan focuses on offshore wind. A plan to quadruple the existing capacity by 2030 is set out. This translates to 40 GW capacity by 2030 and includes 1 GW of floating offshore wind. Whilst a focus of the 10 Point Plan is on offshore wind in 2030 the net zero target will require ongoing roll out of a range of low carbon options over a longer timescale.

¹ HM Government (2020) *The Ten Point Plan for a Green Industrial Revolution. Building back better, supporting green jobs and accelerating our path to net zero.* Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

² HM Government (2020) *Energy White Paper. Powering our Net Zero Future.* Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf

³ HM Government (2021) *Industrial Decarbonisation Strategy.* Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/970229/Industrial_Decarbonisation_Strategy_March_2021.pdf

This provides a challenge for policy design. In recent years, policy has shifted from subsidising new investment in emerging technologies in order to promote innovation and reduce costs, to enabling investment at scale using low carbon options that are now largely cost-competitive on a levelised basis with fossil fuel alternatives⁴. This is currently delivered through government-backed long run fixed price payments; or Contracts for Difference (CfDs), which have proved to be successful at incentivising investment in low carbon generation at low cost⁵⁶.

One of the reasons the CfDs have proved attractive to investors is that they reduce the risk associated with wholesale electricity price. A conventional 'energy only' market where price is set by short run marginal cost (SRMC) will tend to undercompensate participants who have a high sunk cost and very low SRMC. As a result, such markets are likely to fail to deliver the investment in low carbon generation needed to meet ambitious carbon reduction targets. One reason for this is the problem known as 'price cannibalisation' where price falls to low levels or even goes negative during spells when wind or solar output is high and demand is low.

A future challenge is how to best deliver a market design package that brings both incentives for low carbon investment and rewards the flexibility of operation needed to match demand and supply. Removing the CfD would expose generation investors to risks that could deter them from investing altogether, yet sustaining it whilst the share of low carbon generation rises to a high share of total generation creates a challenge for the volume of zero SRMC low carbon generation who may not have a CfD contract, or whose CfD contracts may have expired.

The fundamental research question that arises from this context is how to drive the volume of investment needed to meet the 40 GW target and simultaneously ensure that the market functions more effectively. UKERC would like to commission research that creates new thinking on how to address this challenge, as well as a comprehensive review of market design and renewable energy incentive schemes internationally.

Successful proposals will need to demonstrate how they will secure impact through a clear statement of how a narrative review will be developed that offers direct contribution to policy, as well as new academic insights. Research will be initiated by the autumn of 2021 and need to complete within a 24 month timescale. Maximum budget of £300k.

⁴ Rhodes et al (2019) *Electricity markets, incentives and zero subsidy renewables: Do Britain's power markets and policies need to change?* Imperial College London. Available from: <https://www.imperial.ac.uk/energy-futures-lab/reports/briefing-papers/paper-4/>

⁵ Blyth et al. (nd) *Electricity markets with a high share of variable renewables. A review of issues and design options.* Imperial College London Consultants. Available from: <https://imperialcollegelondon.app.box.com/s/028irer6xb67qodf7ll991ul1wfbcsbp>

⁶ Grubb, M. & Newbery, D. (2018) UK Electricity Market Reform and the Energy Transition: Emerging Lessons. *The Energy Journal*, International Association for Energy Economics, 0 (6). Available from: <https://ideas.repec.org/a/aen/journal/ej39-6-newbery.html>

3.2 The economic impacts of heat system decarbonisation

A range of measures have been announced by UK Government that aim to reduce, and ultimately eliminate, CO₂ emissions from providing heating to homes and businesses and make buildings more energy efficient. The Government's plans including the [Heat in Buildings Strategy](#) anticipates a move away from gas boilers in the next fifteen years, while maintaining thermal comfort and keeping heating costs low. It also sets out the aspiration to future-proof both domestic and non-domestic new buildings, and to deliver the installation of 600,000 heat pumps annually by 2028.⁷

In recommending to government a 6th Carbon Budget⁸ the Committee on Climate Change (CCC) envisages far reaching changes to the delivery of domestic heating. The CCC make clear that by 2025 all new build properties must have low carbon heating and by 2033 fossil fuel heating systems will no longer be installed in existing properties. Their analysis points to a significant role for electricity in heating, and for heat pumps to maximise efficiency. The CCC does not rule out a role for low carbon hydrogen burnt in boilers similar to gas-fired boilers, but also notes significant constraints on the volume of hydrogen available for domestic heating. The CCC note that hydrogen has the potential to replace fossil fuels in areas where electrification may reach limits of feasibility and cost-effectiveness, including a partial role for heat in buildings.

