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**Programme Area:** Carbon Capture and Storage

**Project:** Hydrogen Turbines Follow On

**Title:** Salt Cavern Appraisal for Hydrogen and Gas Storage – Request for Proposal

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**Context:**

This knowledge gathering project collated data on the performance of gas turbines (conventional and novel cycles) operating on methane, hydrogen and mixtures of the two. It carried out plant and whole system modelling with the aim of understanding how much and in what circumstances gas (with and without CCS) is investable and fits and where it is unlikely to fit easily in the developing energy system from 2020-2050, to meet the increasing requirements for flexibility against an increasingly carbon-constrained system. The gas turbine generation work, was targeted at identifying improved configurations that could be taken to concept stage. At a wider level, the work provided greater understanding of factors affecting the deployment of methane and hydrogen turbines in the UK market and provided better, more accurate performance data for key configurations for future system modelling.

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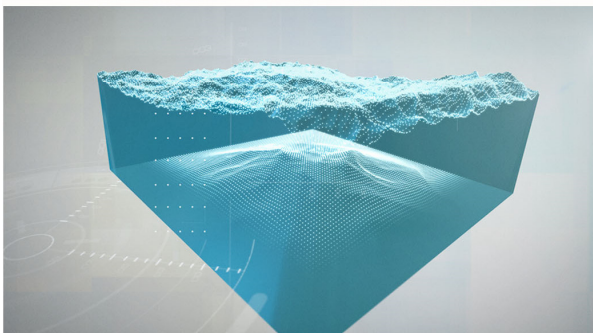
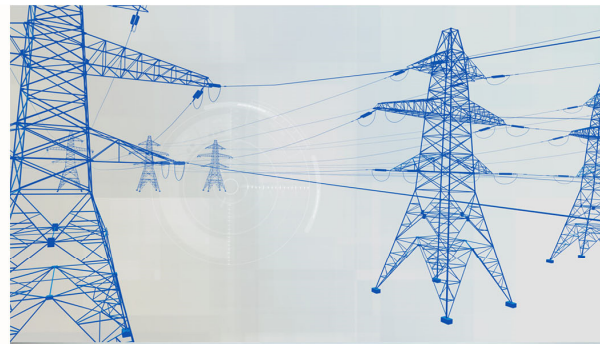
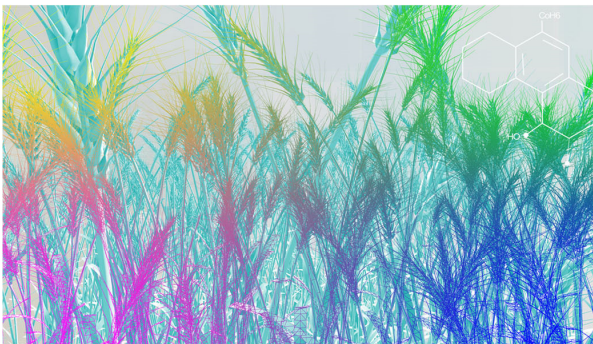
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## Request for Proposals (RfP)

### Salt Cavern Appraisal for Hydrogen and Gas Storage



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# Request for Proposals (RfP)

## SUMMARY OF KEY PROJECT INFORMATION

### Project Summary

In previous projects ETI has identified the benefit of storing hydrogen in salt caverns to supply gas turbines matching the variable load factors of the UK national electricity grid. This paper can be downloaded at <http://www.eti.co.uk>. This could provide a significant contribution to decarbonisation of the UK's future electricity grid. However this was a high level study and now we would like to take this to the next level of detail. Within this Project the ETI wishes to identify existing salt caverns in three UK regions that can be utilised in a transition mode from methane to full hydrogen operation. The end goal is to understand the capabilities and costs to create and operate these stores on methane/hydrogen mixtures up to pure hydrogen. The costings developed will include the creation and all installation/plant items required to operate this energy store excluding the hydrogen production plants. This will support a larger piece of work ETI intends undertaking to bring this whole system together as a cost efficient design solution for operation in the UK electricity generation system.

### Project Investment

The ETI has set aside a budget of up to £170,000 for its investment in this Project.

### Key Information

Summary of Key Information	
<b>Title of Project</b>	Salt Cavern Appraisal for Hydrogen and Gas Storage
<b>Contact for enquiries</b>	Paul Winstanley
<b>Email</b>	<a href="mailto:info@eti.co.uk">info@eti.co.uk</a>
<b>Telephone</b>	01509 202045
<b>Address for notification and submission of Proposals</b>	ENERGY TECHNOLOGIES INSTITUTE Holywell Building Holywell Way Loughborough LE11 3UZ
Request for Proposal and Selection dates	
<b>Issue of RfP</b>	21 April 2016
<b>Closing date for Expression of Intention to Submit a Proposal, including Non-Disclosure Agreement</b>	11 May 2016
<b>Closing date for submission of Proposals</b>	02 June 2016
<b>Preferred Respondent notified</b>	27 July 2016

**Project timescales and anticipated dates**

<b>Agreement execution target date</b>	01 September 2016
<b>Project start</b>	02 September 2016
<b>Project finish</b>	01 March 2017

	Additional documents	Location
1.	Project Commercial and Legal Requirements	<web address>
2.	Annex A1 – Due Diligence Information Requirements	<web address>
3.	Annex A2 – General Due Diligence Requirements	<web address>
4.	Annex A3 – Statement of Compliance	<web address>
5.	Annex A4 – IP Due Diligence for Proposal	<web address>
6.	ETI Non-Disclosure Agreement	<web address>

Respondents shall be wholly responsible for the costs they incur in the preparation and submission of their Proposals in response to the RfP. The ETI shall not be responsible for, and shall not pay, any costs and expenses which may be incurred by Respondents in connection with participation in the Project Commissioning Process, including but not limited to any costs or expenses incurred up to and including execution of the Agreement.

A glossary of terms used in this RfP is provided at **Appendix A**.

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## 1. ETI INTRODUCTION

The Energy Technologies Institute (ETI) is a public-private partnership between global industries – BP, Caterpillar, EDF, Rolls-Royce and Shell – and the UK Government.

The ETI is a commercial organisation that makes targeted commercial investments in technology projects, which can involve the ETI funding entire projects or working with Participants or third parties to co-fund project activity.

Further information can be found on our website at [www.eti.co.uk](http://www.eti.co.uk).

The ETI's energy system modelling work has shown that Carbon Capture and Storage (CCS) is one of the most potent levers to help the UK meet its 2050 CO<sub>2</sub> reduction targets: without CCS the energy system cost in 2050 could be £30bn per annum higher.

