**Specification for analysis to determine zero emission HGV infrastructure requirements and costs.**

Tender Reference Number: ED/1218

**Specification of Requirements**

Invitation to Tender for analysis to determine zero emission HGV infrastructure requirements and cost.

Tender Reference Number: ED/1218

Deadline for Tender Responses: 19th December

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# Preamble

The Committee on Climate Change (CCC) is an independent, statutory body established under the 2008 Climate Change Act. The CCC is tasked with:

* Providing independent advice to Government on setting and meeting carbon budgets and preparing for Climate change.
* Monitoring progress in reducing emissions and achieving Carbon Budgets.

# Background

In October 2018, the CCC was requested to advice on setting a date for achieving net zero greenhouse gas emissions from across the economy in the context of the Paris Agreement, including from transport, industry and agriculture. This request follow a report from the Intergovernmental Panel on Climate Change (IPCC), showing more rapid action is needed to reduce greenhouse gas emissions to avoid devastating risks of climate change to health and global prosperity.[[1]](#footnote-1) The work in this proposal is expected to be supporting evidence for the CCC’s advice, due to be published in spring 2019.

Achieving deep emissions reductions in the transport sector will require the use of ultra-low emission vehicles (ULEVs). ULEVs are vehicles with zero or near-zero tailpipe emissions which make use of electricity or hydrogen from an increasingly decarbonised power sector.

Whilst battery electric vehicles are the most promising technology option for the light duty vehicle sector, the most cost-effective technology to decarbonise the heavy duty vehicle sector is not yet clear. Given the need to reduce transport emissions to zero wherever possible, the CCC have identified the following likely technology options:

* Hydrogen fuel cell vehicles combined with hydrogen refuelling stations
* Battery electric vehicles with extremely fast chargers at strategic stopping points
* Battery electric vehicles supported by on-road charging infrastructure such as overhead catenaries, dynamic wireless inductive charging or conductive charging.
* A hybrid solution combining elements of each of the above.

It should be noted that the CCC recently conducted a review of the uses of biomass in a low-carbon economy, which found that there was no long-term role for the use of biofuels in road transport, and therefore the use of biofuels is explicitly excluded here.[[2]](#footnote-2)

The aim of this research is to assess the infrastructure costs of these options to 2050 and beyond. Given the lack of comprehensive data on the movements of HGVs of different sizes, this appraisal should take a scenario based approach, using simple evidence-based assumptions. The costs of the technology options themselves are not part of this research, and the CCC is happy to share their latest assumptions on vehicle and fuel costs.

The CCC defines a HGV to be any vehicle with a maximum operating weight > 3.5 tonnes. Three types of HGV must be considered: small rigid vehicles (gross vehicle weight (gvw) < 16 tonnes), large rigid vehicles (gvw>16 tonnes) and articulated vehicles (consisting of a separate tractor and trailer of any weight).

The CCC has recently published a review on the uses of hydrogen across the economy.[[3]](#footnote-3) In this review we identified the following key issues associated with the low carbon HGV options:

* Hydrogen fuel cells could be well suited to providing the necessary power and range for heavy duty vehicles, but are currently projected to be more expensive than electric trucks. Based on work by the Energy Technologies Institute (looking at natural gas vehicles), to convert approximately 30% of the HGV fleet requires 350-400 refuelling stations – these would likely be required by the mid-to-late 2030s.[[4]](#footnote-4)
* For larger battery electric trucks, the energy density of batteries would need to improve compared to batteries available on the market today, as there will be volume and weight constraints to what can be installed on the vehicle. Charging infrastructure will be required to enable them to charge overnight at the depot, whilst loading or unloading goods, during the driver’s rest time, or at other points where they could charge rapidly. This will likely require electricity grid upgrades or the pairing of charging infrastructure with large on-site stationary batteries.
* Technologies that charge electric trucks whilst they drive can enable longer journeys and reduce the required size and weight of batteries, which can potentially allow larger payloads. These technologies include overhead catenaries, inductive charging installed into the road and conductive rails installed into the road (although care must be taken to ensure these are safe). In the BDI report ‘Climate Paths for Germany’ it was assumed that 400km of roads could be fitted with overhead electrified lines by 2028.[[5]](#footnote-5)
* Hybrid hydrogen-electric trucks could also be part of the solution, for example batteries plus hydrogen powered generation for range extension.

In the CCC Hydrogen report, we assumed that given the lifetimes of heavy goods vehicles, 100% of new HGV sales must be zero emission by the mid-late 2030s at the latest. This will mean any infrastructure roll-out must be planned from the mid-2020s and begin by the late 2020s at the latest.

The Energy Transitions Commission also recently published a report which concluded:[[6]](#footnote-6)

* For short and medium distance trips, the ownership costs of new electric trucks are likely to reduce below those of conventional trucks during the course of the 2020s, and eventually make electric trucks competitive even on an upfront cost basis.
* For long-distance freight, hydrogen fuel cell vehicles may always have an advantage over battery electric trucks, in particular given battery size and speed of refuelling/recharging. There may be a significant role for hybrid solutions.