Previous research by UKERC also argues for a substantial roll out of heat pumps for domestic heating⁹ and international comparisons demonstrate that the mix of technologies to provide heating is diverse.¹⁰ Research suggests that over several decades complete transformation of heating infrastructure and systems can and has been achieved.¹¹ However, the UK is one of the most gas-dependent nations on earth when it comes to the provision of domestic heating. With around 85% of

⁷ HM Government (2020) *The Ten Point Plan for a Green Industrial Revolution. Building back better, supporting green jobs and accelerating our path to net zero*. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

⁸ Committee on Climate Change (2020) *The Sixth Carbon Budget. The UK's path to Net Zero*. Available from: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>

⁹ Rosenow, J. et al. (2020) *The pathway to net zero heating in the UK*. Briefing Paper. UKERC. Available from: <https://ukerc.ac.uk/publications/net-zero-heating/>

¹⁰ Hanna, R. et al. (2016) *Best practice in heat decarbonisation policy: a review of the international experience of policies to promote the uptake of low-carbon heat supply*. Working Paper, UKERC. Available from: <https://ukerc.ac.uk/project/best-practice-in-heat-decarbonisation-policy/>

¹¹ Gross, R. & Hanna, R. (2019) Path dependency in provision of domestic heating. *Nature Energy*. 4, 358–364 Available from: <https://www.nature.com/articles/s41560-019-0383-5>

households connected to the gas grid and fitted with gas-fired central heating.¹² Approximately 200,000 people are employed in heating, energy efficiency and associated industries.¹³ Replacing any significant fraction of this heating infrastructure will thus result in a profound shift of employment opportunities and skills and training needs. Accelerating the deployment of low carbon heating to meet net zero targets will also require a major programme of building retrofit to improve energy efficiency.

Heating system changes will also have direct costs. Heat pumps are currently more expensive to install than conventional boilers. Energy efficiency retrofit has upfront costs, although this may be rapidly repaid through lower heating bills. Economic impacts therefore include household income and spending patterns.

Overall therefore, heat system decarbonisation will bring jobs and economic benefits for some but render some sectors, skills and roles obsolete. There is almost no evidence of the scale of the *economic, social and employment* shifts. UKERC wishes to commission research that provides new insights into the scale and nature of these changes, in terms the implications for jobs (including the nature of jobs and skills needs) and value creation, including qualitative and quantitative dimensions. The research must take into account:

- Evaluation of the likely impact on overall employment (this could UK, region or national government level)
- Implications for skills and training requirements
- Geographical or 'place based' implications

Successful proposals will need to demonstrate how the proposer will secure impact and develop a narrative review that offers direct contribution to policy, as well as new academic insights. Research will be initiated by the autumn of 2021 and need to complete within a 24 month timescale. Maximum budget of £300k.

¹² Department for Business, Energy & Industrial Strategy (2018) *Clean Growth- Transforming Heating. Overview of Current Evidence*. Available from: <https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base>

¹³ Hanna, R. et al. (2020) *Green Jobs II Project*. Scoping Note. UKERC. Available from: https://d2e1qxpsswcpqz.cloudfront.net/uploads/2020/08/TPA-Green-Jobs-II-Scoping-Note_August-2020.pdf

3.3 Co-benefits: Covid-19 recovery, net zero and wider societal and environmental effects

Institutional, societal and technological changes to reduce CO₂ emissions also affect the natural environment and human societies^{14 15} and reducing greenhouse gas emissions is often argued to bring with it a range of environmental and societal co-benefits. Examples include reduced local air-pollution in urban areas due to a shift to electric mobility or impacts on ecosystems from renewable energy installations. Such impacts are not always positive.

Environmental Net Gain, broadly defined as achieving measurable improvements for the environment¹⁶, is embedded in UK policy, including the 25 Year Environment Plan¹⁷, Environmental planning policy,¹⁸ and the forthcoming Environment Bill.¹⁹ However, despite the net gain aspirations set out in UK planning policies the wider impacts of actions to achieve Net Zero are not always positive^{20 21}. To achieve Net Zero pathways and solutions which are optimal from an economic, social and environmental perspective, there is a clear need to document and evidence the positive, neutral and negative implications at local, regional and national levels.