The ETI CCS Programme comprises a portfolio of projects across the CCS chain:

- **Capture.** Projects for innovative capture technologies for both coal- and gas-fired power generation;
- **Storage.** Overall assessment of UK Storage capacity, the results of which are now available through The Crown Estate and British Geological Survey, [www.CO2Stored.com](http://www.CO2Stored.com); supporting strategic saline aquifer appraisal; measurement, monitoring and verification of storage; Strategic UK CCS Storage Appraisal Project – down selection and appraisal of 5 key stores for the UK;
- **Hydrogen.** Flexible power through hydrogen generation, storage and generation; safe use of high hydrogen fuels in turbines;
- **Whole System.** Development of a whole-system modelling toolkit for system design and operational appraisal; development of scenarios for CCS roll out in the UK; incentivisation of new power-with-CCS projects.

The Programme is supported by world-class energy system modelling, strategic analysis and in-depth understanding of the economic and regulatory barriers to widespread implementation of CCS in the UK.

Full information can be found on the ETI website at: <http://www.eti.co.uk/>



## 2. WELCOME TO RESPONDENTS

We are seeking Respondents who will bring their experience, expertise, innovation and solutions to our Project. The procurement process is designed to offer all Respondents the opportunity to engage in the Project.

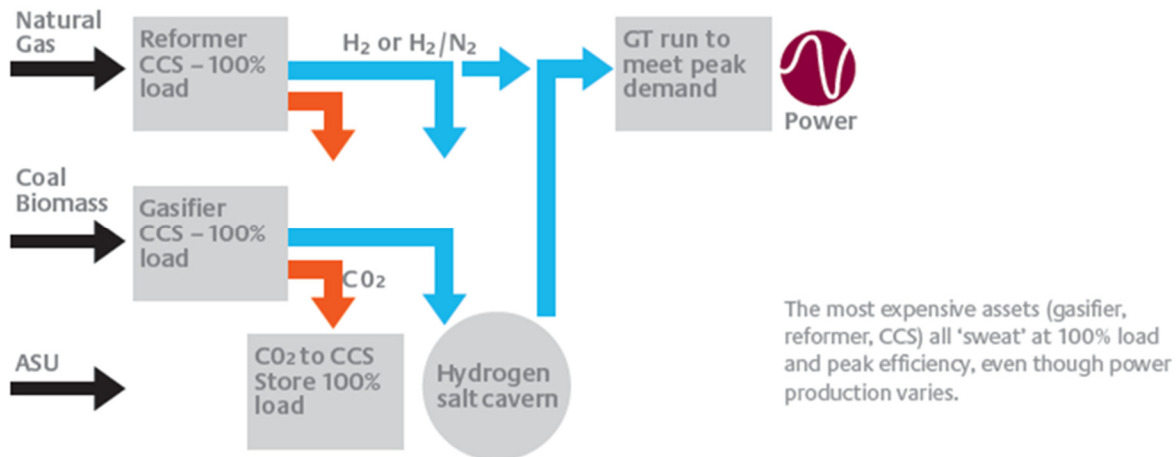
All Respondents have an equal opportunity to be successful. Your Proposal will be given active consideration, recognising the need for compliance with our deliverables, reporting accountabilities and contractual requirements.

We value your enthusiasm, commitment and Proposals from which we can benefit on this strategically important project. Your investment in time and resources making the Proposal is appreciated.

### 3. THE REQUIREMENT

#### 3.1 Project Introduction

In 2012 the ETI commissioned Amec Foster Wheeler to carry out a study on the techno-economic potential of combining hydrogen storage in salt caverns with gas turbines (GTs) to provide a low carbon, despatchable power supply to meet the diurnal cycle in power demand. The configuration studied is shown below:



In the study, the hydrogen generation plants were fitted with CCS, and this section of the asset ran continuously at full load, filling the store during periods of low power demand. The store is emptied through the GT to produce power when demand was high. This configuration is a competitive low carbon power supply if the average turbine load factor is below ~40%, because most of the investment runs at full load and peak efficiency even although the power demand is load following. In short the store acts as a buffer between a constant hydrogen supply and a variable power demand. [An insights paper on the study results can be found on the ETI website<sup>1</sup>.](#)

Based on expert advice from British Geological Survey, who were also participants in the project, the techno-economic study looked at storage in Teesside, Cheshire and East Yorkshire – all areas where storage is currently practised. High level cost breakdowns for schemes in each geology were produced, focussing on large “city” scale supplies, based on large frame GTs and multiple caverns. The cavern operating envelope in terms of pressure fluctuations on a daily basis were taken from the literature but no dynamic geological modelling was carried out for the initial study.

Amec Foster Wheeler completed techno-economic modelling and analysis of coal, coal/biomass and gas fed hydrogen plants and an associated gas turbine.

The ETI seeks now to consolidate its understanding of what flexibility of supply salt caverns may offer the power (and potentially the heat, transport and industrial) market with a detailed investigation of the UK's cavern resource. Although there are references in the literature to modelling of storage caverns<sup>2 3 4</sup> the conditions of temperature and pressure fluctuations may be more severe in the application foreseen in a cavern:

<sup>1</sup> <http://www.eti.co.uk/wp-content/uploads/2015/05/3380-ETI-Hydrogen-Insights-paper.pdf?dl=1>

<sup>2</sup> Nelson and Stacey, A Unique Aspect of Storing Natural Gas in Offshore Salt Caverns, SMRI, Fall 2011

<sup>3</sup> Pellizarro, Bergeret et al, Thermo –Mechanical Behaviour of Stublach Gas Storage Caverns, SMRI Fall 2011

<sup>4</sup> Crotagino et al Large Scale Hydrogen Underground Storage for Securing Future Energy Supplies , 18th World Hydrogen Energy Conference, 2010

- a) filled with hydrogen from a nearby compressor which may have varying load (as opposed to gas from the NTS grid);
- b) emptied to match the weekday power demand cycles (load following).

### 3.2 Project Objectives

The objectives of this project are as follows:

- Consolidate the ETI understanding of cavern flexibility, to support ETI system level modelling activities, for 100% hydrogen and hydrogen/methane mixtures, with a focus on flexibility and cost.
- Characterise key constraints and their causes when operating fast churn storage at selected sites, including those caused by integration with the hydrogen supply and the GTs.
- Identify a range of GTs/CCGT offerings which match cavern capability or market needs (with input from the ETI).
- Produce high quality reports from which publishable insights on cavern capability and limitations on this duty can be extracted.
- Produce documentation which would directly assist a potential cavern development.

