

Ref: LIT0704

## Project Specification: Electricity system stability and security of supply in Scotland

### 1. The need for this research

ClimateXChange wishes to commission research to examine the implications of the Net Zero transition on electricity system stability and security of supply in Scotland.

As Scotland transitions to Net Zero and the demand for low carbon electricity significantly increases, traditional large-scale, centralised power stations are increasingly being replaced by more widely dispersed, low carbon and renewable generation. The intermittency of renewables and the capacity of the electricity network to manage their addition, will change how the electricity system operates, particularly in relation to system stability and security of supply.

Security of electricity supply is a reserved policy area, delivered through UK Government electricity policy, Ofgem as the independent GB energy regulator, and National Grid ESO (the GB Electricity System Operator). The Scottish Government plays a key role in electricity system issues, however, through the planning and consenting process, and this project will provide evidence to support understanding of future impacts of greater renewables and ensure considerations relating to Scotland are given appropriate weight by decision makers.

This research will also be used to inform plans and actions in the upcoming Climate Change Plan<sup>1</sup> and Energy Strategy<sup>2</sup> and Just Transition Plan<sup>3</sup>.

### 2. Project scope and aim

Efforts to reduce greenhouse gas (GHG) emissions, together with the increase in electricity generated from renewable energy, are dramatically changing the electricity supply landscape. Among other things, this has involved the closure of large, fossil-fuelled thermal power stations. Such changes introduce challenges associated with security of electricity supply including: having access to enough dependable sources of electricity to meet all of the demand for power sufficiently often; and preventing, containing and recovering from interruptions to supply arising from disturbances<sup>4</sup>.

This project will contribute evidence for policy development for the period from now until 2045, with particular emphasis on key milestone years of 2030, 2040 and 2045. The aim is to analyse the continued stability and security of supply of Scotland's electricity system as nuclear and other 'baseload' fossil fuel generation retires and are replaced with growing levels of

<sup>1</sup> <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/>

<sup>2</sup> <https://www.gov.scot/publications/scotlands-energy-strategy-position-statement/>

<sup>3</sup> <https://www.gov.scot/publications/transition-fairer-greener-scotland/>

<sup>4</sup> <https://www.climatexchange.org.uk/research/projects/security-of-scottish-electricity-supply-gauging-the-perceptions-of-industry-stakeholders/>

intermittent renewables, and other technologies (e.g. storage, CCUS generators etc.). The study will be conducted under the assumption that Scotland will not host any new nuclear sites in the future.

The research will examine the dynamics and dependencies of the future electricity system in Scotland, looking for solutions which align with Scottish Government energy policy.

Findings will be used in liaison and engagement with electricity system stakeholders in Scotland and across the UK, and it is anticipated that key stakeholders from generators, networks, and the regulator will be interviewed as part of the project.

The research will answer questions including but not limited to:

1. What examples exist internationally of national electricity systems operating/moving towards reliance on renewables, without import of fossil fuel and nuclear baseload?
2. Are there any expected/planned policy or regulatory developments, such as locational pricing, which could impact the future system, and what impacts will these be expected to have?
3. What technology developments need to take place in Scotland to ensure a secure and reliable supply of low and zero carbon electricity out to 2045? This should include generation technologies, networks, flexible response, and storage.
4. What are the likely impacts on transfers of electricity from/to Scotland and the rest of GB, in an electricity system powered almost entirely by intermittent renewables?
5. If Scotland was to have an entirely self-sufficient system what additional volume and type of generation would be required (this should include black start capability)?

Electricity system modelling should be undertaken covering agreed future electricity scenarios for Scotland<sup>5</sup>, in line with current Scottish Government energy policy, with variables flexed, including total (and type of) installed generation capacity, network capacity and import/export capability, storage, and demand side response. There should also be a 'stress test' scenario which looks to establish the point at which the system would become insecure in Scotland.

Comparative analysis should be conducted across the scenarios to provide an assessment of the strengths and weaknesses of each.

