

Specification for the development of trajectories for residential heat decarbonisation ahead of the sixth carbon budget

Tender Reference Number: **RH/1119**

Specification of Requirements

Invitation to Tender for: **The development of trajectories for residential heat decarbonisation ahead of the sixth carbon budget**

Tender Reference Number: **RH/1119**

Deadline for Tender Responses: **9am on 11th December 2019**

Contents

1	Preamble	3
2	Background	3
3	Aims and Objectives.....	4
4	Methodology	5
5	Outputs Required	17
6	Ownership and Publication	18
7	Quality Assurance.....	18
8	Timetable	18
9	Challenges	19
10	Ethics.....	19
11	Working Arrangements.....	20
12	Skills and experience	20
13	Consortium Bids	20
14	Budget	21
15	Evaluation of Tenders	21

1 Preamble

The Committee on Climate Change (CCC) was set up as part of the Climate Change Act. The CCC is an independent body tasked with providing advice to Government on climate change issues, and particularly the setting of carbon budgets, and the monitoring of progress towards meeting those budgets.

The Committee provided advice on the fifth carbon budget (2028-2032) in November 2015 and next year will be providing advice on the sixth carbon budget (2033-2037). This will be the first budget set since the Government legislated to achieve net-zero greenhouse gas emissions by 2050.

The CCC's past reports are available here: <http://www.theccc.org.uk/reports/>.

2 Background

In May 2019 the Committee on Climate Change published 'Net Zero: The UK's contribution to stopping global warming'.¹ This report set out the Committee's advice that the UK should commit to achieving net-zero greenhouse gas emissions by 2050. Earlier this year the Government and Devolved Administrations subsequently legislated for net zero greenhouse gas targets to be enacted in law.

Achieving net zero greenhouse gas emissions requires a close-to-full decarbonisation of heat in buildings.

As part of our advice on net zero, we developed a view of the different technology mixes which have potential to almost fully decarbonise buildings by 2050. To achieve net zero across the economy, buildings emissions must be reduced close to zero (to 5 MtCO₂e or less in 2050), but the preferred technology mix is not yet clear (e.g. the balance between heat pumps, hydrogen, hybrid heat pumps and energy efficiency). As we look towards the sixth carbon budget, our task is now to establish what trajectory of deployment is needed to keep us on track to 2050 and beyond, whilst keeping options open across a range of potential scenarios.

To meet our net zero ambition in buildings, the next 5-15 years will be critical.

¹ CCC (2018) *Net Zero: The UK's contribution to stopping global warming*

We must have meaningful and well-funded policies in place, skilled supply chains must be appropriately supported and trialling and testing at scale will be needed to inform strategic decisions on national and local infrastructure.

The CCC will need a trajectory of deployment which balances these considerations and informs not only what will be needed for the sixth carbon budget period from 2033 to 2037, but in the years leading up to this.

This in turn will be a critical input to the near-term decisions that are urgently needed from Government on policies for delivery, and on the funding required to support them.

A number of key Government publications are expected in the coming year including the Government's heat decarbonisation policy roadmap, the Treasury's review of how the costs of the transition to a net-zero society can be funded, and the spending review and budget. The Committee's advice will be published in September 2020, three months before it is required by the Climate Change Act to ensure that it precedes the pivotal international climate change conference (COP26) due to take place in Glasgow in December 2020.

3 Aims and Objectives

The primary aim of this work is to **develop a trajectory for the deployment of decarbonisation measures across the UK residential building stock in line with the UK's net zero targets. A range of alternative scenarios and trajectories will need to be developed to inform and accompany this central scenario.** As a secondary task to be priced separately, **we are also interested in identifying geographical areas within the UK where there is a low-regrets case for dominance of a particular heating solution.**

The scope of interest will be decarbonisation of heat in existing homes across the UK, with outputs generated on both a UK-wide basis and separated out by Devolved Administration. The focus will be driving direct (i.e. household-level combustion) greenhouse gas emissions as close as possible to zero. Indirect emissions (e.g. from electricity generation for which the CCC will provide assumed emissions intensities) should also be reported. In tandem with this we wish to consider and account for the implications of our scenarios for fuel poverty.

We are keen that this new analysis builds on work to date as much as possible, whilst making best use of relevant new evidence. This project covers four key questions, focused on deployment rates:

- a) What actions and deployment levels must be delivered in the next 5-15 years in order to keep the range of future pathways open to net zero?

- b) How far do current policy commitments take us along this pathway and what new commitments will be needed to fill the gap (e.g. dates by which gas boiler installations must be phased out)?
- c) What policy approaches could best support cost-effective deployment and what is the cost at which they could be delivered?
- d) What emissions and energy demands are associated with the resulting deployment trajectory?

