Vivid Economics Ltd
163 Eversholt Street
London
United Kingdom
W1T 4TP

Monday, December 03, 2018

Dear [redacted]

Contract Title: **BEIS Policy Options to Incentivise Greenhouse Gas Removal Technologies**

Contract Reference: **CR18107**

The contract shall be subject to the UK Shared Business Services Ltd S2 Terms and Conditions for the Purchase of Services and the following Schedules and Appendices:

Please note that this contract is subject to signed contract acceptance.

Yours sincerely,

[redacted]
UK Shared Business Services Ltd

S1 - PRECEDENT CONTRACT FOR THE PURCHASE OF SERVICES

SECTION A

This Contract is dated 8th November 2018.

Parties

(1) **Department for Business, Energy and Industrial Strategy** of 1 Victoria Street, London SW1H 0ET (**The Contracting Authority**).

(2) **Vivid Economics Ltd** with company number 5840846 whose registered office is at 163 Eversholt Street, London, United Kingdom NW1 1BU **(the Supplier)**.

Background

The Contracting Authority wishes the Supplier to supply, and the Supplier wishes to supply, the Services (as defined below) in accordance with the terms of the Contract (as defined below).

A1 Interpretation

A1-1 **Definitions.** In the Contract (as defined below), the following definitions apply:

Agent: Where UK Shared Business Services is not the named Contracting Authority is Parties (1), UK SBS has been nominated as agent on behalf of the Contracting Authority and therefore all communications both written and verbal will be received as issued by the Contracting Authority.

Associated Bodies and Authorised Entities: Associated Bodies and Authorised Entities include but are not limited to The Science and Technology Facilities Council, The Medical Research Council, The Engineering and Physical Sciences Research Council, The Economic and Social Research Council, The Natural Environment Research Council, The Arts and Humanities Research Council, The Biotechnology and Biological Sciences Research Council, UK SBS Ltd, Central Government Departments and their Agencies, Non Departmental Public Bodies, NHS bodies, Local Authority's, Voluntary Sector Charities, and/or other private organisations acting as managing agents or procuring on behalf of these UK bodies. Further details of these organisations can be found at: http://www.uksbs.co.uk/services/procure/contracts/Pages/default.aspx

Business Day: a day (other than a Saturday, Sunday or public holiday) when banks in London are open for business.

Charges: the charges payable by the Contracting Authority for the supply of the Services in accordance with clause B4.

Commencement: the date and any specified time that the Contract starts

Conditions: the terms and conditions set out in this document as amended from time to time in accordance with clause C7-11.

Confidential Information: any confidential information, knowhow and data (in any form or medium) which relates to UK SBS, the Contracting Authority or the Supplier, including information relating to the businesses of UK SBS, the Contracting Authority or the Supplier and information relating to their staff, finances,

policies and procedures. This includes information identified as confidential in the Order or the Special Conditions (if any).

Contract: the contract between the Contracting Authority and the Supplier for the supply of the Services, in accordance with these Conditions, any Special Conditions and the Order only.

Contracting Authority: Department for Business, Energy and Industrial Strategy, as specified at Section A (1) and any replacement or successor organisation.

Deliverables: all Documents, products and materials developed by the Supplier or its agents, contractors and employees as part of or in relation to the Services in any form, including computer programs, data, reports and specifications (including drafts).

Document: includes, in addition to any document in writing, any drawing, map, plan, diagram, design, picture or other image, tape, disk or other device or record embodying information in any form.

EIR: the Environmental Information Regulations 2004 together with any guidance and/or codes of practice issues by the Information Commissioner or relevant government department in relation to such regulations.

FOIA: the Freedom of Information Act 2000 and any subordinate legislation made under the Act from time to time, together with any guidance and/or codes of practice issued by the Information Commissioner or relevant government department in relation to such legislation.

Information: has the meaning given under section 84 of FOIA.

Intellectual Property Rights: all patents, rights to inventions, utility models, copyright and related rights, trademarks, service marks, trade, business and domain names, rights in trade dress or get-up, rights in goodwill or to sue for passing off, unfair competition rights, rights in designs, rights in computer software, database right, topography rights, rights in confidential information (including know-how and trade secrets) and any other intellectual property rights, in each case whether registered or unregistered and including all applications for and renewals or extensions of such rights, and all similar or equivalent rights or forms of protection in any part of the world.

Order: the Contracting Authority's order for the Services, as set out in the Contracting Authority's completed purchase order form (including any Specification) which is in the format of the pro forma order form attached at Schedule 2. For the avoidance of doubt, if the Contracting Authority's purchase order form is not in the format of the pro forma order form at Schedule 2, it will not constitute an Order.

Public Body: any part of the government of the United Kingdom including but not limited to the Northern Ireland Assembly and Executive Committee, the Scottish Executive and the National Assembly for Wales, local authorities, government ministers and government departments and government agencies.

Request for Information: a request for Information or an apparent request under FOIA or EIR.

Scheme Effective Date: the date on which the United Kingdom Research and Innovation become a legal entity.

Services: the services, including without limitation any Deliverables, to be provided by the Supplier under the Contract as set out in the Order.

Special Conditions: the special conditions (if any) set out in Schedule 1.

Specification: any specification for the Services, including any related plans and drawings that is supplied to the Supplier by the Contracting Authority, or produced by the Supplier and agreed in writing by the Contracting Authority.

Supplier or Suppliers: the parties to the contract as named in Section A (2).

Supplier's Associate: any individual or entity associated with the Supplier including, without limitation, the Supplier's subsidiary, affiliated or holding companies and any employees, agents or contractors of the Supplier and / or its subsidiary, affiliated or holding companies or any entity that provides services for or on behalf of the Supplier.

TUPE: the Transfer of Undertakings (Protection of Employment) Regulations 2006 as amended or replaced from time to time.

UK SBS: UK Shared Business Services Limited (a limited company registered in England and Wales with company number 06330639). Where UK SBS is not named as the Contracting Authority within section A (1), UK SBS will be acting as an agent on behalf of the Contracting Authority.

Working Day: any Business Day excluding 27, 28, 29, 30 and 31 December in any year.

A1-2 **Construction.** In the Contract, unless the context requires otherwise, the following rules apply:

A1-2-1 A **person** includes a natural person, corporate or unincorporated body (whether or not having separate legal personality).

A1-2-2 A reference to a party includes its personal representatives, successors or permitted assigns.

A1-2-3 A reference to a statute or statutory provision is a reference to such statute or provision as amended or re-enacted. A reference to a statute or statutory provision includes any subordinate legislation made under that statute or statutory provision, as amended or re-enacted.

A1-2-4 Any phrase introduced by the terms **including, include, in particular** or any similar expression shall be construed as illustrative and shall not limit the sense of the words preceding those terms.

A1-2-5 The headings in these Conditions are for ease of reference only and do not affect the interpretation or construction of the Contract.

A1-2-6 A reference to **writing** or **written** includes faxes and e-mails.

A2 Basis of contract

A2-1 Where UK SBS is not the Contracting Authority, UK SBS is the agent of the Contracting Authority for the purpose of procurement and is authorised to negotiate and enter into contracts for the supply of services on behalf of the Contracting Authority. UK SBS will not itself be a party to, nor have any liability under, the Contract unless it is expressly specified as Contracting Authority in the Order.

A2-2 The terms of this Contract, any Special Conditions and the Order apply to the Contract to the exclusion of all other terms and conditions, including any other terms that the Supplier seeks to impose or incorporate (whether in any quotation, confirmation of order, in correspondence or in any other context), or which are implied by trade, custom, practice or course of dealing.

A2-3 If there is any conflict or inconsistency between the terms of this Contract, the Special Conditions (if any) and the Order (including any Specification), the terms of

the Contract will prevail over the Special Conditions and the Special Conditions will prevail over the Order (including any Specification), in each case to the extent necessary to resolve that conflict or inconsistency.

A2-4 The Order constitutes an offer by the Contracting Authority to purchase the Services in accordance with this Contract (and any Special Conditions). This offer shall remain valid for acceptance by the Supplier, in accordance with clause A2-5, for 28 days from the date of the Order. Notwithstanding that after 28 days the offer will have expired, the Contracting Authority may, at its discretion, nevertheless treat the offer as still valid and may elect to accept acceptance by the Supplier, in accordance with clause A2-5, as valid acceptance of the offer.

A2-5 Subject to clause A2-4, the Order shall be deemed to be accepted on the date on which authorised representatives of both parties have signed a copy of this Contract, at which point the Contract shall come into existence. The Contract shall remain in force until all the parties' obligations have been performed in accordance with the Contract, at which point it shall expire, or until the Contract has been terminated in accordance with clause A3.

A3 Termination

A3-1 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority may terminate the Contract in whole or in part at any time before the Services are provided with immediate effect by giving the Supplier written notice, whereupon the Supplier shall discontinue all work on the Contract. The Contracting Authority shall pay the Supplier fair and reasonable compensation for work-in-progress at the time of termination, but such compensation shall not include loss of anticipated profits or any consequential loss. The Supplier shall have a duty to mitigate its costs and shall on request provide proof of expenditure for any compensation claimed.

A3-2 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority may terminate the Contract with immediate effect by giving written notice to the Supplier if:

A3-2-1 the circumstances set out in clauses B2-1-1, C3 or C4-1 apply;

A3-2-2 the Supplier breaches any term of the Contract and (if such breach is remediable) fails to remedy that breach within 30 days of being notified in writing of the breach; or

A3-2-3 the Supplier suspends, or threatens to suspend, payment of its debts or is unable to pay its debts as they fall due or admits inability to pay its debts or (being a company) is deemed unable to pay its debts within the meaning of section 123 of the Insolvency Act 1986, or (being an individual) is deemed either unable to pay its debts or as having no reasonable prospect of so doing, in either case, within the meaning of section 268 of the Insolvency Act 1986, or (being a partnership) has any partner to whom any of the foregoing apply; or

A3-2-4 the Supplier commences negotiations with all or any class of its creditors with a view to rescheduling any of its debts, or makes a proposal for or enters into any compromise or arrangement with its creditors; or

A3-2-5 (being a company) a petition is filed, a notice is given, a resolution is passed, or an order is made, for or in connection with the winding up of the Supplier; or

A3-2-6 (being an individual) the Supplier is the subject of a bankruptcy petition or order; or

A3-2-7 a creditor or encumbrancer of the Supplier attaches or takes possession of, or a distress, execution, sequestration or other such process is levied or enforced on or sued against, the whole or any part of its assets and such attachment or process is not discharged within 14 days; or

A3-2-8 (being a company) an application is made to court, or an order is made, for the appointment of an administrator or if a notice of intention to appoint an administrator is given or if an administrator is appointed over the Supplier; or

A3-2-9 (being a company) a floating charge holder over the Supplier's assets has become entitled to appoint or has appointed an administrative receiver; or

A3-2-10 a person becomes entitled to appoint a receiver over the Supplier's assets or a receiver is appointed over the Supplier's assets; or

A3-2-11 any event occurs, or proceeding is taken, with respect to the Supplier in any jurisdiction to which it is subject that has an effect equivalent or similar to any of the events mentioned in clause A3-2-3 to clause A3-2-10 inclusive; or

A3-2-12 there is a change of control of the Supplier (within the meaning of section 1124 of the Corporation Tax Act 2010); or

A3-2-13 the Supplier suspends, or threatens to suspend, or ceases or threatens to cease to carry on, all or substantially the whole of its business; or

A3-2-14 the Supplier's financial position deteriorates to such an extent that in the Contracting Authority's opinion the Supplier's capability to adequately fulfil its obligations under the Contract has been placed in jeopardy; or

A3-3 Termination of the Contract, however arising, shall not affect any of the parties' rights and remedies that have accrued as at termination. Clauses which expressly or by implication survive termination or expiry of the Contract shall continue in full force and effect.

A3-4 Without prejudice to clause A3-3, clauses B1, B2, B5, B6, B7, B8, B9, C1, C2, C3, C4, C6 and C7 shall survive the termination or expiry of the Contract and shall continue in full force and effect.

A3-5 Upon termination or expiry of the Contract, the Supplier shall immediately:

A3-5-1 cease all work on the Contract;

A3-5-2 Deliver to the Contracting Authority all Deliverables and all work-in-progress whether or not then complete. If the Supplier fails to do so, then the Contracting Authority may enter the Supplier's premises and take possession of them. Until they have been returned or delivered, the Supplier shall be solely responsible for their safe keeping and will not use them for any purpose not connected with this Contract;

A3-5-3 cease use of and return (or, at the Contracting Authority's or UK SBS's acting as an agent on behalf of the Contracting Authority's election, destroy) all of the Contracting Authority's Materials in the Supplier's possession or control; and

A3-5-4 Cease all use of, and delete all copies of, UK SBS's or the Contracting Authority's or UK SBS's confidential information.

A3-6 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority shall at any time have the right for convenience to terminate the Contract or reduce the quantity of Services to be provided by the Supplier in

each case by giving to the Supplier reasonable written notice. During the period of notice the Contracting Authority may direct the Supplier to perform all or any of the work under the Contract. Where the Contracting Authority has invoked either of these rights, the Supplier may claim reasonable costs necessarily and properly incurred by him as a result of the termination or reduction, excluding loss of profit, provided that the claim shall not exceed the total cost of the Contract. The Supplier shall have a duty to mitigate its costs and shall on request provide proof of expenditure for any compensation claimed

SECTION B

B1 Supply of Services

B1-1 The Supplier shall from the date set out in the Contract and until the end date specified in the Contract provide the Services to the Contracting Authority in accordance with the terms of the Contract.

B1-2 The Supplier shall meet any performance dates for the Services (including the delivery of Deliverables) specified in the Order (including any Special Conditions and any applicable Specification) or notified to the Supplier by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority.

B1-3 In providing the Services, the Supplier shall:

B1-3-1 co-operate with the Contracting Authority in all matters relating to the Services, and comply with all instructions of the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority;

B1-3-2 perform the Services with reasonable skill and care and in accordance with all generally recognised commercial standards and practices for services of the nature of the Services;

B1-3-3 use personnel who are suitably skilled and experienced to perform tasks assigned to them, and in sufficient number to ensure that the Supplier's obligations are fulfilled in accordance with this Contract;

B1-3-4 ensure that the Services and Deliverables will conform with all descriptions and specifications set out in the Contract (including any Special Conditions and any applicable Specification), and that the Deliverables shall be fit for any purpose expressly or impliedly made known to the Supplier by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority;

B1-3-5 provide all equipment, tools and vehicles and such other items as are required to provide the Services;

B1-3-6 use the best quality goods, materials, standards and techniques, and ensure that the Deliverables, and all goods and materials supplied and used in the Services or transferred to the Contracting Authority, will be free from defects in workmanship, installation and design;

B1-3-7 obtain and at all times maintain all necessary licences and consents, and comply with all applicable laws and regulations;

B1-3-8 observe all health and safety rules and regulations and any other security requirements that apply at any of the Contracting Authority's premises; and

B1-3-9 Not do or omit to do anything which may cause the Contracting Authority to lose any licence, authority, consent or permission on which it relies for the purposes of conducting its business, and the Supplier acknowledges that the Contracting Authority may rely or act on the Services.

B1-4 The Contracting Authority's rights under the Contract are without prejudice to and in addition to the statutory terms implied in favour of the Contracting Authority under the Supply of Goods and Services Act 1982 and any other applicable legislation.

B1-5 Without prejudice to the Contracting Authority's statutory rights, the Contracting Authority will not be deemed to have accepted any Deliverables until the Contracting Authority has had at least 14 Working Days after delivery to inspect them and the Contracting Authority also has the right to reject any Deliverables as though they had not been accepted for 14 Working Days after any latent defect in the Deliverables has become apparent.

B1-6 If, in connection with the supply of the Services, the Contracting Authority permits any employees or representatives of the Supplier to have access to any of the Contracting Authority's premises, the Supplier will ensure that, whilst on the Contracting Authority's premises, the Supplier's employees and representatives comply with:

B1-6-1 all applicable health and safety, security, environmental and other legislation which may be in force from time to time; and

B1-6-2 any Contracting Authority policy, regulation, code of practice or instruction relating to health and safety, security, the environment or access to and use of any Contracting Authority' laboratory, facility or equipment which is brought to their attention or given to them whilst they are on Contracting Authority's premises by any employee or representative of the Contracting Authority's.

B1-7 The Supplier warrants that the provision of Services shall not give rise to a transfer of any employees of the Supplier or any third party to the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority pursuant to TUPE.

B2 Contracting Authority Remedies

B2-1 If the Supplier fails to perform the Services by the applicable dates, the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority shall, without limiting its other rights or remedies, have one or more of the following rights:

B2-1-1 to terminate the Contract with immediate effect by giving written notice to the Supplier;

B2-1-2 to refuse to accept any subsequent performance of the Services (including delivery of Deliverables) which the Supplier attempts to make;

B2-1-3 to recover from the Supplier any costs incurred by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority in obtaining substitute services from a third party;

B2-1-4 where the Contracting Authority has paid in advance for Services that have not been provided by the Supplier, to have such sums refunded by the Supplier; or

B2-1-5 To claim damages for any additional costs, loss or expenses incurred by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority which are in any way attributable to the Supplier's failure to meet such dates.