### 3.3 Project Scope

Participants should select three stores for analysis which are either in use, under construction or redundant. Should no compliant store be available the Participant may define a proposed new store, based on real salt bed properties and on a practicably achievable cavern geometry. The stores must comply with good practice in terms of spacing from other stores, distance to salt bed roof and floor, boreholes, public assets - roads, dwellings, railways including any future identified infrastructure options such as High Speed Two Ltd (HS2) and be geometrically and geologically suitable for fast churn storage on hydrogen duty. Wall thickness must be sufficient such that the chosen cavern can operate independently of its neighbours. A proposal to use caverns which deviate from good practice must be justified by both calculation and satisfactory historic performance. Cavern options should not be rejected solely because of the unsuitability of (economically replaceable) items, for example fittings which are metallurgically unsuitable for high pressure hydrogen, or items under-sized for fast churn. There must be an expectation that the chosen cavern could economically either be:

- itself used for an early hydrogen project;
- “duplicated” or an improved version be constructed nearby without major foreseeable issues.

The ETI will fund full investigation of 2 or 3 caverns depending on cost and applicability.

The first storage areas are:-

- the Northwich Halite in the “Cheshire Basin” and is to be stabilised only by cushion gas;
- the Teesside “Boulby” Permian bed and may optionally be stabilised by the “wet” method, and must be amongst the largest in this sector;
- the deeper Fordon Evaporites of East Yorkshire.

As per several salt cavern developments in the UK, the store must combine a diurnal and seasonal storage duty, focussing on the former. The Participant will explore to what extent each of the caverns can participate in different power sectors (response, peaking, load following) and potential thermal market for industrial or domestic sectors. State of art geotechnical modelling should be used to find the limits of use, ensuring the cavern performance will not be expected to deteriorate over a 30 year life. The shape of the delivery volume of hydrogen over time for these sectors will be taken from real data for power demand, for example from

Gridwatch or/and published performance of incumbent assets in the sector (e.g. OCGT for peaking, modern CCGT for load following).

The Project should examine how the stability of the gas source temperature might affect the cavern. It will also match the cavern capability by identifying (with ETI assistance if required) candidate GTs to make best use of the flexibility the cavern can offer, and provide Order of Magnitude (OOM) installed costs together with performance over a range of load factors. OOM costs and performance for electrolyser for hydrogen and fuel cell for power should be provided. There is not an expectation that “engineered / flow sheeted” work will be required for this level of investigation.

The objectives as listed in Section 3.2 may be met in several ways, but the scope may include the following activities:

- Investigating the limits of fast churn hydrogen gas storage (weekday use) in up to three UK salt caverns, using geotechnical modelling.
- Describing the safe operating envelope of caverns in these deposits, designing for negligible shrinkage or damage over a multiyear cycling pattern. Focusing on daily storage.
- Creating power demand profile scenarios, in a renewable world.
- Considering the control of temperature fluctuations from the supply gases.
- Building storage cost curves to service up to 1.0 GWe max power output in fast churn modes (100% H<sub>2</sub> and 50% H<sub>2</sub>/CH<sub>4</sub>). Cavern costs should include development cost, cavern construction, well or wells associated.
- For 100% H<sub>2</sub> and 25% and 50% H<sub>2</sub> in CH<sub>4</sub>, match suitable GTs with selected cavern capability (for 100% H<sub>2</sub>, steam or N<sub>2</sub> may be required). Provide OOM installed costs and performance over a range of load factors. No development work is required on the H<sub>2</sub> generation schemes themselves as the Amec Foster Wheeler work will be made available to the project partners for this.
- Exploring the effects of gas blends – In addition to the base cases listed above check sensitivity of cavern stability to use of:
  - mixtures of H<sub>2</sub> and CH<sub>4</sub> - 25%/75% H<sub>2</sub>/CH<sub>4</sub> and 60%/40% H<sub>2</sub>/CH<sub>4</sub>;
  - mixtures of H<sub>2</sub> and N<sub>2</sub> - 50%/50% H<sub>2</sub>/N<sub>2</sub> and 100% N<sub>2</sub> (for separate cavern storage);
  - listing possible contaminants/scenarios which jeopardise cavern integrity.

The project will comprise two stages. Stage 1 will cover the following:

- Justification for the caverns selected, followed by recommendation on which ones should be progressed. This will need a clear view of any needs for data not yet secured by the project, and any limitations on use of data which will be supplied by others.
- Selection of typical power load profiles for daily market segments, from which the gas demands (pressure cycles) can be developed.
- A decision on whether or not smaller GTs (aero derivatives <50MW) are applicable, based on the above profiles, cavern type selected and preliminary expectation of performance and bearing in mind the scheme is to operate at lower load factors.
- Selection of modelling protocols to be used by the Respondents.

Stage 2 of the project will complete the required scope.

Respondents will need access to a broad range of skills – certainly including geotechnical, power sector, cost estimation and presentational.

### 3.4 Deliverables

- Stage 1 Report (Exploratory phase) – example subheadings:
  - Stores reviewed
  - Power demand profiles (future)
  - Assessment of value of using smaller GTs (including aero derivative in open cycle)
  - Selected practical machines for burning hydrogen mixtures
  - Description of proposed modelling methodologies
  - Future work needed
  - Risks and needs for successful completion of the project
  - Similar projects worldwide
- Stage 1 presentation to the ETI with project slide pack
- Stage 2 Report (Development Phase)
  - Potential power or thermal delivery profile offered by the selected caverns.
  - Cost curves to build up to 1GWe purpose built fast churn caverns for 100% H<sub>2</sub> and 50%/50% H<sub>2</sub>/CH<sub>4</sub>.
  - GT types/ configurations of specific interest for this application.
  - Limiting factors, constraints for design and operation of the cavern.
  - assessments of Life time for the selected stores.
- Stage 2 presentation to ETI with project slide pack

### 3.5 Timescale and Detail of any Milestones

The ETI envisages that the project will be delivered a maximum of 10 months after contract signature. It is anticipated that there will be a formal Project Stage Gate Review after Stage 1. Payment Milestones should be identified by the Respondent and detailed in the bid document. The ETI's preference would be for two Payment Milestones, one on completion of each stage of the Project. There should be an allowance for a post Project presentation to the ETI.

### 3.6 Key Personnel

The ETI places great emphasis on two critical roles in the delivery of the Project – the Project Manager (PM) and the Chief Technologist (CT) – who together will lead the Project on behalf of the Prime Contractor.

**The Project Manager** is responsible for leading and managing the Project team, delivering the programme of work to time and cost, and handling information flows and commercial issues.