Building on the development of the scenarios and trajectories which are the primary aim of this work,² this specification sets out an optional additional task to examine those geographical areas where there is a low-regrets case for dominance of a particular heating solution. This is intended to help inform wider thinking on opportunities for e.g. early electrification or hydrogen deployment/trialling.

Whilst the outputs of these tasks will be used in the first instance to inform our advice to Government next year in the context of the sixth carbon budget, we wish to use the opportunity to develop a model which is designed for longer-term use by the CCC. To fulfil this purpose we are seeking a model which is built to allow for further evolution and capability to be incorporated. This means not only changes to inputs (e.g. baseline heat demand and emissions, costs and savings) but also scope to enable future scenario analysis (e.g. to reflect ongoing policy developments) and functionality upgrades. It should be built in a user-friendly way with appropriate guidance provided to support use in-house at the CCC.

4 Methodology

Below we set out an illustration of how the work package might be taken forward.

However bidders are invited to propose their recommended approach. This includes setting out amendments to tasks where alternative approaches are considered better able to deliver the project objectives within the required timescales and budget. Bids should make clear where simplifying assumptions or simplified methodological approaches are expected to be necessary.

We are conscious that this specification sets out a comprehensive work package, for delivery in limited timeframes. As set out above, we are keen that this work builds upon previous work to a large extent. Consortium approaches are particularly encouraged

² In the course of this tender, the term 'scenario' is used to refer to a view of the world either for a single target year such as 2050, or for the period leading up to and including it. The term 'trajectory' refers specifically to the pathway of deployment up to the target year.

where this enables best use of pre-existing models and data. We have minimum requirements for core outputs which need to be delivered by March 2020. Beyond this we welcome views from bidders on how the work might best be arranged to deliver high quality outputs in the time available.

In total up to £100,000 ex VAT is available for the delivery of this project. This budget is for both task 1 and optional task 2. We would expect the majority of funding to be allocated to task 1.

Bids should set out separate pricing for the two tasks and the anticipated split of funding required across financial years in line with the proposed delivery approach.

1. Scenario and trajectory development

Below we set out a process for how scenario and trajectory development could run, and use this to highlight our areas of interest. However bidders are invited to propose their recommended approach.

The CCC intend to convene a steering group and/or an expert group which will be used to inform the work. In particular we envisage using the group(s) to test thinking, scenarios and policy recommendations prior to finalisation. Bidders should set out their proposed approach to stakeholder engagement, including key junctures at which stakeholder groups will be used.

a) Consolidate a set of assumptions for use in modelling

It is expected that the assumptions underpinning our net zero analysis for residential buildings will be used as a default. We will ensure that these are provided in a usable format.³ We are not anticipating that a full review of input assumptions will be necessary for this work. Rather the focus should be on targeted updates to generate new assumptions where missing from the analysis for net zero, and where necessary to make use of the best available evidence.

³ See Element Energy and UCL (2019) *Analysis on abating direct emissions from 'hard to decarbonise' homes* and the accompanying assumptions log, both available here: <https://www.theccc.org.uk/publication/analysis-on-abating-direct-emissions-from-hard-to-decarbonise-homes-element-energy-ucl/>

We anticipate that the successful bidder will need to generate new or updated assumptions in the following areas:

- *Deployment rates and supply chains* – The focus of this work will be on developing trajectories out to the sixth carbon budget period (2033-37) and beyond (i.e. to 2060). In order to do so it will be necessary to gather evidence and formulate assumptions which influence these trajectories such as innovation, supply chain capacity and growth rates. This will need to take into account both supply of technologies, and the capability of the installer base to cope with demand. As a key input to the scenarios, bidders should set out how they propose to go about evidence gathering for these assumptions.⁴
- *Operational and behavioural components* – In addition to the core measures modelled for net zero (i.e. fabric efficiency measures and low-carbon heating technologies), pathways should include a suite of complementary actions that could be taken to improve efficiency and drive down emissions. These include:
 - Heating controls: In our analysis for the 5th carbon budget we included energy and carbon savings associated with heating controls, including thermostats, timer controls and thermostatic radiator valves.⁵ We would like to represent these in our measure mix for this modelling.
 - Behavioural components: In our 5th carbon budget scenarios we included a 1 degree decrease in thermostat temperatures as a behavioural measure. In the net zero analysis the energy efficiency assumptions were based on ‘informed use’, including reasonable thermostat set temperatures as a core assumption. We would be interested in being able to separate out the effects of lower temperature set points in this modelling to enable us to construct scenarios which differ in the level of behaviour change assumed.