B2-2 These Conditions shall extend to any substituted or remedial services provided by the Supplier.

B2-3 The Contracting Authority's rights under this Contract are in addition to its rights and remedies implied by statute and common law.

B3 Contracting Authority Obligations

B3-1 The Contracting Authority shall:

B3-1-1 provide the Supplier with reasonable access at reasonable times to the Contracting Authority's premises for the purpose of providing the Services; and

B3-1-2 Provide such information to the Supplier as the Supplier may reasonably request and the Contracting Authority considers reasonably necessary for the purpose of providing the Services.

B4 Charges and Payment

B4-1 The Charges for the Services shall be set out in the Order, and shall be the full and exclusive remuneration of the Supplier in respect of the performance of the Services. Unless otherwise agreed in writing by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority, the Charges shall include every cost and expense of the Supplier directly or indirectly incurred in connection with the performance of the Services.

B4-2 Where the Order states that the Services are to be provided on a time and materials basis, the Charges for those Services will be calculated as follows:

B4-2-1 the charges payable for the Services will be calculated in accordance with the Supplier's standard daily fee rates (as at the date of the Order), subject to any discount specified in the Order;

B4-2-2 the Supplier's standard daily fee rates for each individual person will be calculated on the basis of an eight-hour day worked between such hours and on such days as are agreed by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority and the Supplier;

B4-2-3 the Supplier will not be entitled to charge pro-rata for part days without the prior written consent of the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority;

B4-2-4 the Supplier will ensure that every individual whom it engages to perform the Services completes time sheets recording time spent on the Services and the Supplier will use such time sheets to calculate the charges covered by each invoice and will provide copies of such time sheets to the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority upon request; and

B4-2-5 the Supplier will invoice the Contracting Authority monthly in arrears for its charges for time, as well as any previously agreed expenses and materials for the month concerned calculated as provided in this clause B4-2 and clause B4-3

B4-3 The Contracting Authority will reimburse the Supplier at cost for all reasonable travel, subsistence and other expenses incurred by individuals engaged by the Supplier in providing the Services to the Contracting Authority provided that the Contracting Authority's prior written approval is obtained before incurring any such expenses, that all invoices for such expenses are accompanied by valid receipts and provided that the Supplier complies at all times with Contracting Authority's expenses policy from time to time in force.

B4-4 The Supplier shall invoice the Contracting Authority on completion of the Services. Each invoice shall include such supporting information required by the Contracting Authority to verify the accuracy of the invoice, including but not limited to the

relevant purchase order number.

B4-5 In consideration of the supply of the Services by the Supplier, the Contracting Authority shall pay the invoiced amounts within 30 days of the date of a correctly rendered invoice. Payment shall be made to the bank account nominated in writing by the Supplier unless the Contracting Authority agrees in writing to another payment method.

B4-6 All amounts payable by the Contracting Authority under the Contract are exclusive of amounts in respect of value added tax chargeable for the time being (**VAT**). Where any taxable supply for VAT purposes is made under the Contract by the Supplier to the Contracting Authority, the Contracting Authority shall, on receipt of a valid VAT invoice from the Supplier, pay to the Supplier such additional amounts in respect of VAT as are chargeable on the supply of the Services at the same time as payment is due for the supply of the Services.

B4-7 The Supplier shall maintain complete and accurate records of the time spent and materials used by the Supplier in providing the Services, and shall allow the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority to inspect such records at all reasonable times on request.

B4-8 The Supplier shall not be entitled to assert any credit, set-off or counterclaim against the Contracting Authority in order to justify withholding payment of any such amount in whole or in part. The Contracting Authority may, without limiting any other rights or remedies it may have, set off any amount owed to it by the Supplier against any amounts payable by it to the Supplier under the Contract.

B4-9 The Supplier acknowledges and agrees that it will pay correctly rendered invoices from any of its suppliers or other sub-contractors within 30 days of receipt of the invoice.

B5 Contracting Authority Property

B5-1 The Supplier acknowledges that all information (including confidential information), equipment and tools, drawings, specifications, data, software and any other materials supplied by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority to the Supplier (**Contracting Authority's Materials**) and all rights in the Contracting Authority's Materials are and shall remain at all times the exclusive property of the Contracting Authority and UK SBS (as appropriate). The Supplier shall keep the Contracting Authority's Materials in safe custody at its own risk, maintain them in good condition until returned to the Contracting Authority or UK SBS, and not dispose or use the same other than for the sole purpose of performing the Supplier's obligations under the Contract and in accordance with written instructions or authorisation from the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority.

B6 Intellectual Property Rights

B6-1 In respect of any goods that are transferred to the Contracting Authority under this Contract, including without limitation the Deliverables or any part of them, the Supplier warrants that it has full clear and unencumbered title to all such items, and that at the date of delivery of such items to the Contracting Authority, it will have full and unrestricted rights to transfer all such items to the Contracting Authority.

B6-2 Save as otherwise provided in the Special Conditions, the Supplier assigns to the Contracting Authority, with full title guarantee and free from all third party rights, all Intellectual Property Rights in the products of the Services, including for the avoidance of doubt the Deliverables. Where those products or Deliverables incorporate any Intellectual Property Rights owned by or licensed to the Supplier which are not assigned under this clause, the Supplier grants to the Contracting

Authority a worldwide, irrevocable, royalty-free, transferable licence, with the right to grant sub-licences, under those Intellectual Property Rights to maintain, repair, adapt, copy and use those products and Deliverables for any purpose.

B6-3 The Supplier shall obtain waivers of all moral rights in the products, including for the avoidance of doubt the Deliverables, of the Services to which any individual is now or may be at any future time entitled under Chapter IV of Part I of the Copyright Designs and Patents Act 1988 or any similar provisions of law in any jurisdiction.

B6-4 The Supplier shall, promptly at the request of the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority, do (or procure to be done) all such further acts and things and the execution of all such other documents as the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority may from time to time require for the purpose of securing for the Contracting Authority the full benefit of the Contract, including all right, title and interest in and to the Intellectual Property Rights assigned to the Contracting Authority in accordance with clause B6-2.

B7 Indemnity

B7-1 The Supplier shall indemnify, and shall keep indemnified the Contracting Authority and UK SBS acting as an agent on behalf of the Contracting Authority, in full against all costs, expenses, damages and losses (whether direct or indirect), including any interest, fines, legal and other professional fees and expenses awarded against or incurred or paid by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority as a result of or in connection with:

B7-1-1 any claim made against the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority by a third party arising out of, or in connection with, the supply of the Services, to the extent that such claim arises out of the breach, negligent performance or failure or delay in performance of the Contract by the Supplier, its employees, agents or subcontractors; and

B7-1-2 any claim brought against the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority for actual or alleged infringement of a third party's Intellectual Property Rights arising out of, or in connection with, the receipt, use or supply of the Services; and

B7-1-3 Any claim whether in tort, contract, statutory or otherwise, demands, actions, proceedings and any awards arising from a breach by the Supplier of clause B1-7 of these Conditions.

B7-2 This clause B7 shall survive termination or expiry of the Contract.

B8 Insurance

B8-1 During the term of the Contract and for a period of 3 years thereafter, the Supplier shall maintain in force, with a reputable insurance company, professional indemnity insurance, employer liability insurance, product liability and public liability insurance to cover such heads of liability as may arise under or in connection with the Contract, and shall, on request from the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority, produce both the insurance certificate giving details of cover and the receipt for the current year's premium in respect of each insurance.

B9 Liability

B9-1 In this clause B9, a reference to the Contracting Authority or UK SBS's liability for something is a reference to any liability whatsoever which the Contracting Authority or UK SBS might have for it, its consequences, and any direct, indirect or consequential loss, damage, costs or expenses resulting from it or its consequences, whether the liability arises under the Contract, in tort or otherwise, and even if it results from the Contracting Authority's or UK SBS's negligence or from negligence for which the Contracting Authority's or UK SBS would otherwise be liable.

B9-2 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority is not in breach of the Contract, and neither the Contracting Authority nor UK SBS has any liability for anything, to the extent that the apparent breach or liability is attributable to the Supplier's breach of the Contract.

B9-3 Subject to clause B9-6, neither the Contracting Authority nor UK SBS acting as agent on behalf of the Contracting Authority shall have any liability for:

B9-3-1 any indirect or consequential loss or damage;

B9-3-2 any loss of business, rent, profit or anticipated savings;

B9-3-3 any damage to goodwill or reputation;

B9-3-4 loss, theft, damage or destruction to any equipment, tools, machinery, vehicles or other equipment brought onto the Contracting Authority's premises by or on behalf of the Supplier; or

B9-3-5 Any loss, damage, costs or expenses suffered or incurred by any third party.

B9-4 Subject to clause B9-6, the Contracting Authority and UK SBS's total liability shall be limited to the Charges.

B9-5 Subject to clause B9-6, the Supplier's total liability in connection with the Contract shall be limited to £100,000.00

B9-6 Nothing in the Contract restricts either the Contracting Authority, UK SBS or the Supplier's liability for:

B9-6-1 death or personal injury resulting from its negligence; or

B9-6-2 its fraud (including fraudulent misrepresentation); or

B9-6-3 Breach of any obligations as to title implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

SECTION C

C1 Confidential Information

C1-1 A party who receives Confidential Information shall keep in strict confidence (both during the term of the Contract and after its expiry or termination) all Confidential Information which is disclosed to it. That party shall only disclose such Confidential Information to those of its employees, agents or subcontractors who need to know the same for the purpose of discharging that party's obligations under the Contract, and shall ensure that such employees,

agents or subcontractors shall keep all such information confidential in accordance with this clause C1. Neither party shall, without the prior written consent of the other party, disclose to any third party any Confidential Information, unless the information:

C1-1-1 was public knowledge or already known to that party at the time of disclosure; or

C1-1-2 subsequently becomes public knowledge other than by breach of the Contract; or

C1-1-3 subsequently comes lawfully into the possession of that party from a third party; or

C1-1-4 Is agreed by the parties not to be confidential or to be disclosable.

C1-2 To the extent necessary to implement the provisions of the Contract (but not further or otherwise), either party may disclose the Confidential Information to any relevant governmental or other authority or regulatory body, provided that before any such disclosure that party shall make those persons aware of its obligations of confidentiality under the Contract and shall use reasonable endeavours to obtain a binding undertaking as to confidentiality from all such persons.

C1-3 All documents and other records (in whatever form) containing Confidential Information supplied to or acquired by a party from the other party shall be returned promptly to the other party (or, at the election of the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority, destroyed) on expiry or termination of the Contract, and no copies shall be kept.

C2 Transparency

C2-1 The Supplier acknowledges that the United Kingdom Government's transparency agenda requires that contracts, such as the Contract, and any sourcing document, such as the invitation to sourcing, are published on a designated, publicly searchable website.

C2-2 The Supplier acknowledges that, except for any information which is exempt from disclosure in accordance with the provisions of FOIA, the content of the Contract is not Confidential Information. The Contracting Authority and or UK SBS acting as an agent on behalf of the Contracting Authority shall be responsible for determining in their absolute discretion whether any of the content of the Contract is exempt from disclosure in accordance with the provisions of FOIA.

C2-3 Notwithstanding any other term of the Contract, the Supplier hereby consents to the Contracting Authority and or UK SBS acting as an agent on behalf of the Contracting Authority publishing the Contract in its entirety, (but with any information which is exempt from disclosure in accordance with the provisions of FOIA redacted) including from time to time agreed changes to the Contract, to the general public.

C3 Force Majeure

C3-1 If any event or circumstance that is beyond the reasonable control of the Supplier, and which by its nature could not have been foreseen by the Supplier or, if it could have been foreseen, was unavoidable, (provided that the Supplier shall use all reasonable endeavours to cure any such events or circumstances

and resume performance under the Contract) prevent the Supplier from carrying out its obligations under the Contract for a continuous period of more than 10 Business Days, the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority may terminate this Contract immediately by giving written notice to the Supplier

C4 Corruption

C4-1 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority shall be entitled to terminate the Contract immediately and to recover from the Supplier the amount of any loss resulting from such termination if the Supplier or a Supplier's Associate:

C4-1-1 offers or agrees to give any person working for or engaged by the Contracting Authority, UK SBS or any Public Body any favour, gift or other consideration, which could act as an inducement or a reward for any act or failure to act connected to the Contract, or any other agreement between the Supplier and Contracting Authority, or UK SBS or any Public Body, including its award to the Supplier or a Supplier's Associate and any of the rights and obligations contained within it;

C4-1-2 has entered into the Contract if it has knowledge that, in connection with it, any money has been, or will be, paid to any person working for or engaged by the Contracting Authority, or UK SBS or any Public Body by or for the Supplier, or that an agreement has been reached to that effect, unless details of any such arrangement have been disclosed in writing to the Contracting Authority, or UK SBS before the Contract is entered into;

C4-1-3 breaches the provisions of the Prevention of Corruption Acts 1889 to 1916, or the Bribery Act 2010; or

C4-1-4 Gives any fee or reward the receipt of which is an offence under Section 117(2) of the Local Government Act 1972.

C4-2 For the purposes of clause C4-1, "loss" shall include, but shall not be limited to:

C4-2-1 The Contracting Authority's or UK SBS's costs in finding a replacement supplier;

C4-2-2 direct, indirect and consequential losses; and

C4-2-3 Any loss suffered by the Contracting Authority or UK SBS as a result of a delay in its receipt of the Goods.

C5 Data Protection

C5-1 The Supplier shall comply at all times with all data protection legislation applicable in the UK from time to time.

C6 Freedom of Information

C6-1 The Supplier acknowledges that the Contracting Authority and or UK SBS may be subject to the requirements of FOIA and EIR and shall assist and co-operate with the Contracting Authority and or UK SBS to enable them to comply with its obligations under FOIA and EIR.

C6-2 The Supplier shall and shall procure that its employees, agents, sub-contractors and any other representatives shall provide all necessary assistance as reasonably requested by the Contracting Authority or UK SBS to enable the

Contracting Authority or UK SBS to respond to a Request for Information within the time for compliance set out in section 10 of FOIA or regulation 5 of EIR.

C6-3 The Contracting Authority and or UK SBS acting as an agent on behalf of the Contracting Authority shall be responsible for determining (in its absolute discretion) whether any Information:

C6-3-1 is exempt from disclosure in accordance with the provisions of FOIA or EIR;

C6-3-2 is to be disclosed in response to a Request for Information,

And in no event shall the Supplier respond directly to a Request for Information unless expressly authorised to do so in writing by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority.

C6-4 The Supplier acknowledges that the Contracting Authority and or UK SBS may be obliged under the FOIA or EIR to disclose Information, in some cases even where that Information is commercially sensitive:

C6-4-1 without consulting with the Supplier, or

C6-4-2 Following consultation with the Supplier and having taken its views into account.

C6-5 Where clause C6-4-2 applies the Contracting Authority and or UK SBS shall, in accordance with any recommendations issued under any code of practice issued under section 45 of FOIA, take reasonable steps, where appropriate, to give the Supplier advanced notice, or failing that, to draw the disclosure to the Supplier's attention as soon as practicable after any such disclosure.

C6-6 Where the Supplier organisation is subject to the requirements of the FOIA and EIR, C6-7 will supersede C6-2 – C6-5. Where the Supplier organisation is not subject to the requirements of the FOIA and EIR, C6-7 will not apply.

C6-7 The Contracting Authority and UK SBS acknowledge that the Supplier may be subject to the requirements of the FOIA and EIR and shall assist and co-operate with the Supplier to enable them to comply with its obligations under the FOIA and EIR.

C7 General

C7-1 Entire Agreement

C7-1-1 The Contract constitutes the entire agreement between the Contracting Authority and the Supplier in relation to the supply of the Services and the Contract supersedes any earlier agreements, arrangements and understandings relating to that subject matter.

C7-2 Liability

C7-2-1 Where the Contracting Authority is more than one person, the liability of each such person for their respective obligations and liabilities under the Contract shall be several and shall extend only to any loss or damage arising out of each such person's own breaches.

C7-2-2 Where the Contracting Authority is more than one person and more than one of such persons is liable for the same obligation or liability, liability for the total sum recoverable will be attributed to the relevant persons in proportion to the price payable by each of them under the Contract.

C7-3 **Assignment and Subcontracting**

C7-3-1 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority may at any time assign, transfer, charge, subcontract or deal in any other manner with any or all of its rights or obligations under the Contract.

C7-3-2 The Supplier may not assign, transfer, charge, subcontract or deal in any other manner with any or all of its rights or obligations under the Contract without prior written consent from the Contracting Authority's or UK SBS acting as an agent on behalf of the Contracting Authority.

C7-4 **Further Assurance**

C7-4-1 The Supplier will promptly at the request of the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority do (or procure to be done) all such further acts and things, including the execution of all such other documents, as either the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority may from time to time require for the purpose of securing for the Contracting Authority the full benefit of the Contract, including ensuring that all title in the Goods is transferred absolutely to the Contracting Authority.