The analysis should cover the elements of the GB electricity system located in Scotland, as it exists at the moment, with appropriate, referenced assumptions on how this might develop in the coming years.

### 3. Audience

The work is commissioned on behalf of the Scottish Government, and of particular interest to policy teams covering electricity and electricity networks. The research may also be used as a basis for engagement with UK Government, Ofgem, National Grid, and electricity network companies.

The results must be presented in a format and language that can be understood by readers without an academic or technical engineering background. Written outputs must be well presented and written in Plain English.

---

<sup>5</sup> Tbc using scenarios set out in previous CXC research (to be shared with contractor), 6<sup>th</sup> Carbon Budget, National Grid FES, and/or other UK energy system scenarios

## 4. Methodology

The project should be delivered via a combination of electricity system modelling, desk-based research, and stakeholder engagement.

Tenderers are invited to put forward proposals on how to best meet the research aims within the budget available.

A full explanation of your chosen approach, including any limitations, should be provided.

## 5. Outputs

The expected outputs would be a **short** report covering:

- a) an executive summary of no more than two pages, detailing the key findings, the aim of the project and the value to a policy audience; and
- b) a full report of the analysis to include:
  - i) scenario modelling results
  - ii) key findings
  - iii) outstanding priorities for further research and innovation activity/funding
- c) annexes detailing
  - i) the methodologies used and underlying assumptions
  - ii) detailed results
  - iii) a glossary if needed
- d) references

An interim report and presentation will cover research questions 1 and 2 above, see timeline below.

The ownership of the research material including the final report and any data produced as a result of the research lies with ClimateXChange on behalf of Scottish Ministers. The research may be published on the ClimateXChange website, the date and format of which will be determined by the Scottish Government and ClimateXChange.

One or more drafts are likely to be required before a final version is agreed.

ClimateXChange supports the Scottish Government Open Research Guidance for RESAS, summarised as “open as possible, closed as necessary.” This means that all products will be placed in the public domain, unless there is a strong argument otherwise (for example to comply with data protection regulations). Descriptions of all projects and related products will be uploaded to the ResearchFish system.

## 6. Project governance

A small steering group will be established to support delivery of the project. The steering group’s role is to agree the research methodology and project plan, comment on draft findings and drafts of the report, and sign-off outputs for publication. It will include representatives from Scottish Government, ClimateXChange, and the project team. External members will be considered depending on the methodology/approach.

The lead contact for ClimateXChange will be Anne Marte Bergseng, CXC Project Manager – Climate Resilience and social change, who will liaise with the contractor. Regular update calls will be scheduled fortnightly between the principal investigator and the CXC Manager to discuss progress and address any issues, escalating to steering group for consideration where necessary.

## 7. Project timetable

Milestone	Completed by
Project kick-off meeting, to agree <ul style="list-style-type: none"> <li>• Deliverables</li> <li>• Scope, including scenarios</li> <li>• Methodology</li> <li>• Boundaries</li> <li>• Timeframe</li> </ul>	26 August
Report on progress (Principal investigator, CXC Project Manager and Scot Gov representative)	Fortnightly
Interim report and presentation to steering group of findings for research questions 1 and 2 above	30 September
Presentation to steering group of findings for research questions 3, 4 and 5 above	11 November
Full draft report to steering group	30 November
Submission of final report incorporating steering group comments	15 December
Presentation to stakeholders	TBC

## 8. Award criteria

Price 20%

Quality 80%

Quality Criteria	Descriptor	Weight
Understanding the research specification and the policy environment	The proposal should include an introduction which demonstrates a clear understanding of the research requirements, including: <ul style="list-style-type: none"> <li>• The policy and regulatory environment and the supporting role of research</li> <li>• The cross-sectoral nature of the project</li> <li>• The need for this research</li> <li>• The research aim, and how the proposal will address this need</li> </ul>	10%
Research methodology	The proposal should demonstrate a high quality and workable research methodology that will deliver the outputs in the required timescale, including:	40%