Updates to assumptions by the successful bidder in the following areas would be desirable:

- *Space constraints* – For our net zero analysis, we examined internal space constraints as a key barrier to the deployment of several low carbon heating technologies and

⁴ Some evidence is expected to become available during the course of the project. For instance, BEIS has recently commissioned research into heat pump supply chains which is expected to generate outputs early next year. The Construction Industry Training Board is also undertaking research on skills which may yield helpful inputs. There will be a need to map potential evidence sources at the outset and plan the project so that wherever possible, new evidence can be incorporated when it becomes available.

⁵ Element Energy and Energy Saving Trust for the CCC (2013) *Review of potential for carbon savings from residential energy efficiency*

enabling technologies. Further work to improve the characterisation of space constraints (including external) as a barrier to heat decarbonisation would be welcome.

- *Local/spatial infrastructure*– Where possible in the time available, we are interested in representing electricity network constraints in the model such that they can be used to help inform and influence decarbonisation decisions. We are aware of the data issues in this area and welcome thoughts on whether there are any practical approaches that could be taken to create workable assumptions. There are a range of other infrastructure considerations which have potential to add value to the modelling and we welcome proposals on any other items that could helpfully be included.⁶
- *Suitability* – We may wish to refine our measure suitability assumptions further, to the extent modelling flexibility allows this. This includes, for instance, assumptions around the types of home which might be able to accommodate a heat pump or solid wall insulation, given the characteristics of the building.

We also expect to feed a number of additional updated assumptions into the work:

- *Energy efficiency assumptions* – For our work on net zero, analysis was commissioned from UCL to generate a detailed set of energy efficiency assumptions based on a data-derived method for the cost and performance of energy efficiency retrofit packages.⁷ We have since commissioned an extension to UCL’s research in this area which is focused on consolidating assumptions through further evidence gathering and dynamic modelling.⁸

This work will be running from mid-November to late December 2019. The successful bidder will need to engage with UCL soon after appointment in order to discuss the format of UCL’s outputs and ensure the two projects are designed to work effectively together. To inform UCL’s work, we also welcome views in bids on any

⁶ Element Energy and UCL for the CCC (2019) *Analysis on abating direct emissions from ‘hard-to-decarbonise’ homes*, slide 132

⁷ Element Energy and UCL for the CCC (2019) *Analysis on abating direct emissions from ‘hard to decarbonise’ homes*, see slide 41.

⁸ Including generating assumptions for any new technologies such as thin solid wall insulation, and the production of a comprehensive report which details and justifies deviations from our fifth carbon budget assumptions.

energy efficiency technologies which were not part of our net zero advice, but which there is a strong case to include in our 6th carbon budget analysis.

- *Fuel cost and carbon intensity assumptions* - New CCC assumptions will be developed for the sixth carbon budget.
- *Solar technologies* – We are interested in evolving our representation of solar thermal further in our modelling.⁹ We intend to engage with a number of stakeholder experts to inform updated assumptions in this area.
- *Heritage assumptions* – For our net zero analysis, targeted consultation was undertaken with a small group of industry experts to understand the additional challenges and costs of decarbonising heat in heritage homes. We intend to test these assumptions further through stakeholder engagement.
- *Water softening technology* - There is some evidence to suggest that lime scale build up can have a detrimental effect on heating system efficiency. We would like to review the evidence and solutions to determine whether there is a case to incorporate any additional measures in our scenarios.

It is expected that the final list of assumptions to review will be agreed at the start of the project. We welcome proposals from bidders on the approach they intend to take in developing/updating assumptions, and on the key areas where they consider updates will be needed to incorporate the best available evidence.

b) Assess the impact of current policy commitments

As a pre-cursor to scenario development, existing government policy commitments will need to be reviewed to consider how they might be represented in the scenarios. Relevant policy commitments are likely to include:

- I. Fuel poverty policy (such as ECO), including across Devolved Administrations

⁹ Currently, we include solar thermal as a complementary technology to support the provision of hot water in homes. We are interested in refining our assumptions and testing any configurations which stakeholders believe to offer better potential for solar thermal to play a cost effective role. This could include contribution to space heat demand (either directly or in a cascade arrangement), or roles in communal heating systems.

- II. Trajectories for retrofit including commitments made by Central Government¹⁰ and Devolved Administrations¹¹
- III. Low-carbon heat policy such as the RHI and phase-out of high-carbon fossil fuels

To the extent possible, we wish to better understand what levels of measure deployment key policies are consistent with, and the extent to which they may be complementary to cost-effective trajectories for net zero.

We are aware of the inherent challenges of modelling using EPC ratings, and of the uncertainties posed by the policy caveats. We welcome proposals from bidders on how key existing Government policies might be represented in a useful way.

c) Development of scenarios and trajectories

The preceding tasks are envisaged to be prerequisites for the key task of scenario and trajectory development. Alongside a baseline, we currently expect five scenarios/trajectories will need to be developed in total, with potential for additional sensitivities.