C7-5 **Publicity**

C7-5-1 The Supplier shall not make any press announcements or publicise this Contract in any way without prior written consent from the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority.

C7-5-2 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority shall be entitled to publicise this Contract in accordance with any legal obligation upon Contracting Authority or UK SBS, including any examination of this Contract by the National Audit Office pursuant to the National Audit Act 1983 or otherwise.

C7-5-3 The Supplier shall not do anything or cause anything to be done, which may damage the reputation of the Contracting Authority or UK SBS or bring the Contracting Authority or UK SBS into disrepute.

C7-6 **Notices**

C7-6-1 Any notice or other communication given to a party under or in connection with the Contract shall be in writing, addressed to:

C7-6-1-a in the case of the Contracting Authority: [redacted] Address: 1 Victoria Street, London SW1H 0ET; Email: [redacted] (and a copy of such notice or communication shall be sent to: Research Procurement, Polaris House, North Star Avenue, Swindon, Wiltshire SN2 1FF; Email: research@uksbs.co.uk and the Chief Procurement Officer, Polaris House, North Star Avenue, Swindon, Wiltshire SN2 1FF;

C7-6-1-b in the case of the Supplier: the address, fax number and email address set out in the Order, or any other address, fax number or email address which that party may have specified to the other party in writing in accordance with this clause C7-6, and shall be delivered personally, or sent by pre-paid first-class post, recorded delivery, commercial courier, fax or e-mail.

C7-6-2 A notice or other communication shall be deemed to have been received: if delivered personally, when left at the address referred to in clause C7-6-1; if sent by pre-paid first-class post or recorded delivery, at 9.00 am on the second Working Day after posting; if delivered by commercial courier, on the date and at the time that the courier's delivery receipt is signed; or, if sent by fax or e-mail between the hours of 9.00am and 5.00pm on a Working Day, upon successful transmission (provided that the sender holds written confirmation automatically produced by the sender's fax machine of error free and complete transmission of that fax to the other party's fax number), or if sent by fax or e-mail outside the hours of 9.00am and 5.00pm on a Working Day, at 9.00am on the next Working Day following successful transmission (provided that the sender holds written confirmation automatically produced by the sender's fax machine of error free and complete transmission of that fax to the other party's fax number).

C7-6-3 This clause C7-6-3 shall only apply where UK SBS is not the Contracting Authority. In such cases, UK SBS may give or receive any notice under the Contract on behalf of the Contracting Authority and any notice given or received by UK SBS will be deemed to have been given or received by the Contracting Authority.

C7-6-4 Except for clause C7-6-5, the provisions of this clause C7-6 shall not apply to the service of any proceedings or other documents in any legal action.

C7-7 **Severance**

C7-7-1 If any court or competent authority finds that any provision of the Contract (or part of any provision) is invalid, illegal or unenforceable, that provision or part-provision shall, to the extent required, be deemed to be deleted, and the validity and enforceability of the other provisions of the Contract shall not be affected.

C7-7-2 If any invalid, unenforceable or illegal provision of the Contract would be valid, enforceable and legal if some part of it were deleted, the provision shall apply with the minimum modification necessary to make it legal, valid and enforceable.

C7-8 **Waiver**. A waiver of any right or remedy under the Contract is only effective if given in writing and shall not be deemed a waiver of any subsequent breach or default. No failure or delay by a party to exercise any right or remedy provided under the Contract or by law shall constitute a waiver of that or any other right or remedy, nor shall it preclude or restrict the further exercise of that or any other right or remedy. No single or partial exercise of such right or remedy shall preclude or restrict the further exercise of that or any other right or remedy.

C7-9 **No Partnership, Employment or Agency.** Nothing in the Contract creates any partnership or joint venture, nor any relationship of employment, between the Supplier and either the Contracting Authority or UK SBS. Nothing in the Contract creates any agency between the Supplier and either the Contracting Authority or UK SBS.

C7-10 **Third Party Rights**. A person who is not a party to this Contract shall not have any rights under or in connection with it, except that UK SBS and any member of

the UK SBS, Associated Bodies or Authorised Entities that derives benefit under this Contract may directly enforce or rely on any terms of this Contract.

C7-11 **Variation**. Any variation to the Contract, including any changes to the Services, these Conditions, the Special Conditions or the Order, including the introduction of any additional terms and conditions, shall only be binding when agreed in writing by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority and the Supplier.

C7-12 **Governing Law and Jurisdiction.**

C7-12-1 Subject to clause C7-12-2, the Contract, and any dispute or claim arising out of or in connection with it or its subject matter or formation (including non-contractual disputes or claims), shall be governed by, and construed in accordance with, English law, and the parties irrevocably submit to the exclusive jurisdiction of the courts of England and Wales.

C7-12-2 The Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority shall be free to enforce its intellectual property rights in any jurisdiction.

C7-13 **Modern Slavery Act 2015**

C7-13-1 During the Term or any extension of the Contract, the Contracting Authority is committed to ensuring that its supply chain complies with the above Act.

C7-13-2 The Supplier shall provide a report covering the following but not limited to areas as relevant and proportionate to the Contract evidencing the actions taken, relevant to the Supplier and their supply chain associated with the Contract.

C7-13-2-a Impact assessments undertaken

C7-13-2-b Steps taken to address risk/actual instances of modern slavery and how actions have been prioritised

C7-13-2-c Evidence of stakeholder engagement

C7-13-2-d Evidence of ongoing awareness training

C7-13-2-e Business-level grievance mechanisms in place to address modern slavery

C7-13-2-f Actions taken to embed respect for human rights and zero tolerance of modern slavery throughout the organisation

C7-13-3 The Contracting Authority or UK SBS when acting as an agent on behalf of the Contracting Authority reserves the sole right to audit any and all reports submitted by the Supplier to an extent as deemed necessary and the Supplier shall unreservedly assist the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority in doing so.

Note: the Contracting Authority also reserves the right to amend or increase the frequency of reporting , as it deems necessary to secure assurance in order to comply with the MSA.
The Contracting Authority requires such interim assurances to ensure that the Supplier is compliant and is monitoring its supply chain, so as to meet the requirements of the above Act.

The Supplier shall complete and return the report to the contact named in the Contract on the anniversary of the Commencement of the Contract.

The Supplier agrees that any financial burden associated with the completion and submission of this report and asscociated assistance at any time, shall be at the suppliers cost to do so and will not be reimbursable.

C7-14 **Changes in Costs Resulting from Changes to Government Legislation, Levies or Statutory Payments**

The Contracting Authority will reimburse during any term or extension (or, where such costs, awards or damages arise following termination/expiry) of this Agreement, any increases in the Supplier's cost of providing the Services by reason of any modification or alteration to the Government legislation duties or levies or other statutory payments (including but not limited to National Insurance and/or VAT and/or introduction of or amendment to working time minimum wages). Subject always to open book access to the Supplier's records and always after a period of due diligence carried out by the Contracting Authority, relevant and proportionate to the value concerned.

C7-15 **Taxation Obligations of the Supplier**

C7-15-1 The relationship between the Contracting Authority, UK SBS and the Supplier will be that of "independent contractor" which means that the Supplier is not an employee, worker, agent or partner of the Contracting Authority or UK SBS and the Supplier will not give the impression that they are.

(1.) The Supplier in respect of consideration shall at all times comply with the income tax Earnings and Pensions Act 2003 (ITEPA) and all other statues and regulations relating to income tax in respect of that consideration.

(2.) Where Supplier is liable to National Insurance Contributions (NICs) in respect of consideration received under this contract, it shall at all times comply with the Social Security Contributions and Benefits Act 1992 (SSCBA) and all other statutes and regulations relating to NICs in respect of that consideration.

(3.) The Contracting Authority may, at any time during the term, completion extension or post termination of this contract, request (Supplier) to provide information which demonstrates how Supplier complies with its obligations under tax and National Insurance Clauses (1) and (2) above or why those clauses do not apply to it.

C7-15-2 As this is not an employment Contract the Supplier will be fully responsible for all their own tax including any national insurance contributions arising from carrying out the Services.

C7-15-3 A request under Clause (3) above may specify the information which Supplier shall provide and the period within which that information must be provided.

C7-15-4 In the case of a request mentioned in Clause (3) above, the provision of inadequate information or a failure to provide the information within the requested period, during any term or extension, may result in the Contracting Authority terminating the contract.

C7-15-5 Any obligation by Supplier to comply with Clause (1) and (2) shall survive

any extension, completion or termination and Supplier obligations to Indemnify the Contracting Authority shall survive without limitation and until such time as any of these obligations are complied with.

C7-15-6 The Contracting Authority may supply any information, including which it receives under clause (3) to the commissioners of Her Majesty's Revenue and Customs for the purpose of the collection and management of revenue for which they are responsible.

C7-15-7 If the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority has to pay any such tax under clauses (1) and (2) then the Supplier will pay back to the Contracting Authority or UK SBS in full, any money that the Contracting Authority or UK SBS has to pay, and they will also pay back the Contracting Authority or UK SBS for any fine or other punishment imposed on the Contracting Authority or UK SBS because the tax or national insurance was not paid by the Supplier.

C7-16 **Cyber Essentials Questionnaire**

The Supplier agrees that during any term or extension it shall complete and return the attached questionnaire as advised below, within 14 days from notice and shall send this information as directed by the Contracting Authority or UK SBS acting as an agent on behalf of the Contracting Authority. The Contracting Authority and UK SBS acting as an agent on behalf of the Contracting Authority is required to provide such assurances to comply with Government advice and guidance.
Note: the Contracting Authority also reserves the right to amend or increase the frequency of the questionnaire submission due dates, as it deems necessary.
The Contracting Authority requires such interim assurances to ensure that the Supplier is still compliant with the security needs of this Contract.

The Supplier shall complete and return the questionnaire to the contact named in the Contract on the anniversary of the Commencement of the Contract.

The Supplier agrees that any financial burden associated with the completion and submission of this questionnaire and associated assistance at any time, shall be at the suppliers cost to do so and will not be reimbursable.

Copy of Statement of Assurance

Schedule 1 Special Conditions

None

Schedule 2 Pro forma purchase order form

The format of the Proforma Purchase Order will be as follows. Please note that the Purchase Order form will be submitted directly to your chosen email address on completion of the receipt of the signed contract and will contain the confirmed value of goods and services as well as the Purchase Order number that must be used for invoicing purposes.

Purchase Order #0

(Contracting Authority Logo)

Order	
Order Date	
Revision	0
Revision Date	
Payment Terms	As per terms and conditions

Supplier:

Tel:

Fax:

PLEASE QUOTE THE PURCHASE ORDER NUMBER ON ALL CORRESPONDENCE.
INVOICES NOT QUOTING THE PO NUMBER WILL BE RETURNED UNPAID

For all purchase order queries, please contact P2PAdmin@uksbs.co.uk
For all invoicing queries, please contact finance@uksbs.co.uk

Ship to: Contracting authority ship to address

Invoice to: Contracting Authority Invoice Address

Line	Part Number/Description	Delivery Date	Quantity	UOM	Unit Price (GBP)	Tax	Net Amount (GBP)
1							

Total

Grand Total

Whenever a UK SBS Contract number is cited within the narrative description of the Purchase Order that Purchase Order is subject to the Terms and Conditions relating to that Contract, otherwise, the Purchase Order is subject to the Terms and Conditions incorporated herein by this reference. For a copy of the Terms and Conditions please see http://www.uksbs.co.uk/services/procure/Documents/SSCPOterms.pdf

Commercial In Confidence

UKSBS
Shared Business Services

VAT Registration Number GB 618 387 325

(Contracting Authority) , Polaris House, North Star Avenue Swindon, United Kingdom SN2 1EU

Page 1 of 1

Schedule 1 The Services

D1 SCOPE OF SERVICES TO BE PROVIDED

D1-1 To carry out CR18107 BEIS Policy Options to Incentivise Greenhouse Gas Removal Technologies, as outlined in Appendix A – Specification and Appendix B – Bid Response.

D2 COMMENCEMENT AND DURATION

D2-1 This contract is with the understanding that the full rigors and terms and conditions of the that contract apply from the commencement date of the on 22nd October 2018 and subject to any provisions for earlier termination contained in the Standard Terms shall end on 30th April 2019.

Commercials

1.1 Total Contract price shall not exceed £65,679.00 excluding VAT in accordance with the Contract price and breakdown submitted for this contract detailed below: All invoice should ensure that they are provided including VAT.

1.2 All invoices should be sent to BEIS – [redacted], SICE, The Department for Business, Energy and Industrial Strategy, 1 Victoria Street, London SW1H 0ET email: [redacted].

UK Shared Business Services Ltd (UK SBS)

AW5.2 Price Schedule

Please ensure that you DO NOT alter this spreadsheet. Any alterations may result in your Pricing being disqualified.

SOURCING REFERENCE:	CR18107
SOURCING DOCUMENT TITLE:	Assessment of the Policy Options to Incentivise Greenhouse Gas Removal (GGR) Technologies
BIDDER NAME	Vivid Economics

Please complete the shaded yellow sections only.

Please note that the staff costs in section 1 should equal the staff costs outlined in section 2. Section 2 provides further detail around the project team and the distribution of staff days.

The figure used for evaluation is the total Cost (ex VAT) provided in Section 1. The total cost is the total staff costs (ex VAT) and the total Travel and Subsistence, Overhead costs, cost of production of materials and anyfull costs associated with the delivery of the project (ex VAT).

Section 1: Total Project Costs (Summary)

Objective	Number of Days	Per Objective (ex [redacted]	[redacted]
1. Research	15	£ [redacted]	[redacted]
2. Analysis	22	[redacted]	[redacted]
3. Drafting	12.5	[redacted]	[redacted]
4. Project Management	4.5	[redacted]	[redacted]
5. Meetings	16.5	[redacted]	[redacted]
6. Any other costs	0	-	-
TOTAL	70.5	[redacted]	[redacted]

[redacted]

[redacted]

Job Title	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Principal	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Senior Economist/Economist/Analyst	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Expert panel	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Director	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	£ [redacted]
Principal	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Senior Economist/Economist/Analyst	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Expert panel	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Director	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	£ [redacted]
Principal	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Senior Economist/Economist/Analyst	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Expert panel	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Director	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Principal	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Senior Economist/Economist/Analyst	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Director	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	£ [redacted]
Principal	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Senior Economist/Economist/Analyst	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
Expert panel	£ [redacted]	£ [redacted]	[redacted]	[redacted]	£ -	[redacted]	[redacted]
					£ -	£ -	-
	£ -	-			£ -	£ -	-
	£ -	£ -			£ -	£ -	-
	£ -	£ -			£ -	£ -	-
[redacted]						[redacted]	[redacted]

[redacted]

D3 The Contract price is payable according to the following schedule:-

The Contract price is payable according to the following schedule:-

- 30% - Draft report on evidence and policy options, Policy list & snapshots – w/c 17 December - [redacted]
- 30% - Interim report – w/c 11 February - [redacted]
- 30% - Draft final report – w/c 1 April - [redacted]
- 10% - Final repot – w/c 12 April - [redacted]

For and on behalf of Vivid Economics Ltd
(The Supplier)

Signed

Name

Position

For and on behalf of Department
Energy and Industrial Strategy
Contracting Authority)

Signed

Name

Position

Date

Appendix A – Specification

1. Introduction and summary of requirements

Under the Paris Agreement the UK is committed to working with other countries to achieve global net zero emissions in the second half of the century, which the IPCC (Intergovernmental Panel on Climate Change) has indicated will be necessary to stay below 2°C. As we approach the middle of the century, there are likely to be remaining emissions in the sectors where it is the most difficult to cut them – in industry, agriculture, aviation and shipping. Greenhouse Gas Removal technologies (GGRs) are likely to have an important role to play in offsetting difficult-to-cut emissions.

The term "Greenhouse Gas Removal" (or GGR) encompasses any method which removes greenhouse gases from the atmosphere. There is a diverse range of technologies which may be counted as GGR, including:

- Afforestation, reforestation and forest management
- Wetland, peatland and coastal habitat restoration
- Soil carbon sequestration
- Biochar
- Bioenergy (for electricity, heat or other fuels) with carbon capture and storage (BECCS)
- Building with biomass
- Enhanced weathering on land
- Mineral carbonation
- Ocean alkalinity
- Direct air carbon capture and storage (DACCS)
- Low carbon concrete
- Other approaches to removing CO_2 or other GHGs

With few exceptions, GGR development and deployment are constrained by a lack of markets or other policy interventions to encourage deployment of these technologies at scale.

BEIS requires an assessment of potential policy options which might provide such incentives for GGR deployment, both within the UK and as part of international mechanisms under the Paris Agreement.

2. Background

The Climate Change Act, passed in 2008, committed the UK to a series of greenhouse gas emissions limits – or carbon budgets – on a path to a reduction by at least 80 per cent by 2050 when compared to 1990 levels. Under the Paris Agreement, as well as seeking to limit warming to well below 2 degrees, and to pursue 1.5 degrees, the UK is committed to working with other countries to achieve global net zero emissions in the second half of the century.

