



Department for  
Business, Energy  
& Industrial Strategy

**Invitation to Tender for Contractors for the Provision  
of Hydrogen End User Skills and Standards for Heat  
Supporting Research and Evidence**

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2:00 pm, 24  
September 2021

(Revision A)

## Department for Business, Energy & Industrial Strategy

Date: 6 September 2021

The Department for Business, Energy & Industrial Strategy (“BEIS”) wishes to commission suppliers to carry out hydrogen end user skills and standards for heat supporting research and evidence.

Enclosed are the following sections:

- Section 1 (page 5) Instructions and Information on Tendering Procedures
- Section 2 (page 10) Introduction and Background Information
- Section 3 (page 15) Specification of Requirements (all lots)
- Section 4 (page 44) Tender Requirements (all lots)
- Section 5 (page 60) Further Information on Tender Procedure
- Section 6 (page 64) Declarations to be submitted by the Tenderer;
  - Statement of Non-Collusion
  - Form of Tender
  - Conflict of Interest
  - Standard Selection Questionnaire
  - The General Data Protection Regulation Assurance Questionnaire for Contractors
  - Code of Practice for Research
  
- Annex A: Pricing Schedule
- Annex B: Code of Practice for Research
- Annex C: Exclusion Grounds
- Annex D: Key Performance Indicators
- Annex E: List of Abbreviations
- Annex F: List of Related Standards

Please register your interest in submitting a tender for this project by emailing **[nzip.hydrogen@beis.gov.uk](mailto:nzip.hydrogen@beis.gov.uk)**. To apply for this tender please also register on the following website **[www.delta-esourcing.com](http://www.delta-esourcing.com)**. This will ensure you receive immediate notification of updates to the ITT process or answers to questions raised by potential bidders.

Please read the instructions on the tendering procedures carefully since failure to comply with them may invalidate your tender. Your tender must be returned by **2.00 pm on Friday 24<sup>th</sup> September 2021** clearly marked as “TENDER”.

We look forward to receiving your response.

Yours sincerely,

John Foyster

E:mail: **[nzip.hydrogen@beis.gov.uk](mailto:nzip.hydrogen@beis.gov.uk)**

## **Privacy Notice**

This notice sets out how we will use your personal data, and your rights. It is made under Articles 13 and/or 14 of the General Data Protection Regulation (GDPR).

### **YOUR DATA**

We will process the following personal data:

Names and contact details of employees involved in preparing and submitting the bid;  
Names and contact details of employees proposed to be involved in delivery of the contract;  
Names, contact details, age, qualifications and experience of employees whose CVs are submitted as part of the bid.

#### *Purpose*

We are processing your personal data for the purposes of the tender exercise described within the remainder of this Invitation to Tender, or in the event of legal challenge to such tender exercise.

#### *Legal basis of processing*

The legal basis for processing your personal data is processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the data controller, such as the exercise of a function of the Crown, a Minister of the Crown, or a government department; the exercise of a function conferred on a person by an enactment; the exercise of a function of either House of Parliament; or the administration of justice.

#### *Recipients*

Your personal data will be shared by us with other Government Departments or public authorities where necessary as part of the tender exercise. We may share your data if we are required to do so by law, for example by court order or to prevent fraud or other crime.

#### *Retention*

All tenders will be retained for a period of 6 years from the date of contract expiry, unless the contract is entered into as a deed in which case it will be kept for a period of 12 years from the date of contract expiry.

### **YOUR RIGHTS**

You have the right to request information about how your personal data are processed, and to request a copy of that personal data.

You have the right to request that any inaccuracies in your personal data are rectified without delay.

You have the right to request that any incomplete personal data are completed, including by means of a supplementary statement.

You have the right to request that your personal data are erased if there is no longer a justification for them to be processed.

You have the right in certain circumstances (for example, where accuracy is contested) to request that the processing of your personal data is restricted.

You have the right to object to the processing of your personal data where it is processed for direct marketing purposes.

You have the right to object to the processing of your personal data.

## **INTERNATIONAL TRANSFERS**

As your personal data is stored on our IT infrastructure and shared with our data processors Microsoft and Amazon Web Services, it may be transferred and stored securely in the UK and European Economic Area. Where it is the case that your personal data is stored outside the UK and EEA it will be subject to equivalent legal protection through the use of Model Contract Clauses.

## **COMPLAINTS**

If you consider that your personal data has been misused or mishandled, you may make a complaint to the Information Commissioner, who is an independent regulator. The Information Commissioner can be contacted at:

Information Commissioner's Office  
Wycliffe House  
Water Lane  
Wilmslow  
Cheshire  
SK9 5AF  
0303 123 1113  
casework@ico.org.uk

Any complaint to the Information Commissioner is without prejudice to your right to seek redress through the courts.

## **CONTACT DETAILS**

The data controller for your personal data is the Department for Business, Energy Industrial Strategy (BEIS).

You can contact the BEIS Data Protection Officer at: BEIS Data Protection Officer, Department for Business, Energy and Industrial Strategy, 1 Victoria Street, London SW1H 0ET. Email: **dataprotection@beis.gov.uk**.



Department for  
Business, Energy  
& Industrial Strategy

**Section 1**

**Instructions and Information on Tendering  
Procedures**

Invitation to Tender for Contractors for the Provision of Hydrogen End User Skills and Standards for Heat Supporting Research and Evidence

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## A. Indicative Timetable

The anticipated timetable for this tender exercise is as follows. THE DEPARTMENT reserves the right to vary this timetable. Any variations will be published on contracts finder or circulated to all organisations who have registered an interest in notifications.

<b>Tender Timeline</b>	<b>Date</b>
Advert and full invitation to tender issued	10 August 2021
Deadline for questions relating to the tender	20 August 2021
Responses to questions published	6 September 2021
Deadline for receipt of tender	By 2:00 pm, 24 September 2021
Invite suppliers for bid clarification (if needed)	w/c 4 October 2021
All suppliers alerted of outcome	18 October 2021
10 day standstill	19 October 2021 to 28 October
Contract award on signature by both parties	w/c 8 November 2021
Contract start date	15 November 2021

The contract is to be for a period as stated below for each lot unless terminated or extended by the Department in accordance with the terms of the contract.

The contract duration of each lot will be:

- Lot 1: 12 months
- Lot 2: 15 months
- Lot 3: 12 months
- Lot 4: 12 months
- Lot 5: 12 months

## B. Procedure for Submitting Tenders

The maximum page limit for tenders is 20 A4 pages (excluding declarations, pricing schedule and CVs) per lot. The font type should be in Arial, minimum size 12 pt with single line spacing and minimum 2.5 cm margins.

To apply for this tender please register on the following website [www.delta-](http://www.delta-)

**esourcing.com**. Please contact the Delta Helpdesk on 0845 270 7050 for any registration queries. Please upload your proposal before the deadline via BIP Solutions Delta Website.

For questions regarding the procurement process please contact John Foyster at: **nzip.hydrogen@beis.gov.uk**

Tenders will be received up to the time and date stated. Please ensure that your tender is delivered not later than the appointed time on the appointed date. The Department does not undertake to consider tenders received after that time. The Department requires tenders to remain valid for a period indicated in the specification of requirements.

The Department shall have the right to disqualify you from the procurement if you fail to fully complete your response, or do not return all of the fully completed documentation and declarations requested in this ITT. The Department shall also have the right to disqualify you if it later becomes aware of any omission or misrepresentation in your response to any question within this invitation to tender. If you require further information concerning the tender process, or the nature of the proposed contract, email **nzip.hydrogen@beis.gov.uk**. All questions should be submitted by 2.00 pm, 20 August 2021; questions submitted after this date may not be answered. Should questions arise during the tendering period, which in our judgement are of material significance, we will publish these questions with our formal reply by 6 September 2021 and circulate – unnamed - to all organisations that have expressed an interest in bidding. All contractors should then take that reply into consideration when preparing their own bids, and we will evaluate bids on the assumption that they have done so.

You will not be entitled to claim from the Department any costs or expenses that you may incur in preparing your tender whether or not your tender is successful.

### **C. Conflict of Interest**

The Department's standard terms and conditions of contract include reference to conflict of interest and require contractors to declare any potential conflict of interest to the Secretary of State.

For research and analysis, conflict of interest is defined by the presence of an interest or involvement of the contractor, subcontractor (or consortium member) which could affect the actual or perceived impartiality of the research or analysis.

Where there may be a potential conflict of interest, it is suggested that the consortia or organisation designs a working arrangement such that the findings cannot be influenced (or perceived to be influenced) by the organisation which is the owner of a potential conflict of interest. For example, consideration should be given to the different roles which organisations play in the research or analysis, and how these can be structured to ensure maintain an impartial approach to the project is maintained.

The process by which this is managed in the procurement process is as follows:

1. **During the bidding process, organisations may contact BEIS to discuss whether or not their proposed arrangement is likely to yield a conflict of interest.** Any responses given to individual organisations or consortia will be published on contract finder (in a form which does not reveal the questioner's identity). Any organisation thinking of submitting a bid should share their contact details with the staff member responsible for this procurement, to ensure they receive an update when any responses to questions are published.
2. **Contractors are asked to sign and return Declaration 3 (page 70) to indicate whether or not any conflict of interest may be, or be perceived to be, an issue.** If this is the case, the contractor or consortium should give a full account of the actions or processes that it will use to ensure that conflict of interest is avoided. In any statement of mitigating actions, contractors are expected to outline how they propose to achieve a robust, impartial and credible approach to the research.
3. **When tenders are scored, this declaration will be subject to a pass/fail score,** according to whether, on the basis of the information in the proposal and declaration, there remains a conflict of interest which may affect the impartiality of the research.

Failure to declare or avoid conflict of interest at this or a later stage may result in exclusion from the procurement competition, or in the Department exercising its right to terminate any contract awarded.

BEIS has appointed the Health and Safety Executive (HSE) to advise on the outputs from this contract, as part of a memorandum of understanding between BEIS and HSE. The regulatory arm of the HSE have contributed to the design of this ITT and will participate in the evaluation of tenders received. All necessary steps will be taken to mitigate any actual or perceived conflict of interest potentially arising as a result.

## **D. Evaluation of Responses**

The tender process will be conducted to ensure that bids are evaluated fairly and transparently, in accordance with agreed assessment criteria. Further details are provided in the specification.

## **E. Terms and Conditions Applying to This Invitation to Tender**

The Department's Standard Terms and Conditions of Contract will apply to this contract. These are published on the on BiP Solutions Delta website alongside this Invitation to Tender.

The Standard Terms shall be amended as follows:



**Clause 18(7) Indemnities and Insurance** is replaced with the following:

(7) Except in relation to death or personal injury as referred to in Condition 18(1), and subject to Conditions 18(5) and 30(15) the amount of liability under this clause shall be limited to a sum of £1,000,000 or twice the contract value, whichever is the greater, or such other sum as may be agreed in writing between the Head of Procurement on behalf of the Authority and the Contractor.

## **F. Further Instructions to Contractors**

The Department reserves the right to amend the enclosed tender documents at any time prior to the deadline for receipt of tenders. Any such amendment will be numbered, dated and issued by 6 September 2021. Where amendments are significant, the Department may at its discretion extend the deadline for receipt of tenders.

The Department reserves the right to withdraw this contract opportunity without notice and will not be liable for any costs incurred by contractors during any stage of the process. Contractors should also note that, in the event a tender is considered to be fundamentally unacceptable on a key issue, regardless of its other merits, that tender may be rejected. By issuing this invitation the Department is not bound in any way and does not have to accept the lowest or any tender and reserves the right to accept a portion of any tender unless the tenderer expressly stipulates otherwise in their tender.

## **G. Checklist of Documents to be Returned**

- CVs for team members
- Proposal (maximum 20 A4 pages per lot)
- Annex A: Pricing Schedule
- Declaration 1: Statement of non-collusion
- Declaration 2: Form of Tender
- Declaration 3: Conflict of Interest
- Declaration 4: Standard Selection Questionnaire
- Declaration 5: The General Data Protection Regulation Assurance Questionnaire for Contractors
- Declaration 6: Code of Practice

## **Section 2**

### **Introduction and Background Information**

Invitation to Tender for Contractors for the Provision of Hydrogen End User Skills and Standards for Heat Supporting Research and Evidence

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## 1 Overview

This ITT invites potential suppliers to set out their proposal to deliver primary research to support Hydrogen Skills and Standards for Heat, for the Department of Business, Energy and Industrial Strategy (BEIS). This research is required to fill in gaps in the existing hydrogen evidence base. It will support the development of a set of hydrogen standards that will cover the design, installation and service requirements for pipework, including ancillary devices and appliances downstream of the Emergency Control Valve (ECV).

For technical proposals, bidders must explain clearly what expertise they can bring to each research area. All communications products, including reports, summaries, and presentations, should use clear language appropriate to a non-expert audience.

## 2 Background and Context

Achieving the UK's legally binding 2050 climate change targets is likely to require the almost complete decarbonisation of heat in domestic and non-domestic buildings. From 2016-18, BEIS performed an extensive review of evidence and analysis on heat decarbonisation and undertook modelling work to assess the costs and benefits of different pathways<sup>1</sup>. This review identified further work that was needed to explore the options before decisions could be made about the future of heat.

To enable these decisions, further work is needed between now and the mid-2020s to evaluate the safety, technical feasibility, costs, benefits, impacts and barriers of the option of transitioning to hydrogen for heat. The importance of this work is underscored by the Prime Minister's Ten Point Plan for a Green Industrial Revolution<sup>2</sup> which sets out ambitious goals for hydrogen heating trials: supporting industry to begin a neighbourhood trial by 2023 and a pioneering hydrogen village by 2025, and set out plans for a possible hydrogen town before the end of the decade.

The Hydrogen Skills and Standards for Heat programme forms part of the BEIS £1 billion Net Zero Innovation Portfolio (NZIP), which aims to accelerate the commercialisation of innovative clean energy technologies and processes through the 2020s and 2030s. The NZIP programme follows on from BEIS's Energy Innovation Portfolio, which supported the Hy4Heat programme<sup>3</sup> that carried out work related to this programme.

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<sup>1</sup> Department for Business, Energy and Industrial Strategy (2018) Clean Growth – Transforming Heating. Overview of Current Evidence <https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base>

<sup>2</sup> HMG (2020) The Ten Point Plan for a Green Industrial Revolution <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution/title>

<sup>3</sup> Hy4Heat Programme <https://www.hy4heat.info/>

The Hydrogen Skills and Standards for Heat programme has been initiated to develop technical standards to enable government and industry to deliver hydrogen heating trials and create policy enabling evidence. The standards developed will define the required criteria when using hydrogen in order to;

- a) Safely repurpose existing natural gas equipment
- b) Design and install new pipework and appliances
- c) Train a workforce of competent installers

The work will support hydrogen trial activities. The programme will support consideration of hydrogen for heat as a potential decarbonisation pathway for domestic/light commercial and industrial premises.

The programme is made up of four elements:

#### **1. Technical research and evidence gathering**

The subject of this ITT. This work will develop new primary research to fill identified gaps in the standards which are to be developed.

#### **2. Ancillary device and component standards**

Up to three Publicly Available Specification (PAS) standards will be produced by the British Standards Institution (BSI) covering:

- (a) Functional and test specification for hydrogen gas metering
- (b) Material specifications for ancillary hydrogen devices and components such as pipework, connectors and valves.
- (c) Functional and test specifications for ancillary hydrogen devices such as Excess Flow Valves (EFV) and installation test equipment.