**The Chief Technologist** is responsible (on behalf of the Prime Contractor) for the technical quality and content of the work and ensuring the competence of key technical staff allocated to individual Work Packages.

### 3.7 Project Meetings and Reviews

Project Manager meetings between the ETI PM and the Project PM will be held weekly by telephone and are expected to take approximately 30 minutes.

There will be 3 formal technical review meetings through the Project life cycle with ETI as part of the Project and all three should be budgeted for holding in the ETI offices, Loughborough UK. These would be full day meetings with presentations and pre read material for the ETI team that would be supplied one week before

the meeting. The ETI expects that there will be a Stage Gate Review at the end of stage one. A Stage Gate Review is a 'go/no-go' decision point for the ETI to determine, with support from the Project team, whether the Project is on track to deliver the intended outcomes and whether the intended scope of the Project has been satisfactorily completed to date.

### **3.8 Payment**

Payment will be made according to milestones as detailed by the Respondent and agreed during negotiation. These milestones must be based on tangible deliveries that can justify the value of the payment. Please provide clear details in your bid document of your expectations.

#### 4. PROJECT COMMERCIAL AND LEGAL REQUIREMENTS

Please refer to the **Project Commercial and Legal Requirements** document (see the Key Information table), noting that the following specific requirements apply to this Project:

- Value Return – please refer to the requirements for a Knowledge Gathering Project
- Participant Contracting Structure – Prime Contractor strongly preferred.
- Form of ETI Investment – Fixed Price strongly preferred.
- The requirements of Technology Development and System Demonstration projects are not expected to be relevant to this Project.
- It is expected that this project will be entirely desk-based, so any references in Section 8 of the Commercial and Legal Requirements document to CDM regulations will not apply. The ETI does not anticipate that a formal HSE Competency Assessment will be required;

##### Intellectual Property

The ETI expects to own the Arising IP: refer to the requirements for Arising IP and Background IP relating to Knowledge Gathering Projects in the **Commercial and Legal Requirements** document.

In most cases, it does not expect that Respondents will wish to make use of the Arising IP after the Project.

##### Arising IP – Academic Research, Teaching and Publication

As set out in the **Commercial and Legal Requirements** document, the ETI will generally agree for any academic institutions that are Participants or Sub-contractors to obtain a licence to the Arising IP that they create in the Project to be used for academic teaching and research.

The ETI welcomes proposals for active dissemination of the outputs of the Project and these should be set out.

##### Arising IP – Commercial use by Respondents

The ETI envisages that it is possible for Stage 2 of the Project to start to build a knowledge base about specific salt caverns that may have commercial application or represent the initial work for commercial development of a specific salt caverns. Given the ETI's belief that salt caverns may make a meaningful contribution through hydrogen storage to decarbonisation of electricity, the ETI would welcome Proposals which propose to take the development of specific salt caverns forward following the ETI's Project. The ETI is therefore open to discussions with Respondents to discuss how a successful Participant could access the Arising IP relating to specific salt caverns studied in this Project for such commercial development and the terms of such licence. Generally, where Participants propose to use Arising IP on a commercial basis where the ETI has funded 100% of a Project, the ETI will expect to licence Arising IP on a commercial basis. This may be through royalties or through provision of further data to the ETI during such salt-cavern development.

In this case, the ETI strongly recommends early discussion with the ETI before submission of a Proposal.

Please note that although ETI would welcome such Proposals to subsequently develop a specific salt cavern store, it is not the main driver for this Project and Respondents are encouraged to ensure the remainder of their Proposal meet the requirements of this RfP.

##### Background IP and Third Party IP: Bringing together existing work

This Project will bring together and analyse existing works to identify and support the optimal use of salt cavern storage in a flexible energy storage future. The successful Respondent will need to ensure that it has appropriate rights to use or refer to existing work in the Project. The ETI expects that Background IP and Third Party IP may take the form of copyright in reports, data, databases, models and software. To the extent that there is any Background IP or Third Party IP included in any Deliverables, successful Respondents will need to ensure that they obtain appropriate written permissions to do so that enable the ETI to have the full flexibility to share and disseminate the outputs of the Project.



The Respondents will need to identify prior to submission any key Background IP and Third Party IP, identify the approach to obtaining permissions and to the extent that any Third Party IP will form a critical part of the Project, have initial discussions about how Third Party IP with the owners of such Third Party IP and whether it can be used in the way proposed in the Respondent's Proposal.

Respondents will need to consider and propose its Third Party IP management strategy in their Proposal and to demonstrate this can be done in line with the Project's timescales and budget.

## 5. PROPOSAL, FORMAT AND SUBSEQUENT EVALUATION

Your Proposal shall follow the format set out in Appendix D.

All Proposals will be evaluated by the ETI against the selection criteria below.

Respondents should note that specific, independent and objective evidence of performance, capabilities and experience will carry greater weight than general statements about organisational capabilities and experience.

S1 Ability of the Participants to deliver the Project, based on evidence provided in the Proposal and presented at the Selection Panel(s). It should be noted that the performance of the Respondents and quality of information provided to the ETI during the Project Commissioning Process will be considered by the ETI as an indicator of likely performance during the Project:

### S1A Technical

- Experience and availability of the proposed Chief Technologist;
- Level of experience and completeness of the technical skills amongst the Consortium to deliver the Project, including but not limited to:
  - Geology;
  - Geographic surveying for store development;
  - UK Power engineering;
  - Safe use of hydrogen in plant design and operation;
  - Cost estimating, (OPEX and CAPEX);
  - Development of salt caverns for operation;
  - Permitting and development of salt caverns in the UK.

### S1B Delivery

- Experience and availability of the proposed Project Manager;
- Record and ability in quality, timely and on-budget delivery of projects (of the type requested in this RfP) to the full satisfaction of the main stakeholders;
- Project management systems and expertise appropriate for this sort of project;
- Appropriate health, safety and environmental management systems and experience;
- Effectiveness of the contracting, organisational, governance and control structures and processes proposed for the participating entities / organisations, including interfacing with ETI as it requires, etc;
- Project approach and plan, including Gantt chart, indicating suitable Stage Gate Review points and Payment Milestones; and
- Risk Management. Respondents will need to demonstrate clear evidence of a rigorous, risk-based approach to management of the Project. A register identifying the key risks and how they will be managed is required.

### S2 Compliance with the requirements:

- Compliance with the requirements set out in Section 3 of this RfP

### S3 Value for money with respect to Project funding:

- Contributions from Participants and third parties (including funding, in-kind support and making their own IP available to the Project, e.g. data, models, previous analysis);
- Competitiveness of costs; and
- Willingness and capacity to accept the financial risk profile for the Project.