In 2017 the Government published its Clean Growth Strategy[1] for meeting the UK's carbon budgets, which sets out an approach to greenhouse gas removals. It states:

"*As highlighted by the Committee on Climate Change, greenhouse gas removal (GGR) technologies are likely to have an important role to play in offsetting difficult-to-cut emissions, by removing greenhouse gases from the air. As we learn more about how*

GGRs could be developed and deployed, we want the UK's entrepreneurs, universities and engineering industries to be well placed to exploit the advantages of global demand for these new technologies.

We are therefore taking active steps to strengthen our understanding of these technologies and, where appropriate, move forward with deployment. The Government's strategic approach to GGR has two main elements:

- ***A Government programme of research and development**, which aims to improve our understanding of GGR technologies, to help overcome the uncertainties around their costs, deployment potential, and impacts on the environment. We have been working with the Research Councils, who launched a new £8.6 million research programme looking at all GGR technologies in April 2017. We will also develop robust estimates of sustainable biomass resource available to the UK, reporting during 2018, and consider Royal Society scientific views on GGR.*

- ***The Government will consider the scope for removing barriers and strengthening incentives to support the deployment of GGR**, to position the UK at the leading edge of GGR development. This includes, for example, considering options for developing a carbon offset market and exploring how UK timber could be used in construction. We are also considering how best to take forward CCUS, as set out in 'Improving Business and Industry Efficiency and Supporting Clean Growth'. We will conduct a study on how GGR activity can be incentivised, in the UK and in other countries, which will help us develop policy and accounting frameworks fit for the future. And we will also consider how legal, financial and regulatory frameworks could support the rollout of GGR technologies at scale."*

3. Aims and Objectives

This aim of this project is to meet the commitment in the Clean Growth Strategy: "*We will conduct a study on how GGR activity can be incentivised, in the UK and in other countries, which will help us develop policy and accounting frameworks fit for the future.*"

The objective of this project is to provide options for policies and emissions accounting, contributing to the BEIS evidence base to inform the development of our strategic approach to GGR technologies.

4. Suggested Methodology

In this section we set out an approach which we envisage would meet our project aim.

Task 1: Understand the range of GGRs and barriers to their deployment.

By reviewing literature and other evidence, the contractors should identify GGRs (including the possibility of new GGR technologies), and the policy and accounting barriers to their deployment. There is a large and rapidly growing volume of literature addressing the need for, and characteristics, costs and potential scale of, deployment of GGRs. Much of this is being summarised in a Royal Society and Royal Academy of Engineering Review expected to be published in September 2018, and the IPCC Special Report on Global Warming of 1.5°C, due to be published 7 October 2018. We expect contractors to use these as starting points, with the review should concentrate on barriers to development and deployment, plus mechanisms to overcome these (see Task 2).

The contractors should seek grey literature as well as peer-reviewed literature, and they should review all evidence critically.

This review of evidence may need to be continued after engagement with policy teams (see Task 5).

Task 2: Identify potential policy options.

Consultants should continue the review of literature and other evidence to identify policy options. They should then propose a typology of policy interventions and consider how these could be applied to the different GGRs and barriers identified. GGRs can be grouped together where they share common features, making them suitable for the same policy options. In applying this typology consultants should consider available literature on policy options (as per Task 1), policy theory and analogues. Also to be considered are existing policy mechanisms which either apply to GGRs already or could be modified to apply, such as:

- The UK Woodland Carbon Code
- The UK Peatland code
- Emissions pricing/taxing, through the EU Emissions Trading System (ETS) or any successor scheme in which the UK participates
- Development of international market mechanisms under the Paris Agreement (to incentivise GGRs in developing countries)
- Private sector emissions reporting and domestic offsetting
- Contracts for Difference in the UK electricity market
- Building regulations
- Innovation policy
- Biomass supply policies (for both energy and construction)
- Agricultural subsidies post-CAP
- Government procurement policy

Furthermore, existing policies outside the UK that apply to GGR should also be identified and considered, such as:

- The Australian Emissions Reduction Fund and Carbon Farming Initiative;
- US tax credit for CCS;
- Forestation projects/CDM schemes

Contractors should identify an initial long list of policy options, which may be a mix of existing and novel options. Some may be cross-cutting and applicable to most or all GGRs; some may be very specific to a particular GGR.

Task 3: Assess policy options.

Contractors should set out an approach to assessing this long list of policy options that could enable the Government to enable GGR deployment, informed by the principles in the Treasury Green Book (e.g. in terms of potential scale of GHG removal; ability to monitor and evaluate the level of GHG removal; economic, social and other costs and benefits to government and others; strategic fit to wider policy objectives; potential value for money; distributional impacts).

Existing policies identified during Task 2 should be appraised in the same way, as well as how well they were or are implemented, their effectiveness, whether costs were as anticipated, and whether there were unintended consequences.

Given the range of potential policy options, and the limited resources available to this project, a full policy appraisal is not expected for all options. A strategic approach should be developed with the steering group, e.g. based on near-term priority areas (such as the EU ETS and private sector reporting & offsetting) and policies that incentivise the widest range of options.

All evidence should be critically appraised for robustness.

Task 4: Refine assessment through engagement with policy teams.

The policy assessment should be checked and refined by engagement with BEIS and other policy teams through facilitated meetings and/or workshops.

Individuals from several policy teams have been involved in scoping this project and are ready to engage with the contractors, including (but not necessarily limited to):

- BEIS EU ETS (Emissions Trading Scheme)
- BEIS Carbon Budgets and Clean Growth
- BEIS Carbon Capture Utilisation and Storage (CCUS)
- BEIS Heat and Business Energy
- BEIS Biomass Electricity
- BEIS Business Energy Use (working on streamlined Energy and Carbon Reporting)
- BEIS Global Carbon Markets team
- Defra Trees, Woodlands & Forestry Policy
- Defra Soils and Peatlands
- MHCLG
- HM Treasury Energy, Environment and Agriculture

BEIS will convene a Steering Group on which some of the above teams will be represented. Members of the Steering Group, and other government representatives, will be available to provide input.

Task 5: Summarise and identify lead options.

Contractors should summarise their findings and identify lead options, explaining their reasoning. Contractors should be prepared to revisit Tasks 1-3 in the light of information gained during engagement with policy teams during Task 4.

The contractors should suggest further work, e.g. the development of pilots of policy options, which cannot be accommodated within the resources available to this contract.

Stakeholder Engagement

Engagement with government policy teams is a crucial aspect of this work. It should begin at the kick-off meeting and continue during the work, especially Task 4, via the facilitated meetings. Policy teams may have tacit knowledge, including of grey literature, and relevant contacts to provide important additional information on policy options and their appraisal. This engagement is important to enable the contractors to understand:

- the breadth and depth of existing knowledge within government;
- wider policy ambitions and constraints which would either limit the deployability of policy options or, conversely, result in co-benefits across policy areas other than tackling climate change;
- the risk of perverse incentives, compared to investments in mitigation measures such as energy efficiency;
- the type of information which policy teams would find most useful.

5. Outputs Required

- An overall report setting out the project scope, method, results and a summary of key findings.
- Bespoke, shorter reports (e.g. 2-page) for each Government policy team relevant to GGR incentivisation.

- A PowerPoint presentation summarising the above, suitable for presenting the findings to Government colleagues including both those participating in the project and others not already familiar with the work.

6. Ownership and Publication

The overall report will be published on the public government website, gov.uk, in line with standard practice for work commissioned by the BEIS Science Team. The draft report should be sent to BEIS and time allowed for review and agreement of the final version.

7. Quality Assurance

The contractor must state how all of the work on the project will be quality assured by producing a Quality Assurance (QA) plan. A summary of this plan should be included within the proposal. The plan should:

- Ensure that QA is done by individuals who were not directly involved in the research, analysis or model development.
- Specify who will be responsible for QA before the work is delivered to BEIS.
- Explain how the successful bidder will take responsibility for any work supplied by sub-contractors.

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. BEIS reserves the right to refuse to pay for outputs which do not meet the required standard specified in this invitation to tender.

Draft outputs of the interim and final reports and datasets must be submitted to BEIS by the deadlines given in Section 8 below, and then the contractor should attend a meeting with officials to present the draft interim and final results to the panel at BEIS offices. Verbal and written comments will be collated by the BEIS project manager and submitted to the Contractor following these meetings. Invoices for deliverables will only be processed if the submitted officials' comments have been addressed to the standard deemed acceptable by the officials and BEIS project manager. The Contractor should make it clear in writing exactly where and how comments have been addressed.

BEIS officials will scrutinise not only the quality of the data and analysis, but also the quality of the reporting. Reports deemed by BEIS to be poorly written or poorly presented will be returned to the supplier to re-produce to the high standard required before invoices are paid. Invoices will be paid by deliverable and will not be processed unless deliverables are submitted on time and to the standard required. BEIS will withhold a percentage of the cost for each deliverable to dissuade sub-standard and /or late submissions. Further details are provided in clauses 19-21 of the BEIS Terms and Conditions.

The Contractor will be expected to produce high quality reports that meet the following criteria:

General:

- Clearly set out findings and supporting evidence, in plain correct English.

Diagrams:

- Clear and appropriate use of diagrams (large enough size, data can be read clearly).
- All diagrams should be clearly explained and discussed.

Data quality:

- Limitations in the research approach must be clearly stated and justified.
- Where the findings are stronger and more robust and where they are not needs to be stated clearly.

8. Timetable

A proposed timetable is set out below. This will be reviewed and agreed at the kick-off meeting.

Contract Timeline	Date
Contract start date	Monday 1 October
Kick-off meeting	Week beginning 1 October
Deliver draft review of evidence and policy options	Week beginning 8 November
Steering Group meeting to discuss initial evidence-gathering	Mid November
Facilitated Meetings with policy teams	November/December
Deliver interim report	January 2019
Workshop / further meetings	Feb 2019
Deliver draft final report	15 March 2019
Presentation of draft final report	Week beginning 18 March 2019
Deliver final report	31 March 2019

9. Ethics

Applicants should consider ethical issues and, where necessary, 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 (Government Social Research) Principles:

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

Further guidance is available in "Ethical Assurance Guidance for Social research in Government": https://www.gov.uk/government/publications/ethical-assurance-guidance- for-social-research-in-government

10. Working Arrangements

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

11. 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.

12. Payment

Payments will be linked to delivery of key milestones. The indicative milestones and phasing of payments is as follows:

Deliverable	Date	Proportion of contract cost
Interim report	January 2019	50%
Final report	March 2019	50%

This can be adjusted and agreed with the contractor based on the tender response/details. Please advise in your tender response how this breakdown reflects your usual payment processes, however in line with HM Treasury guidance all payment will be made in arrears

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.

Appendix B – Supplier Responses

Assessment of policy options to incentivise GGR technologies
PROJ1.1 Understanding the Project Environment

Interpretation of the project

Research on the techno-economics of GGRs is strengthening but little attention has been given to the policy tools to unlock these opportunities. In the context of achieving the Paris Agreement goal of net zero emissions, the GGR field has grown rapidly. Different attempts to summarise this body of work show the proliferation of options and challenge in summarising a complex and rapidly developing space. The Royal Society's 2018 review is the latest in a series of assessments (e.g. Majumdar and Deutch, 2018; Mclaren, 2017) to characterise the need for, and potential of GGR globally and for the UK. However, literature on the policy toolkit is restricted to studies of isolated GGR techniques (e.g. CCS policy tools, policy to encourage afforestation) and the tools to unlock many emerging GGR do not appear to have been considered at all. In order that GGR options can be deployed, there is a need for a comprehensive review of GGR policy, to assess the suite of tools available to government and explore the ways in which these tools can be efficiently and effectively deployed.

This aim of this study is to start to fill this gap by providing a prioritised policy options to inform BEIS' strategic policy approach to GGR technologies. The Government stated in the Clean Growth Strategy: *"We will conduct a study on how GGR activity can be incentivised, in the UK and in other countries, which will help us develop policy and accounting frameworks fit for the future. And we will also consider how legal, financial and regulatory frameworks could support the rollout of GGR technologies at scale".*
The objective of this project is stated in the ITQ as: "provide options for policies and emissions accounting, contributing to the BEIS evidence base to inform the development of our strategic approach to GGR technologies". To do this, the project will build on the techno-economic literature and existing disparate policy case studies, complementing it with a policy appraisal anchored in Treasury Green Book principles. Key sources of evidence for this work include the techno-economic literature referenced above, information from case studies of GGR technologies already deployed, evidence from analogous policy challenges around the world and the Research Councils' emerging results from the ongoing 11 research projects.

The challenges of this work are to draw together different strands of evidence (literature, case studies, expert opinion), consider the wide range of policy needs of different GGR, and conduct a strategic assessment of the policy tools that would work best in the UK. The project is unable to rely on proven international policy frameworks, and will need to do a significant amount of original analysis to build a framework to consider GGR policy reform. The project also needs to prioritise policies, but there is not resource to do a full policy impact assessment. We have operationalised these challenges by designing a methodology that achieves three specific objectives, or pillars:

1. **Focus on strategic policies.** To be effective, GGR policy will need to leverage existing schemes, address near-term priorities and span multiple technologies or technologies at scale.
2. **Engagement at the heart of the assessment.** It is vital to synthesise perspectives from government policy teams on co-benefits, perverse incentives, related policies and wider policy ambition.
3. **A portfolio approach.** GGR policy is not one size fits all - some GGR technologies are deployable today at low cost, but it is unlikely that these will go far enough. Other GGR technologies are early stage, and some have a complex set of co benefits and costs, or accounting requirements. A portfolio of policies is therefore required to unlock appropriate investment.

In the methodology we describe the detail of how we meet these challenges, and in Staff to Deliver we show the team and expert panel we have assembled, including the Chair and key members of the Royal Society team.

The need for GGRs

"The role of rapid emissions reduction in meeting this target is widely understood. But it is increasingly clearer that reducing emissions is not enough – we must also actively remove greenhouse gases from the atmosphere": Royal Society (2018).

"Greenhouse Gas Removal (GGR) technologies are likely to have an important role to play in offsetting difficult-to-cut emissions, by removing greenhouse gases from the air" Clean Growth Strategy (2017)

The Paris Agreement commits the world to limiting global average temperature increases to well below 2°C, and pursuing efforts to keep the them below 1.5°C. The agreement also commits the world to the global peaking of emissions as soon as possible, and to *'achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century'* – the so-called net-zero goal.

The linked obligations of 1.5°C and net-zero are capturing increasing attention around the world and the UK. Some countries are legislating for net-zero targets, notably Sweden (by 2045) and New Zealand (by 2050), although which gases are included is a topic of debate. The UK has not yet committed to a net-zero emissions target, but the Secretary of State has indicated that "The UK will need to legislate for a net-zero emissions target at an appropriate point in the future to provide legal certainty on where the UK is heading" and asked the Committee on Climate Change to analyse what the 1.5°C target could mean, following the IPCC's Special Report on 1.5°C, due in October.

It has become clear that several sectors, such as agricultural, are 'hard to treat', which suggests the need for greenhouse gas removal to offset emissions. GGRs are likely necessary both to compensate for the pace of emission reductions, and the remaining emissions which are particularly hard to treat.

- At a global level, net zero is challenging to achieve through emission reductions alone. The rate of emissions reductions is limited by feasibility constraints (e.g. undue cost of scrapping assets, time to build up supply chains of low carbon alternatives), and this creates a role for developing emissions sinks.
- In the UK, even if emission sources can be reduced rapidly, it is likely that emissions sinks are required to offset difficult to reduce emissions in industry, agriculture and transport.

The scale of required GGR is substantial. To 2050, scenarios run for Vivid Economics in the TIAM-Grantham modelling suite show that the minimum required negative emissions in 2050 to achieve 2 degrees is 3GtCO2e/year in 2050, equivalent to around 10% of the entire current electricity generation capacity. This is at the low end of studies conducted for the IPCC in its 5th Assessment Report. By 2100, the quantity of required GGR escalates rapidly, to around 20 MtCO2e/year.

Large scale GGR to achieve net-zero is challenging yet feasible. The Royal Society (2018) have found that the UK's remaining 130 MtCO2e of emissions in 2050 can be offset with GGR, to reach net zero in 2050. This involves a ramp up of forests, habitat restoration and social carbon restoration, as well as pursuing a set of unproven GGR methods and building infrastructure to support CO2 transport and storage. Vivid Economics is currently undertaking work for another client on a scenario to reduce emissions to net zero by 2050, but adopting a strategic of reducing industry emissions further than the Royal Society, and therefore allowing a slightly less ambitious deployment of GGR. Even in this case, a large amount of GGR is required to meet a net zero 2050 goal.

Current understanding of GGR technologies

Previous analysis on negative emissions has focussed on the role of one GGR – that of bioenergy with carbon capture and storage technologies. However, recent literature and the

proposed study has developed knowledge about a suite of options not just in geological structures but also on the land, in oceans and in the built environment. Another, simpler way of inventorising GGR options is to consider the different removal methods, which can be categorised in three broad ways:

- **Increasing biological uptake through sequestration on the land or in the ocean:** Options include storage in soils (biochar); afforestation, reforestation and forest management; Wetland, peatland and coastal habitat restoration; Ocean fertilisation; storage in the built environment (use of wood in construction); or burning biomass to generate electricity (BECCS).
- **Natural reactions.** These options include spreading minerals over large areas of land, changing alkalinity of oceans or using waste products from industry. The resulting carbon store could be used on land or in the oceans.
- **Engineered removals from the atmosphere:** these options involve passing air over chemicals that adsorbs CO2 and then separating this out for storage or use in industrial materials (e.g. cement). This method is knows as direct air capture with carbon storage (DACCS).