These standards will be developed in parallel with the evidence gathering work, with preliminary results used to support standards.

#### **3. Hydrogen enabling standards**

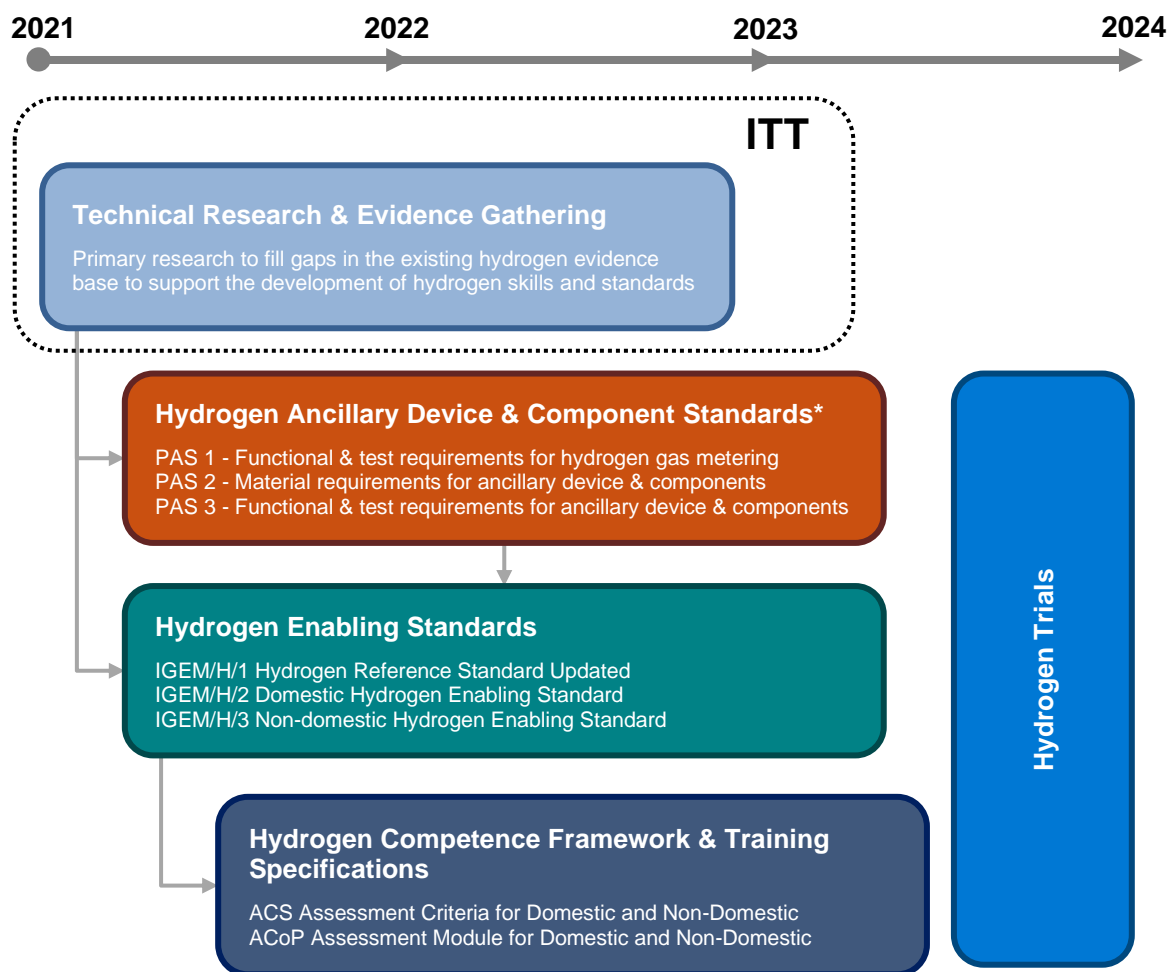
An update to the Institution of Gas Engineers and Managers' (IGEM) Reference Standard will be made with the latest information available from industry. The reference standard provides a point of reference for those seeking to understand the characteristics and implications of using 100% hydrogen in domestic and small commercial buildings.

Following the update, two full enabling standards will be produced covering considerations for gas installers in domestic and non-domestic (up to light industrial sites). The scope will include installing new gas pipes and repurposing existing gas infrastructure in a building.

The enabling standards will make reference to a mixture of existing and new standards, including the BSI PAS standards which are to be developed. The IGEM enabling standards will focus on installer guidance materials and will cross reference areas like material specifications being incorporated into BSI's PAS standards.

#### **4. Hydrogen competence framework and training specifications**

Energy and Utility Skills (EUS) will codify both the IGEM domestic and non-domestic enabling standards into competency frameworks and training specifications to facilitate the training of a competent workforce for trials. They will produce Accredited Certification Scheme (ACS) assessment criteria and Approved Code of Practice (ACoP) assessment modules for both enabling standards, working with industry to ensure there is a clear path for existing competent installers to train for the installation of hydrogen.



**Figure 2.1** Hydrogen skills and standards programme timelines (\*total number of PAS standards required is to be determined through programme scoping workshops).

### 3 Objectives

The Hydrogen Skills and Standards for Heat programme is necessary to deliver evidence for policy decisions. It will support work to codify changes needed to heating systems, on which basis an accurate assessment of costs/impacts and therefore the feasibility of converting end-users from natural gas to hydrogen can be made. With 85% of homes heated by gas in the UK, having a firm basis to compare hydrogen with other decarbonisation heating options, such as electrification, is a critical input to government's strategic policy decision to be taken in mid 2020s.

Successful completion of the Hydrogen Skills and Standards for Heat programme will provide:

- A clear unambiguous set of installation instructions for hydrogen systems.
- A benchmark against which to assess the 'hydrogen readiness' of existing homes and businesses, and therefore the costs, impacts and feasibility of conversion.
- **Primary research (this ITT)** to fill gaps in the existing hydrogen evidence base, enabling the completion of the Hydrogen Skills and Standards for Heat programme itself.

## 4 Summary of Requirements

The primary research will be delivered through five separate lots as detailed below in Table 2.1. The specific requirements for each lot are provided in Section 3.

**Table 2.1** Summary table of lots.

<b>Lot</b>	<b>Project Title</b>	<b>Section Number</b>
<b>1</b>	Research and evidence gathering for piped systems with respect to hydrogen for: i) purging ii) tightness and material compatibility.	3.1 (Page 15)
<b>2</b>	Research and evidence gathering for material and component suitability - domestic and non-domestic for hydrogen.	3.2 (Page 23)
<b>3</b>	Research and evidence gathering for installation ventilation and flues.	3.3 (Page 30)
<b>4</b>	Research and evidence gathering for pipe sizing and pressure drop criteria with respect to hydrogen.	3.4 (Page 35)
<b>5</b>	Research and evidence gathering for hydrogen: i) meter, internal and external, ventilation study ii) installation and set point of excess flow valves (EFV)	3.5 (Page 39)

**Note: Tenderers can bid for any or all lots and should complete a separate submission for each lot that they wish to bid for. Bid submissions should include information as requested in the lot specific requirement detailed in Sections 3.1 – 3.5 and the tender requirements stipulated in Section 4 of this ITT.**



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## Section 3.1

### Specification of Requirements

**(Lot 1 - Research and Evidence Gathering for Piped Systems with Respect to Hydrogen for:**

- i) Purging**
- ii) Tightness and Material Compatibility)**

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

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# Department for Business, Energy & Industrial Strategy

## 3.1 Lot 1: Research and Evidence Gathering for Piped Systems with Respect to Hydrogen for:

- i) **Purging**
- ii) **Tightness and Material Compatibility**

The supporting evidence research for hydrogen standards addresses particular aspects of the use of hydrogen where the physical properties of hydrogen will potentially have an impact on existing procedures and practices for natural gas.

**Lot 1** is split into two focus areas addressing:

- i) **purging** of systems which aims to identify where additional data is required to permit the development of safe purging procedures for both domestic and non-domestic environments.
- ii) gas **tightness and material compatibility** of existing pipework and fittings downstream of the ECV for hydrogen gas (BS ISO 14687<sup>4</sup> Type A) and natural gas (G20) as a baseline.

### 1.1 Purging: Project Aims and Objectives

The primary questions to be addressed in the test programme are:

1. For domestic sized installations is there an increased risk from stratification (Gas accumulation measurements should focus on maximum concentrations developed during the purge) and/or mixing within large bore pipework?
2. Are the purge rates and purge volumes recommended in IGEM/UP/1<sup>5</sup>, IGEM/UP/1A<sup>6</sup> and IGEM/UP/1B<sup>7</sup> for natural gas appropriate for hydrogen? Can recommendations be made for suitable sized purge points or other means of controlling the purge rate?
3. What are the potential sources of ignition within a pipework system during purging, or after an incomplete purge? Are there any mitigations that should be applied?
4. What are the impacts of an ignition within a pipework system (including consideration of dead legs) during purging? Can the energy release be contained/safely vented, or will this represent a risk to the operators, public and building structure?
5. Based on the above can a safe direct purge methodology be developed?
6. Are existing venting arrangements for natural gas acceptable for hydrogen?
7. Is flaring of purged gas desirable/are changes needed to the vent stack design?

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<sup>4</sup> BS ISO 14867:2019 Hydrogen fuel quality. Product specification

<sup>5</sup> IGEM/UP/1 Edition 2 +A:2005 Strength testing/tightness testing/direct purging of industrial and commercial gas installations

<sup>6</sup> IGEM/UP/1A Edition 2 +A: 2005 – Strength/tightness testing/purging of small, low pressure industrial and commercial installations

<sup>7</sup> IGEM/UP/1B Edition 3 +A: 2012 - Tightness testing and direct purging of small Liquefied Petroleum Gas/Air, NG and LPG installations



8. Should a flame arrestor be included in the venting arrangement and to what specification?
9. Are there any requirements for additional equipment such as a passive hydrogen detector, or automatic purging equipment?
10. Any there any requirements to use specific tools during the purging operation (e.g non-sparking such as brass)?

## 1.2 Purging: Scope of Work

The testing will fall into two stages as follows:

### 1.2.1 Stage 1a: Literature Search and Assessment of Existing Evidence

A thorough review of the existing evidence and research information relating to the impact of hydrogen, whether pure or as a blend, on the purging of existing or new gas systems in domestic and commercial buildings. This should include Steer Energy Report developed under Hy4Heat programme on Domestic hydrogen purge procedures<sup>8</sup>.

The search should include both UK and international based papers, articles and reports. The evidence should be assessed for relevance to the purging within low pressure end-user gas systems, and should classify the findings as:

- a) Fully relevant – the data can be regarded as being fully applicable for use in a 100% hydrogen gas system operating within the **criteria 1-4** (outlined below). No further testing required.
- b) Partially relevant – focussed testing is required to address specific aspects before the data can be applied.
- c) No relevant evidence – full testing required to provide new evidence to allow recommendations to be made.

### 1.2.2 Stage 1b: Physical Testing

Three broad areas of testing are currently envisaged, though these should be developed as part of the test plan and expanded as necessary:

1. An extension of the work carried out by Steer Energy to include pipework sizes up to 150 mm, and to identify whether there are any additional or increased risks. This should identify whether there is a requirement to amend any of the purge criteria currently given in IGEM/UP/1<sup>9</sup>, IGEM/UP/1A<sup>10</sup> and IGEM/UP/1B<sup>11</sup>
2. Identification of practical ignition sources within pipework, including static discharge, and review of the impact of ignition. This should include a representative range of pipework materials and jointing techniques.
3. Dependent on the outcome of the testing on the impact of ignition, a review of whether the existing venting arrangements are adequate and whether a flame arrestor should be incorporated into the venting arrangement.

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<sup>8</sup> Steer Energy Final **Report** V1.5 Domestic hydrogen purge procedures dated 18 March 2021

<sup>9</sup> IGEM/UP/1 Edition 2 +A:2005 Strength testing/tightness testing/direct purging of industrial and commercial gas installations

<sup>10</sup> IGEM/UP/1A Edition 2 +A: 2005 – Strength/tightness testing/purging of small, low pressure industrial and commercial installations

<sup>11</sup> IGEM/UP/1B Edition 3 +A: 2012 - Tightness testing and direct purging of small Liquefied Petroleum Gas/Air, NG and LPG installations

The detailed methodology of the physical testing programme is to be defined by the appointed testing house, with the overriding requirement to demonstrate whether the risks are materially different from the current assumptions for natural gas. The final output is to be a list of evidence-informed recommended amendments for the purging section of IGEM/UP/1, IGEM/UP/1A and IGEM/UP/1B.

The aim is to relate the testing regime, as far as is possible, to the reality of gas installations within domestic and commercial buildings and their environs. The following **criteria** will be set:

1. The testing should be carried out at pressures as defined in IGEM/UP/1A, with a maximum Operating Pressure of less than 40 mbar. However, the majority of systems within buildings actually operate between 21-25 mbar and although the potential pressure regime for Hydrogen has still to be determined, and there are indications that it will need to operate at a higher pressure regime than natural gas to overcome pipework pressure losses, it is felt that this is a representative range.
2. The testing should be carried out at ambient temperature (-30°C to +50°C). The range is selected to reflect extreme temperature range within the UK (though not absolute extremes). The upper temperature reflects that gas pipework tends to be run through ceiling voids, and within plantrooms where higher ambient temperatures may be experienced.
3. The testing should be carried out using nominally 100% hydrogen to either DNV Hy4Heat WP2 Purity Standard or BS ISO 14687:2019 Type A Standard, or air (dependent on particular test).
4. This work on purging needs to be applicable to the changeover purging from natural gas to hydrogen, but this will always be a lower risk than both purging from air to hydrogen, or natural gas to air, and so any purging procedures for hydrogen should be acceptable.
5. The testing should be carried out on pipework sizes up to 150 mm diameter.

### 1.3 Purging: Outputs Required

Deliverable Name	Type	Content
<b>Lot 1 Literature Review Report</b>	Document	Documented thorough review of the existing evidence and research information relating to the impact of hydrogen, whether pure or as a blend, on the purging of existing or new gas systems in domestic and commercial buildings.
<b>Lot 1 Purging Report</b>	Document	Write a comprehensive report on test plan and method, experiment setup and details, analysis and conclusion of results to demonstrate whether the risks are materially different from the current assumptions for natural gas. This should include a list of recommended amendments for the purging section of IGEM/UP/1, IGEM/UP/1A and IGEM/UP/1B.
<b>Lot 1 Purging Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.



# Department for Business, Energy & Industrial Strategy

## 2.1 Tightness and Material Compatibility: Aims and Objectives

The aim of this work is to determine the fitness for purpose of fittings and general pipework within typical non-domestic environments for hydrogen gas (BS ISO 14687 Type A) vs. natural gas (G20). This work should expand evidence gained from Hy4Heat programme in this area for end user systems, across the full possible range of piped systems converted, either demonstrating tightness or highlighting existing systems for which there will be risks. Experimental results should consider life of components and will be used to support the development of:

- The functional specifications (i.e which pipes & fittings could be used/re-used).
- The installation standards (i.e how could the pipe & fittings be used/re-used and tested).