S4 Risks associated with reaching acceptable agreement with the ETI within the timescales set out in this RfP:

- Respondents' willingness to materially comply with the terms and conditions of the proposed Project Contract; and
- Availability and commitment of the necessary technical, legal and financial resources to meet the requirements of ETI's Project Commissioning Process.

## 6. PROJECT COMMISSIONING PROCESS AND ESTIMATED TIMESCALES

### 6.1 Notification of Intention to Submit a Proposal / NDA

Prior to making a Submission in response to this RfP, Respondents are required to provide to the ETI:

- (i) a formal notification of their intention to submit a Proposal, in the form set out at **Appendix B**, and
- (ii) a Non-Disclosure Agreement in the form provided on the website alongside this RfP, signed by all Respondents involved in the Proposal and returned to the ETI in accordance with the instructions at **Appendix C**.

Both documents must be received by the ETI no later than the closing date specified in the Key Information table at the front of this RfP.

### 6.2 Submissions in Response to the RfP

The ETI will make available a draft Project Contract to all Respondents who have submitted a Notification of Intention to Submit a Proposal. Respondents are required to provide feedback on the draft Project Contract as part of the Submission requirements.

Respondents are required to make a Submission comprising the following components.

- a) Detailed Proposal, arranged according to the structure set out in **Appendix D**. The content must clearly demonstrate how the proposed Prime Contractor or Consortium, as appropriate, will meet the requirements and criteria set out in Sections 3 to 5 of this RfP. The Proposal must be written in a succinct manner and must not include imprecise statements, generalities or repetition. The Proposal must be easily readable with appropriate font sizes (10pt or larger), margin widths, and **shall not exceed a maximum of 30 pages, plus supporting information**.
- b) Any supporting information as specifically set out in **Appendix A**.
- c) Initial due-diligence information, as set out in Section 1 of the Due Diligence Information Requirements **Annex A1** (including in relation to State aid, insurance, intellectual property, health, safety and the environment, and the General Due Diligence Information Requirements, **Annex A2**).
- d) Statement of Compliance, with supporting information, confirming compliance with or identifying exceptions to the requirements of this RfP and/or the draft Project Contract, as set out in Annex A3. This must be signed by each Respondent; if a Consortium structure is proposed, every member organisation of the Consortium must provide a separate Statement of Compliance.

Additional information (such as organisational brochures, etc.) may be provided to accompany the Submission, but such additional information will not be taken into account when reviewing Proposals.

The Submission shall be provided in electronic format, in both PDF and Microsoft Word formats, with each component as a separate file..

### 6.3 Questions and Clarifications

Potential Respondents may request a one-to-one briefing with the ETI. The purpose of this would be to further describe the Project Requirements and to provide an opportunity to ask questions prior to further development of Respondents' Submissions in response to this RfP.

Respondents should indicate their desire to attend a one-to-one briefing by contacting the ETI using the same contact details in the Key Information table, no later than the deadline for submission of the signed Non-Disclosure Agreement. The ETI shall notify Respondents of their allocated meeting dates and times when the number of attendees is known. Such meetings will be a maximum of 2 hours duration and will take place at the ETI's offices in Loughborough or by teleconference. The ETI will not meet with Respondents unless they have submitted signed NDAs according to the instructions in **Appendix C**.

The ETI welcomes written questions from Respondents for ETI consideration and written responses. The questions are to be submitted no later than the closing date for notification of intention to submit a Proposal (see Key Information table). The ETI will endeavour to provide written answers in a reasonable period, prior to submission of the Proposal, but cannot guarantee doing so.

Any advice or clarifications of ETI requirements requested by and provided to any Respondent may (at the ETI's discretion) be made available to all Respondents to ensure parity of information. Respondents should therefore consider presenting requests for advice and clarifications in a way that the ETI can respond to all Respondents without revealing confidential information.

#### 6.4 Selection Process

Following the closing date for Submissions, the ETI will convene an appropriate Selection Panel to consider all Proposals. The Selection Panel will assess the Proposals against the selection criteria and discuss their merits and drawbacks.

As part of the Selection Panel process, Respondents may be requested to make a presentation to support information provided in their Submission. Respondents should ensure that all information and evidence that the Submission meets all applicable acceptance criteria is included in their Proposal.

The ETI may request further clarifications before or after the meeting of the Selection Panel and/or as part of the Project Shaping, Due Diligence and Contract Negotiation Stage.

In the event that the ETI receives a large number of Submissions, the ETI may make an assessment to select a manageable shortlist of Respondents/Submissions for consideration by the Selection Panel.

The Selection Panel will make a recommendation to the ETI as to the preferred Respondent(s) to move forward into the Project Shaping and Contract Negotiation Stage (however, Respondents should note that the final decision to proceed with any Respondent(s) rests with the ETI).

#### 6.5 Project Shaping and Contract Negotiation Stage

Following selection, the ETI will invite any preferred Respondent(s) to enter into negotiations with the ETI to shape the Project and finalise the terms of the Project Contract.

**The ETI may decide to negotiate with more than one Respondent to ensure that all key issues are resolved fully and promptly, before making a final selection decision.**

The Project Shaping and Contract Negotiation Stage will include the following activities (as required and dependent on the level of detail provided in the Respondent's Proposal):

- a) detailing of the proposed technical programme, including definition of deliverables, acceptance criteria and date for the delivery of hardware for the demonstration(s) during the Project;
- b) detailing and agreement of Stage Gate Reviews, where Project performance and the business case are critically reviewed and decisions taken on whether to proceed with the Project;
- c) negotiation and agreement of the Project Contract;
- d) detailing and due diligence relating to the breakdown of costs of the Project;
- e) gaining all necessary Respondent and ETI approvals to undertake the Project; and
- f) any further information or assessment that may be necessary to meet State aid requirements.

Respondents are required to commit to provide legal, technical, commercial and managerial resources as required to achieve the target Project Contract execution date. The ETI reserves the right to re-open/conduct discussions with other parties and/or cancel the commissioning of the Project should it become apparent that this date may not be achieved.