A baseline will need to be developed to represent counterfactual emissions. We anticipate that this will need to include turnover of the boiler stock (i.e. increasing efficiency). The baseline should be calibrated to actual energy demand.

We currently expect to develop a total of 5 scenarios to include:

- Three alternative scenarios, representing different states of the world in 2050:
 - One scenario will be based around a hydrogen-led mix. This could represent a world where there is a large degree of Government intervention/ a commitment to large-scale infrastructure change. The trajectory and scenario

¹⁰ Central Government have committed to making as many homes as possible EPC band C by 2035 where practical, cost-effective and affordable (with the caveats recently having been defined here: <https://publications.parliament.uk/pa/cm201920/cmselect/cmbeis/124/12403.htm>); all fuel poor homes are planned be upgraded to EPC C by 2030; and as many privately rented homes as possible are planned meet EPC band C by 2030 where practical, cost effective and affordable; social housing is planned to meet similar standards over this period.

¹¹ The Scottish Government have committed to upgrading all owner-occupied homes in Scotland to EPC band C by 2040 where technically feasible and cost effective (with an intention to encourage action by 2030); all social housing in Scotland is planned to meet EPC band B by the end of 2032 and within the limits of cost, technology and necessary consent; a trajectory has been published for the private rented sector in Scotland, with proposals being consulted on for reaching EPC band C at point of rental from 2025.

will need to be compatible with a realistic rollout approach (e.g. staggered regional deployment).

- Another scenario will be based around high levels of energy efficiency and electrification via heat pumps. This could materialise in the event of high levels of consumer engagement in the transition for instance.¹²
- Another scenario is expected to be based around a hybrid heat pump mix with a niche role for hydrogen (as was used for our Net Zero Further Ambition scenario).

By March 2020 we wish to have both a 2050 view, and trajectories to 2050 for each of these scenarios if possible.¹³

- A central scenario and trajectory to be used for setting the sixth carbon budget. This is the key deliverable for delivery by the end of March 2020. It should be based around deployment driven by necessary policy measures and milestones and keep all of the three alternative scenarios in play through the 2020s, minimising path dependency. It will need to be designed as a fuel-poverty first scenario.
- A 'max' scenario where maximum progress is made as soon as possible on buildings. It will be used to feed into a maximum progress scenario across the sectors, and is currently envisaged to give a view on the earliest possible date at which net zero could be achieved. This scenario/trajectory could be delivered after March if necessary.

As set out above, these scenarios will need to include trajectories out to net zero, with a particular analytical focus on the period from now to 2037. Our May 2019 report, 'Net zero – the UK's contribution to stopping global warming', was based on a scenario for residential buildings which leaves 4 MtCO₂e of residual emissions in 2050, with full decarbonisation being achieved by 2060.¹⁴ Broadly we expect to retain an approach which achieves emissions of 5Mt or less by 2050.¹⁵

¹² More generally we are interested in what other characteristics might be used define a 'behaviour-led' scenario.

¹³ These trajectories are anticipated to be required to enable development of an informed trajectory for the central scenario. However, if not considered viable it may be possible to focus on developing 2050 snapshots for the alternative scenarios by March with the accompanying trajectories developed shortly after this. In this event bids must make clear the proposed approach, including what steps will need to be taken to ensure a robust central scenario (including trajectory) can still be developed by the end of March.

¹⁴ We do not consider that there is a need for the precise measure mix for our Net Zero Further Ambition scenario to be reflected in our scenarios for the sixth carbon budget.

¹⁵ Our Further Ambition scenario abated 95% of direct emissions from existing buildings by 2050 at an annual cost of around £13bn/yr. Our Further Ambition scenario left up to around 4Mt CO₂e of emissions unabated in 2050. There are a range of circumstances which are consistent with residual emissions in residential buildings after 2050. Across these cases, decarbonisation is expected to be technically feasible, but costly or difficult and on this basis we assume that our Speculative scenario is

We expect that an iterative process of engagement and input between the successful contractor and the CCC will be needed in order to deliver finalised scenarios and trajectories. Prior to finalisation, testing with key stakeholders will also be necessary via the steering/expert group. The CCC will convene the stakeholder group(s) but the successful contractor will need to develop material for testing in these meetings.

The metrics associated with the finalised scenarios and trajectories will need to be reported in a template, to be agreed with the CCC at the outset. This will include the emissions, energy demands and costs associated with scenarios.

We envisage scenario/trajectory development and reporting will require use of a model of the UK housing stock with good locational granularity, which can be effectively combined with key datasets, assumptions and analytical outputs. Any model of this kind should be designed to incorporate a wide range of locational data including on physical building attributes,¹⁶ consumer attributes,¹⁷ and location attributes.¹⁸ Overall, we expect that the analytical framework will need to be capable of delivering the following:

- a) **Stock segmentation** to support analysis and the development of recommendations.¹⁹
- b) A detailed representation of **measure suitability** such that constraints can be accurately represented.²⁰
- c) **Optimised measure deployment for given years.** As with our analysis for net zero, optimisation will involve determining the most cost-effective balance of energy efficiency and low-carbon heat measures for homes.²¹ It will be important to retain

likely to require until 2060 to approach zero emissions. For further discussion see CCC (2019) Net Zero – Technical Report.