The objectives of this work package are to test and compare the gas tightness of existing pipework and fittings downstream of the ECV for hydrogen gas (BS ISO 14687 Type A) and natural gas (G20) as a baseline. The test method should consider the use of a mock-up of a typical non-domestic pipe system (downstream of the ECV).

## 2.2 Tightness and Material Compatibility: Scope of Work

Testing of the pipework and accessory types commonly found in gas installation systems will cover fitness for purpose of general pipework, fittings and joints commonly found in new and existing gas distribution systems within buildings.

The testing is to be carried out by suitably qualified and experienced materials testing house, either commercial or academic. This will fall into two sub-stages as follows:

### 2.2.1 Stage 1a: Literature Search and Assessment of Existing Evidence

A thorough review of the existing evidence and research information relating to the impact of hydrogen, whether pure or as a blend, on the suitability of pipe work, fittings and joints that are commonly found as part of existing or new gas systems in domestic and commercial buildings in the UK. This should include Steer Energy Report developed under Hy4Heat programme, Safety Assessments for Suitability of Hydrogen in Existing Buildings<sup>12</sup>.

The search should include both UK and international based papers, articles and

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<sup>12</sup> Steer Energy Report **Report** Safety Assessments for Suitability of Hydrogen in Existing Buildings

reports.

The evidence should be assessed for relevance to the use of the pipe work, fittings and joints within low pressure end-user gas systems, and should classify the findings as:

- a) Fully relevant – the components and joints can be regarded as being acceptable, or not acceptable as appropriate, for use in a 100% hydrogen gas system operating. No further testing required.
- b) Partially relevant – focussed testing is required to address specific aspects before the components and joints can be classified as acceptable or not acceptable.
- c) No relevant evidence – full testing required to provide new evidence to allow classification as acceptable or not acceptable.

Testing should consider longevity/operational impacts (e.g. impact of temperature cycling on joints/tightness).

### **2.2.2 Components Leakage**

This should be designed to test a wide range of components and jointing techniques in normal operational conditions, to verify that their performance in terms of leakage using hydrogen is not significantly worse than is deemed acceptable for natural gas installation systems.

This should test the leakage to external from the fittings through the jointing techniques and internal paths such as component or material joints and gland packing, and the internal leakage through components such as valve shoes/gates. The selection of a representative sample of components for new materials is a relatively easy task. The selection can be reduced significantly if it is accepted that a straight joint of a particular type is the same in terms of the leakage principles as an elbow or a tee joint.

The selection of existing aged components is considerably more challenging, partly because of the range of different materials and components that have been used over the years, but also because the age of the components may impact on their performance with the potential to deteriorate over time. The impact of this is that it will be necessary to test multiple components, each at several age points to cover existing installation life spans where appropriate. The supplier method and test plan should clearly demonstrate how this will be achieved. The proposal should cover provision for at least three sample ages for each component type, the actual age range will be agreed following literature review with BEIS project team and standards bodies.

### **2.2.3 System Leakage Rates**

This should be designed to test typical pipework and equipment arrangements to verify that their performance in terms of leakage is not significantly worse than is deemed acceptable for natural gas installation systems.

For new pipework and equipment, if it is already demonstrated that the performance of the individual components is satisfactory, and the systems are then assembled in a laboratory environment, it is likely that the system as a whole will be found to be satisfactory. The system approach is required to provide assurance that all possible tests have been executed in demonstrating the safety of hydrogen installations.

The range of existing aged systems would need to be tested in-situ. Having first ascertained that the system is acceptable under current requirements for natural gas the systems would then be filled with hydrogen for a static pressure test. If the system is found to have leakage, beyond what is considered acceptable, then the locality of the leakage will be investigated and recorded. Final acceptability criteria will be agreed between the supplier and the programme during project initiation. Over the full range of testing, a picture should emerge of issues associated with a particular joint technique or a particular age of equipment.

The challenge with the existing aged system is quantifying what would constitute a representative sample of existing installations that would provide a reasonable degree of confidence that the findings can be applied to the whole of the existing gas installations.

### 2.3 Tightness and Material Compatibility: Outputs Required

Deliverable Name	Type	Content
<b>Lot 1 Tightness and Material Compatibility Literature Review Report</b>	Document	Documented review of the existing evidence and research information relating to the impact of hydrogen, whether pure or as a blend, on the suitability of pipe work, fittings and joints that are commonly found as part of existing or new gas systems in domestic and commercial buildings in the UK.
<b>Lot 1 Tightness and Material Compatibility Report</b>	Document	Write a comprehensive report on test plan and method, experiment setup and details, analysis and conclusion of results to demonstrate fitness of purpose for common use in pipework, fittings and joints for new and existing systems are suitable for use with hydrogen.  This should include list of acceptable, acceptable with limitations and non-acceptable components and joints with associated defined design life.
<b>Lot 1 Tightness and Material Compatibility Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.



## Section 3.2

### Specification of Requirements

#### (Lot 2 - Research and Evidence Gathering for Material and Component Suitability - Domestic and Non-Domestic with Respect to Hydrogen)

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting  
Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

### Contents

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# Department for Business, Energy & Industrial Strategy

## **3.2 Lot 2: Research and Evidence Gathering for Material and Component Suitability - Domestic and Non-Domestic with Respect to Hydrogen**

### **1.1 Aims and Objectives**

The aim of this work is to determine materials which are suitable for use with hydrogen. The work will initially consist of a literature search followed by experimental testing (where the literature search concludes additional evidence is required) to quantify the relative risk of using these materials with hydrogen against the baseline of natural gas systems, including longevity.

The objectives of this work package are to test and compare the material suitability of existing and new pipework and fittings downstream of the ECV for hydrogen gas relative to natural gas. The threshold measure of evidence for the materials work is that the work can determine if anticipated failure modes of the materials (through mechanisms such as embrittlement, degradation and permeability) used in hydrogen end use settings would be comparable to the current natural gas systems, including consideration of installation life span.

The primary areas of concern identified in previous research are:

- Embrittlement - small changes in tensile strength, reduction in ductility (leading to brittle behaviour) and a reduction in fatigue life for materials subject to cyclic loading, e.g. valve springs.
- Permeability – the ability of hydrogen gas to dissociate into atomic hydrogen, pass through the material structures and then recombine as hydrogen gas on the surface of the pipe, or diffusion for non-metallic materials (if this action leads to any form of material degradation).

There is extensive existing evidence on the impact of hydrogen on the performance of various materials, but the majority of this work has been centred on high pressure systems for hydrogen generation and storage, on primary distribution network underground pipework, and on hydrogen/methane mixes. Although the evidence is generally positive, it is not clear how directly the evidence can be applied to low pressure, downstream of the ECV pipework installation systems operating with 100% hydrogen.

IGEM have already carried out a literature review on the impact of hydrogen on

materials, which is summarised in IGEM/H/1 Reference Standard<sup>13</sup> for Low Pressure Hydrogen Utilisation, with 21 papers, reports and data sheets reviewed. The general conclusion is that the majority of materials in common use would be satisfactory in a hydrogen system, but there are some where further research is required. The intent is that this research will confirm and support the findings of the IGEM work, and fill both the recognised gaps and any further gaps that are identified. This new evidence will then be used to support the standards to be developed for the use of hydrogen.

## **1.2 Scope of Work**

Testing of the pipework and accessory types commonly found in gas distribution systems will cover the impact of prolonged exposure to 100% hydrogen on the internal structure and performance of the various materials commonly found in new and existing gas installation systems within buildings.

The testing is to be carried out by suitably qualified and experienced materials testing house, either commercial or academic. This will fall into two sub-stages as follows:

### **1.2.1 Stage 1a: Literature Search and Assessment of Existing Evidence**

A thorough review of the existing evidence and research information relating to the impact of hydrogen, whether pure or as a blend, on the materials that are commonly found as part of existing or new gas systems in domestic and commercial buildings in the UK. The search should include both UK and international based papers, articles and reports.

The evidence should be assessed for relevance to the use of the materials within low pressure end-user gas systems, and should classify the findings as

- a) Fully relevant – the material can be regarded as being acceptable, or not acceptable as appropriate, for use in a 100% hydrogen gas system operating within the criteria given in basis of testing (section 1.3 below). No further testing required.
- b) Partially relevant – focussed testing is required to address specific aspects before the material can be classified as acceptable or not acceptable.
- c) No relevant evidence – full testing required to provide new evidence to allow classification as acceptable or not acceptable.

The work should also consider how an individual might be able to determine the type of materials installed in an existing setting (e.g visual inspection, XRF – X-Ray Fluorescence Spectrometry, LIBS Laser Induced Breakdown Spectroscopy).

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<sup>13</sup> IGEM/H/1 Reference Standard for Low Pressure Hydrogen Utilisation  
<https://www.igem.org.uk/technical-services/technical-gas-standards/hydrogen/igem-h-1-reference-standard-for-low-pressure-hydrogen-utilisation/>



### 1.2.2 Stage 1b: Physical Testing

The physical testing will investigate the potential issues with permeability and embrittlement, where the literature search concludes additional evidence is required for specific materials.

The study plan developed should review whether there would be benefit in conducting tests to quantify the impact of hydrogen gas at velocity within piping systems, particularly at changes of directions. For a given heat output the volume flowrate of gas required in a hydrogen system is approximately three times that of a natural gas system. Pipe velocities in hydrogen systems are therefore likely to be significantly higher than is designed for in current piping systems.

The detailed methodology of the physical testing programme is to be defined by the appointed testing house, with the over-riding requirement to demonstrate whether the predicted failure rates are materially different from the current assumptions for natural gas.

The final output is to be a list of acceptable materials, acceptable materials with limitations and non-acceptable materials.

### 1.3 Materials for Testing

A preliminary list of materials in common use in pipework, equipment and components for new and existing systems are listed in Table 3.1 below. This would form the core list of testing requirements under Stage 1b, unless evidence has been identified of their satisfactory performance under Stage 1a.

**Table 1.3** Materials used for hydrogen pipework, equipment, and components.

Use	New Materials	Existing Aged Materials
Pipework	<ul style="list-style-type: none"> <li>- Carbon Steel</li> <li>- Stainless Steel</li> <li>- Polyethylene</li> <li>- Copper</li> <li>- Corrugated Stainless Steel Tube (CSST)</li> </ul>	<ul style="list-style-type: none"> <li>- Carbon Steel</li> <li>- Stainless Steel</li> <li>- Polyethylene</li> <li>- Copper</li> <li>- Corrugated Stainless Steel Tube (CSST)</li> <li>- Lead</li> <li>- Aluminium</li> <li>- Chrome Plated Carbon Steel</li> </ul>
Equipment	<ul style="list-style-type: none"> <li>- Carbon Steel</li> <li>- Stainless Steel</li> <li>- Brass</li> <li>- Bronze</li> </ul>	<ul style="list-style-type: none"> <li>- Carbon Steel</li> <li>- Stainless Steel</li> <li>- Brass</li> <li>- Bronze/Gunmetal</li> <li>- Cast Iron</li> <li>- Chrome Plated Carbon Steel</li> </ul>

Use	New Materials	Existing Aged Materials
Components	<ul style="list-style-type: none"> <li>- PTFE</li> <li>- Jointing Compound/Anaerobic Sealants/Tape</li> <li>- Solder/Brazing Rod</li> <li>- Soft Body Parts of Valves (Elastomers/Polymers)</li> <li>- Materials as above, but in different forms (i.e. springs)</li> </ul>	<ul style="list-style-type: none"> <li>- PTFE</li> <li>- Jointing Compound/Anaerobic Sealants/Tape</li> <li>- Solder/Brazing Rod</li> <li>- Soft Body Parts of Valves (Elastomers/Polymers)</li> <li>- Materials as above, but in different forms (i.e. springs)</li> <li>- Hemp</li> </ul>

This list is not exhaustive, but should be added to as additional materials are identified, particularly when relating to knowledge of existing installations, or through the literature review carried out in Stage 1a.

The status of multi-material piping systems, such as GF Alupex should be considered as part of the study, and in particular whether the evidence on individual materials can be aggregated to provide evidence on the mixed materials, or if additional, separate testing is required.

#### Notes:

1. The list of new materials is based on those scheduled in IGEM/UP/2<sup>14</sup> and BS 6891<sup>15</sup>. This standard does not preclude the use of other materials, but their use is not expected in normal installations.
2. Polyethylene is not permitted within buildings, but it is widely used in private network distribution downstream of the primary meter and between buildings so should be included.
3. The use of lead and aluminium pipework is no longer recommended in gas distribution systems. However for complete understanding their testing is required as part of this work.
4. As hydrogen embrittlement is a diffusion based mechanism, on completion of hydrogen charging, samples should be tested immediately or as soon as reasonable practicable to avoid outgassing of the hydrogen.

### ***Basis of Testing***

The aim is to relate the testing regime, as far as is possible, to the reality of gas installations within domestic and commercial buildings and their environments. The following **criteria** will be set:

1. The testing should be carried out at pressures of less than 75 mbar. This figure has been selected as the top of the allowable pressure range for Low Pressure 2<sup>nd</sup> family natural gas installations. The majority of systems within buildings actually operate between 21-25 mbar and there is an argument that the test criteria should be reduced to this level to be as representative of the installed systems as possible. However, the potential pressure regime for hydrogen is still to be determined, and

<sup>14</sup> IGEM/UP/2 Edition 3 – Installation pipework on industrial and commercial premises

<sup>15</sup> BS 6891:2015+A1:2019 Specification for the installation and maintenance of low pressure gas installation pipework of up to 35 mm (R114) on premises

there are indications that it will need to operate at a marginally higher pressure regime than natural gas to overcome pipework pressure losses. Conversely there will be installations where the pressure is locally boosted to >75 mbar in order to supply a particular item of equipment, or a local system. These systems are rare, and the suitability of materials in such circumstances can be assessed from a combination of the outcomes of this low pressure (<75 mbar) testing and the existing evidence for high pressure systems. It is felt that using the limiting value of 75 mbar covers the majority of potential installations.

2. The testing should be carried out at ambient temperature (-30°C to +50°C). The range is selected to reflect extreme temperature range within the UK (though not absolute extremes). The upper temperature reflects that gas pipework tends to be run through ceiling voids, and within plantrooms where higher ambient temperatures may be experienced.
3. The testing should be carried out using nominally 100% hydrogen to either DNV Hy4Heat Work Package (WP) 2 Purity Standard<sup>16</sup> or BS ISO 14687 Type A Standard. This should include standard additives, such as odorant and colourant. It is accepted that the work on additives, particularly the need for a colourant, is ongoing but the testing should include the “most likely” additives at that stage. This is required as some of the high pressure testing has suggested that the inclusion of impurities within the gas mixture may either accentuate or attenuate the impact of the hydrogen on the material.
4. The testing should be carried out using:
  - a) New materials currently available and obtained on the open market from plumber’s merchants or pipe stockholders. For each material multiple samples from different manufacturers should be tested, and
  - b) Aged materials reclaimed from representative existing systems. Again, multiple samples should be used, but here the selection should be based more on the age of the materials, rather than necessarily their source. It will be necessary to test multiple materials and components, each at several age points to cover existing installation life spans, where appropriate. The proposal should cover provision for three sample ages for each material and component type, the actual age range will be agreed following literature review with BEIS project team and standards bodies.