A key challenge for the nexus of energy and environmental policy research is to better understand environmental net gain, including the spatial and temporal variation, so that we can identify gaps in knowledge and maximise net the co-benefits, or secure net gain, and appraise whether policies that seek to reduce CO₂ emissions can also deliver sustained environmental net gain.²² Societal and economic impacts are also extremely important and for this reason the call encompasses both environmental net gain and economic/societal co-benefits. In

¹⁴ Randle-Boggis et al. (2020) Realising co-benefits for natural capital and ecosystem services from solar parks: A co-developed, evidence-based approach. *Renewable and Sustainable Energy Reviews*. Volume 125, 109775

¹⁵ Hernandez RR et al. (2019) Techno-ecological synergies of solar energy for global sustainability. *Nature Sustainability*. 2:560-8.

¹⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909269/ncc-advice-net-environmental-gain.pdf

¹⁷ HM Government (2018) *A Green Future: Our 25 Year Plan to Improve the Environment*. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

¹⁸ Ministry of Housing, Communities & Local Government (2019) *National Planning Policy Framework*.

Available from:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

¹⁹ More information available at: <https://services.parliament.uk/bills/2019-21/environment.html>

²⁰ Holland, R.A., Scott, K., Agnolucci, P., Rapti, C., Eigenbrod, F., Taylor, G. (2019). The influence of the global electric power system on terrestrial biodiversity. *Proceedings of the National Academy of Sciences*. 116 (51) 26078-26084

²¹ Thaker M, Zambre A, Bhosale H. (2018) Wind farms have cascading impacts on ecosystems across trophic levels. *Nature Ecology & Evolution*. 2:1854-8

²² Randle-Boggis et al. (2020) Realising co-benefits for natural capital and ecosystem services from solar parks: A co-developed, evidence-based approach. *Renewable and Sustainable Energy Reviews*. Volume 125, 109775

both cases applicants will need to develop methods and approaches to assess net gain and co-benefits. The overall objective is to factor environmental and societal impacts into policies that seek to deliver net zero and contribute to economic recovery from the impacts of Covid-19. Evaluation and cross comparison of different impacts creates many challenges.²³ However, environmental impacts are amenable to systematic qualitative and quantitative appraisal that seeks to determine whether policies that seek to reduce CO₂ emissions also bring sustained environmental net gains.²⁴

UKERC would like to commission research on the development of an evaluation tool, or co-benefits 'tracker', to evaluate and track environmental and societal co-benefits in order to scope the potential to factor co-benefit creation into policies that seek to deliver net zero and create economic benefits in the context of Covid-19 recovery programmes. Proposed research could include the identification of the range of co-benefits associated with specific CO₂ emission reduction interventions, such as vehicle electrification, mobility pattern shifts or the roll-out of renewable energy technologies, and the development of a methodology to track co-benefits and link them to ongoing policy developments.

Successful proposals will need to clearly demonstrate how the proposer will secure impact and develop a narrative review that offers direct contribution to policy, as well as new academic insights. Research will be initiated by the autumn of 2021 and need to complete within a 24 month timescale. Maximum budget of £300k.

4. Eligibility

Proposals are invited from eligible UK researchers, i.e. applicants based in UK Higher Education Institutions (HEIs), Research Council Institutes and Centres, and Independent Research Organisations (IROs) approved by any of the Research Councils. Please refer to the [UKRI website](#) for details on Research Councils funding eligibility. Potential applicants should contact UKERC well in advance of the submission deadline if they have any queries concerning their eligibility. Organisations not eligible to receive Research Council funding directly (e.g. industry, government agencies, third sector organisations) may participate as project partners.

Individuals may submit no more than one proposal as Principal Investigator plus one as Co-investigator, or two as Co-Investigator, to this call.

²³ Hooper et al. (2021) Developing policy and practice for marine net gain. *Journal of Environmental Management*. Volume 277, 111387

²⁴ SPIES (nd) *Solar Park Impacts on Ecosystem Services*. Available from: <https://www.lancaster.ac.uk/spies/>

5. Procedure for Submitting Proposals

All documents should be submitted directly to UKERC and should be sent by email to Ioanna Ketsopoulou (i.ketsopoulou@ucl.ac.uk). We are requesting that applicants register their intent to apply for funding before submitting a full proposal.