¹⁶ E.g. wall type, roof type, property type, construction, size, heritage value

¹⁷ E.g. tenure type, household income and socio economic group/fuel poverty

¹⁸ E.g. availability of heat network/waste heat, availability of gas grid, conservation areas, areas of extreme exposure, network capacity

¹⁹ As a default, we expect to retain the stock segmentation developed for our 2019 net zero analysis. This was based around the development of both a long and short list of property archetypes, informed by the prevalence of homes with certain characteristics and by the nature of the expected packages of solutions.

²⁰ For further discussion on the limitations of past modelling in this area see Element Energy and UCL for the CCC (2019) *Analysis on abating direct emissions from 'hard to decarbonise' homes*, slide 131

²¹ Historically we have defined cost-effectiveness using carbon values. These are not expected to be the primary metric for determining cost-effectiveness in this project. For our work on net zero, cost effectiveness was determined by identifying measure packages associated with the lowest £/tCO₂e.

flexibility to fix or force in measures (e.g. 10m hybrid heat pumps by 2035, or solid wall insulation for fuel poverty benefits), with the model then capable of optimising around them.

- d) Any model should be capable of choosing to **deploy energy efficiency and low carbon heat separately and ideally would also have capability to choose deployment of individual measures** separately (i.e. sequentially) or as packages on a partial or whole house basis
- e) It will be necessary to **generate trajectories** of deployment given assumptions on e.g. profiles of uptake and key milestones. We wish to be able to model the impact of existing and potential government policies in trajectory development. Where it is possible to design a model to generate these trajectories this is considered beneficial (e.g. changes to fuel poverty ambition, changes to EPC ambition across different tenure types).
- f) The model should be capable of **accommodating and running with large volumes of data**, including spatially mapped physical building attributes, location attributes and consumer attributes (such as tenure type, fuel poverty status etc.). We welcome the ability to retain as much locational granularity as possible across the range of data items whilst running efficiently.
- g) **Reporting** should be integrated into any model design from the outset. We will need to generate template outputs for the sixth carbon budget. The reporting template will be agreed with the CCC at an early stage of the project and is expected to include items such as deployment, energy, emissions, and resource and investment costs (gross and net).²² We anticipate the need to regularly reassess the costs associated with scenarios in the process of development, in order to help inform the final scenario composition.²³
- h) We are interested in **novel and engaging ways of presenting the findings**, including automating charts into the model outputs where helpful. We welcome any views on potential approaches here.
- i) The analytical framework, including the model, must be developed with **long-term usability** in mind. This includes maximising flexibility to allow for future upgrades and extensions (for instance to integrate detailed network data, or new build homes). It also includes ensuring it can be run efficiently in short timeframes, and

²² For examples of the reporting template for the 5th carbon budget please see: <https://www.theccc.org.uk/publication/fifth-carbon-budget-dataset/>. Reporting will need to set out these results on both a UK basis and by Devolved Administration. Flexibility must be retained to report on an individual measure basis.

²³ Where feasible we will also have an interest in understanding the bill and distributional impacts of scenarios, e.g. on fuel poor groups.

that it is designed such that it can be used in-house by the CCC in the future, with accompanying guidance documents provided to support this.

Bidders should set out in their bids what capabilities will be provided by any model vs. what analytical work will need to be undertaken off-model.

d) Policy recommendations

The final report produced for this work will need to include discussion of the policy measures, standards and behaviour change which are expected to be necessary to support the delivery of the scenarios (in particular the central and max scenarios).

As noted above, we are aware of the inherent challenges of modelling using EPC ratings. Whilst we are not likely to recommend standards on this basis, we wish to consider how we might usefully frame standards and to the extent possible, understand what our scenarios are equivalent to in the context of EPC ratings. We welcome views from bidders on the extent to which their method might enable analysis of EPC equivalence.

Funding requirements will be a key component of the policy advice. Resource and investment costs associated with the scenarios will be used to inform advice to Government on the funding gap for different measures and the profile of spend that is expected to be necessary.

2. OPTIONAL: Developing views on low-regrets regional deployment opportunities

This task aims to understand, from a buildings perspective, which geographical areas of the UK might be low-regrets candidates for early deployment of particular low-carbon heat solutions.

There is a substantial volume of thinking going on at local level on decarbonisation pathways, including heating decarbonisation solutions. This analysis can drive valuable insights and inform decision-making at local level. However there also remains a risk that national strategic opportunities and considerations are missed unless they are factored in from the outset.