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<sup>16</sup> Hy4Heat Work package 2 - Hydrogen quality standards. <https://www.hy4heat.info/wp2>

## 1.4 Outputs Required

<b>Deliverable Name</b>	<b>Type</b>	<b>Content</b>
<b>Lot 2 Literature Review Report</b>	Document	Documented review of the existing evidence and research information relating to the impact of hydrogen, whether pure or as a blend, on the materials that are commonly found as part of existing or new gas systems in domestic and commercial buildings in the UK.
<b>Lot 2 Report</b>	Document	<p>Write a comprehensive report on test plan and method, experiment setup and details, analysis and conclusion of results to demonstrate which materials in common use in pipework, equipment and components for new and existing systems are suitable for use with hydrogen.</p> <p>This should include list of acceptable materials, acceptable materials with limitations (which may include longevity) and non-acceptable materials.</p>
<b>Lot 2 Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.



Department for  
Business, Energy  
& Industrial Strategy

**Section 3.3**

**Specification of Requirements  
(Lot 3 - Installation Ventilation and Flues)**

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

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# Department for Business, Energy & Industrial Strategy

## 3.3 Lot 3: Installation Ventilation and Flues

### 1.1 Aims and Objectives

This work will undertake a set of scenario specific ventilation and flueing projects to address specific gaps in the evidence base. The work is not seeking to examine whole property ventilation. It is intended to provide evidence to understand the requirements of specific sub-categories of installation work such as ventilation of inter floor piping/voids and flueing requirements of specific appliances such as hydrogen gas fires. The work splits into two workstreams:

- Ventilation associated with pipework located within voids, shafts and ducts.
- Ventilation and flueing requirements of open flued and flueless appliances such as hydrogen gas fires, water heaters, hobs and cookers.

### 1.2 Scope of Work

#### *Pipework Located Within Voids*

BS 6891:2015+A1:2019<sup>17</sup> – Specification for the installation and maintenance of low pressure gas installation pipework of up to 35 mm (R1¼) on premises applies to natural gas installations only.

The Gas Safety (Installation and Use) Regulations require “adequate ventilation to be present when pipework is located within voids, shafts and ducts”.

Annex C of BS 6891 sets out the results of work carried out by Advantica (now DNV) to address the concern regarding the level of potential natural gas build-up within the voids between joists of intermediate floors associated with minor gas leaks.

It is required that the work outlined in Annex C of BS 6891, be repeated to address similar concerns in respect of “minor” leakage from installation pipework carrying hydrogen.

#### **1.2.1 Literature Search and Assessment of Existing Evidence**

A thorough review of the Advantica Research Project, Gas in intermediate floors, Annex C of BS 6891 which provides a complete description of the research and testing

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<sup>17</sup> BS 6891:2015+A1:2019 Specification for installation of low pressure gas pipework of up to 35 mm (R1¼) on premises

carried out using natural gas. Review Hy4Heat outputs and any other relevant industry information.

Use the literature search to inform the design of a testing methodology to address the evidence gap.

### **1.2.2 Physical Testing**

The detailed methodology of the physical testing programme is to be defined and carried out by the appointed testing house.

The research and testing carried out should result in a report, equivalent to Report Number 6699 with a summary equivalent to Annex C of BS 6891 which can be included in PAS 4444<sup>18</sup> and used to inform other installation standards being developed by Hydrogen Skills and Standards for Heat.

#### ***Ventilation and Flueing Requirements of Open Flued and Flueless Appliances***

The research should cover ventilation and flueing requirements of open-flued and flueless appliances such as hydrogen gas fires, water heaters, hobs and cookers found in domestic and non-domestic settings. Such ventilation is required to ensure adequate air supply for efficient combustion without depleting air quality for the occupants of the room.

Conversion to hydrogen clearly eliminates all risk from the production of either carbon monoxide (CO) or carbon dioxide (CO<sub>2</sub>) as is the case with natural gas but it may change the potential production levels of other toxic or undesirable products such as nitrous oxides (NO<sub>x</sub>).

Additionally, combustion of hydrogen results in the production of water vapour. It is essential to know what amounts of water vapour could be produced, the impact on flue materials and what the appropriate ventilation and/or flueing requirements are which will protect against problems such as condensation and mould growth within properties.

Therefore, there is a need to determine whether any specific measures will be necessary to prevent problems arising from hydrogen combustion and to prepare the appropriate and associated standards, specifications and installation procedures.

### **1.2.3 Literature Search and Assessment of Existing Evidence**

The principal standards covering combustion ventilation and flues for residential and

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<sup>18</sup> PAS 4444:2020 Hydrogen-fired gas appliance. Guide

small commercial appliances are BS 5440-1<sup>19</sup>, BS 5546<sup>20</sup> and these relate to 1st and 2nd family gases. In addition, IGEM/UP/10, IGEM/UP/11 and IGEM/UP/16 also relate to flued appliances but mainly in relation to natural gas utilisation in non-domestic installations.

Some work has been carried out in the Hy4Heat<sup>21</sup> programme both by the technical teams and also by hydrogen appliance manufacturers. It is also probable that some information/data is available from the Gas Industry Hydrogen testing programmes such as H21<sup>22</sup>, HyDeploy<sup>23</sup> and H100<sup>24</sup>.

Identify and review relevant standards and existing evidence covering combustion ventilation and flues for residential and small commercial to determine significant gaps and further testing work required.

### 1.2.4 Physical Testing

The detailed methodology of the physical testing programme is to be defined and carried out by the appointed testing house to support the preparation of the standards under Hydrogen Skills and Standards for Heat.

### 1.3 Outputs Required

Deliverable Name	Type	Content
<b>Lot 3 Literature Review Report</b>	Document	Documented review of the Advantica Research Project, Gas in intermediate floors, Report Annex C of BS 6891 , Hy4Heat outputs and any other relevant industry information.
<b>Lot 3 Report</b>	Document	Write a comprehensive report on test plan and method, experiment setup and details, analysis and conclusion of results with respect to: <ul style="list-style-type: none"> <li>• Ventilation associated with pipe work located within voids, shafts and ducts.</li> <li>• Ventilation and flueing requirements of open flued appliances such as hydrogen gas fires, water heaters, hobs and cookers</li> </ul> Experimental results to support development of standards under Hydrogen Skills and Standards for Heat.
<b>Lot 3 Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.

<sup>19</sup> BS 5440-1:2009 Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases).

<sup>20</sup> BS 5546:2010 Specification for installation and maintenance of gas-fired water-heating appliances of rated input not exceeding 70 kW net

<sup>21</sup> Hy4Heat Programme. <https://www.hy4heat.info/>

<sup>22</sup> H21 Gas Industry Projects. <https://h21.green/>

<sup>23</sup> HyDeploy Programme. <https://hydeploy.co.uk/>

<sup>24</sup> H100 Fife Project. <https://www.sgn.co.uk/H100Fife>



## **Section 3.4**

### **Specification of Requirements (Lot 4 - Pipe Sizing and Pressure Drop Criteria)**

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

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# Department for Business, Energy & Industrial Strategy

## 3.4 Lot 4: Pipe Sizing and Pressure Drop Criteria

### 1.1 Aims and Objectives

The supporting evidence research for hydrogen standards addresses particular aspects of the use of hydrogen as a thermal energy source where the physical properties of hydrogen will potentially have an impact on existing procedures and practices for natural gas.

The aim of Lot 4 is to confirm an appropriate and standardised methodology to be applied to installation pipework sizing. This will ensure that such pipework has adequate capacity to deliver the flow of hydrogen (per mass or per volume) required to deliver the same flow of energy required to hydrogen burning appliances. Sizing methodology output will take the form of ready reckoner tables in terms of power requirement.

### 1.2 Scope of Work

#### 1.2.1 Literature Search and Assessment of Existing Evidence

Initially a thorough review of the existing evidence and research information is required. It is considered likely that much of the significant data and information required to complete this piece of work already exists within various hydrogen programmes including Hy4Heat, H21, HyDeploy and H100.

There are several empirical flow formulae which can be used for the calculation of pressure drop in pipes for natural gas. Generally, these formulae produce results which are sufficiently accurate but only for use within a specified range of flow conditions. It is very likely that the same will hold good for similar calculations for hydrogen, but the formulae and the range of applicability may change due to the inherent differences in the physical properties of the two gases.

IGEM/H/2 Hydrogen Interim Standard provides, in Appendix A, a qualified recommendation to use the approach given in BS 6891:2015+A1:2019<sup>25</sup>. (A1.1) and a “Pipe Sizing Table” (A1.2) which gives “Approximate” hydrogen pressure loss data.

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<sup>25</sup> BS 6891:2015+A1:2019 Specification for installation of low pressure gas pipework of up to 35 mm (R114) on premises

The confirmed standardised methodology must be consistent with those prescribed for distribution mains and service pipes. In addition, and concurrent with the above, there is a necessity to confirm the appropriate flow equations which should be used to design or check the size of pipe required for both domestic and non-domestic pipe installations for hydrogen operation.

This task will collate the confirmatory evidence to ensure that a practical solution exists to demonstrate that existing installation pipework in a domestic and non-domestic property which was designed and operating with natural gas can generally be converted to provide an equivalent energy capacity with hydrogen. It will identify any changes to the physical installation and its operating parameters required. The work also needs to consider any other implications of higher volumetric flows rates such as increased levels of noise and / or vibrations, and the work will need to demonstrate these are also acceptable.

Current industry standards for natural gas prescribe:

- Design standards including flow formulae for sizing mains and service pipes.
- Set pressure for meter regulators (noting that this also impacts billing systems through the pressure/temperature correction factor used to calculate gas consumption).
- Minimum operating pressure at the appliance inlet connection – this recognising that there can be variation in pressure achieved at the meter outlet and consequently at the appliance itself.
- Maximum allowable design pressure drop in installation pipework and across meter installation.
- Pipe sizing tables for small diameter installation pipework and necessary allowances to be incorporated for the effects on pressure drop caused by pipe fittings.

### **1.2.2 Physical Testing**

It is important that any empirically determined flow formula can be validated in terms of “reasonable accuracy range” by physical testing wherever possible.

The detailed methodology of the physical testing programme is to be defined and carried out by the appointed testing house to validate the pipe sizing methodology.

### 1.3 Outputs Required

<b>Deliverable Name</b>	<b>Type</b>	<b>Content</b>
<b>Lot 4 Literature Review Report</b>	Document	Documented review of the existing evidence and research information including but not limited to Hy4Heat, H21, HyDeploy and H100.
<b>Lot 4 Report</b>	Document	Write a comprehensive report on pipe sizing standardised methodology, test plan and method, experiment setup and details, analysis and conclusion of results.  Experimental results to validate standardised methodology to support development of standards under Hydrogen Skills and Standards for Heat.
<b>Lot 4 Sizing Methodology</b>	Table	Sizing methodology output should take the form of ready reckoner table.
<b>Lot 4 Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.



## Section 3.5

### Specification of Requirements

**(Lot 5 – Research and Evidence Gathering for Hydrogen:**

- i) Meter, Internal and External, Ventilation Study**
- ii) Installation and Set Point of Excess Flow Valves (EFVs))**

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

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# Department for Business, Energy & Industrial Strategy

## 3.5 Lot 5: Research and Evidence Gathering for Hydrogen:

- i) **Meter, Internal and External, Ventilation Study**
- ii) **Installation and Set Point of Excess Flow Valves (EFVs)**

The supporting evidence research for hydrogen standards addresses particular aspects of the use of hydrogen as a thermal energy source where the physical properties of hydrogen will potentially have an impact on existing procedures and practices for natural gas.

Lot 5 is split into two focus areas addressing:

- i) **Meter Ventilation Study**
- ii) **Excess Flow Valve:** items such as the installation and calibration of excess flow valves (EFVs) to cover domestic and non-domestic supply. This will include what methodology and basis will be used to set the shutoff point for the valves during operation, and understand how to check and test them.

### 1.1 Meter Ventilation Study: Aims and Objectives

Research to consider representative, internal and external, meter housing, design considerations including necessary clearances, ventilation requirements for gas and the potential for humidity/water build up.

### 1.2 Meter Ventilation Study: Scope of Work

#### 1.2.1 Literature Search and Assessment of Existing Evidence

A thorough review of any existing evidence and research information, related to design considerations including outputs from Hy4Heat, for both domestic and non-domestic environments.

Identify full range of meters, domestic and non-domestic, to be considered in the study and the evidence required for different archetypes (e.g internal and external meter placement). Consideration should be made of whole meter installation for different designs that are in common use, which depend on the volumetric flow rate measured (U6, U16 etc), the range of flows anticipated, and other factors measuring hydrogen.

Study (possible desk research) to assess the potential issues such as humidity/water and gas build up in external meter enclosures and then considerations for the requirements around ventilation.

### 1.2.2 *Physical Testing*

It is important that a study to assess the potential issues can be validated in terms of “reasonable accuracy range” by physical testing wherever possible.

The detailed methodology of the physical testing programme is to be defined and carried out by the appointed testing house to validate the study.

The study and experimental results will be used to support development of standards under Hydrogen Skills & Standards for Heat.

### 1.3 Meter Ventilation Study: Outputs Required

Deliverable Name	Type	Content
<b>Lot 5 Literature Review Report</b>	Document	Documented review of any existing evidence and research information, related to design considerations including outputs from Hy4Heat, for both domestic and non-domestic environments.
<b>Lot 5 Meter Ventilation Report</b>	Document	Write a comprehensive report on the meter, internal and external ventilation study, test plan and method, experiment setup and details, analysis and conclusion of results. Experimental results to validate study and to support development of standards under Hydrogen Skills & Standards for Heat.
<b>Lot 5 Meter Ventilation Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.

### 2.1 EFV: Aims and Objectives

The research would consider items such as the installation and calibration of EFVs to cover domestic and non-domestic supply. This will include what methodology and basis will be used to set the shutoff point for the valves during operation and purging, and understand how to check and test them.

### 2.2 EFV: Scope of Work

The study should consider EFVs either to be installed as a retrofit or as part of new installation for both domestic and non-domestic supply. The work will consider the methodology and basis used to set the shutoff point for the valves (if adjustable) during operation, catering for the maximum usage of appliances installed within a full range of properties.

### **2.2.1 EFV Prior to the Meter**

This EFV being upstream of ECV is a Gas Distribution Network Operators (GDNO) asset responsibility. However, this work is required to support development of comprehensive installation standards under Hydrogen Skills and Standards for Heat.

The installation of this mechanical hydrogen EFV shall align to the requirements set out in ASTM F2138 – 12 (2017) Standard Specification for Excess Flow Valves for Natural Gas Service.

It could be located in either of the following locations:

- In the service pipe itself.
- Immediately after the ECV.

Considerations to take account of the work include the ability to reset the valve (if required) with minimal cost and disruption and effects of dust/ debris in gas supply.

### **2.2.2 EFV Integral to the Meter**

A study will be required to determine an appropriate range of demand diversity factors which could be applied to a domestic and non-domestic installation to get an indication of the possible range of settings to calibrate the flow rate through the proposed EFV in the range of standard meters (U6, U16 etc).

Note: Hy4Heat QRA made the assumption that a domestic hydrogen gas meter would contain an integrated EFV to limit the flow rate to <20 m<sup>3</sup>/hr or set at a value that is related and proportionate to the maximum usage of appliances installed within the individual property.

### **2.2.3 Physical Testing**

It is important that any study assesses that potential issues can be validated in terms of “reasonable accuracy range” by physical testing wherever possible.

The detailed methodology of the physical testing programme is to be defined and carried out by the appointed testing house to validate the study.