Given these uncertainties, it is important to appraise the infrastructure costs of refuelling for each of these different solutions.

The CCC will be able to share their assumptions for the numbers of HGV vehicles and total km driven from 2010 to 2050 by small rigid, large rigid and articulated vehicles, to inform the project.

# Aims and Objectives

The key aim of the project is to assess the infrastructure costs of the technologies set out above aimed at reducing emissions from HGVs to zero. The project should consider how fast infrastructure could be rolled out and likely timelines over which costs could be incurred, using these an inputs to draw conclusions about the feasible and cost-effective date for reaching zero emissions from the HGV sector.

The project should answer the following questions:

* How many hydrogen refuelling stations will be required to refuel the HGV fleet? How long is the roll-out likely to take and what is the range of costs? Will these predominantly be depot/private or public locations?
* How many electric vehicle chargers would be required to refuel the HGV fleet? How much will this cost? How fast would they need to be to feasibly refuel HGVs without significantly disrupting their operations? How long would the roll-out of this infrastructure take? How might this be affected by vehicle design and battery pack size?
* How much is it likely to cost to install different types of on-road charging infrastructure on motorways and trunk roads? How long would the roll-out of this infrastructure take?
* The % of each journey that is spent on motorways and trunk roads and hence how much additional refuelling infrastructure must be required in addition to the electrification of major roads (whether this is battery chargers or hydrogen refuelling stations).
* If larger weight categories of HGVs will not be able to run on batteries alone, do total infrastructure costs increase if small rigid HGVs use batteries, whereas larger HGVs use other technologies?

The model should cover the whole of the UK, including the devolved administrations. Given the uncertainties involved, ranges of cost estimates can be used. These scenarios should consider the costs to decarbonise the whole fleet.

The project will need to take account of:

* What types of journeys different types of HGVs do and where they operate?[[7]](#footnote-7)
  + This will cover length of journey and proportion of journeys on motorways and A roads. A full spatial analysis of HGV journeys across the UK is out of scope, due to the tight timescales. However, if qualitative or quantitative evidence is available that the majority of HGV journeys are on particular motorways/A roads, this would be of interest, as a way to prioritise roll-out of refuelling infrastructure.
* The refuelling regime that is likely to operate in each of the scenarios, and whether this fits with normal operations, or whether it will be disruptive.
* Future likely battery developments in terms of energy density by weight and volume – how large/heavy a battery can realistically be used for a HGV, and what distance would this cover on a single charge for different truck types?
* What is the likely limit of charging speed for batteries and chargers for different segments of the HGV market?
* What are the likely costs of disruption to other road users?
* What would the impact be if other nearby countries chose a different technology option? This can be dealt with qualitatively in the report.
* What would the costs be to maintain an existing diesel refuelling network in the counterfactual case of no transition to other technologies? Can these costs be avoided in the scenarios considered?

Plausible scenarios should be proposed for each of these which will be agreed at the inception meeting.

# Methodology

As part of your tender, you should set out your preferred modelling approach. The key features of the model should be set out.

**Task 1:** To develop a set of scenarios to be modelled and agree with the CCC.

Plausible scenarios being developed should consider the following combinations of assumptions. A minimum, central and maximum assumption should be developed for the following:

* Distribution of journey length by type of HGV (proposed types of HGV to include small rigid, large rigid and articulated vehicles).[[8]](#footnote-8)
* % of distance driven on roads likely to have overhead charging infrastructure installed for each type of HGV (separate estimates should be made for motorways and for major A roads.)[[9]](#footnote-9)
* The maximum likely weight/size of battery that could be installed in each type of HGV. What is the likely maximum charging speed for a battery?
* Costs of each infrastructure type (£/charger, £/km of on road recharging station, £/hydrogen refuelling station). Cost estimates should take account of potential reductions over time as the infrastructure roll-out expands.
* The number of charging stations, charge points or total km of electric charging on roads needed to meet the demands of the HGV fleet to 2050, and how fast these can be rolled out.

Responses should be clear in their tenders what data they intend to base these assumptions on. The range of variation in the assumptions between different scenarios should reflect the level of uncertainty in the underlying data.

**Task 2:** To combine these assumptions in a simple spreadsheet model, which should output the total costs of infrastructure for combinations of different assumptions. The costs should be outputted for each segment of vehicles (small rigid/large rigid/artic) transitioning to the following technologies:

* Hydrogen
* Battery (charged from chargers)
* Battery (charged from pantograph and refuelled off motorways/A roads by chargers)
* Hybrid (charged from pantograph and refuelled off motorways/A roads by hydrogen refuelling stations)
* Hybrid (charged from pantograph and refuelled off motorways/A roads by fossil fuels).
* Hybrid (battery without pantograph and hydrogen)

The costs should be split out between capex and opex costs and should be produced annually from 2020 to 2050 or until it is feasible and cost-effective for 100% of the fleet to have transitioned to new technologies (whichever is later). The model should output the annual and cumulative cost of building and maintaining the infrastructure in that year and the % of the HGV fleet able to operate in zero emission mode.[[10]](#footnote-10) Net Present Values for each technology should also be calculated from a private and social perspective (using appropriate discount rates and carbon prices).