We have previously made a range of recommendations around the development of low-carbon hydrogen, including the need for trials and pilot projects for buildings, industry and

transport uses which are of sufficient scale and diversity.²⁴ We have also commented on the pressing need for large-scale trials of heat pump deployment, and for the development of low-carbon heat networks across the UK.²⁵

We wish to help inform wider work by undertaking analysis at a national level on those regions and areas which might be particularly well suited to early deployment or widespread trialling of particular low-carbon heat solutions on a low-regrets basis.

We have undertaken some analysis on regional heat to date through Element Energy's 2015 'Research on district heating and local approaches to heat decarbonisation' which developed scenarios for heat network deployment based on a geographical assessment.²⁶ We wish to build on this such that we are able to advise on areas of the UK where there is a low-regrets case for dominance of different heating solutions. We do not wish to form a view on the best solutions for every area of the UK, but rather to identify a shortlist of areas/or regions which are likely to be low-regrets candidates for e.g. early electrification or hydrogen deployment/trialling.

This will be combined with analysis we are undertaking on industrial clusters, which are expected to be a key driver of the geographical distribution of early hydrogen deployment.²⁷ We anticipate that the analytical process for this work will need to be split into two sub-tasks:

- a) Early and high-level assessment of which areas in, or near to, industrial clusters are also likely to be low-regrets candidates for hydrogen deployment in buildings. The findings will be fed back into our scenarios for hydrogen deployment in industrial clusters. This will require estimates of buildings demand for hydrogen in these areas.
- b) Broader assessment of which areas or regions are likely to be low-regrets candidates for early deployment or trialling of different low-carbon heat solutions from a buildings perspective. The findings of the industry scenarios are expected to be an input to this. The outputs should include assessment of the costs for different pathways in the shortlisted areas. We also have an interest in bill impacts and the

²⁴ CCC (2019) *Net Zero Technical Report*, chapter 2.

²⁵ CCC (2019) *Reducing UK emissions – 2019 Progress Report to Parliament*.

²⁶ Element Energy, Frontier Economics, and Imperial College London for the CCC (2019) *Research on district heating and local approaches to heat decarbonisation*, slide 15 and 90.

²⁷ We have previously advised that significant volumes of low-carbon hydrogen should be produced at one or more industrial clusters by 2030. We expect the industrial clusters under consideration to include Teesside, Humber, North-West, Southampton, Aberdeen/Peterhead, Grangemouth and South Wales

average and marginal costs of deployment (i.e. the cost curve) to help inform questions over how early trials might best be funded.

Factors that are expected to play into the advice from a buildings perspective include:

- The type and condition of the housing stock
- The prevalence of fuel poor consumers (and subsequently whether there are wider benefits associated with high energy efficiency deployment)
- The gas and electricity network conditions in the area
- The broader potential for hydrogen infrastructure e.g. storage
- The heat density and availability of low carbon heat for district heating
- The local climate and environmental conditions

We envisage that this task will be undertaken through a mix of modelling, desk based research and targeted stakeholder engagement. We welcome proposals on what insight could be generated in the time available, and on what approach might be taken to best manage any key information deficits, e.g. in relation to network conditions.

We would expect outputs to include a write up of the analysis and recommendations in the final report, potentially alongside spreadsheet-based outputs which detail key metrics in relation to the analysis. We are particularly interested in opportunities for engaging ways to present the findings (e.g. through map based graphics) and would be interested in views from bidders on what might be possible here.

The outputs of this task need not materially impact on the buildings scenarios, but are expected to inform our industry scenarios, and our broader recommendations around early deployment and trialling.

Guidance on scheduling of work

We will need the final baseline, central and alternative scenarios and trajectories to be developed, with reporting templates finalised and fully QA'd, by the end of March 2020.²⁸

²⁸ The alternative scenario trajectories are anticipated to be required to enable development of an informed trajectory for the central scenario. However, if not considered viable it may be possible to focus on developing 2050 snapshots for the alternative scenarios by March with the accompanying trajectories developed shortly after this. In this event bids must make clear the proposed approach, including what steps will need to be taken to ensure a robust central scenario (including trajectory) can still be developed by the end of March.

Where undertaking the additional optional task on low-regrets regional deployment, task 2a) will need to be delivered by January or February 2020.

The proposed final deadline for all deliverables is the end of May 2020.

Subject to the above guidance, there is some flexibility over when final deliverables are produced for each element of the specification over the course of the project (including refinement of policy advice, report drafting, model refinement for long-term use and the broader assessment of low-regrets regional deployment opportunities). We welcome proposals on a delivery approach which best balances resource capacity and analytical rigour. We note that whilst some tasks are not on the critical path for delivery of others, they may nonetheless be complementary. This should be considered in the development of the proposed project plan. We expect to discuss and agree key milestones and timings in a scoping session at the outset of the work.