The study and experimental results will be used to support development of standards under Hydrogen Skills and Standards for Heat.



### 2.3 EFV Outputs Required

<b>Deliverable Name</b>	<b>Type</b>	<b>Content</b>
<b>Lot 5 Excess Flow Valve Report</b>	Document	<p>Write a comprehensive report on the installation and calibration of Excess Flow Valves (EFVs) to cover domestic and non-domestic supply.</p> <p>Experimental results to validate study and to support development of standards under Hydrogen Skills and Standards for Heat.</p>
<b>Lot 5 Excess Flow Valve Data (Raw and Processed Data Sets)</b>	Data (MS Excel or equivalent)	All data sets – both raw data and analysed data from the tests and experiments.



Department for  
Business, Energy  
& Industrial Strategy

## Section 4

### Tender Requirements (All lots)

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

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## 1. Methodology

Tenderers should set out in their proposals the details of their proposed methodology for delivering this scope of works set out above.

This should cover, but should not be limited to the following items;

- How the tenderer proposes to obtain the required information necessary to enable them to answer the research questions being asked in a manner that quantifies the relative risks of using hydrogen and natural gas. This process should include verifying understanding of the research questions with the standards bodies.
- The methodology proposed should make clear how contractors will deliver new robust evidence and add value to the Hydrogen Skills and Standards for Heat programme. In particular, the results should be presented in such a way as to directly inform the hydrogen installation, ancillary device and training standards.
- Where applicable, relevant existing evidence should be interrogated, critically analysed, evaluated and as appropriate used as a basis to build on.
- How the contractor will ensure accurate and reliable data is gathered that stands up to industry scrutiny.
- How contractors will liaise and integrate with the Hydrogen Skills and Standards for Heat team, and the standards bodies developing standards including BSI, IGEM and EUS.
- How the contractor will ensure that adequate safety and test procedures are in place for delivering this work.
- The proposed team who will be working on delivering this work and how their past relevant experience will be used to benefit this work.
- The facilities and equipment the contractor will use to conduct the work.
- The risks that have been identified and how these will be mitigated.
- How the contract will deliver the required outputs on time.

## 2. Deliverables

During the study, BEIS will expect to review and comment on a range of outputs which relate to the project plan, methodology and other associated project documents described in each lot and in the table below.

In addition, there are a number of specific deliverables that are expected from the successful contractor, which merit identification in the table below.

**Please note that a full set of the deliverables set out below are required for each of the five lots.**

Deliverable	Description
Presentation at project inception meeting	The contractor will be expected to present their proposed approach to the study at a meeting with the BEIS project team and standards bodies.

Final project plan	The contractor will need to provide a final project plan to be signed off by BEIS. This should detail key phases of work, a weekly activity plan and delivery dates.
Literature review	The contractor will produce a report providing a short summary of similar or related works and the impact (if any) on the research work which is planned to be undertaken. Specific considerations for the literature review in each Lot are in section 3.
Progress updates	<p>Regular updates between the contractor and BEIS Hydrogen Skills and Standards for Heat Project Manager, either via telephone or virtual meeting. These should be held monthly at a minimum but more regular short meetings may be required at times, for example around milestone deliveries.</p> <p>The contractor will produce monthly reports containing a general overview of progress and KPIs including:</p> <ul style="list-style-type: none"> <li>○ General update supported by the relevant reports as required.</li> <li>○ Progress against the timetable, where delays are anticipated or reported, an explanation for these and a proposed plan for resolving the causes.</li> <li>○ Challenges and risks.</li> <li>○ Requests to the BEIS project team for additional input from other parts of the Hydrogen Skills and Standards for Heat programme.</li> </ul> <p>The contractor will also need to report on a short set of evaluation KPIs on a quarterly basis as set out in Annex D.</p>
Interim meeting presentation	The contractor will be expected to present a progress update at a meeting with the BEIS project team and standards bodies.
Interim project report	This report should follow the interim presentation. Both the presentation and report should be scheduled for when the works are at least 50% complete.
Final presentation	The contractor will be expected to present the draft findings from the study at a meeting with the BEIS project team and standards bodies.
Written report  <b>(Lot specific, please see section 3, 3.1 to 3.5)</b>	<p>A detailed report describing the test method, experiment setup, analysis, results and conclusion. The report should also include any references/links as appropriate.</p> <p>Draft and Final Reports will be required for submission to BEIS.</p> <p>This will be a quality assured written report. In addition, full technical appendices should include (but not be limited to):</p>

	<ul style="list-style-type: none"> <li>• All supporting analysis and data as detailed below in this table.</li> <li>• Procedures used in the course of the study.</li> </ul>
All supporting analysis and data used from the completed tests.	<p>A set of raw data, and a set of analysed/processed data from the experiments and tests.</p> <p>This will allow the evidence to be used with confidence by BEIS officials to support policy-making and directly inform the hydrogen installation, ancillary device and training standards. The analysis files should be intuitive to use, with all assumptions recorded in notes sections with links to primary data sources along with uncertainty ranges (where possible). As a general guide, the BEIS assumptions log template and wider quality assurance guidance is available at: <a href="https://www.gov.uk/government/collections/quality-assurance-tools-and-guidance-in-decc">https://www.gov.uk/government/collections/quality-assurance-tools-and-guidance-in-decc</a></p>

### 3. Timetable

As part of the submission, the tenderer is expected to submit a delivery plan including, as a minimum:

- An organisation chart and list of key people within the successful tenderer's delivery team with an outline description of how they will be managed in order to ensure that delivery will be completed on time
- A detailed schedule of works showing when the scope will be delivered
- The methodology that will be used to produce the deliverables and to ensure the quality of the deliverable
- An outline description of the risks to delivery and your proposed mitigation measures
- Outline description of how the time schedule and resources will be managed, in order to ensure that delivery will be completed on time.

Aligned with the deliverables presented in Section 4 – Part 2 and the Milestone Payments in Section 4 – Part 13, an indicative, outline time schedule is presented below for each Lot detailed in Section 3;

Reporting points/deliverables	Proposed date				
	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Contract Commences	15/11/21				

Project Inception Meeting	w/c 22/11/21				
Submission of Literature Review	14/01/22				
Interim Project Meeting/Presentation and Report	w/c 16/05/22	w/c 04/07/22	w/c 16/05/22	w/c 16/05/22	w/c 16/05/22
Submission of Interim Report (at least 50% complete)	w/c 23/05/22	w/c 11/07/22	w/c 23/05/22	w/c 23/05/22	w/c 23/05/22
Submission of Draft Report	w/c 26/09/22	w/c 19/12/22	w/c 26/09/22	w/c 26/09/22	w/c 26/09/22
Submission of Final Report	w/c 24/10/22	w/c 23/01/23	w/c 24/10/22	w/c 24/10/22	w/c 24/10/22
BEIS Sign-off	w/c 14/11/22	w/c 13/02/23	w/c 14/11/22	w/c 14/11/22	w/c 14/11/22

The contract duration of each lot will be:

- Lot 1: 12 months
- Lot 2: 15 months
- Lot 3: 12 months
- Lot 4: 12 months
- Lot 5: 12 months

#### 4. Ownership and Publication

BEIS is committed to openness and transparency. All outputs listed in the Specification of Requirements in Section 3.1 – 3.5 (with the exception of project updates and progress reports) should be accessible, non-disclosive and suitable for publication and further use.

The exceptions to this are where:

- 1) the intellectual property rights to an output (or part of an output) are owned by someone other than the contractor. Tenderers should state in their tender if this

is the case and indicate whether the third party copyrighted materials can be redacted;

- 2) data is commercial in confidence; and
- 3) a non-anonymised dataset is required for the project.

If these exceptions apply to any part of the outputs, tenderers should indicate this in their proposal alongside any approaches to resolving these.

Unless the above exceptions have been stated in a proposal, all outputs from a project will be assumed to be owned by BEIS. The outputs, raw data and tools developed in the research cannot therefore be used by contractors for purposes other than our work.

BEIS standard terms and conditions require that BEIS acquire and retain the Intellectual Property (IP) from all models and software paid for by BEIS in accordance with clause 27:

- Where the contractor is using or building on top of existing IP, such as modules that interface with the model, or proprietary datasets, this must be explicitly stated in the tender response.
- Where open source code or models are to be used within this model, please make clear under which licence this open source software is released.
- The Open Government Licence should be used wherever possible:

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/2/>

### **Non-Disclosure**

All outputs must be provided to BEIS in a format that is non-disclosure (i.e. no individuals or individual organisations are identifiable from the data or analysis, directly or indirectly), unless the specification states otherwise or the individual / organisation has given their permission. The contractor is responsible for ensuring that the data is supplied in this form alongside a report on the checks made. A minimum standard for checking includes cell counts within sub-groups for all outputs and analysis. The contractor will be asked to agree their approach to checking for disclosure with BEIS during the course of the contract, before the checks are carried out. Where data or analysis is found to be disclosive during checking, the contractor will be required to suggest an approach or approaches to aggregate the analysis and to agree this with BEIS.

### **Storage and Transfer**

The contractor will need to ensure that all appropriate regulations are adhered to regarding safe storage and transfer, compliant with BEIS requirements for the data processing and storage of restricted data.



## 5. Quality Assurance

This project must comply with the BEIS Code of Practice for Research (Annex B) and bidders must set out their approach to quality assurance in their response to this ITT.

Tenderers should include a quality assurance plan that they will apply to all of the Work Packages.

To demonstrate relevant experience in producing high quality reporting, the tenderer must:

- Specify who will be responsible for quality assurance. This must be undertaken before information is issued to BEIS. More information can be found in the working arrangements in Section 5 below.
- Specify the specific responsibilities of the contractor's project manager/director.

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

The successful bidder will be responsible for any work they or subsequent Work Package contractors supply and should therefore provide assurance that all work in the contract is undertaken in accordance with the Code of Practice.

BEIS reserves the right to request an audit of projects against the BEIS Code of Practice for Research and the commitments made in the tender documents and subsequent contract. Your response could be automatically rejected if the project will not be performed under quality assurance measures that fully meet the Code's requirements.

Other useful sources of guidance and advice that will help bids and the resulting work be of the highest quality include:

- The Government Social Research (GSR) Code, in particular those that relate to GSR Products: <http://www.civilservice.gov.uk/networks/gsr/gsr-code>
- The Green Book: appraisal and evaluation in central government. <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>
- [Quality in Qualitative Evaluation: A Framework for assessing research evidence](#) provides a Framework for appraising the quality of qualitative evaluations.
- Rapid Evidence Assessment (REA):. <http://www.civilservice.gov.uk/networks/gsr/resources-and-guidance/rapid-evidence-assessment/what-is>. This toolkit will help researchers to identify

whether a Rapid Evidence Assessment is best for their needs, and help with the process of planning and carrying out a review

Where relevant, all bids should refer to these pieces of guidance and advice and how they will be used.

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

General:

- They answer the research questions clearly, in plain English
- They are clearly structured so that information presented in each section of each report is clear
- Connections between sections are clear
- Executive summaries are no more than two sides and set out the findings clearly and their relevance to BEIS policies
- All sections have clear introductions and conclusions (including findings being written concisely upfront)

Use of good quality English:

- They are thoroughly peer reviewed for writing quality
- No jargon is used and all terms are defined and referenced clearly
- All acronyms are written out in full the first time that they are mentioned in each section of each report
- No grammar and phrasing errors are present
- No typos / typographical errors are present
- They contain concise and non-wordy sentences and paragraphs
- They are concise reports that are not too long and do not have vast annexes

Visualisations:

- All visualisations are labelled
- All axes are labelled, including with appropriate units
- Clear and appropriate use of visualisations (large enough size, data can be read clearly without reference to the raw data, and there are not too many visualisations presented at once)
- All visualisations are clearly explained and discussed
- A range of different types of visualisations are used to provide more interesting and innovative ways of presenting the results

Data quality:

- Any limitations in the research approach need to be clearly stated and justified
- Further research should be stated to build upon the limitations that cannot be addressed in the research

- Where the findings are stronger and more robust and where they are not needs to be stated clearly
- They must use appropriate and consistent units
- All numerical units should include the range of uncertainty / error margin

## **6. Challenges**

There will be a number of challenges in delivering this requirement; some are identified below. Bidders should consider how these, and any other challenges, will be addressed and mitigated while designing and developing the projects.

- Successful, effective and timely production of outputs to support the development of hydrogen installation, ancillary device and training standards.
- Resourcing the programme at peak periods if individuals with specialist knowledge are unavailable or deployed elsewhere.
- If bidders are a consortium, ensuring effective working across multiple organisations so that project deadlines and milestones are met.
- Delivering accessible and user-friendly complex technical data.

## **7. Ethics**

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

We expect contractors to adhere to the following 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

## **8. 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.

## **9. Data Protection**

The Contractor will be compliant with the Data Protection Legislation, as defined in the terms and conditions applying to this Invitation to Tender. A guide to The General Data

Protection Regulation published by the Information Commissioner’s Office can be found **here**.

The only processing that the Contractor is authorised to do is listed in Annex 1 by BEIS, “the Authority” and may not be determined by the Contractor.

**Annex 1: Processing, Personal Data and Data Subjects**

(1) The contact details of the Authority’s Data Protection Officer are:

BEIS Data Protection Officer  
 Department for Business, Energy and Industrial Strategy  
 1 Victoria Street  
 London  
 SW1H 0ET

Email: **dataprotection@beis.gov.uk**

(2) The contact details of the Contractor’s Data Protection Officer (or if not applicable, details of the person responsible for data protection in the organisation) are: [To be completed by the Contractor]

(3) The Contractor shall comply with any further written instructions with respect to processing by the Authority.

(4) Any such further instructions shall be incorporated into this Annex 1.

Description	Details
Subject matter of the processing	<p>It is not expected that any processing of personal data will be required under this contract this includes collection, recording, organisation, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction of data.</p> <p>The processing of names and business contact details of staff of both the Authority and the Contractor will be necessary to deliver the services exchanged during the course of the Contract, and to undertake contract and performance management.</p> <p>The Contract itself will include the names and business contact details of staff of both the Authority and the Contractor involved in managing the Contract.</p>

Duration of the processing	Processing will take place from 01/11/2021 for the duration of the Contract plus a 12 month retention period. The Contract will end by 31/03/2023.
Nature and purposes of the processing	<p>The nature of the processing will include collection, recording, organisation, structuring, storage, retrieval, use, restriction and manual erasure or destruction of data etc.</p> <p>The nature of processing will include the storage and use of names and business contact details of staff of both the Authority and the Contractor as necessary to deliver the services and to undertake contract and performance management. The Contract itself will include the names and business contact details of staff of both the Authority and the Contractor involved in managing the Contract.</p>
Type of Personal Data	Names, business telephone numbers and email addresses, office location and position of staff of both the Authority and the Contractor as necessary to deliver the services and to undertake contract and performance management. The Contract itself will include the names and business contact details of staff of both the Authority and the Contractor involved in managing the Contract.
Categories of Data Subject	Staff of the Authority and the Contractor, including where those employees are named within the Contract itself or involved within contract management.
Plan for return and destruction of the data once the processing is complete UNLESS requirement under European Union or European member state law to preserve that type of data	The Personal Data will be retained by the Contractor for a twelve month retention period, following which the Contractor will provide the Authority with a complete and uncorrupted version of the Personal Data in electronic form (or such other format as reasonably required by the Authority) and erase from any computers, storage devices and storage media that are to be retained by the Contractor after the expiry of the Contract and the Contractor retention period.