In accompanying documentation, it should be clear how the refuelling regime will work for each technology option and whether this will represent any disruption to normal HGV fleet operations and whether there will be disruption to other road users. The risks and barriers to each potential technology option should also be presented.

# Outputs Required and Timetable

The outputs from the project will include:

* Presentation of the interim and final results of the project to members of the CCC secretariat and other interested parties
* Transparent excel spreadsheets showing costs of different infrastructure options to refuel the whole HGV fleet.
* A technical report setting out the assumptions and scenarios used in the project and summarising the outputs.

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

|  |  |
| --- | --- |
| **Date** | **Action/Deliverable** |
| 5th December | Advertise tender |
| 19th December | Deadline for responses to tender |
| 3rd/4th January | Interviews |
| 7th January | Kick off meeting to discuss scenarios. |
| 13th February | Interim report shared with CCC to inform presentation in committee meeting to include 1 scenario to be agreed in kick-off meeting. This will need to include an estimate of whether and when it is feasible and cost-effective to get to zero emissions. |
| 28th February | Interim meeting to finalise full set of scenarios |
| 22nd March | Draft report on full set of scenarios. |
| 5th April | Final report agreed with CCC, ready for publication |

# Quality Assurance

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

* Include a quality assurance (QA) plan that they will apply to the modelling
* Specify who will take lead responsibility for ensuring quality assurance. This responsibility should rest with an individual not directly involved in the research, analysis or model development.
* Provide a QA log to demonstrate the QA undertaken, which must identify who undertook the QA and the scope, type and level of QA that has been undertaken.

Sign-off for the quality assurance must be done by someone of sufficient seniority within the contractor organisation to be able to 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 contact is undertaken in accordance with the quality assurance expectation agreed at the beginning of the project.

The CCC expects that:

* Economic analysis must be delivered in a simple, transparent Excel spreadsheet, where key assumptions (agreed with the CCC) can be varied. All assumptions and figures should be adequately referenced, and include any supporting workings. This spreadsheet will be the property of the CCC.
* Existing analysis and work regarding technical challenges and deployment constraints should be reviewed (e.g. including technology options and barriers developed by the CCC) and incorporated into this assignment.

# Challenges

Tenderers should highlight any challenges or risks that they envisage in delivering all the outputs of the project, whether in terms of scope of the work, resources or timelines. Alternative suggestions will be considered if the risks are such that the project is unlikely to be able to be delivered in its current form.

# Working Arrangements

The successful contractor will be expected to identify one named point of contract through whom all enquiries can be filtered. A CCC project manager will be assigned to the project and will be the central point of contact.

# Skills and experience

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 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.

# 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.

# Budget

The budget for this project is £50,000 excluding VAT.

Contractors should provide a full and detailed breakdown of costs (including options where appropriate). This should include staff (and day rate) allocated to specific tasks.

Cost will be a criterion against which bids which will be assessed.

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 Department 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.

# Evaluation of Tenders

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** | 15% |
| 2 | **MANAGING YOUR RELATIONSHIP WITH THE CCC** | 10% |
| 3 | **QUALITY ASSURING THE SERVICES YOU PROVIDE** | 10% |
| 4 | **PROJECT TEAM – SKILLS AND KNOWLEDGE** | 15% |
| 5 | **METHOD, ABILITY AND TECHNICAL CAPACITY** | 30% |
| 6 | **UNDERSTANDING OF REQUIREMENTS** | 10% |
| 7 | **RISK AND CHALLENGES** | 10% |
| 8 |  |  |
|  |  |  |
|  | | 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 3rd or 4th January. If this date changes, 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.

1. IPCC (2018) *Special Report on Global Warming of 1.5 degrees C.* [↑](#footnote-ref-1)
2. Committee on Climate Change (2018) *Biomass in a low-carbon economy.*  [↑](#footnote-ref-2)
3. Committee on Climate Change (2018) *Hydrogen in a low-carbon economy.*  [↑](#footnote-ref-3)
4. Energy Technologies Institute (2017) *Natural Gas Pathway Analysis for Heavy Duty Vehicles.*  [↑](#footnote-ref-4)
5. BCG and Prognos for BDI (2018) *Klimapfade für Deutschland.*  [↑](#footnote-ref-5)
6. Energy Transitions Commission (2018) *Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-To-Abate sectors by mid-century.*  [↑](#footnote-ref-6)
7. The CCC is currently in discussions with the Energy Technologies Institute about informing this research with data they own on the lengths of journeys undertaken by HGVs of different weight categories and the types of roads on which they drive. Further details of exactly what will be available will be added to the advert later and please inquire if you have any questions. [↑](#footnote-ref-7)
8. See footnote 7. [↑](#footnote-ref-8)
9. See footnote 7. [↑](#footnote-ref-9)
10. In the event that it is found to be not feasible or cost-effective to transition the whole fleet to zero emission technologies, a date should be agreed with the CCC that represents the year at which the maximum penetration of the fleet is reached. This should be used as the end point of the model instead. [↑](#footnote-ref-10)