Different attempts to summarise this body of work[1] show the proliferation of options and challenge in summarising a complex and rapidly developing space. The ITQ for this study propose the following list: Afforestation, reforestation and forest management; Wetland, peatland and coastal habitat restoration; Soil carbon sequestration; Biochar; Bioenergy (for electricity, heat or other fuels) with carbon capture and storage (BECCS); Building with biomass; Enhanced weathering on land; Mineral carbonation; Ocean alkalinity; Direct air carbon capture and storage (DACCS); Low carbon concrete. The Royal Society adds Ocean fertilisation to this list. Within each of the above options, there are variants which will be categorised in more detail in the proposed study (see methodology for GGR categorisation).

There are still further options GGR, but they tend to be bespoke and not scaleable. These include options that remove non-CO2 such as use of bacteria or other options for sequestering CO2 in plastics or other industrial products. However, these tend to be bespoke options with relatively limited potential.

The techno-economic analysis suggests that a range of GGR options are possible, however these vary significantly in terms of technical and commercial maturity. Furthermore, the mechanisms to account for captured emissions are poorly understood for the less developed GGR options. Three broad categories can be distinguished, with indicative technology readiness levels (TRLs) indicated[2]

- **Mature options (TRL 7-9)** such as reforestation, and wood in construction can be deployed today. Accreditation is relatively well understood, and the mature forestry sector could be incentivised effectively to increase scale. The uncertainties are around the feasible rate of deployment, competition with other land uses, and biodiversity impacts.
- **Relatively well-understood options (TRL 5-6)**, such as BECCS. For technologies such as BECCS the necessary parts of the supply chain have all individually been tested, however they have not been applied in the UK, or the supply chain has not been combined in the way envisioned. The uncertainties involve scaling up, cost, availability of sustainable biomass, and flexibility to take different roles in the energy system
- **Early stage technologies (TRL 1-4)** include various technologies such as soil carbon sequestration, enhanced weathering, biochar, ocean liming, GGR in iron and steel industry etc. These technologies have not yet been demonstrated outside of controlled lab settings. Fundamental questions typically remain about the precise amounts of CO_2 captured, and

[1] E.g. Royal Society, 2018; Majumdar and Deutch, 2018 and Mclaren, 2017

[2] Technology readiness levels as reported by the CCC (2016): UK climate action following the Paris Agreement

wider environmental effects. More RD&D is typically needed before considering more commercial questions such as cost and feasible scale.

Owing to the early stage of development, the costings for most GGR are very uncertain and only a preliminary economic assessment can be conducted. Nonetheless, the more mature biological uptake options tend to be the cheapest, with many options available at or below $100/tCO2 (e.g. afforestation, and soil carbon). The natural reactions options tend to be more expensive, at between $50 and 500/tCO2 and the engineered removal options are the most expensive (the top end of the range is the highest) at $50-600/tCO2.

Application of GGR technologies in the UK

Given the technological immaturity of most GGR options, estimates for their cost and deployment potential in the UK vary significantly. The UK is likely to require a combination of several GGRs if it is to reach net zero. The Royal Society (2018) find a scenario that can achieve 130 MtCO2e/year in 2050, although this is very costly and challenging:

- Options that require CCS (BECCS and DACCS) form the majority of the reductions (around 75 MtCO2e/year)
- Immediately deployable GGR (e.g. forests) provide a further 35 MtCO2e/year
- A further 20 MtCO2e/year is available from biochar and weathering, although these options are yet to be deployed at scale.

Ocean pathways are only likely to be possible beyond 2050. However, given the uncertainty in deployment potential of most individual GGRs, estimates of the total $MtCO_2e$/year that can be captured (using a portfolio GGRs) in the UK covers a wide range. (For example, current estimates for the combined negative emissions potential of land based GGRs lie between 12-49 $MtCO_2e$[3]).

To explore this in more detail a new £8.6 million UK research programme is currently investigating the applicability of a broad spectrum of GGRs, which will improve the evidence based of GGR potential in the UK. The programme includes 4 consortium projects and 7 topic specific projects covering land based, ocean based, industrial and lifecycle based GGRs. The projects vary from fundamental research and early demonstration (e.g. proof of concept of methane capture techniques)[4] to considering policy barriers in more mature GGRs such as agroforestry[5].

Challenges and risks of deploying GGR

Beyond the mature GGR options such as forests, what we do know about the remainder of GGR options suggests many challenges and risks to deploying GGR at scale, beyond simply their high cost and lack of demonstrations:

- GGR has consequences for the biosphere, intended and unintended, which are difficult to predict. For example, biomass-based technologies could cause biodiversity damage, or ocean fertilisation could cause risks to marine ecosystems. GGR also may have broader economic impacts, which are difficult to predict such as higher food prices due to competition for land. To deploy GGR safely these impacts need to be explored in more detail, and risks mitigated.
- GGR requires a detailed and international system of accounting, supported by monitoring reporting and verification to trac carbon and financial flows along the value chain. This is

3 Pete Smith et al. (2016). Preliminary assessment of the potential for, and limitations to, terrestrial negative emission technologies in the UK

4 led by Euan Nisbet, Royal Holloway, University of London. See: https://nerc.ukri.org/press/releases/2017/09-greenhousegas/

5 led by Martin Lukac, University of Reading. See: https://nerc.ukri.org/press/releases/2017/09-greenhousegas/

important to ensure emissions reductions are genuine, and to avoid increases in emissions due to the non-additionality of forests. This system would need institutions to enforce and ensure that standards were being upheld – this system is yet to be developed to cater to a gigatonne scale GGR industry.

- Many GGR options have large energy requirements, which could increase emissions if it is itself not low carbon. BECCs and DACCs have a large energy penalty associated with capture, transport and storage of CO2. Therefore, development of low carbon electricity is required alongside the development of GGR, increasing its costs.
- GGR can not be simply incorporated into carbon pricing schemes, as this could result in a moral hazard. It may delay the development of mitigation options, or allow traders to sell emissions reductions that never materialise.
- Finally, there a large number of enabling factors that are needed for GGR to succeed at scale, including developing the supply chain and infrastructure to support GGR at scale.

Incentivising GGR is therefore complex given any policy will interact across a range of impacts and policy areas (e.g. agricultural and land use policy, innovation policy, carbon policy, and other environmental policy). Successful support for GGRs will need to take the complex interactions into account to efficiently and effectively support GGR deployment in the UK.

Barriers and policy response

Notwithstanding the above challenges, it is possible to identify policy that can address many of the barriers to deploying GGR, focussing on the more mature options and further research and development can be conducted in to the less mature options – in short, a policy portfolio approach is required. In the methodology section we outline a summary of the key barriers faced by GGR, and these include (1) Deployment barriers (2) Financial barriers (3) Barriers to demonstration (4) Barriers to innovation and (5) barriers to accounting. This set of barriers suggests a portfolio of policies is needed that addresses the different barriers.

International, and UK specific, experience on how to incentivise GGR deployment is limited. Further analysis is necessary, applying fundamental economics and lessons from e.g. renewable support, to design policies which incentivise GGR options sufficiently to allow the UK to reach net-zero emissions. A few international examples of policies which have supported GGR deployment exist, such as the US tax credits for CCS, and the Carbon Farming Initiative in Australia, and Afforestation incentives in New Zealand. However, no country has a coherent policy framework which supports GGR options to reach national climate targets. Furthermore, limited work has been done to understand the impact of various relevant policies[6] in the UK on overall GGR deployment.

In GGR, it is likely that a range of policies will be needed, given a wide range of externalities and stages of deployment. If GGR are to be used at scale in 2050, then Government should prepare its policy framework to include research, development and demonstration (RD&D), deployment, and integrating negative emissions into accounting frameworks. This will enable the scale up of deployment of GGR options which are commercially ready now, and push the technical and commercial development of GGR options which will likely be required in the UK's GGR portfolio by 2050.

[6] Such as the UK Woodland Carbon Code, UK Peatland Code, EU ETS, Biomass support policies etc.

Assessment of policy options to incentivise GGR technologies

PROJ1.2 Methodology

The objective of this project is stated in the ITQ as: "provide options for policies and emissions accounting, contributing to the BEIS evidence base to inform the development of our strategic approach to GGR technologies".

Vivid Economics' approach to delivering this objective is based on three pillars:

1. **Balance a strategic, pragmatic approach with a systematic assessment.** To be effective, GGR policy will need to leverage existing schemes, address near-term priorities and span multiple technologies with potentially different support requirements. To do this, a **strategic policy assessment tool** will be developed that involves BEIS in developing a set of criteria and then systematically assessing against them. The **refinement phase considerations** pick up on cross-cutting issues that require further exploration.
2. **Engagement at the heart of the assessment.** It is vital to synthesise perspectives from government policy teams on co-benefits, perverse incentives, related policies and wider policy ambition. Outside government, it is important to harness the cutting edge of research currently in operation in the UK and internationally. To do this we set out a **tested engagement approach**, based on previous BEIS projects (e.g. the regular Steering Group meetings mimic the Progress meetings of the 2-year Energy Innovation Needs Assessment, with clear board papers circulated beforehand, and testing with other policy teams) and have recruited an **academic expert panel as part of the project team.** This panel can connect us to broader stakeholders in the UK and internationally.
3. **A portfolio approach.** GGR policy is not one size fits all - some GGR technologies are deployable today at low cost, but it is unlikely that these will go far enough. Other GGR technologies are early stage, and some have a complex set of co benefits and costs, or accounting requirements. A portfolio of policies is therefore required to unlock appropriate investment. A **three-tier policy typology** spans these different modes of intervention and **a policy roadmapping exercise** explores how different GGR policies can be deployed together and how this evolves over time.

Note: In this method we use "policies" to refer to all government measures, e.g. covering market-based incentives and regulatory instruments and institutional frameworks. A policy measure can be implemented on a standalone basis (e.g. a subsidy programme), whereas a policy portfolio refers to measures being implemented together (e.g. a subsidy programme and a compensation package to address the impacts of the subsidy programme).

<u>Methodological challenges</u>

1. **GGR policy needs are diverse. Our three-tier policy typology** is proven to cater to the wide range of needs, and to identify the most important policy areas. The **expert panel** has expertise across the main technical and regulatory barriers faced by GGRs (including the Chair and key members from the recent Royal Society report). Vivid Economics have **world-class policy synthesis expertise**, having recently authored a landmark global CCS policy report for the Oil and Gas Climate Initiative, and supported BEIS, World Bank, IEA and IRENA in similar policy review exercises.
2. **Poor evidence base.** Most GGR methods are at an early stage with uncertain impacts. Our **uncertainty assessment** looks explicitly at the different dimensions of uncertainty and ensures that policy recommendations are robust to this. We look at how policies can evolve over time, including **stage gates**, which define points to increase or decrease policy support for a specific GGR method when additional information becomes available. We will include portfolio thinking and optionality within policy design, to maintain the UKs flexibility in deploying different GGR methods.

3. **Unquantifiable co-costs/benefits.** Biodiversity benefits of forestry, or risks to biotic aquatic systems are hard to assess, value, and design policy to avoid. Our policy assessment tool includes **qualitative criteria** to cover key co-costs and co-benefits, and the refinement phase evaluates co-costs/benefits **across the policy portfolio.**

Method and justification

Task 1: understand the range of GGRs and barriers to their deployment

Objective: build an understanding of the barriers and policy needs.
Deliverable: an evidence reports at the end of January, that includes a literature quality assessment (incl. a standalone excel database), a screened GGR list and a barriers assessment, highlighting key opportunities for where policy is required

1.1 Generate a longlist of GGR technologies
In the context of achieving the Paris Agreement goal of net zero emissions, the GGR field has grown rapidly. Different attempts to summarise this body of work[1] show the proliferation of options and challenge in summarising a complex and rapidly developing space. We begin with a rapid search of academic and grey literature, using major databases (for example Google, Microsoft Academy, Science Direct) and using a literature review search tool (Publish or Perish) for GGR options. Then, our expert panel and BEIS teams will review the list to provide complementary evidence and views. The expert panel have access to the latest research in this area, including unpublished sources, and will be used to help augment and synthesise the relevant options from the literature. The desk research and expert input will be complemented with in-depth interviews (e.g. Carbon Removals in the US; New Zealand forestry sector). These interviews will focus on tapping into policy efforts or research that are being made internationally in the most critical areas.

1.2 Place GGR technologies in groups and prioritise most important barriers
We will create a sensible grouping of GGR options which face similar barriers. Note, each GGR option is likely to face multiple barriers. In preparation for this bid we have catalogued groups of barriers from the literature:

- **Deployment barriers:** In these cases, the GGR option is mature and impacts well understood. The policy needs are to deploy and ensure robust emissions accounting. For example, timber use in construction, soil carbon management in organic agriculture, wetland restoration and afforestation, and regenerative grazing. These projects can be deployed with policies that have a strong track record internationally or already exist.
- **Financial barriers:** These include long payback periods, lack of commercial and operational track record, or other investor risks associated with commercialisation at scale. These barriers could apply to both mature and immature options
- **Barriers to demonstration,** such as lack of test sites or regulatory hurdles to piloting. This applies to less mature options where the impacts are reasonably well understood. Examples are BECCs and DACs. Policy needs are to pilot and demonstrate, financing to scale up and research to better understand impacts.
- **Barriers to innovation,** which applies to immature options, where costs, performance and overall impacts are poorly understood. For example, direct and indirect ocean techniques (e.g. liming or fertilisation). The needs of these options include research.
- **Barriers to accounting:** Options that use biomass in particular face complexities around the verification and guaranteeing of genuine and permanent reductions. These projects require accounting frameworks in order to be deployed sustainably.

These groupings will be disaggregated further, and GGRs mapped to them. In the engagement (see below) the barriers will be prioritised for each GGR.

[1] E.g. Royal Society, 2018; Majumdar and Deutch, 2018 and Mclaren, 2017

Task 1 engagement approach

- **Expert panel workshop** uses our expert panel to prioritise the barriers. The list of GGR and barriers will be circulated to our expert panel. At this workshop two exercises will be conducted: (1) GGR pre-screen, where options that are not deployable at a meaningful scale in the UK, are taken out and (2) Barriers prioritisation where a low/moderate/severe rating is assigned, based on how important the barrier is to GGR uptake.
- **BEIS facilitated meetings/review**: In late October/early November the draft evidence lists will be reviewed by BEIS to solicit further evidence sources
- **Steering group meeting**: In early/mid November, draft evidence lists, GGR options and key barriers will be provided to the steering group in the form of the evidence report. At the meeting, the Steering group will respond to this report, we will solicit further sources, and agree areas of evidence strength and weakness.

Task 2: Identify and describe potential policy options

Objective: Identify and characterise policies that address key barriers.
Deliverable: a mapping of candidate policies and 1-2 page "policy snapshots" of their features.

2.1 Build a three-tier GGR policy typology

Starting with well-established existing policy frameworks, we will build a policy typology that is grounded in the policy needs and barriers assessed in Task 1, so that candidate policies can be matched with policy needs that are relevant to deploying GGR in the UK context.

In preparation for this bid we have reviewed policy typologies, including standard economic classifications (e.g. market-based, regulatory, voluntary) through to detailed taxonomies (e.g. policies categories by the market failure they address, or the barrier they overcome). However, for this project, we require a broad framework that can cover the wide range of policy needs, not just to drive GRR but also to integrate with other policies and covering co-costs and co-benefits. The best framework is therefore a broad framework (such as that used by IRENA/IEA) that spans these needs. The first two-tiers of this framework are:

- **Direct policies** that drive deployment.
  - Push policies, which mandate action through quotas or rules
  - Pull policies, which incentive deployment through the market
  - Financial policies, which are aimed at securing finance or meeting finance needs, such as debt guarantees and insurance products.
- **Enabling policies** that develop GGR technology options and facilitate deployment
  - Research, development and demonstration: such as investigating the risks associated with enhanced weathering, pilots of DACs
  - Infrastructure and supply chain support: such as developing CO2 pipelines and storage for BECCS
  - Supportive governance such as accounting and sustainability frameworks
- **Integrating policies**, that reflect co-benefits and co-costs, maximise synergies or avoid counterproductive policy interactions.
  - Policies to reward co-benefits and public goods
  - Policies to avoid co-costs and unintended consequences, such as competitiveness and leakage policies
  - Economy-wide or strategic policies, which maximise efficiency/effectiveness through a broad scheme across the economy or across many sectors

We will then further subdivide this framework to a third tier, which describes the key features of the policy design (e.g. within RDD&D, pilot schemes versus basic research). This three-tier classification framework will be used to classify GGR policy options.

2.2 Develop candidate policy options

This subtask creates a list of candidate policies mapped to the policy typology. We will populate a table of the policy typology with candidate polices. These are sourced from UK and international GGR case studies, and policies from analogous options, as well as more novel options developed by our experts.