	The Contractor will certify to the Authority that it has completed such deletion. Where Personal Data is contained within the Contract documentation, this will be retained in line with the Department's privacy notice found within the Invitation to Tender.
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## 10. Skills and Experience

BEIS would like you to demonstrate that you have the experience and capabilities to undertake the project.

Tender responses should include a summary of each proposed team member's experience and capabilities in the main bid response, as well as CVs for the proposed team as annexes (CVs should be limited to two single-sided pages each and are not included in the overall application page limit).

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

Tenderers should identify the individual(s) who will be responsible for managing the project and those who will carry out quality assurance (QA).

The appropriateness of the skills and expertise of the team should match the proposed tasks being undertaken. For instance, this may include a team with expertise in the fields of mechanical or chemical engineering with specific knowledge of natural gas and hydrogen applications, as well as expertise in conducting research and report writing.

The following skills are considered particularly important for this work:

- Technical experience within the gas industry.
- Previous practical research and development (R&D) in the gas industry.
- Excellent understanding of the principles of combustion of hydrogen and natural gas.
- Excellent understanding of the principles of gas movement and behaviours.
- Proven track record for delivering experimental work in a controlled environment to provide quantified comparative assessments of risk.
- Suitable facilities to conduct the research and experimental work required.
- Excellent track record of delivering work of this nature safely.
- Reporting writing and recommendations.

Demonstrable knowledge of;

- Leaks from gas pipes arising from corrosion and interference at different pressures and diameters with a variety of materials of construction.
- Movement of gas in domestic properties.

## 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.

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

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

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

## 12. Budget

Lot	Project Title	Section 3	Budget (exc VAT)
1	Research and evidence gathering for purging domestic and non-domestic and tightness and material compatibility for non-domestic piped systems for hydrogen.	3.1 (Page 15)	£225,000 to £250,000
2	Research and evidence gathering material and component suitability - domestic and non-domestic for hydrogen.	3.2 (Page 23)	£180,000 to £200,000
3	Research and evidence gathering for installation ventilation and flues.	3.3 (Page 30)	£225,000 to £250,000
4	Research and evidence gathering for pipe sizing and pressure drop criteria with respect to hydrogen.	3.4 (Page 35)	£90,000 to £100,000

<b>5</b>	Research and evidence gathering for hydrogen meter and ventilation Study and installation and set point of excess flow valve(s) (EFV).	3.5 (Page 39)	£110,000 to £125,000
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Contractors should provide a full and detailed breakdown of costs (including options where appropriate). This should include staff (and day rate) allocated to specific tasks.

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

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

Ref.	Expected Milestone	Percentage Paid
1	BEIS acceptance of the project delivery plan	0%
2	BEIS acceptance of literature review	10%
3	Interim presentation and report of progress (to be held and submitted once at least 50% of the work can be presented)	30%
4	BEIS acceptance of the draft report	30%
5	Receipt of final report	20%
6	BEIS acceptance of the final report	10%

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

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

### **13. Social Value**

Social Value is a broad term used to describe the wider social, environmental and economic effects of an organisation's actions, and how they contribute to the long-term wellbeing of individuals, communities and societies. Social value is not just what the contract delivers but the legacy or footprint of the contract. The supplier should be going above and beyond the specified requirements to create added social value



***through the contract.***

Bidders should describe, over and above the contractual and legal requirements, how your organisation would demonstrate action, ***in the course of delivering this requirement***, to identify and tackle workforce inequality in employment and skills in the contract workforce, increase supply chain resilience and capacity and how you would monitor and measure these.

You should base your proposal to deliver value under this Priority Policy Area around the following activities that demonstrate and describe the tenderer's existing or planned:

- Measures to tackle workforce inequality. Applicants are expected to demonstrate how they will support in-work progression to help people, including those from disadvantaged or minority groups, to move into higher paid work by developing new skills relevant to the contract.
- Measures to increase supply chain resilience and capacity. Applicants are expected to demonstrate collaboration throughout the supply chain, and a fair and responsible approach to working with supply chain partners in delivery of the contract.

Bidders may find the following resources useful:

- Procurement Policy Note 06/20 – taking account of social value in the award of central government contracts:  
<https://www.gov.uk/government/publications/procurement-policy-note-0620-taking-account-of-social-value-in-the-award-of-central-government-contracts>

## 14. Evaluation of Tenders

Tenderers are invited to submit full tenders of no more than 20 A4 pages, (in Arial 12 pt), excluding declarations and CVs. Tenders will be evaluated by at least three assessors including BEIS staff with technical support from HSE regulatory staff. The cost criterion will be scored by BEIS staff only.

BEIS will select the bidder that scores highest against the criteria and weighting listed below:

Criterion		Description	Weighting
0	Conflict of interest	See page 8 of the ITT for further information.	Pass/Fail
1	Skills and expertise	Demonstrated capability of relevant skills and a strong team of individuals with the capability to fulfil this project's objectives and required outputs [As set out in section 2, 12.0 (Skills and Experience) above].	15%
		Demonstrate any relevant capability on previous project(s).	15%

2	Methodology	Effective proposed approach to deliver the project's objectives.	15%
		Clear demonstration of the methodology to be used and demonstration of an ability to deliver valid, reliable and robust evidence within each of the lots safely [As set out in 1.0 (Methodology) above].	
		Demonstration of access to suitable facilities and equipment, and experience in its use to deliver high quality outputs from experimental work.	5%
3	Management of delivery	Effective quality, relevance and breadth of management oversight including, planning, risk management / identification, effective working arrangements, information handling and quality assurance [As set out in 3.0].	15%
4	Social Value	Measures to tackle workforce inequality. Demonstration of supporting in-work progression to help people, including those from disadvantaged or minority groups, to move into higher paid work by developing new skills relevant to the contract.	5%
		Measures to increase supply chain resilience and capacity. Demonstration of collaboration throughout the supply chain, and a fair and responsible approach to working with supply chain partners in delivery of the contract.	5%
5	Price	Price: To be marked proportionately to the lowest tender [Please see example below].	25%
<b>TOTAL</b>			<b>100%</b>

### Scoring Method

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

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

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

### Scoring for Pricing Evaluation

Price will be marked using proportionate pricing. Please see the example below.

Marking proportionate to the lowest price. Price will be scored as set out below.

There will be a maximum of e.g. 25 marks

The lowest priced bid will receive the full 25 marks, all other bids will then be marked as set out below.

Proportionate Pricing scoring example

If 25% = 25 marks

Supplier	Price	Marks
1 (lowest bid)	£50,000	25
2	£60,000	$50/60 * 25 = 20.8$
3	£75,000	$50/75 * 25 = 16.7$

### Structure of Tenders

Contractors are strongly advised to structure their tender submissions to cover each of the criteria above. Complete the price schedule attached at Annex A and submit it as a separate document, specifying the daily rates (ex-VAT) you will charge for each level of your staff.

### Bid Clarification

After reviewing and evaluating the written proposals, BEIS may decide to hold bid clarifications with suppliers.

### Feedback

Feedback will be given in the unsuccessful letters or emails.

## **Section 5**

### **Further Information on Tender Procedure**

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

#### **Contents:**

<b>A</b>	<b>Definitions</b>	<b>61</b>
<b>B</b>	<b>Data Security</b>	<b>62</b>
<b>C</b>	<b>Non-Collusion</b>	<b>63</b>

## A. Definitions

Please note that references to the "Department" throughout these documents mean The Secretary of State for Business, Energy and Industrial Strategy acting through his/her representatives in the Department for Business Energy & Industrial Strategy.

The Freedom of Information Act 2000 ("FOIA") and the Environmental Information Regulations 2004 ("EIR") apply to the Department. You should be aware of the Department's obligations and responsibilities under FOIA or EIR to disclose, on written request, recorded information held by the Department. Information provided in connection with this procurement exercise, or with any contract that may be awarded as a result of this exercise, may therefore have to be disclosed by the Department in response to such a request, unless the Department decides that one of the statutory exemptions under the FOIA or the exceptions in the EIR applies. If you wish to designate information supplied as part of this response as confidential, or if you believe that its disclosure would be prejudicial to any person's commercial interests, you must provide clear and specific detail as to the precise information involved and explain (in broad terms) what harm may result from disclosure if a request is received, and the time period applicable to that sensitivity. Such designation alone may not prevent disclosure if in the Department's reasonable opinion publication is required by applicable legislation or Government policy or where disclosure is required by the Information Commissioner or the First-tier Tribunal (Information Rights).

Additionally, the Government's transparency agenda requires that tender documents (including ITTs such as this) are published on a designated, publicly searchable web site. The same applies to other tender documents issued by the Department (including the original advertisement and the pre-qualification questionnaire (if used)), and any contract entered into by the Department with its preferred supplier once the procurement is complete. By submitting a tender you agree that your participation in this procurement may be made public. The answers you give in this response will not be published on the transparency web site (but may fall to be disclosed under FOIA or EIR (see above)). Where tender documents issued by the Department or contracts with its suppliers fall to be disclosed the Department will redact them as it thinks necessary, having regard (inter alia) to the exemptions/exceptions in the FOIA or EIR.

## **B. Data Security**

The successful tenderer must comply with all relevant Data Protection Legislation, as defined in the terms and conditions applying to this Invitation to Tender.

Section 6 contains a “The General Data Protection Regulation Assurance Questionnaire for Contractors” (Declaration 5) to evidence the extent of readiness. The Authority may ask the Contractor to provide evidence to support the position stated in the questionnaire. The Authority may require the successful Contractor to increase their preparedness where the Authority is not satisfied that the Contractor will be in a position to meet its obligations under the terms and conditions. If the Contractor fails to satisfy the Authority that it will be in a position to meet its obligations under the terms and conditions in the event that the Contractor is successful, the Authority reserves the right to exclude the bidder from this procurement.

## C. Non-Collusion

No tender will be considered for acceptance if the contractor has indulged or attempted to indulge in any corrupt practice or canvassed the tender with an officer of the Department. Section 6 contains a "Statement of non-collusion" (declaration 1); any breach of the undertakings covered under items 1 - 3 inclusive will invalidate your tender. If a contractor has indulged or attempted to indulge in such practices and the tender is accepted, then grounds shall exist for the termination of the contract and the claiming damages from the successful contractors. You must not:

- Tell anyone else what your tender price is or will be, before the time limit for delivery of tenders.
- Try to obtain any information about anyone else's tender or proposed tender before the time limit for delivery of tenders.
- Make any arrangements with another organisation about whether or not they should tender, or about their or your tender price.

Offering an inducement of any kind in relation to obtaining this or any other contract with the Department will disqualify your tender from being considered and may constitute a criminal offence.

## **Section 6**

### **Declarations to be Submitted by the Tenderer**

Invitation to Tender for Contractors to Carry Out Hydrogen Standards Supporting Research

Tender Reference Number: 5045/04/2021

Deadline for Tender Responses: 2.00pm, 24 September 2021

### **Contents**

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## Declaration 1: Statement of Non-Collusion

To: The Department for Business, Energy & Industrial Strategy

1. We recognise that the essence of competitive tendering is that the Department will receive a bona fide competitive tender from all persons tendering. We therefore certify that this is a bona fide tender and that we have not fixed or adjusted the amount of the tender or our rates and prices included therein by or in accordance with any agreement or arrangement with any other person.

2. We also certify that we have not done and undertake not to do at any time before the hour and date specified for the return of this tender any of the following acts:

- (a) communicate to any person other than the Department the amount or approximate amount of our proposed tender, except where the disclosure, in confidence, of the approximate amount is necessary to obtain any insurance premium quotation required for the preparation of the tender;
- (b) enter into any agreement or arrangement with any other person that he shall refrain for submitting a tender or as to the amount included in the tender;
- (c) offer or pay or give or agree to pay or give any sum of money, inducement or valuable consideration directly or indirectly to any person doing or having done or causing or having caused to be done, in relation to any other actual or proposed tender for the contract any act, omission or thing of the kind described above.

3. In this certificate, the word "person" shall include any person, body or association, corporate or unincorporated; and "any agreement or arrangement" includes any such information, formal or informal, whether legally binding or not.

.....  
Signature (duly authorised on behalf of the tenderer)

.....  
Print name

.....  
On behalf of (organisation name)

.....  
Date

## Declaration 2: Form of Tender

To: The Department for Business, Energy & Industrial Strategy

1. Having considered the invitation to tender and all accompanying documents (including without limitation, the terms and conditions of contract and the Specification) we confirm that we are fully satisfied as to our experience and ability to deliver the goods/services in all respects in accordance with the requirements of this invitation to tender.
2. We hereby tender and undertake to provide and complete all the services required to be performed in accordance with the terms and conditions of contract and the Specification for the amount set out in the Pricing Schedule.
3. We agree that any insertion by us of any conditions qualifying this tender or any unauthorised alteration to any of the terms and conditions of contract made by us may result in the rejection of this tender.
4. We agree that this tender shall remain open to be accepted by the Department for 8 weeks from the date below.
5. We understand that if we are a subsidiary (within the meaning of section 1159 of (and schedule 6 to) the Companies Act 2006) if requested by the Department we may be required to secure a Deed of Guarantee in favour of the Department from our holding company or ultimate holding company, as determined by the Department in their discretion.
6. We understand that the Department is not bound to accept the lowest or any tender it may receive.
7. We certify that this is a bona fide tender.

.....  
Signature (duly authorised on behalf of the tenderer)

.....  
Print name

.....  
On behalf of (organisation name)

.....  
Date

### Declaration 3: Conflict of Interest

I have nothing to declare with respect to any current or potential interest or conflict in relation to this research (or any potential providers who may be subcontracted to deliver this work, their advisers or other related parties). By conflict of interest, I mean, anything which could be reasonably perceived to affect the impartiality of this research, or to indicate a professional or personal interest in the outcomes from this research.

Signed .....

Name .....

Position .....

**OR**

I wish to declare the following with respect to personal or professional interests related to relevant organisations\*;

- X
- X

*Where a potential conflict of interest has been declared for an individual or organisation within a consortia, please clearly outline the role which this individual or organisation will play in the proposed project and how any conflict of interest has or will be mitigated.*

- X
- X

Signed .....

Name .....

Position .....

Please complete this form and return this with your ITT documentation - Nil returns **are** required.

\* These may include (but are not restricted to);

- A professional or personal interest in the outcome of this research
- For evaluation projects, a close working, governance, or commercial involvement in the project under evaluation
- Current or past employment with relevant organisations

- Payment (cash or other) received or likely to be received from relevant organisations for goods or services provided (Including consulting or advisory fees)
- Gifts or entertainment received from relevant organisations
- Shareholdings (excluding those within unit trusts, pension funds etc) in relevant organisations
- Close personal relationship or friendships with individuals employed by or otherwise closely associated with relevant organisations

***All of the above apply both to the individual signing this form and their close family / friends / partners etc.***

If your situation changes during the project in terms of interests or conflicts, you must notify the Department straight away.

A DECLARATION OF INTEREST WILL NOT NECESSARILY MEAN THE INDIVIDUAL OR ORGANISATION CANNOT WORK ON THE PROJECT; BUT IT IS VITAL THAT ANY INTEREST OR CONFLICT IS DECLARED SO IT CAN BE CONSIDERED OPENLY.