## 7. IMPORTANT NOTICES

- a) The ETI at its discretion may request clarification of a Proposal, and may reject any Proposal which is unclear.
- b) Neither the issue of any documentation in the Project Commissioning Process nor any of the information presented in it should be regarded as a commitment or representation on the part of the ETI or any other person to enter into a contractual arrangement. The issue of the RfP is not an agreement or offer to purchase goods or services, and the ETI is not bound to enter into any contract with the (or any) Respondent. By responding to this Request for Proposals, the Respondent does not commit itself to entering into a contract with the ETI.
- c) All decisions made by the ETI relating to the acceptance, review and selection or otherwise of Proposals are final.
- d) All documents, including Proposals, submitted to the ETI become the property of the ETI. They will be received and held in confidence by the ETI, subject to the terms of the Non-Disclosure Agreement. No part of a Proposal, or other documents provided by Respondents, shall be returned.
- e) The ETI reserves the right at any time to (i) withdraw the RfP; (ii) change the basis, timetable and/or requirements of, and/or the procedures for, the Project Commissioning Process, including the timetable or closing date for receipt by the ETI of Proposals/Submissions, (iii) make modifications to, or alter any of the information within, the RfP, (iv) reject any or all of the Proposals received, (v) not invite any Respondent(s) to proceed further; and/or (vi) terminate the Project Commissioning Process.
- f) Neither the ETI nor any of its agents or advisers accepts any liability or responsibility for the accuracy, adequacy or completeness of any of the information provided or any opinions contained in this RfP or of any other information made available during the Project Commissioning Process. No representation or warranty, express or implied, is or will be given by the ETI or any of its agents or advisers with respect to such information provided or opinion given therein. Any liability is thereby expressly disclaimed to the fullest extent permitted by applicable law.
- g) Respondents must assess the information and terms contained in this RfP independently, having taken professional advice if necessary. Each Respondent will be deemed to have examined all the documents provided with this Request for Proposals and by its own independent observations and enquiries will be held to have fully informed itself as to the nature and extent of the requirements of the RfP. Each Respondent must rely on its own enquiries and on the terms and conditions contained in any agreement, when and if finally executed, subject to such limitations and restrictions as may be specified therein.
- h) Respondents shall be wholly responsible for the costs they incur in the preparation and submission of their responses to the RfP. The ETI shall not be responsible for, and shall not pay, any costs and expenses which may be incurred by the Respondent (or by any third party, including proposed Subcontractors) in connection with its participation in the Project Commissioning Process, including but not limited to any costs or expenses incurred up to and including the execution of the Project Contract.
- i) The ETI may, at its discretion, shortlist Respondents for the next stage of the Project Commissioning Process (Project Shaping and Contract Negotiation Stage). The ETI does not undertake to accept the lowest bid or to accept part or all of any Proposal/Submission and the acknowledgement of receipt of any Proposal/Submission (and/or any invitation to any Respondent(s) to proceed to the next stage) shall not constitute any actual or implied agreement between the ETI and the Respondent.
- j) The copyright in the documentation and any other materials supplied by the ETI and/or its advisers in this Project Commissioning Process, in whatever format, belongs to the ETI or its appointed advisers.



Such documentation and materials may not, either in whole or in part, be copied, reproduced, distributed or otherwise made available to any other third party or used without the prior written consent of the ETI, except in relation to the preparation of the Proposal/Submission in the course of the Project Commissioning Process. All documentation supplied by the ETI in relation to this Project Commissioning Process must be returned on demand, without any copies being retained by the Respondent(s).

- k) In this RfP, any phrase introduced by the term “include”, “including”, “in particular”, “for example”, “such as” or similar expression shall be construed as illustrative and shall not limit the sense of the words preceding that term.
- l) This RfP, and any dispute or claim arising out of or in connection with it (including any dispute or claim relating to non-contractual obligations), shall be governed by and construed in all respects in accordance with the laws of England and Wales and the parties agree that the Courts of England and Wales shall have exclusive jurisdiction to settle any dispute or claim arising out of or in connection with this RfP (including any non-contractual disputes or claims).
- m) The submission of a Proposal will confirm acceptance of the foregoing provisions by the Respondent(s) without qualification. Any attempt to qualify any of the foregoing provisions in this Section 7 (Important Notices), either expressly or impliedly, may result in a Respondent (or Respondents) being disqualified.

**8. ANNEXES**

	<b>Additional Documents</b>
1.	Project Commercial and Legal Requirements
2.	Annex A1 – Due Diligence Information Requirements
3.	Annex A2 – General Due Diligence Requirements
4.	Annex A3 – Statement of Compliance
5.	Annex A4 – IP Due Diligence for Proposal
6.	ETI Non-Disclosure Agreement

**APPENDIX A – GLOSSARY OF TERMS**

Term	Definition
<b>Arising IP</b>	Any intellectual property which is created by or for any Participant during the Project or for the purposes of the Project.
<b>Background IP</b>	Any intellectual property which existed prior to any Participant's commencement of the Project and which was created by or for the Participant.
<b>CCGT</b>	Combined Cycle Gas Turbine
<b>Chief Technologist</b>	The individual as described in <b>Section 3.4</b> .
<b>Company Registration Number</b>	Company number as registered at Companies House. Universities should enter their Royal Charter (RC) number in place of the Company Registration Number.
<b>Consortium</b>	The group of organisations which contract with the ETI to perform the Project. This will not include the ETI itself or any Subcontractors.
<b>Consortium Member</b>	An organisation which forms part of the Consortium.
<b>Due Diligence Information Requirements</b>	Due Diligence Information Requirements are provided in <b>Annex A1</b> .
<b>ETI</b>	The Energy Technologies Institute LLP, a limited liability partnership (Company no. OC333553) whose registered office is at Holywell Building, Holywell Way, Loughborough, Leicestershire LE11 3UZ.
<b>Fixed Price</b>	An ETI investment structure under which agreed fixed payments will be made against each accepted milestone.
<b>General Due Diligence Requirements</b>	General Due Diligence Requirements are provided in <b>Annex A2</b> .
<b>GT</b>	Gas Turbine
<b>Her Majesty's Government</b>	Her Majesty's Government, including but not limited to all of its departments and executive agencies and the devolved administrations of Scotland, Wales and Northern Ireland.
<b>IP</b>	Intellectual property.
<b>Lead Coordinator</b>	The organisation which is a Consortium Member, and which manages and coordinates the activities of all the Consortium Members, and which acts as the primary interface between the Consortium and the ETI.
<b>Member</b>	The ETI's industry members (as identified on the ETI's website) and Her Majesty's Government (including but not limited to those public sector members identified on the ETI's website (above) from time to time).
<b>NI</b>	National Insurance
<b>Non-Disclosure Agreement</b>	A non-disclosure agreement in the form provided at <b>Appendix C</b> .