Quality Criteria	Descriptor	Weight
	<ul style="list-style-type: none"> <li>• How the evidence will be identified, reviewed and assessed</li> <li>• How the research objectives will be addressed</li> <li>• The suitability, robustness and limitations of the methodology</li> </ul>	
Project management and staff resource	<p>The proposal should:</p> <ul style="list-style-type: none"> <li>• Include a clear project plan, that captures: <ul style="list-style-type: none"> <li>○ The key steps required to deliver the desired output within scope and to time</li> <li>○ Reference – where relevant – to mechanisms for compliance with regulations (e.g. GDPR)</li> </ul> </li> <li>• Provide details of individual staff members who will work on this project and demonstrate how they will meet the project requirements, specifically their experience and expertise: <ul style="list-style-type: none"> <li>○ In research generally</li> <li>○ In tasks specific to this research</li> <li>○ In inter-disciplinary team-working</li> </ul> </li> <li>• Provide a commitment that named staff members will be available to work on the contract if the bid is successful</li> <li>• Set out the management arrangements for the project</li> <li>• Include a timetable for delivery of tasks and project milestones covering the duration of the contract</li> <li>• Clearly show allocation of staff and staff time against each task</li> </ul>	15%
Communication and report writing	<p>The proposal should describe the approach to writing the report, which will be published on the ClimateXChange website. This should include how different contributions from the team will be brought together.</p> <p>The proposal should outline any planned visualisations and/or added value presentations of the material.</p> <p>It should detail who will take lead responsibility for report-writing and overall report quality. It should provide accessible links to outputs and/or publications they have been involved in, detailing their role in the work.</p> <p>It should detail specific data management tasks (and their related costs) required to comply with the open data guidelines</p>	5%
Quality assurance and risk mitigation	<p>The proposal should provide details of quality assurance procedures to demonstrate how the contract will be continuously delivered to a high standard. It should specifically address issues of quality control at different stages of the project, including evidence gathering, analysis and report writing.</p> <p>The proposal should provide a risk assessment matrix detailing any risks identified in relation to the delivery of this contract, and proposed mitigation measures to minimise their probability and impact.</p>	10%

## 9. Submitting a proposal

Please send a brief work plan (no more than six pages excluding CVs) responding to the award criteria above and including deadlines, applicable day rates, relevant research experience, examples of previous work and the number of person days' work proposed. CVs for the proposed delivery team can be outwith the 6 page limit. *Your submission should be a single document in PDF format with the file name in the following format name of submitting organisation – Electricity system stability and security of supply in Scotland – IQ16-2022. File size should not exceed 5MB.*

You should highlight any potential conflicts of interest in your proposal.

Proposals need to be submitted to [lee.callaghan@ed.ac.uk](mailto:lee.callaghan@ed.ac.uk) and cc'd to [annemarte.bergseng@ed.ac.uk](mailto:annemarte.bergseng@ed.ac.uk) for evaluation by **noon on Friday 12<sup>th</sup> August. Any documents or amendments submitted after the deadline will not be accepted.**

Any clarifications questions regarding the specification should be submitted by email at least 5 working days before the bid submission deadline above.

We expect to contact the successful bidder by Friday 19<sup>th</sup> August.

The costs of proposals for this project are expected to be in the range of £70-80k (including VAT). However, ClimateXChange would welcome proposals for less than this amount. We welcome consortium bids.

Depending on the quality of proposals received, CXC may chose not to appoint any contractor.

CXC Secretariat

July 2022

---

**climateXchange**

Scotland's centre of expertise connecting  
climate change research and policy

ClimateXChange, Edinburgh Climate Change Institute, High School Yards, Edinburgh EH1 1LZ

✉ [info@climatexchange.org.uk](mailto:info@climatexchange.org.uk)  
☎ +44(0)131 651 4783  
🐦 @climatexchange\_  
📍 [www.climatexchange.org.uk](http://www.climatexchange.org.uk)