5 Outputs Required

The outputs of the work should include:

- **An excel workbook**, containing all the scenario template outputs. This should be clearly set out and formatted, maximising ease of future use and reference for users not directly involved in the work. Spreadsheets should be unlocked.
- **A detailed assumptions log**, (including ranges on key data items where required to test sensitivities and deliver robust conclusions).
- **Associated models**. Where excel models are used these should be shared, fully unlocked and linked to rest of the excel workbook deliverable above, allowing future capability to update assumptions and re-run outputs. Where alternative modelling software is used any relevant inputs such as scripts, stock and model version should be shared. In the event of any limitations on sharing (e.g. in wider sharing beyond the CCC), these should be specified as part of the tender. Guidance documents should be provided to support in-house use.
- **A report**, setting out the scope of work, assumptions, methodology and findings. This report should also include discussion of the policy measures needed to support the delivery of the scenarios.

All outputs should be provided in a publishable format.

In addition to the above, we also expect interim deliverables to be required, including slide packs for the purposes of milestone and/or steering group meetings.

6 Ownership and Publication

The key deliverables will be handed over to the CCC, who may choose to publish these as supporting evidence on their website. Spreadsheets should be open access and unrestricted, to enable full QA of results and assumptions.

7 Quality Assurance

This project must comply with the 'CCC – Quality Assurance of Evidence and Analysis' guidance and bidders must set out their approach to quality assurance in their response to this ITT.

All research tasks and modelling must be quality assured and documented. Contractors should:

- Include a quality assurance (QA) plan that they will apply to all of the research tasks and modelling,
- Specify who will be responsible for quality assurance and ensure that this is done by individuals who were not directly involved in the research, analysis or model development,
- Provide a QA log to demonstrate the QA undertaken, including who undertook the QA and the scope, type and level of QA that has been undertaken (e.g. a log entry only stating 'the data was checked' will not be sufficient)

Sign-off for the quality assurance must be done by someone of sufficient seniority within the contractor organisation to be able take responsibility for the work done. Acceptance of the work by the CCC will take this into consideration. The CCC reserves the right to refuse to sign off outputs which do not meet the required standard specified in this invitation to tender.

The successful bidder will be responsible for any work supplied by sub-contractors and should therefore provide assurance that all work in the contract is undertaken in accordance with the quality assurance expectation agreed at the beginning of the project.

For primary research, contractors should be willing to facilitate CCC research staff to attend interviews or listen in to telephone surveys as part of the quality assurance process.

8 Timetable

The proposed timetable for the project is set out in the following table.



In addition to the formal reporting points, the CCC would expect to have regular scheduled discussions (weekly meetings or calls) to ensure the work is progressing as expected.

Date	Action
14 th Nov 2019	Publication of ITT
11 th Dec 2019, 9 am	Deadline for response to ITT
13 th or 17 th Dec	Interviews
w/c 16 th Dec 2019	Kick-off meeting
Jan/Feb 2020	Task 2a) outputs
31 st March 2020	Central and alternative scenarios and trajectories, fully QA'd and in final output form.
29 th May 2020	All deliverables

9 Challenges

The specific challenges that the CCC envisage with this project include:

- Establishing an analytical methodology and approach which enable high quality insights to be delivered in short timeframes
- Gathering input from stakeholders in short timeframes to ensure the scenarios and wider project findings are robust
- Ensuring that the project findings can be integrated effectively and coherently with the previous work in this area
- Effective coordination and utilisation of UCL's review of energy efficiency assumptions
- Integration of emerging evidence (e.g. BEIS research on heat pump supply chain) at late project stages where necessary

Bids should set out how these risks will be managed alongside any other risks and challenges to successfully undertaking this work.

10 Ethics

All applicants will need to identify and propose arrangements for initial scrutiny and on-going monitoring of ethical issues. The appropriate handling of ethical issues is part of the tender assessment exercise and proposals will be evaluated on this as part of the 'addressing challenges and risks' criterion.

We expect contractors to adhere to the following GSR Principals:

1. Sound application and conduct of social research methods and appropriate dissemination and utilisation of findings
2. Participation based on valid consent
3. Enabling participation
4. Avoidance of personal harm
5. Non-disclosure of identity and personal information

11 Working Arrangements

The successful contractor will be expected to identify one named point of contact through whom all enquiries can be filtered. [REDACTED] will be the CCC project manager and the central point of contact. The CCC expect close collaboration with contractors, especially around judgements over underpinning assumptions on what is possible and on the policy levers that can deliver it.