<b>NTS</b>	Nominal Tube Size
<b>OOM</b>	Order of magnitude
<b>Own Funds</b>	Funding sourced by the Respondent's own resources and not dependent in any way on third party lending to either the Respondent or member of the Respondent's group.
<b>Participant</b>	Either the Prime Contractor or a Consortium Member.
<b>Payment Milestone</b>	A contract milestone with defined constituent deliverables, associated deliverable acceptance criteria, deliverable value and milestone value (all to be detailed in the Respondent's Proposal and agreed in the Contract which should be completed in order to reach the said milestone, and at which, subject to acceptance by the ETI that the milestone has in fact been reached, payment may be claimed from the ETI.
<b>Prime Contractor</b>	A sole organisation which contracts with the ETI to perform the Project, on its own or (subject to ETI approval) together with Subcontractors.
<b>Programme</b>	The ETI Carbon Capture and Storage Programme that includes the Project.
<b>Programme Manager</b>	The individual appointed by the ETI to manage the overall ETI programme to which this Project is affiliated, and to whom the Project Manager is accountable.
<b>Project</b>	The ETI project for which the purpose, scope of work and other details are described in this Request for Proposals.
<b>Project Commercial and Legal Requirements</b>	The separate document published with the RfP setting out the ETI's commercial and legal requirements for ETI Projects.
<b>Project Commissioning Process</b>	The ETI's process for procuring the Project, as described at <b>Section 6</b> .
<b>Project Contract</b>	The contract to be entered into between the ETI and the Participants (whether between the Consortium Members or a Prime Contractor).
<b>Project Manager</b>	The individual as described in <b>Section 3.4</b> .
<b>Project Shaping and Contract Negotiation Stage</b>	The Project/contract negotiation stage of the Project Commissioning Process, as described at <b>Section 6</b> .
<b>Project Organisation</b>	The entity or group of entities / organisations, and the contracting and management structure which they adopt, which together will carry out the Project if commissioned by the ETI and includes any Consortium Members or Prime Contractor and any Subcontractors.
<b>Proposal</b>	The proposal for the Project submitted to the ETI, in response to this Request for Proposals.
<b>Public Funding</b>	Any Third Party Funding provided by a public authority or agency.
<b>RfP</b>	This Request for Proposals (including its Appendices and the Annexes/additional documents (see Section 8)).

<b>Respondent(s)</b>	The organisation (in the case of a Prime Contractor) or organisations (in the case of a Consortium structure) submitting a Proposal to the ETI.
<b>Review Point</b>	A Project review involving Project Participants and ETI representatives at which the overall progress in Project or a specific Work Package will be critically reviewed and following which a formal decision will be made on the future Project programme.
<b>Stage Gate Review</b>	A major Review Point involving Project Participants and ETI representatives at which the overall performance and business case for the Project will be critically reviewed and following which a formal decision will be made whether to continue with the Project, based on whether agreed Stage Gate Review criteria have been met.
<b>Selection Panel</b>	A group of technical specialists who will assess the offer and presentation against the Project objectives.
<b>Statement of Compliance</b>	The statement of compliance required by the ETI, as described at <b>Annex A3</b> .
<b>Subcontract</b>	A contractual arrangement between a Participant and another organisation to which work for the Project has been subcontracted.
<b>Subcontractor</b>	An organisation which has a Subcontract.
<b>Submission</b>	A Proposal supporting information and other components submitted by the Respondent(s) in response to this Request for Proposals.
<b>Task</b>	A significant activity or group of activities (within a Work Package) which results in completion of a deliverable or a significant part of one, or which represents a significant step in the process towards one.
<b>Value Return</b>	The value to be delivered by the Project to the ETI, the Members and the UK economy in return for the ETI's investment in the Project.
<b>Work Package (WP)</b>	A major section of the Project scope of work, which may be identified in this Request for Proposals or in the Respondent's Proposal, in order to break up the scope of work into separate manageable parts. A Work Package will usually consist of a number of Tasks.

**APPENDIX B – NOTIFICATION OF INTENTION TO SUBMIT A PROPOSAL**

The following form is to be completed and received at the address (postal or email) on the front cover no later than the date defined in the Key Information table.

Notification of Intention to Submit a Proposal

Respondent Name: [Legal Name]

Address: [Registered Office Address]

Contact:

Email/telephone:

The above named Respondent hereby notifies the ETI of its intention to submit a Proposal in response to the ETI's Request for Proposal entitled Salt Cavern Appraisal for Hydrogen and Gas Storage, issued on 20 April 2016.

The Respondent submits this notification on its own behalf and on behalf of the following proposed [Consortium Members] [Subcontractors]:

Please list below the legal names of the organisations / entities proposed to deliver the Project.

1. [Enter Name]
2. [Enter Name]
3. [Enter Name]
4. [Enter Name]
5. [Enter Name]
6. [Enter Name]
7. [Enter Name]
8. [Enter Name]
9. [Enter Name]
10. [Enter Name]

Signed: \_\_\_\_\_  
For and on behalf of the Respondent(s).

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## APPENDIX C – NON-DISCLOSURE AGREEMENT EXECUTION INSTRUCTIONS

The Non-Disclosure Agreement (NDA) protects the confidential information of the Respondents and the ETI during the period of the Project Commissioning Process. For the successful Respondent(s), the confidentiality provisions in the Project Contract (when executed) will supersede this NDA.

### Notes

In order to ensure parity across different groups of Respondents, the ETI will not enter into negotiations on the terms of this NDA.

Respondents should note the definition of 'Respondents' in the ETI NDA: for the purpose of the NDA this just refers to named parties signing the NDA. The NDA allows exchange of information received from one party with another, but **not** sharing confidential information with other bidders.

### NDA Execution Process / Instructions

A separate electronic version of the NDA is available on the ETI Website alongside this RfP document for completion and signature by Respondents in accordance with the following instructions.

- The Prime Contractor should complete Schedule 1 of a single electronic NDA with its company (legal) details and a postal address for return by the ETI of a fully executed NDA.
- The Prime Contractor should print and sign **TWO** paper copies of the NDA. **The NDA must not be dated on the front page.**
- The Prime Contractor should scan a copy of a signed and undated NDA and email it to the ETI at the address on the front of the RfP.
- The Prime Contractor should post both original signed and undated copies to the ETI.
- On receipt, the ETI will countersign and date the two original copies of the NDA. The ETI will retain one of these copies and post the other to the Prime Contractor at the address provided by the Prime Contractor at Schedule 1 of the completed NDA. Note that the ETI will not release confidential information (e.g. the draft Project Contract) until the NDA has been executed by both parties.

Please contact the ETI if the Respondents intend to submit a Proposal as a **Consortium**.