This task begins by drawing on the literature reviewed in task 1, and the experts in the team, to brainstorm a long list of policy options that they understand could be applicable to GGRs. This list will include, but not be limited to, those policies listed below (we have expanded the list that was provided in the ITQ, novel policies have an asterix):

- **Direct policies:** CfDs, building regulations, Post-CAP agriculture subsidies (including options in recently announced agriculture bill); Government procurement policy; Australian ERF and CFI; US tax credits for CCS; New Zealand Afforestation incentives; *a carbon burial obligation on fossil fuel suppliers; *negative emissions bonds; *direct government purchasing of negative emissions
- **Enabling policies:** Innovation policy, The UK Woodland Carbon Code; The UK Peatland code; Emissions reporting; Biomass supply policies; Support for the supply chain for negative emissions technologies; government procurement of CO2 transport and storage infrastructure
- **Integrating policies:** Emissions pricing/taxing; international market mechanisms (e.g. CDM); offsetting; exemptions or compensation for competitiveness impacts; *negative emissions performance standard

To extend this list we will review and assess the evidence on key case studies (domestically and internationally) of policies that have already been implemented to overcome barriers to deployment in analogous areas (e.g. other RDD&D efforts to overcome barriers similar to those of GGR technologies).

Task 2 engagement approach

- **Expert Panel:** To ensure the policy list is comprehensive we will send the policy lists to the expert panel. In particular [redacted] are global leaders in policy design for GGR and will be able to suggest options from other jurisdictions, or more novel ideas that have not yet been implemented.
- **BEIS facilitated meetings:** In November, we will engage with BEIS stakeholder to cross check our list of policies and understand what other options could be available.

Task 3: Strategic assessment of policy option performance

Objective: Conduct a strategic policy assessment of the longlist of policy options.
Deliverable: Interim report in late January, including the results of the policy assessment, a prioritised set of policies, agreed with BEIS.

3.1 Finalise policy assessment framework

This task provides clear scoring criteria for GGR policies, agreed with BEIS stakeholders. Vivid will begin with a tried and tested policy assessment tool which evaluates options against basic economic criteria. We will adapt this to suit the needs of GGR, and add criteria of most relevance to BEIS and wider UK Government objectives. **Core criteria are efficiency, effectiveness, feasibility and relevance.** Experience suggests that if the policy performs well on these criteria, then it is best placed to address the barriers identified in task 1. Under

each of these we will develop sub-criteria as they relate to GGR. An example of how we did this for CCS policy in a recent project for the Oil and Gas Climate Initiative is show below.

Key features of the framework are:

- **Balances a systematic approach with adaptability:** The benefit of this framework is its clarity and systematic nature, while being simple and easy to adapt (in essence it consists of a set of yes/no questions – the majority of the effort is in developing and agreeing the questions to begin with, then the scoring is a comparatively easier task). The framework can be applied to different types of policies and accounting frameworks – not all sub-criterion needs to be scored for every policy (e.g. accounting frameworks may leave the £/t criterion blank).
- **Easy to prioritise policies, without having to conduct a full policy impact assessment:** The goal is to prioritise policies, however it is not possible to conduct a full impact assessment for all polices in this project. The framework we propose captures the key information on each policy against agreed criterion and prioritises on a clear and transparent basis.
- **Surfaces the salient and strategic policy features:** The framework can be adapted to the needs of the project, and in this case we propose adding a fourth "strategic fit" criterion (more detail below). This will cover the need for policies to leverage existing schemes, addressing near-term priorities, span multiple technologies or technologies at scale, and maximise co-benefits.
- **Transparent on level of robustness:** against each criterion, the robustness of this measure is reported (i.e. the certainty level of the assessment)
- **Provides a clear and concise report on each policy:** Against each sub-criterion, notes are recorded that explain and provide evidence for the result that has been given. These notes themselves provide a systematic report of the policy profile (e.g. it will include evidence on co-benefits and co-costs under the "external efficiency" sub-criterion)

In the interim report, we will assemble key insights from the assessment, include the summary against each sub-criterion, and also report a set of lead indicators for each policy, such as cost and scale of emissions reductions. These lead indicators are not scored, but reflect information categories that are needed to easily compare policies.

Example of the policy assessment framework applied to CCS technologies

The framework consists of three criterion, and sub criterion. The sub-criterion is phrased as binary questions i.e. they are either met or not met for each policy. Policy options are then scored at the criterion level, on a "Harvey Ball" scale (i.e. 0, 0.25, 0.5, 0.75 and 1), as follows:

- 0 = no sub-criterion are met
- 0.25 = 1 sub-criterion are met
- 0.5 = some sub-criterion are met
- 0.75 = all but 1 sub-criterion are met
- 1 = all sub-criterion are met

A minimum threshold is then established at, say, 0.5 Policies performing below this level are rejected.

Criterion 1: Effectiveness. A policy is effective if it is likely to deliver a set of outputs, such as a fleet of operating plants built to time and budget, or a quantity of sequestered CO_2. The sub-criteria are:

- **Incentives:** high confidence that the policy will provide sufficient revenue or other benefits to projects to make them attractive to investors;
- **Risks:** policy can balance risks between government and business, each actor can bear the risks implied by this policy.

- **Past experience:** a track record of a policy having been effective before; a simple and familiar contracting structure that businesses and investors have encountered previously.

Criterion 2: Efficiency. Policy is efficient if it minimises cost per tonne of CO_2 stored and, if pore space is limited, makes efficient use of that resource. Sub-criteria:

- **Abatement cost:** is the £/t below the government's policy trajectory
- **Competition:** policy creates opportunities for competition between projects;
- **Cost reduction opportunities:** policy drives cost reduction through innovation or economies of scale.
- **Distributive impacts:** does the policy have competitiveness implications for businesses or affordability implications for households that are difficult to address
- **External efficiency:** does the policy have environmental externalities or present risks that are unknown or difficult to address

Criterion 3: Feasibility. Policy is feasible if it receives widespread political support, which means that it must be fair and trusted to deliver. Sub-criteria:

- **Fair:** whether the policy effects a progressive or regressive distribution of its burden on consumers, and the relative burden placed upon taxpayers, businesses and consumers;
- **Credible:** whether there exists a track record of experience in the policy instruments and trust in the delivery institutions;
- **Acceptable:** whether government and business find the allocation of risks between them acceptable.

As described below, this approach will be adapted to suitable GGR and new a new fourth criterion added for "strategic fit".

In the proposed "strategic fit" criterion, the policy is assessed on whether it addresses near term priority areas and unlocks wider benefits. Proposed sub-criterion are:

- **Criticality:** is the policy essential to any policy portfolio (e.g. accounting frameworks)
- **Complementarity:** does the policy meet near term government policies and priorities, such as create business and export opportunities
- **Compatibility:** does the policy use skillsets that already exist in the UK, and leverage an existing supply chain, and can it be fit with existing policies
- **Flexibility:** can the policy be adapted to meet changing needs of the option as it matures (stage-gating, described more in Task 5)
- **Coverage and scale:** can the policy support multiple options or support roll out at scale

Once the criterion, sub-criterion, scoring framework and lead indicators are agreed, it is relatively simple to assess the policies in a systematic way.

3.2 Assess and prioritise policies

This task assesses the policies against the criteria, reports the evidence for these scores and prioritises based on these scores. This prioritisation is simple: policies are tagged as "priority policies" if they perform higher than 0.5 on all four criteria; policies are rejected if they score 0 on any criterion.

The assessment is relatively systematic, to ensure an unbiased view of policies. However, we recognise the need to balance a systematic approach with the need to feed in pragmatic information and expert opinion where available. Before the framework is rolled out, it is important to pilot the assessment against two different policies, and then reflect on whether the results concur with intuition and common sense. If not, the criterion can be adjusted to ensure that results reflect expert consensus.

Following this pilot and any final adjustments, the assessment can be rolled out across all policies. A preliminary assessment is done by the project team, and then this is validated in workshops and meetings (see below engagement plan).

3.3 Assemble preliminary policy portfolios

The project team will conduct an initial policy roadmapping exercise, to provide a basis for the refinement phase 4. These options will take the priority policies, and consider them working in tandem to roll out GGR at a scale compatible with the UK's national and international climate commitments. The objective of this roadmapping exercise is to consider how the policies fit together as a portfolio, and the sequencing of deployment, major dependencies and constraints. The output of this is alternative policy sets for the short term (to 2023, end of the third carbon budget) medium term (to 2032, end of the fifth carbon budget and long term (2050). We look how policies can include stage gates, which define points to increase or decrease policy support for a specific GGR method when additional information becomes available. Furthermore, we include portfolio thinking and optionality within policy design, to maintain the UKs flexibility in deploying different GGR methods.

Engagement during task 3

- **Expert workshop** uses the expert panel to review the project teams' initial policy assessment. The scoring framework will be provided to the expert panel prior to the workshop along with list of policies. The exercise will be to step through each of the criterion and assign a rating. BEIS representatives can also attend this scoring session to provide input at this early stage.
- **BEIS facilitated meetings** during November provide some preliminary guidance on the criteria and other features that are important in the policy assessment. Following the pilot of the framework, we will meet with BEIS to discuss whether the criterion need changing.
- **Steering group meeting.** A steering group meeting to present the results of the initial policy assessment, and deliver the interim report. The objective of this meeting will be to ensure the policy assessment has met the needs of the steering group and to demonstrate how wider BEIS concerns have been considered.

Task 4: Refine policy option assessment

Objective: Refine the policy assessment and identify the key policy options which could support a portfolio of GGR methods.
Deliverable: Finalised policy assessment, to feed into the reporting task 5.

Task 4 moves beyond the policy assessment through four **refinement phase considerations** which are explored through a set of engagement activities:

- **Maximising strategic value.** The policy roadmaps will be scrutinised by the expert panel and BEIS with a view to exploring specific options for linking schemes – see below "final workshop".
- **Co-benefits/costs.** Task 3 covers co-benefits and costs, but the refinement phase will look at what policy would maximise benefits and minimise risks across the portfolio (e.g. policy portfolios that lead to better soils and/or avoid risks to forests or ocean environments would be preferable).
- **Implementation challenges.** Task 3 evaluates policies on a static basis, task 4 investigates lead times, dependencies and constraints of policy development and implementation. The purpose is to explore how practical implementation may change to modify the preferred set of policies (i.e. a previously preferred policy may be exceedingly difficult to implement).

- **Uncertainty assessment.** Ensuring the recommendations are robust to changed information across the different dimensions of uncertainty e.g. rapid changes in technology costs, new information on risks, changes in international policy, or a changed target for reducing emissions in the UK.

A pre-read will be circulated prior to each engagement activity, addressing the refinement phase considerations. Engagement activities are:

- **BEIS facilitated meetings:** the ITQ lists a set of policy teams (e.g. EU ETS, Carbon budgets, CCUS etc) that will be covered in this phase. Prior to these meetings, drafts of the 2-page bespoke reports (see task 5 below) will be provided to each of the relevant teams, setting out how the preferred policies interact with the interests of their policy team.
- **Combined expert/BEIS workshop:** This includes BEIS and expert panel delegates. The main activities of the workshop will include a policy roadmapping exercise (building on the project teams' roadmaps in task 4) and a scenarios developments exercise, where the group explores how the policies would respond in the face of risks and challenges, or when things change.
- **Final steering group meeting.** This explores the considerations above, and signs off on the final preferred policies.

Task 5: Summarise lead policy options

Objective: Final reporting on project, and briefings for relevant BEIS teams.
Deliverables:

- **Final report** with scope, method, results and a summary of findings
- **Shorter reports** (e.g. 2-page) for each policy team relevant to GGR incentivisation.
- **Summary presentation**, suitable for Government and those not familiar with the work.

Following task 4, a workshop report will be prepared and circulated at end of February, with recommendations on how to augment the initial policy assessment to take account of the full range of considerations. This will provide a final opportunity for the steering group to feed in before final reporting begins. The final set of reports will then be developed throughout March 2019, with drafts in mid-March and a final at end-march. By this stage, much of the material will have been reviewed by the teams, and new findings should be avoided. The objective of the final review phase is messaging and presentation rather than substantial changes.

Optional: Dissemination outside of Government.
As set out above, there is a detailed plan of engagement for the dissemination of the materials across BEIS. Outside of BEIS, Vivid Economics propose a dissemination event that takes this information beyond government in two roundtables. The first policy roundtable includes delegates from the NGO and academic community, the second business roundtable could include key members from the supply chain of forestry, agriculture, CCS and other sectors affected by a GGR programme. The purpose of these roundtables could be to consult on the implications of potential policy changes for key UK stakeholders.

Assessment of policy options to incentivise GGR technologies
PROJ1.3 Risk Management

Vivid follows rigorous and documented risk management and quality assurance procedures in all projects and adapts these to specific project needs. All staff members are inducted into the procedures upon joining the firm and the procedures are periodically updated to incorporate learning from project evaluations.
Vivid's project management project management aspects that ensure quality of service and risk mitigation include

- deliverable-based work planning and resource management to ensure timely work
- clear roles and responsibilities for outputs and their quality
- procedures for ensuring team continuity
- regular team discussions and internal review of output quality
- regular progress reporting and review with client of satisfaction with quality
- standard risk management procedures, including risk log and mitigation measures

We have worked with BEIS' preferred risk and issues log templates in past projects. We have found this an effective way to flag key risks early, and formulate mitigation measures in concert with BEIS. Hence, we propose to follow the BEIS process for this project as well.
The following sets out key risks we anticipate for this project and how we propose to mitigate these risks. Subsequently, we lay out our quality assurance process. In our experience, this process allows us to ensure high quality delivery, and effectively manage key risks and issues as they emerge.

Risk management plan
As described in the 'Staff to Deliver' document, a number risks to achieving the project objectives arise from potential staff absences. Mitigation measures for these risks are discussed in the aforementioned document. The following focusses on risks not associated with staffing. They key risks identified are listed in the table below, along with relevant mitigation measures (a further set of risks, with lower importance, have been identified and will be detailed in full at the kick off meeting).

Key risk	Impact	Mitigation	Impact after mitigation
Limited evidence available on some GGR options	High: Policy assessment based on non-robust evidence base	Heavy use of expert panel, potentially reaching out to wider research community through expert panel's network	Low
Expectations on depth/breadth of policy assessment differ between Vivid and BEIS	High: Providing an appropriate policy assessment is critical to supply BEIS with the evidence it requires	Frequent engagement with policy teams. Frequent sharing of early drafts to ensure work is meeting expectations	Low
Difficulty engaging with BEIS and other experts in a timely way	High: Engagement is at the heart of this assessment, and required to validate outputs	Clear engagement plan, ensure key meetings happen allowing for contingency if senior representatives cancel. Utilise facilitators in BEIS, flexible to meet by phone / in person	Low

Key messages are not clearly distilled given broad evidence base and differing opinions among experts	High: Given broad scope, extracting key messages and highlighting key evidence gaps is a key output	The Vivid team is highly experienced in this field. Draft outputs will go through frequent reviews to sharpen messages	Low

Quality Assurance roles and plan

This section outlines the quality management systems to be used for this project to ensure high quality and timely outputs. Vivid follows rigorous and documented procedures in all projects, and adapts these to specific project needs. Compliance with these procedures is monitored on every project. Staff performance in implementing these procedures is incorporated into individual performance reviews, and performance across the company is assessed every six months as part of our Balanced Score Card, to which all employees contribute. Company-level results are discussed periodically at team meetings and appropriate actions are taken to improve performance. Vivid and our subcontractors on this project will undertake all work in compliance with the Code of Practice for Research and BEIS guidance on Quality Assurance. The proposal sections on project management and approach demonstrate our compliance with the specific requirements of the code.

Quality monitoring spans five roles in this project:

1. **Project Director** ([redacted]) serves as the ultimate quality manager, overseeing the implementation of all quality management elements, and serving as the final quality control.
2. **Quality Assurance Auditor** [redacted] is tasked with ensuring QA procedures are adhered to throughout the project, ensures quality assurance of the data collection and analysis, ensuring peer review of the quality of project deliverables. He will review the project in full, including model templates, datasets, documentation and the QA Log against a range of criteria. As per QA standards, [redacted] will not be directly involved in the research.
3. **Project Manager** ([redacted]) will implement on a day-to-day basis the quality management elements.
4. **Core Team** will integrate quality management into all project work streams under the guidance of Vivid's standard procedures and those bespoke to this process, with guidance from the Project Manager and Director. Vivid Economics carefully selects the project team to ensure that the team has the appropriate skill set and there is sufficient senior oversight to deliver high quality outputs.
5. **Specialist and Expert Panel** ([redacted]) – provide a secondary layer of quality management through peer review of deliverables.

The elements of the QA plan are:

1. **Ensuring timeliness and efficiency of service delivery:** To ensure quality of delivery, the Project Manager will keep track of budget and timelines through Vivid's dedicated tools and processes, including dedicated time and budget tracking software, resource planning software integrated with the project plan, SharePoint files structured against deliverables, and regular team meetings. We propose weekly meetings between the Project Manager and BEIS, updating on progress and timelines. The Project Manager will also report twice a week to the Project Director on progress and timelines. Ahead of key deliverables, the Project Manager will confirm with BEIS the precise form of these, to ensure that the outputs are delivered as expected. The Project Director will ensure that any disruptions likely to affect project delivery are caught early, and do not translate into delays in project milestones, including the approval of additional project resource if necessary.