5.1 Registration of intent to submit a full proposal

Applicants are required to register their intent to submit a full proposal before the final submission. This information is being requested by UKERC to help gauge interest and manage the call. It will not be peer reviewed or used in the assessment of proposals in any form. The deadline for the registration of intent is the **21st May, 4pm**.

A short note of no more than two A4 sides should be submitted, including the following:

- Name, institution and contact details of the Principal Investigator.
- A list of Co-Investigators, including names and institutions.
- The title of the proposal.
- A brief description of the proposed project in no more than 250 words.

There is no need to inform UKERC of any minor changes in the project or changes in the list of Co-Investigators before the final submission. However UKERC should be notified about any major changes in the proposed research or a change of Principal Investigator.

5.2 Full proposal submission

We are inviting the submission of full proposals by the **4th June, 4pm**. Proposals should include the following:

1. Case for Support, a maximum of eight A4 sides long, comprising up to two A4 sides for a track record, and six A4 outlining the proposed research, academic outputs and its context. The track record should be used to demonstrate expertise to deliver on the specific proposal and research area.
2. Impact statement, up to two A4 sides, explaining how impact, in particular a contribution to policy will be achieved.
3. Statement of up to two A4 sides explaining the contribution and links to UKERC's core Research Programme.
4. Justification of Resources, up to two A4 sides.
5. Workplan, maximum one A4 side.
6. Letters of support from any named Project Partners, up to two A4 sides each.
7. CVs for named investigators and researchers, up to two A4 sides each.
8. Financial information should be submitted using the form in the Appendix. The form should be complemented by an attached costing from the institution's

Research Services Office, using their standard costing software (e.g: WorkTribe, Pfact etc.)

9. A list of 3 potential peer reviewers should be submitted on a single A4 sheet. UKERC reserves the right to request reviews from other reviewers as we see fit.

The minimum font size is 11 for all documents, with minimum margins of 2cm. All documents should be sent in PDF format.

6. Evaluation Procedure

In order to help ensure that research takes place as soon as possible this call will operate a 'one stage' approach. The UKERC Research Committee will first screen proposals based on the fit with the call specification and their potential to achieve impact. The proposals that pass the screening stage from each topic will be sent for full academic peer review.

Proposals that move on to peer review will be assessed and graded by independent referees on research design and methodology, contribution to UKERC, appropriateness of requested resources and overall quality. The UKERC Research Committee will then establish a ranked list within each topic area.²⁵ The screening and peer review process may be amended depending on the number of applications received.

UKERC has the option not to fund the top-ranked proposal within each topic area if it considers that the fit with its overall research programme is inadequate. However, UKERC would exercise that option only in the most exceptional circumstances. Taking advice from the UKERC Research Committee, UKERC may negotiate modifications to the scope of proposals and associated funding levels to ensure adequate fit with the research programme.

7. Timeline

Deadline for registration of intent to submit: 21st May 2021, 4pm

Deadline for proposals: 4th June 2021, 4pm

Outcome announced: Late July 2021

Research commences: Autumn 2021

²⁵ Research Committee members who are directly involved in proposals under a given research topic will be excluded from the Committee's deliberations on that topic.



8. More Information and Contact Details

In developing their full proposals, bidders are strongly encouraged to discuss their proposals, and potential linkages with the UKERC research programme, with the UKERC HQ team.

Successful research teams will be considered full members of the UKERC consortium, and will need to liaise throughout their award with the UKERC HQ team, and with other members of the consortium as appropriate.

Successful projects will be assigned to one of UKERC's research themes and will be expected to participate in theme meetings and other activities. UKERC's Collaboration Agreement makes provision for Flexible Fund projects to be incorporated into the award as subcontractors associated with the existing themes. All UKERC participants are subject to the conditions set out in the Collaboration Agreement, which will be made available to successful applicants.

For queries on the Call for Proposals or any other UKERC matters please contact Ioanna Ketsopoulou (i.ketsopoulou@ucl.ac.uk).

Appendix

Must be complimented by an attached costing from the institution's Research Services Office, using their standard costing software (e.g: WorkTribe, Pfact etc.)

Indexation should not be included in the costing.

	Costed at 100% fEC (£)	Awarded at 80% fEC (£)
Directly Allocated Costs		
Investigators		
Estates		
Other Directly Allocated		
Indirect Costs		
Directly Incurred Costs		
Staff		
Travel and subsistence		
Consumables		
Other Directly Incurred (please state type of cost)		
Total Requested		