## APPENDIX D – PROPOSAL CONTENT AND FORMAT

The Proposal shall be arranged according to the structure defined below and shall explicitly include all the information listed. Proposals will, ideally, be a maximum of 30 of pages. Appendices are in addition to this stipulation.

### Executive Summary

no more than 2 pages

This should briefly describe:

- your organisation and the Project Organisation structure (including whether bidding as Prime Contractor or Consortium basis);
- your relevant experience and expertise;
- summary of the proposed outcomes, approaches taken and key deliverables;
- proposed ETI Investment, any investment from the Participant(s) (if relevant); and
- confirmation of compliance with RfP requirements, including the Project Contract, and any material exceptions/deviations.

### Background to Proposed Participants and Structure

no more than 3 pages, plus appendices, if required, to include:

- Project Participants – a brief description of each proposed Participant, together with any proposed Subcontractors, partners and suppliers of goods/services who have key roles to play in the Project;
- Key Individuals and Roles – identify all key roles and all key individuals, in addition to key technical and other specialists. It must specifically include the detail of the nominated Project Manager and Chief Technologist. The estimated proportion of each individual's time to be dedicated to the Project should be identified and their skills and expertise in relation to the Project's deliverables should be summarised. CVs should be included as an Appendix; and
- Project Organisation – include an organisation diagram showing the organisation(s) and their principal roles, complete with key personnel and their roles.

### Project Description

no more than 5 pages, plus appendices if required to include:

- Project Approach;
- Programme of work;
- Project Schedule;
- Milestones and deliverables;
- Project Management Approach and Activities.

### Risk Management

no more than 2 pages, plus Risk Register

Respondents should identify the key risks and their approach to managing them. They should explain which risks will be managed exclusively by the Participant(s), which risks will be managed by the ETI and which risks will be jointly managed between the Participant(s) and the ETI.

## Health, Safety & Environmental Management

no more than 1 page

Respondents should set out how they will meet the requirements of Section 8 of the Project Commercial and Legal Requirements document, as relevant for the proposed Project approach.

## Intellectual Property

no more than 3 pages

Respondents should fully familiarise themselves with Section 2 (Intellectual Property) of the Project Commercial and Legal Requirements document before completing this section.

### Background IP and Third Party IP:

Respondents should identify and describe any Background IP and Third Party IP (e.g. copyright in reports, proprietary data, computer algorithms, know-how and/or other IP) including but not limited to specifically in relation to deliverables, reports, data or software models) to the extent that there is Background IP and/or Third Party IP which will or may be needed during the Project or by the ETI in using the outputs of the Project. Annex A4 is available to complete if Respondents find this helpful.

Respondents should identify their management approach and roles and responsibilities in the Project for managing this aspect.

### Arising IP:

Respondents should confirm that they accept the key concept that the ETI should own the Arising IP.

In the event that Respondents seek any licence for academic purposes and for publication, this should be set out.

In the event, any other proposal is to be made for ownership of the Arising IP or any commercial use of the Arising IP, early discussion with the ETI should be held and then full details should be set out in the Proposal.

### Dissemination:

It is expected that the primary route for dissemination of the Project results will be through the ETI. However, the ETI welcomes any Proposals for active dissemination from any Respondents and these should be set out, including specifically the areas of the Project outputs that Respondents would seek to disseminate and the strategy. The Project Contract will set out the ETI's publication process.

## Project Costs

no more than 2 pages

The Respondent should provide a breakdown of the total Fixed Price contract value as set out in the Tables 1, 2 and 3 below. If there are any assumptions or limitations to this price, these should be clearly stated.

Respondents should provide:

- a figure for the proposed Total Project Cost;
- a figure for the proposed (maximum) ETI Investment;
- figures for any proposed Participant Funding and/or Third Party Funding (as appropriate); and
- a breakdown of Total Project Cost (a) between milestones and, in the case of a Consortium contracting structure, between Participants against each milestone, (b) between Participants and cost categories and (if relevant) (c) between the ETI Investment and other sources of funds, in the form shown in Tables 1, 2 and 3 below.

**Notes to Respondents on Category Breakdown table**

Base labour should include direct add-ons (e.g. NI, pension etc).

If a Prime Contractor/Subcontractor Project structure is proposed, major Subcontractors should be considered as Participants and fill in a column in the table.

Participants should note that, under state aid rules, profit cannot be paid to Participants if they wish to receive a licence for Arising IP.

Academic Consortium Members should determine their costs using the JeS system. Note that ETI funds academic Consortium Members at 100% Full Economic Cost.

Note that during the Project Shaping and Contract Negotiation (prior to Project Contract signature) the ETI will require more detailed cost breakdowns, including a schedule of payments against the milestones. This will require completion of ETI's project budget forms. Whilst not compulsory, it is recommended that Participants use these forms in support of this proposal to produce the Project costings,. These forms are available from the ETI on request.

**Project Costs – Table 1**

	Finish Date	Participant 1 (Lead Coordinator or Prime Contractor)	Participant 2	Participant 3	Participant 4 etc.	Total
<b>Milestone 1</b>						
<b>Milestone 2</b>						
<b>Milestone 3</b>						
<b>TOTALS</b>						

**Project Costs – Table 2**

	<b>Participant 1</b> (Lead Coordinator or Prime Contractor)	<b>Participant/ Major Subcontractor 2</b>	<b>Participant/ Major Subcontractor 3</b>	<b>Participant/ Major Subcontractor 4 etc.</b>	<b>Total</b>
<b>Number of Person-days</b>					
<b>Materials Consumed</b>					
<b>Capital Equipment</b>					
<b>Sub-contracts; Consultancy; Fees including fees for Trial and Testing</b>					
<b>Travel and Subsistence</b>					
<b>Other Costs</b>					
<b>Labour Costs</b>					
<b>Profit</b>					
<b>Overheads</b>					
<b>TOTAL PROJECT COSTS (ELIGIBLE COSTS)</b>					

Respondents should note that this breakdown is required even if a Fixed Price is proposed, to enable the ETI to undertake a value for money assessment.

**Project Costs – Table 3**

	<b>Participant 1</b> (Lead Coordinator or Prime Contractor)	<b>Participant/ Major Subcontractor 2</b>	<b>Participant/ Major Subcontractor 3</b>	<b>Participant/ Major Subcontractor 4 etc.</b>	<b>Total</b>
<b>ETI Investment (Project Contract)</b>					
<b>ETI Investment (%)</b>					
<b>Own Funds (Participant Funding)</b>					
<b>Third Party Funding (Private Funding)</b>					
<b>Third Party Funding (Public Funding)</b>					
<b>ETI Equity Investment (if applicable)</b>					

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