2. **Management of sub-contractors.** We do not have extensive sub-contracting in this work, however we use an expert panel. We have existing relationships with all the sub-contractors and have worked with them before, with reliable results. We have ensured that their time is available during the project and we will plan their 3 days of time each at an early stage – e.g. workshop dates will be confirmed at a relatively early stage in the project. To ensure their input is high quality, we will provide pre-reads before workshops, and solicit feedback ahead of the workshop. The final written deliverables do not rely on these experts to a high degree.
3. **Risk management, including continuity of service delivery:** Above the key risks are detailed, and a more fulsome list will be provided at the kick off meeting. The Project Manager is responsible for closely and continuously monitoring and reporting on these risks. The Project Director will regularly monitor risks, and work closely with the Project Manager to respond to risks if and as they arise. Staff availability has been confirmed but any unexpected unavailability will be identified, reported across the team, and resolved by bringing on suitable replacements from Vivid's experienced and qualified pool of resources, with sign off from the client. Any adverse circumstances that arise will be communicated directly to the team and client, as well as any mitigation measures that will be undertaken in response.
4. **Quality assurance and validation:** The Project Director will conduct first stage of quality review of overall analytic approach and specific methods, and is responsible for ensuring the Project Manager and Core Team are aware of the quality standards expected. The Core Team in turn bears an obligation to raise any quality issues known to them to the Project Manager and Project Director, as necessary during the course of the work. The Project Director conducts a second stage of quality review to ensure a high-quality standard and validity of approach as the work is being delivered through the detailed review of any deliverables provided to the client. The Quality Assurance Auditor provides a final line of quality assurance on approach and the resulting content by providing input to proposed approach and to all interim content, and by formally reviewing all *final* content of the project. These reviews are built into the detailed project team work plan so that they are provided on a timely basis, with adequate time for necessary quality improvements.
5. **Audit procedure for quantitative work:** All quantitative datasets or models are subject to independent auditing by a technically competent team member who is independent from the project, and whose audit is guided by a member of the expert panel. When quantitative outputs have been produced, and prior to final submission to the client, the Project Director will ensure that this audit procedure takes place. The audit procedure for the dataset envisioned in this project will consist both in querying the methods used in data collection, and potential issues with data quality and consistency. It will also assure that a full log of assumptions and sources has been made.
6. **Language proofing and editing:** The Project Director has ultimate responsibility for the language and design of major outputs, with the Project Manager acting as first level quality control, and the Expert Advisors providing external input on the clarity and accuracy of language. The Project Director and Manager will personally review all materials before they are shared with the client. Vivid will also deploy professional proof-reading and copyediting of deliverables deemed necessary by the client.
7. **Complaint management and client satisfaction:** The Project Director will serve as the client's first point of contact in case of a complaint regarding the implementation of this project. Vivid Economics welcomes feedback and performance evaluation both during the project and upon its completion. We will implement improvements wherever they are required, and carry out post-project debriefs and performance analysis. The Project Director will be responsible for ensuring client satisfaction. Vivid achieves a high standard in client relationship management, through processes such as planning of calls and meetings in advance, with agendas, notes and action lists; debriefs after meetings and project stages; a bi-weekly update phone call with the client; maintaining an issues log; tracking the closure of all comments and issues; transparency in stakeholders liaison; and early layout of the structure of any final deliverables for early steer from the client.

Assessment of policy options to incentivise GGR technologies
PROJ1.4 Staff to Deliver

To ensure the successful delivery of this project, we have recruited a world class a project team which brings:

- **Unparalleled expertise in strategic policy assessment.** Vivid Economics are trusted by the IEA, IRENA, OCGI, World Bank and governments around the world to assess and prioritise policies across the economy. Clients value our clear, detailed and consultative approach. We have specific experience in policy development around net zero strategies and the use of GGR techniques, having generated the evidence base on potential impacts of net zero emissions trajectories, which underpins New Zealand's forthcoming Zero Carbon Act.
- **World leading GGR expertise, including the Chair and key authors of the recent Royal Society report.** We have assembled a combination of experts from centres of excellence on GGRs Oxford University, Imperial College, the University of Aberdeen and the Energy Systems Catapult. The team includes [redacted] and [redacted], key contributors of the recently published Royal Society report[1] on GGR. Vivid Economics are uniquely qualified in this area, having conducted a range of projects on Net Zero in the UK and internationally (for example in New Zealand where we are the primary advisor on the recent Net Zero legislation) and are currently undertaking a scenario work for meeting net-zero emissions in 2050 in the UK.
- **Significant experience engaging with BEIS, government and non-government stakeholders.** We are tried and tested providers of projects that involve drawing in expertise from across BEIS, Government stakeholders and non-governmental stakeholders. Vivid Economics and the Energy Systems Catapult ([redacted]) will bring this expertise of effective engagement and convening power to the project.

The project will be led by Vivid Economics, with expert input from a panel of leading experts. The following provides an overview of Vivid, before describing the project team in more detail.

Vivid company overview

Vivid Economics is a leading strategic economics consultancy with global reach. We strive to create lasting value for our clients, both in government and the private sector, and society at large. We are a premier consultant in the policy-commerce interface and resource- and environment-intensive sectors, where we advise on the most critical and complex policy and commercial questions facing clients around the world. The success we bring to our clients reflects a strong partnership culture, solid foundation of skills and analytical assets, and close cooperation with a large network of contacts across key organisations. From our beginnings in 2006, we have become well recognised and trusted in our field and known for our uncompromising quality. In all our work, we put economics to good use by:

- addressing the public interest to enhance both our clients' interests and the public good;
- supporting important decisions and carrying the argument to implement them.

Energy, climate change and natural resources are core areas of work:

- The economics of climate change has taken centre-stage for energy-intensive industries and governments across the world. It is a huge international challenge. We are established leaders in thinking in this field, levering our expertise on competitiveness, strategy, infrastructure, resources and innovative policy.
- We are a top consultancy provider on policy design at international and national level, commercial strategy and planning, mitigation of emissions, adaptation to climate change, investment, infrastructure, innovation and economic growth, with a thorough understanding of related financial and scientific issues. Our frameworks of analysis offer

[1] Available here: https://royalsociety.org/topics-policy/projects/greenhouse-gas-removal/

insight on the effects of policy on prices, market shares, firm profits, emission and abatement incentives, network regulation and growth, that are not available elsewhere.
- Our natural resource practise has extensive expertise in the sustainable management of natural resources including the development of business cases for ecosystem services and assessment of social and environmental impacts in forestry, water and other sectors.

Core team expertise

The key team members from Vivid are described below. The work will be supported by 2-3 further Vivid analysts during the research-intensive stages of the work.

- [redacted] is a Professor of Environmental Economics at the Smith School, University of Oxford, and an associate director at Vivid Economics. He is an expert in energy, market economics, commercial strategy, and climate policy. He has almost two decade's experience working on environmental and climate change issues, with particular interests in the implementation of emissions trading, the economics of cost-benefit analysis of energy system transitions, and the economics of apparently irrational individual behaviour (for example, in relation to energy demand). [redacted] has deep knowledge of policy design and is a trusted advisor to the UK on GGR and broader topics. He was recently a co-author on the Royal Society's review of GGR. He is also a member of the Economics Advisory Group, along with [redacted] to the UK Secretary of State for Energy & Climate Change. He served for almost a decade as a member of the Academic Panel, in the UK Department of Environment, Food and Rural Affairs and the Department of Energy and Climate Change. [redacted] has advised governments, including China, India, UK, and Australia, as well as international institutions such as the OECD and UN organisations on energy, resources, and environmental policy.
- [redacted] is an expert in the fields of energy and industrial system transitions; infrastructure design and cost-benefit assessment at system and project level. He has previously overseen significant programmes (including the Technology Innovation Needs Assessments) to target innovation funding in his roles at the Carbon Trust, where he was head of innovation strategy, the Global Green Growth Institute and McKinsey. He is a thought leader in low-carbon policies and recently with BEIS, [redacted] has led the development of a new innovation prioritisation programme, which builds on his previous work in this area at the Carbon Trust. [redacted] has advised businesses on low carbon, net zero and net negative emissions technologies pathways, synthesising the results from multiple modelling frameworks and identifying the plausibility of different policy mixes. In particular, [redacted] has advised on the viability of GGR technologies such as afforestation and BECCs in Europe, Latin and North America. Prior to Vivid, [redacted] served as Regional Director for the Global Green Growth Institute, where he oversaw programs in Latin America, Africa and India supporting public policy and private sector investment decisions in the energy, transport, and industrial sectors. He has also led innovation strategy at the Carbon Trust, guiding government programmes aimed at developing and demonstrating new low-carbon energy technologies in preparation for large-scale deployment. Prior to this, [redacted] was an Engagement Manager at McKinsey & Co. where he worked with private clients in energy-intensive sectors, and with public clients on policies to support low-carbon investment in the energy and energy-intensive sectors. [redacted] has a Ph.D. in Economics from the University of California, Berkeley, and a B.A. from Yale University.
- [redacted], has 15 years' experience leading policy and innovation advice to governments, business and NGOs, across the energy sector and in GGR policy. Recently, with BEIS, he has delivered an assessment of global low-carbon heat policies, and has designed an innovation policy prioritisation assessment, that is now being deployed across Government. Beyond BEIS, Alex also leads policy assessment work for the National Infrastructure Commission, in low carbon financing and transport. Outside of Government [redacted] works to advice the oil and gas sector on low-carbon policies, and

recently built a policy assessment tool for global CCS policies for the Oil and Gas Climate Initiative, a club of oil and gas majors, drawing on Vivid Economics' earlier work for the IEA in this area. In GGRs, [redacted] leads Vivid's work in New Zealand and Australia, looking at the role and potential of negative emissions technologies, and is currently engaged by WWF to evaluate the role of GGR's in the UK. Prior to working at Vivid, [redacted] liaised closely with BEIS in his role as Head of the Power Sector at the CCC, where he worked for 7 years, playing an instrumental role in the 4th and 5th carbon budget advice, annual progress reports and periodic policy assessment.

- [redacted] is an expert in innovation, green competitiveness, and energy system analysis. Combining a physics and economics background, he works on the interface of both, synthesising technoeconomic insights to map the impacts of innovation and climate policy on energy markets and systems. [redacted] has built up significant expertise in low carbon technologies, including battery storage, EVs and CCS, but has also worked on higher level policy questions around the energy transition. He is currently managing a project which maps the feasible roll out of carbon sinks in the UK, the understand the feasible timeline towards net-zero in the UK. [redacted] has a MSc. in Economics from LSE, and a BSc in Applied Physics from TU Delft.

Expert Panel

The Vivid team will be complemented by an expert panel. The expert panel is composed of a number of GGR options experts, including key contributors to the recent Royal Society report on greenhouse gas removal. We complement this deep scientific expertise with several broader policy and/or emissions accounting experts. Across the selected experts, the GGR technologies with most deployment potential in the UK are represented.

- [redacted], **Chair of the 2018 Royal Society GGR review, is a professor of earth sciences at the University of Oxford and an expert in ocean based GGR in particular.** [redacted] is a geochemist who has greatly improved our knowledge about changes in the Earth's climate over its history. His findings have been fundamental to building predictions of climate change initiated by human industrial and agricultural activities. [redacted] most recent research includes collaboration with ocean modellers on the feasibility of ocean geoengineering schemes as a means of storing carbon dioxide. [redacted] accolades include the European Geosciences Union's outstanding young scientist award, and a Philip Leverhulme Prize. He is a member of the Scientific Committee on Oceanic Research's planning group for GEOTRACES, an international research programme for the study of biogeochemical cycles and the distribution of trace elements in the marine environment.
- [redacted], **is the Professor of Soils and Global Change at the Institute of Biological and Environmental Sciences at the University of Aberdeen (Scotland, UK), and is Science Director of the Scottish Climate Change Centre of Expertise (ClimateXChange), with a focus on land based GGR options.** He is a key contributor to the recent Royal Society report on Greenhouse Gas Removal. Since 1996, he has served as Convening Lead Author, Lead Author and Author for the Intergovernmental Panel on Climate Change (IPCC), which was awarded the Nobel Peace Prize in 2007. He is a global ecosystem modeller with interests in soils, agriculture, food security, bioenergy, greenhouse gases, climate change, greenhouse gas removal technologies, and climate change impacts and mitigation. He was awarded a Royal Society Wolfson Research Merit Award (2008-2013), the John S. Waid Award for the best Review in Soil Biology & Biochemistry (2012), the British Ecological Society Marsh Award for Climate Change Research (2014), the European Geosciences Union Philippe Duchaufour Medal (2017) and was made an Honorary Member of British Soil Science Society (2017). He is a Fellow of the Royal Society of Biology, a Fellow of the Institute of Soil Scientists, a Fellow of the Royal Society of Edinburgh, a Foreign Fellow of the Indian

National Science Academy, a Fellow of the European Academy of Sciences and a Fellow of the Royal Society (London).

- [redacted] **at Vivid Economics and policy design expert**, will bring extensive policy design experience, with a view to enable financing and deployment of GGR options [redacted] is an economist of over 22 years' professional practice. His principal interest is resources and infrastructure, and his time is divided between questions of investment, finance, competition and strategy for large private industrials and issues of policy development, evaluation and service delivery for government. He brings substantial experience from across industry policy, natural resources, water and energy (power, oil and gas), earth observation, infrastructure and heavy industry coupled with knowledge of the financial investment community. He has ministerial advisory committee experience
- [redacted] **is a Senior Research Fellow at the Grantham Institute, Imperial College London, and provides input on the industrial GGR options**. Through his link to Imperial College, [redacted] will be able to connect the project team to emerging research particularly on the industrial GGR technologies. His research focuses on low-carbon pathways, specifically the role of technology and policy in achieving stringent climate change mitigation targets. This has included assessments of the level of negative emissions technologies such as bioenergy with carbon capture and storage, as well as a range of other low-carbon technologies. Ajay has a strong policy background, having been the Team Leader for EU and International Climate Change Economics at the UK Government's Department for Energy and Climate Change in 2009, and having been part of the original team that drafted the UK Climate Change Bill in 2007. He holds Masters degrees in Chemical Engineering and Economics, and a PhD in Energy Economics.
- [redacted] **Head of Markets, Policy & Regulation, Energy Systems Catapult.** [redacted] has worked on a wide range of whole systems emissions accounting projects in the UK, leveraging the whole systems philosophy of the Catapult. He is an experienced policy economist and regulatory specialist with over 25 years' experience of economic and policy analysis in a variety of competitive and regulated markets. [redacted] leads the ESC's work on market, policy and regulatory issues, identifying and communicating policy and regulatory insights emerging from the Catapult's innovative portfolio. [redacted] has particular expertise in carbon capture, utilisation and storage, bioenergy and carbon accounting, having authored a number of policy reports and analyses for the Energy Technologies Institute, advised the CCC, co-convened the CCS Commercial Development Group 2013–16, and been a member of the recent BEIS CCUS Cost Challenge Task Force. Before his time at the ESC and ETI, George was a member of the Senior Civil Service as a senior director of Ofwat, responsible for network regulation, efficiency assessment, regulatory incentives and charging and metering issues.

<u>Project plan and ability to deliver for the duration of the project</u>

The project is divided into 5 key tasks (see methodology).

1. Understand GGR and barriers
2. Identify potential policy options
3. Strategic assessment of policy option performance
4. Refine policy option assessment
5. Summarise lead options

Below we have elaborated the timeline, including these tasks and showing additional engagement and events. This timeline also shows where and how the experts above are involved in the process, through three expert workshops (evidence and barriers, policy assessment, and policy refinement). We will also use the networks with which experts are associated to ensure all evidence sources and collected, and all case studies are considered. We also detail how we propose to use the Steering Group, to sign off on key phases of the work (similar to the process used in other BEIS projects.

Date	Milestone	Deliverable (D) or engagement (E)
1st October	1	Kick-off meeting (E)
8th November (w/c)	2, 3	End task 1, draft report on evidence and policy options (D) BEIS meetings: evidence gathering (E)
15th November (w/c)	4, 5	Steering Group meeting 1: evidence gathering (E) Expert panel workshop 1: evidence and barriers prioritisation (E)
26th November (w/c)	6	End of task 2: Policy list and snapshots (D)
1st December (w/c)	7	BEIS meetings: assessment criteria (E)
14th January	8	Expert panel workshop 2: policy assessment (E)
28th January	9, 10	End of Task 3: Interim report Steering Group meeting 2: policy assessment (E)
4th and 11th February (w/c)	11	BEIS meetings: policy refinement (E)
25th February (w/c)	12,13	Combined expert/BEIS workshop on policy refinement (E) Steering group meeting 3 to sign off policy refinement
15th March (w/c)	14, 15	Deliver draft final report and 2 page policy ream reports (D) Presentation of final report at BEIS (E)
31st March	16	Deliver final report (D)

To ensure our ability to deliver the project to the above timelines, we have mapped key dependencies and identified solutions to potential bottlenecks. The table below sets out the contribution of key team members, key dependencies are identified.