## Declaration 4: Standard Selection Questionnaire

### **Financial Credit Checks:**

*BEIS will carry out financial due diligence on all preferred bidder(s). This may include, but not be limited to, credit checks and the detailed scrutiny of comprehensive reports resulting from said credit checks.*

*BEIS may need to check with bidder(s) that the information within the report is correct. BEIS may also request the latest accounts and financial information from the preferred bidder(s).*

*The outcome of BEIS financial due diligence may result in preferred bidder(s) not being awarded a Contract.*

### **Potential Supplier Information and Exclusion Grounds: Part 1 and Part 2.**

The standard Selection Questionnaire is a self-declaration, made by you (the potential supplier), that you do not meet any of the grounds for exclusion<sup>26</sup>. If there are grounds for exclusion, there is an opportunity to explain the background and any measures you have taken to rectify the situation (we call this self-cleaning).

A completed declaration of Part 1 and Part 2 provides a formal statement that the organisation making the declaration has not breached any of the exclusions grounds. Consequently we require all the organisations that you will rely on to meet the selection criteria to provide a completed Part 1 and Part 2. For example these could be parent companies, affiliates, associates, or essential sub-contractors, if they are relied upon to meet the selection criteria. This means that where you are joining in a group of organisations, including joint ventures and partnerships, each organisation in that group must complete one of these self-declarations. Sub-contractors that you rely on to meet the selection criteria must also complete a self-declaration (although sub-contractors that are not relied upon do not need to complete the self-declaration).

When completed, this form is to be sent back to the contact point given in the procurement documents along with the selection information requested in the procurement documentation.

### **Supplier Selection Questions: Part 3**

The procurement document will provide instructions on the selection questions you need to respond to and how to submit those responses. If you are bidding on behalf of a group (consortium) or you intend to use sub-contractors, you should complete all of the selection questions on behalf of the consortium and/or any sub-contractors.

If the relevant documentary evidence referred to in the Selection Questionnaire is not provided upon request and without delay we reserve the right to amend the contract award decision and award to the next compliant bidder.

### **Consequences of misrepresentation**

If you seriously misrepresent any factual information in filling in the Selection Questionnaire, and so induce an authority to enter into a contract, there may be significant consequences. You may be excluded from the procurement procedure, and from bidding for other contracts for three years. If a contract has been entered into you may be sued for damages and the contract may be rescinded. If fraud, or fraudulent intent, can be proved, you or your

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<sup>26</sup> For the list of exclusion please see [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/551130/List\\_of\\_Mandatory\\_and\\_Discretionary\\_Exclusions.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551130/List_of_Mandatory_and_Discretionary_Exclusions.pdf)

responsible officers may be prosecuted and convicted of the offence of fraud by false representation, and you must be excluded from further procurements for five years.

**Invitation to Tender for Contractors for the Provision of Hydrogen End User Skills and Standards for Heat Supporting Research and Evidence**

**TRN: 5045/04/2021**

**OPEN PROCEDURE**

**Notes for completion**

1. The “authority” means the contracting authority, or anyone acting on behalf of the contracting authority, that is seeking to invite suitable candidates to participate in this procurement process.
2. “You” / “Your” refers to the potential supplier completing this standard Selection Questionnaire i.e. the legal entity responsible for the information provided. The term “potential supplier” is intended to cover any economic operator as defined by the Public Contracts Regulations 2015 (referred to as the “regulations”) and could be a registered company; the lead contact for a group of economic operators; charitable organisation; Voluntary Community and Social Enterprise (VCSE); Special Purpose Vehicle; or other form of entity.
3. Please ensure that all questions are completed in full, and in the format requested. If the question does not apply to you, please state ‘N/A’. Should you need to provide additional information in response to the questions, please submit a clearly identified annex.
4. The authority recognises that arrangements set out in section 1.2 of the standard Selection Questionnaire, in relation to a group of economic operators (for example, a consortium) and/or use of sub-contractors, may be subject to change and will, therefore, not be finalised until a later date. The lead contact should notify the authority immediately of any change in the proposed arrangements and ensure a completed Part 1 and Part 2 is submitted for any new organisation relied on to meet the selection criteria. The authority will make a revised assessment of the submission based on the updated information.
5. For Part 1 and Part 2 every organisation that is being relied on to meet the selection must complete and submit the self-declaration.
6. All sub-contractors are required to complete Part 1 and Part 2<sup>27</sup>.
7. For answers to Part 3 - If you are bidding on behalf of a group, for example, a consortium, or you intend to use sub-contractors, you should complete all of the questions on behalf of the consortium and/ or any sub-contractors, providing one composite response and declaration.

The authority confirms that it will keep confidential and will not disclose to any third parties any information obtained from a named customer contact, other than to the Cabinet Office and/or contracting authorities defined by the regulations, or pursuant to an order of the court or demand made by any competent authority or body where the authority is under a legal or regulatory obligation to make such a disclosure.

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<sup>27</sup> See PCR 2015 regulations 71 (8)-(9)

## Part 1: Potential Supplier Information

Please answer the following questions in full. Note that every organisation that is being relied on to meet the selection must complete and submit the Part 1 and Part 2 self-declaration.

Section 1	Potential supplier information	
Question number	Question	Response
1.1(a)	Full name of the potential supplier submitting the information	
1.1(b) – (i)	Registered office address (if applicable)	
1.1(b) – (ii)	Registered website address (if applicable)	
1.1(c)	Trading status a) public limited company b) limited company c) limited liability partnership d) other partnership e) sole trader f) third sector g) other (please specify your trading status)	
1.1(d)	Date of registration in country of origin	
1.1(e)	Company registration number (if applicable)	
1.1(f)	Charity registration number (if applicable)	
1.1(g)	Head office DUNS number (if applicable)	
1.1(h)	Registered VAT number	
1.1(i) - (i)	If applicable, is your organisation registered with the appropriate professional or trade register(s) in the member state where it is established?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
1.1(i) - (ii)	If you responded yes to 1.1(i) - (i), please provide the relevant details, including the registration number(s).	
1.1(j) - (i)	Is it a legal requirement in the state where you are established for you to possess a particular authorisation, or be a member of a particular organisation in order to provide the services specified in this procurement?	Yes <input type="checkbox"/> No <input type="checkbox"/>
1.1(j) - (ii)	If you responded yes to 1.1(j) - (i), please provide additional details of what is required and confirmation that you have complied with this.	
1.1(k)	Trading name(s) that will be used if successful in this procurement	
1.1(l)	Relevant classifications (state whether you fall within one of these, and if so which one) a) Voluntary Community Social Enterprise (VCSE) b) Sheltered Workshop	



	c) Public service mutual	
1.1(m)	Are you a Small, Medium or Micro Enterprise (SME) <sup>28</sup> ?	Yes <input type="checkbox"/> No <input type="checkbox"/>
1.1(n)	<p>Details of Persons of Significant Control (PSC), where appropriate: <sup>29</sup></p> <ul style="list-style-type: none"> <li>- Name;</li> <li>- Date of birth;</li> <li>- Nationality;</li> <li>- Country, state or part of the UK where the PSC usually lives;</li> <li>- Service address;</li> <li>- The date he or she became a PSC in relation to the company (for existing companies the 6 April 2016 should be used);</li> <li>- Which conditions for being a PSC are met; <ul style="list-style-type: none"> <li>- Over 25% up to (and including) 50%,</li> <li>- More than 50% and less than 75%,</li> <li>- 75% or more.<sup>30</sup></li> </ul> </li> </ul> <p>(Please enter N/A if not applicable)</p>	
1.1(o)	<p>Details of immediate parent company:</p> <ul style="list-style-type: none"> <li>- Full name of the immediate parent company</li> <li>- Registered office address (if applicable)</li> <li>- Registration number (if applicable)</li> <li>- Head office DUNS number (if applicable)</li> <li>- Head office VAT number (if applicable)</li> </ul> <p>(Please enter N/A if not applicable)</p>	
1.1(p)	<p>Details of ultimate parent company:</p> <ul style="list-style-type: none"> <li>- Full name of the ultimate parent company</li> <li>- Registered office address (if applicable)</li> <li>- Registration number (if applicable)</li> <li>- Head office DUNS number (if applicable)</li> <li>- Head office VAT number (if applicable)</li> </ul> <p>(Please enter N/A if not applicable)</p>	

Please note: A criminal record check for relevant convictions may be undertaken for the preferred suppliers and the persons of significant in control of them.

<sup>28</sup> See EU definition of SME: <http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/sme-definition/>

<sup>29</sup> UK companies, Societates European (SEs) and limited liability partnerships (LLPs) will be required to identify and record the people who own or control their company. Companies, SEs and LLPs will need to keep a PSC register, and must file the PSC information with the central public register at Companies House. [See PSC guidance.](#)

<sup>30</sup> Central Government contracting authorities should use this information to have the PSC information for the preferred supplier checked before award.

Please provide the following information about your approach to this procurement:

Section 1	Bidding model				
Question number	Question	Response			
1.2(a) - (i)	Are you bidding as the lead contact for a group of economic operators?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, please provide details listed in questions 1.2(a) (ii), (a) (iii) and to 1.2(b) (i), (b) (ii), 1.3, Section 2 and 3.  If no, and you are a supporting bidder please provide the name of your group at 1.2(a) (ii) for reference purposes, and complete 1.3, Section 2 and 3.			
1.2(a) - (ii)	Name of group of economic operators (if applicable)				
1.2(a) - (iii)	Proposed legal structure if the group of economic operators intends to form a named single legal entity prior to signing a contract, if awarded. If you do not propose to form a single legal entity, please explain the legal structure.				
1.2(b) - (i)	Are you or, if applicable, the group of economic operators proposing to use sub-contractors?	Yes <input type="checkbox"/> No <input type="checkbox"/>			
1.2(b) - (ii)	If you responded yes to 1.2(b)-(i) please provide additional details for each sub-contractor in the following table: we may ask them to complete this form as well.				
Name					
Registered address					
Trading status					
Company registration number					
Head Office DUNS number (if applicable)					
Registered VAT number					
Type of organisation					
SME (Yes/No)					
The role each sub-contractor will take in providing the works and /or supplies e.g. key deliverables					
The approximate % of contractual obligations assigned to each sub-contractor					

**Contact details and declaration**

I declare that to the best of my knowledge the answers submitted and information contained in this document are correct and accurate.

I declare that, upon request and without delay I will provide the certificates or documentary evidence referred to in this document.

I understand that the information will be used in the selection process to assess my organisation's suitability to be invited to participate further in this procurement.

I understand that the authority may reject this submission in its entirety if there is a failure to answer all the relevant questions fully, or if false/misleading information or content is provided in any section.

I am aware of the consequences of serious misrepresentation.

Section 1	Contact details and declaration	
Question number	Question	Response
1.3(a)	Contact name	
1.3(b)	Name of organisation	
1.3(c)	Role in organisation	
1.3(d)	Phone number	
1.3(e)	E-mail address	
1.3(f)	Postal address	
1.3(g)	Signature (electronic is acceptable)	
1.3(h)	Date	

## Part 2: Exclusion Grounds

Please answer the following questions in full. Note that every organisation that is being relied on to meet the selection must complete and submit the Part 1 and Part 2 self-declaration.

Section 2	Grounds for mandatory exclusion	
Question number	Question	Response
2.1(a)	<p><b>Regulations 57(1) and (2)</b>            The detailed grounds for mandatory exclusion of an organisation are set out on this <b>web page</b>, which should be referred to before completing these questions.</p> <p>Please indicate if, within the past five years you, your organisation or any other person who has powers of representation, decision or control in the organisation been convicted anywhere in the world of any of the offences within the summary below and listed on the <b>webpage</b>.</p>	
	Participation in a criminal organisation.	Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes please provide details at 2.1(b)
	Corruption.	Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes please provide details at 2.1(b)
	Fraud.	Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes please provide details at 2.1(b)
	Terrorist offences or offences linked to terrorist activities	Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes please provide details at 2.1(b)
	Money laundering or terrorist financing	Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes please provide details at 2.1(b)
	Child labour and other forms of trafficking in human beings	Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes please provide details at 2.1(b)
2.1(b)	<p>If you have answered yes to question 2.1(a), please provide further details.</p> <p>Date of conviction, specify which of the grounds listed the conviction was for, and the reasons for conviction,</p> <p>Identity of who has been convicted</p> <p>If the relevant documentation is available electronically please provide the web address, issuing authority, precise reference of the documents.</p>	
2.2	If you have answered Yes to any of the points above have measures been taken to demonstrate the reliability of the organisation despite the existence of a relevant ground for exclusion ? (Self Cleaning)	Yes <input type="checkbox"/> No <input type="checkbox"/>

<p>2.3(a)</p>	<p><b>Regulation 57(3)</b>          Has it been established, for your organisation by a judicial or administrative decision having final and binding effect in accordance with the legal provisions of any part of the United Kingdom or the legal provisions of the country in which the organisation is established (if outside the UK), that the organisation is in breach of obligations related to the payment of tax or social security contributions?</p>	<p>Yes <input type="checkbox"/>          No <input type="checkbox"/></p>
<p>2.3(b)</p>	<p>If you have answered yes to question 2.3(a), please provide further details. Please also confirm you have paid, or have entered into a binding arrangement with a view to paying, the outstanding sum including where applicable any accrued interest and/or fines.</p>	

Please Note: The Authority reserves the right to use its discretion to exclude a potential supplier where it can demonstrate by any appropriate means that the potential supplier is in breach of its obligations relating to the non-payment of taxes or social security contributions.