12 Skills and experience

The CCC would like you to demonstrate that you have the experience and capabilities to undertake the project. Your tender response should include a summary of each of the proposed team members' experience and capabilities.

Contractors should propose named members of the project team, and include the tasks and responsibilities of each team member. This should be clearly linked to the work programme, indicating the grade/ seniority of staff and number of days allocated to specific tasks.

Contractors should identify the individual(s) who will be responsible for managing the project.

13 Consortium Bids

In the case of a consortium tender, only one submission covering all of the partners is required but consortia are advised to make clear the proposed role that each partner will play in performing the contract as per the requirements of the technical specification. We expect the bidder to indicate who in the consortium will be the lead contact for this project, and the organisation and governance associated with the consortia.

Contractors must provide details as to how they will manage any sub-contractors and what percentage of the tendered activity (in terms of monetary value) will be sub-contracted.

If a consortium is not proposing to form a corporate entity, full details of alternative proposed arrangements should be provided. However, please note CCC reserves the right to require a successful consortium to form a single legal entity in accordance with Regulation 28 of the Public Contracts Regulations 2006.

CCC recognises that arrangements in relation to consortia may (within limits) be subject to future change. Potential Providers should therefore respond in the light of the arrangements as currently envisaged. Potential Providers are reminded that any future proposed change in relation to consortia must be notified to CCC so that it can make a further assessment by applying the selection criteria to the new information provided.

14 Budget

The budget for this project is up to £100,000 excluding VAT. This budget is for both task 1 and optional task 2. We would expect the majority of funding to be allocated to task 1.

Contractors should provide a full breakdown of costs, including breakdown by task and the total expected to be billed in each financial year based on the proposed scheduling of work. Costings should include staff (and day rate) allocated to specific tasks.

Payments will be linked to delivery of key milestones. The indicative milestones and phasing of payments can be adjusted and agreed with the contractor and Project Manager. Please advise in your tender response how this breakdown reflects your usual payment processes:

In submitting full tenders, contractors confirm in writing that the price offered will be held for a minimum of 60 calendar days from the date of submission. Any payment conditions applicable to the prime contractor must also be replicated with sub-contractors.

The Committee on Climate Change aims to pay all correctly submitted invoices as soon as possible with a target of 10 days from the date of receipt and within 30 days at the latest in line with standard terms and conditions of contract.

15 Evaluation of Tenders

Contractors are invited to submit full tenders of no more than 35 pages, excluding declarations and CV's. Tenders will be evaluated by at least three CCC staff.

CCC will select the bidder that scores highest against the criteria and weighting listed below, see the ITT for further information.

EVALUATION CRITERIA AND SCORING METHODOLOGY

Criterion	Description	Weighting
1	RELEVANT EXPERIENCE / DEMONSTRATION OF CABABILITY	20%
2	MANAGING YOUR RELATIONSHIP WITH THE CCC	5%
3	QUALITY ASSURING THE SERVICES YOU PROVIDE	10%
4	MANAGEMENT STRUCTURE	5%
5	PROJECT TEAM – SKILLS AND KNOWLEDGE	20%
6	METHOD, ABILITY AND TECHNICAL CAPACITY	20%
7	UNDERSTANDING OF REQUIREMENTS	10%
8	RISK AND CHALLENGES	10%
		100%

Scoring Method

Tenders will be scored against each of the criteria above, according to the extent to which they meet the requirements of the tender. The meaning of each score is outlined in the table below.

The total score will be calculated by applying the weighting set against each criterion, outlined above; the maximum number of marks possible will be 100. Should any contractor score 1 in any of the criteria, they will be excluded from the tender competition.

Score	Description
1	Not Satisfactory: Proposal contains significant shortcomings and does not meet the required standard
2	Partially Satisfactory: Proposal partially meets the required standard, with one or more moderate weaknesses or gaps
3	Satisfactory: Proposal mostly meets the required standard, with one or more minor weaknesses or gaps.
4	Good: Proposal meets the required standard, with moderate levels of assurance
5	Excellent: Proposal fully meets the required standard with high levels of assurance

Structure of Tenders

Contractors are strongly advised to structure their tender submissions to cover each of the criteria above and supply a price schedule specifying the daily rates (ex-VAT) you will charge for each level of your staff.

Evaluation for Interviews, if held

CCC reserves the right to award the contract based on applicants' written evaluation only if one candidate emerges from the evaluation stage as significantly stronger than the others.

Should interviews go ahead, CCC will shortlist the top three suppliers with the highest marks from the written proposals. Interviews are provisionally expected to be held on the 13th or 17th December. If these dates change, CCC will notify applicants.

The areas to be covered in the interview, and markings allocated to each topic area will be sent to the shortlisted supplier prior to interview.

Further details of interviews will be sent to successful applicants on selection.

Feedback

Feedback will be given in the unsuccessful letters or emails.