Project team	Project role	Key dependencies
[redacted]	**Project director**, overall delivery lead on this project, quality manager, and ultimate level of escalation for issues and risks.	• Task 1-5: Oversight of all tasks • Task 3-4: Particularly involved in the policy option assessment. His wealth of policy experience will be valued when determining lead policy options (task 4).
[redacted]	**Quality assurance**, will provide assurance on policy options, and implement the QA plan (see risks section).	• Task 1-5: provide independent challenge and QA all products
[redacted]	**Project manager**, will lead the coordination of expert input on this work, and ensure project risks are regularly reviewed and communicated. He will oversee methodology development and implementation for this work.	• Task 1-5: Day to day management of tasks. • Task 3-4: Particularly involved in the policy option assessment using previous CCC policy experience. • Task 5: Key to final drafting of outputs given continuous in-depth involvement throughout project.
[redacted]	**Lead analyst**, will be the primary analyst conducting policy appraisal and assembling the initial long list of	• Tasks 1-2: Oversee other analysts when gathering evidence on GGRs, barriers to their deployment, and

	GGRs, their potential, and barriers associated to deployment. He will coordinate the work of other analysts and report to [redacted]	policy options to incentivise deployment. • Task 5: Key to final drafting of outputs given continuous in-depth involvement throughout project.
Expert panel (each expert contributes 3 days of time)		
[redacted]	**Soil and land based GGR expert,** will provide expert input and sense check on technical and policy details	• Tasks 1-2: GGR options experts will be key to guide research and ensure a robust evidence base is collated efficiently. Their contribution to the recent Royal Society work will enable us to collate the latest evidence, and target research at knowledge gaps • Task 3: The technical experts will be involved in the policy assessment • Task 4: Experts will be involved the policy refinement phase and wider considerations (see methodology)
[redacted]	**Industrial GGR expert, will provide** expert input and sense check on technical and policy details	
[redacted]	**Ocean based GGR expert,** will provide expert input and sense check on technical and policy details	
[redacted]	**Whole systems emissions accounting, governance and credibility** will provide expert input on interaction of GGR policy on wider climate action	
[redacted]	**Policy mechanism expert,** will provide expert input and internal quality assurance	

To maintain our ability to deliver the project throughout its lifetime, several key risks have been identified and mitigated. In preparation for this proposal, we ensures that the days for the experts and core team members were available across the projects and along the timelines suggested above.

- Risk: *Absences of key Vivid staff* may be disruptive to progress, however Vivid has the capacity to internally cover any unanticipated long-term absences. Mitigation measures include
  - [redacted] will be able to cover each other's absences should the need arise. For long term absences of senior Vivid management on the project, [redacted] (also a Director at Vivid) will take a more operational role on the project.
  - A prolonged absence from [redacted] can be covered by other experienced analysts, operating within the same practise group as [redacted], who have ample experience in climate policy analysis.

Other risks can be identified across initial evidence gathering (task 1-2), policy appraisal (task 3-4), and final reporting (task 5).

During tasks 1-2, the key risks and mitigation measures are:

- Risk: *Absences of GGR option experts.* This risk can be mitigated by
  - Flexibly using the relatively small number of expert days required for sense checks and planning expert time well in advance
  - If necessary, devoting more Vivid resource to primary research

- Reaching out to other UK based experts[2] involved with the Research Council research for periodic sense checks should expert absence be long term.

During tasks 3-4, the key risks and mitigation measures are

- Risk: *Absence or difficulty scheduling sufficient engagement between Vivid staff, policy experts, and BEIS teams given December holidays.* This can be mitigated by
  - Scheduling in engagement with BEIS teams early to ensure availability
  - Allowing for potential "spillovers" into January where necessary
- Risk: *Long term absence of key polices experts.* This risk is mitigated by the extensive policy experience across the team which implies some redundancy in the team.

During task 5, the key risk and mitigation measures are

- Risk: *Absence of key team members during tight reporting turn arounds.* This can be mitigated by
  - Ensuring interim deliverables are of a high quality, reducing reporting workload later in the project
  - Resourcing wider Vivid resource, many of whom have extensive experience producing reports for HMG including policy assessments, to assist with drafting.

Wider risks, not directly related to maintaining the capacity to deliver the project, are discussed separately in the risk management section.

Project expertise

The project team has extensive experience in three key areas relevant to this work

1. **GGR experience** including technical, barrier, and policy analysis, across key GGR options. This includes Vivid's work on forestry and BECCS/CCS which scope out various GGR options. The project team includes world leading technical experts across the spectrum of GGR options, a guide to their more technical, past projects is also included in the provided CVs.
2. **Broader policy assessment experience** across innovation, environment, climate and renewables policies. Vivid has extensive policy assessment experience with the UK government, the EC, IEA, World Bank and within multinational energy businesses.
3. **Government engagement during the various stages of policy development**. Vivid worked with BEIS on a variety of areas including heat and innovation policy. More broadly, Vivid has deep expertise engaging with governments on how GGR support fits into broader climate goals, particularly in New Zealand.

The below presents a selection of past projects that Vivid has led.

Projects focussing on GGR options

Achieving net-zero GHG emissions in the UK, WWF (2018). The project creates a credible scenario for when the UK can feasibly reach net zero emissions. The work includes analysing feasible emission reductions beyond CCC scenarios, but focusses on understanding the potential for deployment of GGR options. The project includes a literature review, and interviews with key experts to establish credible deployment pathways (in the UK) for GGR options. The final analysis will also consider policies necessary to achieve net zero emissions.

Incentivising CCS in industry, IEA (2013). Further to an earlier successful project reviewing incentive policies for Carbon Capture and Storage (CCS), the IEA commissioned Vivid Economics to provide a more detailed review of incentives and policies to encourage CCS in industry. The work reviewed the differential risks of leakage risk in different sectors where CCS might be deployed as well as opportunities for international cooperation to overcome these challenges. Through augmenting an earlier developed framework, we identified a suite

[2] Listed here: https://nerc.ukri.org/press/releases/2017/09-greenhousegas/

of appropriate policies to support CCS deployment in different sectors depending on the characteristics of that sector and the maturity of the technology.

Economic appraisal of policy options for promoting CCS and BECCS, IEA (2011). The report analyses the different market failures that restrict development of CCS and the strength and weaknesses of different policies to overcome these market failures. It pays particular attention to how the emphasis and mix of policies to support CCS are likely to evolve over time and how this evolution can be managed to minimise regulatory risk yet still allow governments and regulators to respond to unforeseen events. It also addresses how CCS might be encouraged in the developing world as well as discussing how biomass energy with CCS (BECCS) can be supported.

Financing requirements and structures to deploy 'natural climate solutions' focused on the agriculture, forestry and water sectors, The Nature Conservancy (2016). The Vivid team assessed the global commercial and investment needs for 10 major activities (with large conservation and climate mitigation value), breaking down the potential for commercial investment and the needs for public finance. It analysed each activity in detail to understand where existing commercial players might be able to finance these investments, and under what conditions. It also analysed the potential for new funding models incorporating commercial actors that gain value from these activities farther "downstream". Finally, it examined the extent of public benefits, and the appropriate and feasible public funding mechanisms for ensuring private investment. Total investment requirements were estimated, and specific funding structures were explored for 5 high-potential areas.

The global potential for commercial and climate mitigation value across 25 land use mitigation options, or 'Natural Climate Solutions', identified by the IPCC, The Nature Conservancy (2016). The Vivid team developed detailed cash flow models to assess the commercial value and investment needs of the 8 most promising activities, spanning the agriculture, forestry and water sectors. Total revenues, operating costs and investment needs were calculated alongside mitigation potential under both a central and 'stretch' scenario, depicting accelerated progress in the development of new technologies and markets. For each, the analysis broke down the potential for private investment and the need for public finance. It also analysed the potential for new funding models incorporating commercial actors that gain value from these activities farther 'downstream'.

Technical support to the Government of Colombia's 'Amazon Vision', and the creation of a 'payment for performance' fund, Three Basins Initiative (2015). The support consisted of three activities. The main activity was the structuring and aggregation of an investment portfolio of specific projects/programs to reduce deforestation, encourage sustainable forest activities, and/or alternative economic activities for forest-based populations. Vivid drew upon a broader assessments of investment opportunities, and was the lead author of the Amazon Vision's "Investment portfolio" chapter. In addition, we supported the establishment and structuring of the financing mechanism, and the establishment of reference levels and an MRV mechanism. This project provides us with experience and a deep knowledge of the focus areas of avoided deforestation and payments for forest ecosystem services.

Analysis of the barriers to CCS deployment and development of policy suggestions to incentivise large scale CCS take up, energy company consortium (2016). Vivid collaborated with Element Energy, and our work focussed on the policy analysis. The project progressed in two stages: firstly, a long list of possible policies was created based on stakeholder interviews, analysis of existing CCS support policies, and analysis of policies in analogous sectors. In a workshop with stakeholders, the long list was then narrowed down to four possible policies, such as a CCS obligation. The four selected policies were analysed in detail to assess their likely efficiency, effectiveness and feasibility.

Assessment of the private investment opportunities created by sustainable rural development projects in the Amazon region, with a focus on the agroforestry industry, IDB (2016). The initial phase of this two-part project involved the review and analysis of Colombia's sectoral INDC proposals in overlay with Colombia's rural development initiatives for post-conflict areas. This enabled the identification of relevant sectoral and geographical activities which would meet the desired criteria of emissions abatement, sustainable rural development and private sector involvement. The results of this analysis were then presented with case study investment opportunities for the agroforestry sector, and a review and analysis of private sector engagement opportunities and funding modalities. A review of enabling factors and government actions to put these in place was also carried out. Phase two of the project examined in more depth the investment opportunities in 8 key areas, analyzing the necessary enabling conditions, and proposing different funding structures that use public finance to enable maximum private investment

Broader policy assessments, evaluation and design

Evaluation of the financing for energy projects in the EU in recent years to inform the financing needs for energy beyond 2020, DG Ener (2017). The multi-lateral financing framework (MFF) is the planning tool used by the EU to allocate its annual budget. Specifically, it spells out how much money the EU can use, both per activity and on aggregate, each year when it enters into legally binding obligations. In this work Vivid Economics investigated and evaluated the types of instruments used to provide EU financing, using a cost effectiveness and efficiency framework, and evaluating their performance against EU objectives, such as a need to provide additional value over and above what member states are doing. Vivid was also involved in setting out the likely demands for financing to 2020, to inform the design of the next MFF. Vivid used results from the PRIMES energy system model to estimate the needs given different potential climate targets and these results are now needing in to negotiations about the allocation of funds.

Evaluation of UK Feed-in Tariff regime, NAO (2011). Vivid worked with the UK's National Audit Office to help with their evaluation of the UK's Feed-in Tariff regime for small-scale renewables. Our involvement helped the NAO to understand the policy context and history rapidly, to conduct effective interviews with policy and economic staff, to assess the quality of the analytical work and models prepared by the department, to distil its findings and generate recommendations in a report commissioned by the Public Accounts Committee of the House of Commons. This was a mid-term, policy and process review, looking at the economic performance of a national policy in preparation for public hearings in committee.

Assessment of business case for, and appropriate role of, the Green Investment Bank, BIS (2011). Vivid's work provided the main evidence base used by the UK government in determining the financial products that the Bank should offer, the sectors it should focus on and the impact that it might be expected to have on the attainment of the UK's environmental objectives. This work involved looking at the market failures restricting low-carbon and other environmental investments, the way in which a Green Investment Bank might overcome these market failures, and the possible emissions and environmental gains that different products that the Bank might offer could yield. It also looked at the broader role that the Bank could play in promoting green-growth.

Government engagement on GGRs, climate and innovation policy

Pathways to net zero emissions, GLOBE-NZ (2017). GLOBE-NZ, a cross-party grouping of New Zealand parliamentarians, commissioned Vivid Economics to develop pathways for the country to achieve net zero emissions. The work firstly involved analysing literature on mitigation potential for each sector of the economy to develop a comprehensive understanding of abatement opportunities, costs and co-benefits. Vivid then organised a lengthy process of

engagement with a wide range of stakeholders including senior government ministers, civil society groups, business interests and experts in order to develop credible abatement options for each sector. This engagement also developed key in-country relationships and generated buy-in among groups. Abatement potential for each sector was estimated along with cost benchmarks to construct scenarios with varying levels of ambition. Our final report is framed to provide compelling narratives on how the pathways could be achieved, and the critical policy choices New Zealand faces in order to be consistent with a net zero emissions future.

Developing an Energy Innovations Needs Assessment (EINA) Methodology, BEIS (2017-2018). Vivid was commissioned by BEIS and is leading a consortium of academics and an engineering consultancy to design a methodology for the prioritisation of innovation funding by the UK Government, taking account of a deep understanding of technological and non-technological innovation processes, and the impact of new technologies on business opportunities for the UK. The aim of the EINAs will be to build a deep evidence base to inform the prioritisation of government funding in energy innovations. The work involves drafting and piloting the assessment methodology which includes phases on

- horizon scanning to map the landscape of possible energy innovation
- systematically modelling the energy system benefit of different innovations understanding the technical detail of innovation
- calculating the wider economics impacts on GVA, exports, and jobs
- and mapping the market barriers to innovation and hence the rationale for public support.

International comparisons of the technological innovation and policy design of low carbon heat policies, drawing out lessons and potential application in the UK context, BEIS (2017). The focus of the work was heating and cooling in buildings, viewed across residential and non-residential sectors with an emphasis on OECD countries. At first, the team carried out a broad review of international evidence on heating and cooling, identifying strengths and weaknesses, based on which a catalogue of the key policy interventions was created. A shortlist of countries (Germany, Sweden, Japan) was then selected for 'deep dive' analyses providing much more granularity on the policies and strategies that have been implemented, as well as their effectiveness, efficiency and transferability to the UK context. The findings were presented on to the heat strategy team within BEIS including the Director of Heat and Business Energy.

Update Timelines

Proposal Timeline

Date	Milestone	Deliverable (D) or engagement (E)
1st October	1	Kick-off meeting (E)
8th November (w/c)	2, 3	End task 1, draft report on evidence and policy options (D) BEIS meetings: evidence gathering (E)
15th November (w/c)	4, 5	Steering Group meeting 1: evidence gathering (E) Expert panel workshop 1: evidence and barriers prioritisation (E)
26th November (w/c)	6	End of task 2: Policy list and snapshots (D)
1st December (w/c)	7	BEIS meetings: assessment criteria (E)
14th January	8	Expert panel workshop 2: policy assessment (E)
28th January	9, 10	End of Task 3: Interim report Steering Group meeting 2: policy assessment (E)
4th and 11th February (w/c)	11	BEIS meetings: policy refinement (E)
25th February (w/c)	12,13	Combined expert/BEIS workshop on policy refinement (E) Steering group meeting 3 to sign off policy refinement
15th March (w/c)	14, 15	Deliver draft final report and 2 page policy ream reports (D) Presentation of final report at BEIS (E)
31st March	16	Deliver final report (D)

Revised timeline given delayed start

Date	Milestone	Deliverable (D) or engagement (E)
26th October	1	Kick-off meeting (E)
26th November (w/c)	2, 3	End task 1, draft report on evidence and policy options (D) BEIS meetings: evidence gathering (E)
3rd December (w/c)	4, 5	Steering Group meeting 1: evidence gathering (E) Expert panel workshop 1: evidence and barriers prioritisation (E)
17th December (w/c)	6	End of task 2: Policy list and snapshots (D)

1st December (w/c)	7	BEIS meetings: assessment criteria (E)
21st January (w/c)	8	Expert panel workshop 2: policy assessment (E)
11th February (w/c)	9, 10	End of Task 3: Interim report Steering Group meeting 2: policy assessment (E)
11th and 18th February (w/c)	11	BEIS meetings: policy refinement (E)
18th March (w/c)	12,13	Combined expert/BEIS workshop on policy refinement (E) Steering group meeting 3 to sign off policy refinement
1st April (w/c)	14, 15	Deliver draft final report and 2 page policy ream reports (D) Presentation of final report at BEIS (E)
12th April (w/c)	16	Deliver final report (D)

Key Deliverables

Date	Deliverable	Payment schedule
26th November (w/c)	Draft report on evidence and policy options	
17th December (w/c)	Policy list and snapshots	30%
11th February (w/c)	Interim report	30%
1st April (w/c)	Draft final report	30%
12th Aprtil	final report	10%

Expert panel workshops; Exact dates

Date	Workshop
20th of Nov or 14th Dec	Workshop 1: Barriers prioritisation
25th January	Workshop 2: Policy assessment
tbd	Workshop 3: Policy refinement workshop with steering group

Steering group meetings; Exact dates

Date	Purpose of meeting
10/12/2018	Meeting 1: Respond to initial evidence report
tbd	Meeting 2: Policy assessment
tbd	Workshop with expert panel;
tbd	Meeting 3: to sign off policy refinement

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