Section 3		Grounds for discretionary exclusion
	Question	Response
3.1	<p><b>Regulation 57 (8)</b></p> <p>The detailed grounds for discretionary exclusion of an organisation are set out on this <b>web page</b>, which should be referred to before completing these questions.</p> <p>Please indicate if, within the past three years, anywhere in the world any of the following situations have applied to you, your organisation or any other person who has powers of representation, decision or control in the organisation.</p>	
3.1(a)	Breach of environmental obligations?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1 (b)	Breach of social obligations?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1 (c)	Breach of labour law obligations?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(d)	Bankrupt or is the subject of insolvency or winding-up proceedings, where the organisation's assets are being administered by a liquidator or by the court, where it is in an arrangement with creditors, where its business activities are suspended or it is in any analogous situation arising from a similar procedure under the laws and regulations of any State?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(e)	Guilty of grave professional misconduct?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(f)	Entered into agreements with other economic operators aimed at distorting competition?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(g)	Aware of any conflict of interest within the meaning of regulation 24 due to the participation in the procurement procedure?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(h)	Been involved in the preparation of the procurement procedure?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(i)	Shown significant or persistent deficiencies in the performance of a substantive requirement under a prior public contract, a prior contract with a contracting entity, or a prior concession contract, which led to early termination of that prior contract, damages or other comparable sanctions?	Yes <input type="checkbox"/> No <input type="checkbox"/> If yes please provide details at 3.2
3.1(j)	Please answer the following statements	
3.1(j) - (i)		Yes <input type="checkbox"/>

<p>3.1(j) - (ii)</p>	<p>The organisation is guilty of serious misrepresentation in supplying the information required for the verification of the absence of grounds for exclusion or the fulfilment of the selection criteria.</p> <p>The organisation has withheld such information.</p>	<p>No <input type="checkbox"/></p> <p>If Yes please provide details at 3.2</p> <p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p>If Yes please provide details at 3.2</p>
<p>3.1(j) –(iii)</p>	<p>The organisation is not able to submit supporting documents required under regulation 59 of the Public Contracts Regulations 2015.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p>If Yes please provide details at 3.2</p>
<p>3.1(j)-(iv)</p>	<p>The organisation has influenced the decision-making process of the contracting authority to obtain confidential information that may confer upon the organisation undue advantages in the procurement procedure, or to negligently provided misleading information that may have a material influence on decisions concerning exclusion, selection or award.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p>If Yes please provide details at 3.2</p>

<p>3.2</p>	<p>If you have answered Yes to any of the above, explain what measures been taken to demonstrate the reliability of the organisation despite the existence of a relevant ground for exclusion? (Self Cleaning)</p>	
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## Part 3: Selection Questions<sup>31</sup>

Section 4	Economic and Financial Standing	
	Question	Response
4.1	Are you able to provide a copy of your audited accounts for the last two years, if requested? If no, can you provide <b>one</b> of the following: answer with Y/N in the relevant box.	Yes <input type="checkbox"/> No <input type="checkbox"/>
	(a) A statement of the turnover, Profit and Loss Account/Income Statement, Balance Sheet/Statement of Financial Position and Statement of Cash Flow for the most recent year of trading for this organisation.	Yes <input type="checkbox"/> No <input type="checkbox"/>
	(b) A statement of the cash flow forecast for the current year and a bank letter outlining the current cash and credit position.	Yes <input type="checkbox"/> No <input type="checkbox"/>
	(c) Alternative means of demonstrating financial status if any of the above are not available (e.g. forecast of turnover for the current year and a statement of funding provided by the owners and/or the bank, charity accruals accounts or an alternative means of demonstrating financial status).	Yes <input type="checkbox"/> No <input type="checkbox"/>
4.2	Where we have specified a minimum level of economic and financial standing and/ or a minimum financial threshold within the evaluation criteria for this procurement, please self-certify by answering 'Yes' or 'No' that you meet the requirements set out.	Yes <input type="checkbox"/> No <input type="checkbox"/>

Section 5	If you have indicated in the Selection Questionnaire question 1.2 that you are part of a wider group, please provide further details below:	
	Name of organisation	
	Relationship to the Supplier completing these questions	

5.1	Are you able to provide parent company accounts if requested to at a later stage?	Yes <input type="checkbox"/> No <input type="checkbox"/>
5.2	If yes, would the parent company be willing to provide a guarantee if necessary?	Yes <input type="checkbox"/> No <input type="checkbox"/>
5.3	If no, would you be able to obtain a guarantee	Yes <input type="checkbox"/>

<sup>31</sup> See Action Note 8/16 Updated Standard Selection Questionnaire



	elsewhere (e.g. from a bank)?	No <input type="checkbox"/>
<b>Section 6</b>	<b>Technical and Professional Ability</b>	
<b>6.1</b>	<p><b>Relevant experience and contract examples</b></p> <p>Please provide details of up to three contracts, in any combination from either the public or private sector; voluntary, charity or social enterprise (VCSE) that are relevant to our requirement. VCSEs may include samples of grant-funded work. Contracts for supplies or services should have been performed during the past three years. Works contracts may be from the past five years.</p> <p>The named contact provided should be able to provide written evidence to confirm the accuracy of the information provided below.</p> <p>Consortia bids should provide relevant examples of where the consortium has delivered similar requirements. If this is not possible (e.g. the consortium is newly formed or a Special Purpose Vehicle is to be created for this contract) then three separate examples should be provided between the principal member(s) of the proposed consortium or Special Purpose Vehicle (three examples are not required from each member).</p> <p>Where the Supplier is a Special Purpose Vehicle, or a managing agent not intending to be the main provider of the supplies or services, the information requested should be provided in respect of the main intended provider(s) or sub-contractor(s) who will deliver the contract.</p> <p>If you cannot provide examples see question 6.3</p>	

	<b>Contract 1</b>	<b>Contract 2</b>	<b>Contract 3</b>
<b>Name of customer organisation</b>			
<b>Point of contact in the organisation</b>			
<b>Position in the organisation</b>			
<b>E-mail address</b>			
<b>Description of contract</b>			
<b>Contract Start date</b>			
<b>Contract completion date</b>			
<b>Estimated contract value</b>			

<b>6.2</b>	<p>Where you intend to sub-contract a proportion of the contract, please demonstrate how you have previously maintained healthy supply chains with your sub-contractor(s)</p> <p>Evidence should include, but is not limited to, details of your supply chain management tracking systems to ensure performance of the contract and including prompt payment or membership of the UK Prompt Payment Code (or equivalent schemes in other countries)</p>

<b>6.3</b>	<p>If you cannot provide at least one example for questions 6.1, in no more than 500 words please provide an explanation for this e.g. your organisation is a new start-up or you have provided services in the past but not under a contract.</p>

<b>Section 7</b>	<b>Modern Slavery Act 2015: Requirements under Modern Slavery Act 2015<sup>32</sup></b>	
<b>7.1</b>	<p>Are you a relevant commercial organisation as defined by section 54 ("Transparency in supply chains etc.") of the Modern Slavery Act 2015 ("the Act")?</p>	<p>Yes <input type="checkbox"/></p> <p>N/A <input type="checkbox"/></p>
<b>7.2</b>	<p>If you have answered yes to question 1 are you compliant with the annual reporting requirements contained within Section 54 of the Act 2015?</p>	<p>Yes <input type="checkbox"/></p> <p>Please provide relevant the url ...</p> <p>No <input type="checkbox"/></p> <p>Please provide an explanation</p>

<sup>32</sup> Procurement Policy Note 9/16 Modern Slavery Act 2015

Section 8	The General Data Protection Regulation (GDPR) <sup>33</sup>	
8.1	<p>Compliance with the GDPR is a mandatory requirement for all contracts or agreements that involve the transfer and processing of personal data from 25<sup>th</sup> May 2018. Will your organisation be compliant with the GDPR and all Data Protection Legislation (as defined in the terms and conditions applying to this Invitation to Tender) in regards to the processing required under this contract by the time of contract award?</p> <p>Contractors are also required to complete Declaration 5: The General Data Protection Regulation Assurance Questionnaire for Contractors, to evidence the extent of readiness. The Authority may ask the Contractor to provide evidence to support the position stated in the questionnaire. The Authority may require the successful Contractor to increase their preparedness where the Authority is not satisfied that the Contractor will be in a position to meet its obligations under the terms and conditions. If the Contractor fails to satisfy the Authority that it will be in a position to meet its obligations under the terms and conditions in the event that the Contractor is successful, the Authority reserves the right to exclude the bidder from this procurement.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

<sup>33</sup> Procurement Policy Note 02/18 Changes to Data Protection Legislation & General Data Protection Regulation

## 9. Additional Questions

Suppliers who self-certify that they meet the requirements to these additional questions will be required to provide evidence of this if they are successful at contract award stage.

Section 9	Additional Questions
9.1	<b>Insurance</b>
a.	<p>Please self-certify whether you already have, or can commit to obtain, prior to the commencement of the contract, the levels of insurance cover indicated below: Y/N</p> <p>Employer's (Compulsory) Liability Insurance = £5m</p> <p>Public Liability Insurance = £5m Professional Indemnity Insurance = £2m</p> <p>*It is a legal requirement that all companies hold Employer's (Compulsory) Liability Insurance of £5 million as a minimum. Please note this requirement is not applicable to Sole Traders.</p>

9.2	Skills and Apprentices <sup>34</sup> – (please refer to supplier selection guidance)	
a.	<p>Public procurement of contracts with a full life value of £10 million and above and duration of 12 months and above should be used to support skills development and delivery of the apprenticeship commitment. This policy is set out in detail in Procurement Policy Note 14/15.</p> <p>Please confirm if you will be supporting apprenticeships and skills development through this contract.</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
b.	<p>If yes, can you provide at a later stage documentary evidence to support your commitment to developing and investing in skills, development and apprenticeships to build a more skilled and productive workforce and reducing the risks of supply constraints and increasing labour cost inflation?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
c.	<p>Do you have a process in place to ensure that your supply chain supports skills, development and apprenticeships in line with PPN 14/15 (see guidance) and can provide evidence if requested?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>

<sup>34</sup> [Procurement Policy Note 14/15– Supporting Apprenticeships and Skills Through Public Procurement](#)

<b>9.3</b>	<b>Suppliers' Past Performance<sup>35</sup> - (please refer to supplier selection guidance - this question should only be included by central government contracting authorities)</b>	
<b>a.</b>	Can you supply a list of your relevant principal contracts for goods and/or services provided in the last three years?	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>b.</b>	On request can you provide a certificate from those customers on the list?	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>c.</b>	If you cannot obtain a certificate from a customer can you explain the reasons why?	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>d.</b>	If the certificate states that goods and/or services supplied were not satisfactory are you able to supply information which shows why this will not recur in this contract if you are awarded it?	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>e.</b>	Can you supply the information in questions a. to d. above for any sub-contractors [or consortium members] who you are relying upon to perform this contract?	Yes <input type="checkbox"/> No <input type="checkbox"/>

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<sup>35</sup> Procurement Policy Note 04/15 Taking Account of Suppliers' Past Performance

## Declaration 5: The General Data Protection Regulation Assurance Questionnaire for Contractors



GDPR  
declaration.xls

## Declaration 6: Code of Practice<sup>36</sup>

I confirm that I am aware of the requirements of the Department's Code of Practice<sup>37</sup> for Research (see Annex B) and, in the proposed project, I will use my best efforts to ensure that the procedures used conform to those requirements under the following headings:

- Responsibilities
- Competence
- Project planning
- Quality control
- Handling of samples and materials
- Documentation of procedures and methods
- Research/work records

I understand that the Department has the right to inspect our procedures and practices against the requirements of the Code of Practice, and that I may be asked to provide documentary evidence of our working practices or provide access and assistance to auditors appointed by the Department.

(There is some flexibility in the application of the Code of Practice to specific research projects. Contractors are encouraged to discuss with the Department any aspects that cause them concern, in order to reach agreement on the interpretation of each requirement.)

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<sup>36</sup> Please note that this declaration applies to individuals, single organisations and consortia.

<sup>37</sup> The Code of Practice is attached to this ITT as Annex B

## Annex A: Pricing Schedule

Proposals should include a pricing breakdown based on deliverables as demonstrated in the Table below. A separate bid and separate pricing schedule must be submitted for each lot applied for.

Staff costs shall be assigned to each deliverable based on day rate and the number of days required to complete the deliverable. Non-staff costs do not need to include a fully itemised list but can group similar costs, e.g. standards/journals access, experimental set-up. Sub-contractor costs should be clearly identified as separate line items.

Rows for staff and non-staff costs can be added to each deliverable as required. All prices are exclusive of VAT. For non-staff costs, please provide the full cost and insert n/a into the “Number of days” column.

Deliverable	Charge type	Activity undertaken	Day rate/charge (exc VAT)	Number of days	Total
Deliverable Name	Staff: Level 1		£		£
	Staff: Level 2		£		£
	Staff: Level 3		£		£
	Staff: Level 4		£		£
	Non-Staff:		£	n/a	£
	Non-Staff:		£	n/a	£
	<b>Deliverable Sub-Total</b>				
Deliverable Name	Staff: Level 1		£		£
	Staff: Level 2		£		£
	Staff: Level 3		£		£
	Staff: Level 4		£		£
	Non-Staff:		£	n/a	£
	Non-Staff:		£	n/a	£
	<b>Deliverable Sub-Total</b>				
<i>[Add more rows for deliverables as required]</i>					
Full Price Offered	<b><u>TOTAL (exc VAT)</u></b>				<b>£</b>
	<b><u>VAT</u></b>				<b>£</b>
	<b><u>TOTAL (inc VAT)</u></b>				<b>£</b>



Please include any cost assumptions made in the course of pricing the bid into the table below, adding more rows as required.

<b>Cost assumption</b>	<b>Description</b>

## **Annex B: Code of Practice for Research**

### **Issued by the Department for Business, Energy and Industrial Strategy**

The Department has developed this Code of Practice from the Joint Code of Practice issued by Biotechnology and Biological Sciences Research Council (BBSRC); the Department for Environment, Food and Rural Affairs (Defra); the Food Standards Agency; and the Natural Environment Research Council (NERC) which lays out a framework for the proper conduct of research. It sets out the key aspects of the research process and the importance of making judgements on the appropriate precautions needed in every research activity.

The Code applies to all research funded by The Department. It is intended to apply to all types of research, but the overriding principle is fitness of purpose and that all research must be conducted diligently by competent researchers and therefore the individual provisions must be interpreted with that in mind.

### **PRINCIPLES BEHIND THE CODE OF PRACTICE**

Contractors and consortia funded by the Department are expected to be committed to the quality of the research process in addition to quality of the evidence outputs.

The Code of Practice has been created in order to assist contractors to conduct research of the highest quality and to encourage good conduct in research and help prevent misconduct.

Set out over 8 responsibilities the code of practice provides general principles and standards for good practice in research.

Most contractors will already have in place many of the measures set out in the Code and its adoption should not require great effort.

### **COMPLIANCE WITH THE CODE OF PRACTICE**

All organisations contracting to the Department (including those sub-contracting as part of a consortium) will be expected to commit to upholding these responsibilities and will be expected to indicate acceptance of the Code when submitting proposals to the Department.

Contractors are encouraged to discuss with the Department any clauses in the Code that they consider inappropriate or unnecessary in the context of the proposed research project. The Code, and records of the discussions if held, will become part of the Terms and Conditions under which the research is funded.

Additionally, The Department may conduct (or request from the Contractor as appropriate) a formal risk assessment on the project to identify where additional controls may be needed.

## **MONITORING OF COMPLIANCE WITH THE CODE OF PRACTICE**

Monitoring of compliance with the Code is necessary to ensure:

- Policies and managed processes exist to support compliance with the Code.
- That these are being applied in practice.

In the short term, the Department can require contractors to conduct planned internal audits although the Department reserves the right to obtain evidence that a funded project is carried out to the required standard. The Department may also conduct an audit of a Contractor's research system if deemed necessary.

In the longer term it is expected that most research organisations will assure the quality of their research processes by means of a formal system that is audited by an impartial and competent third party against an appropriate internationally recognised standard that is fit for purpose.

A recommended checklist for researchers can be found on the UK Research Integrity Office (UKRIO) website at <http://www.ukrio.org/what-we-do/code-of-practice-for-research>

## **SPECIFIC REQUIREMENTS IN THE CODE OF PRACTICE**

### **1. Responsibilities**

All organisations contracting to the Department (including those sub-contracting as part of a consortium) will be responsible for the overall quality of research they conducted. Managers, group leaders and supervisors have a responsibility to ensure a climate of good practice in the research teams, including a commitment to the development of scientific and technical skills.

The Principal Investigator or Project Leader is responsible for all the work conducted in the project including that of any subcontractors. All staff and students must have defined responsibilities in relation to the project and be aware of these responsibilities.

### **2. Competence**

All personnel associated with the project must be competent to perform the technical, scientific and support tasks required of them. Personnel undergoing training must be supervised at a level such that the quality of the results is not compromised by the inexperience of the researcher.

### **3. Project planning**

An appropriate level of risk assessment must be conducted to demonstrate awareness of the key factors that will influence the success of the project and the ability to meet its objectives. There must be a written project plan showing that these factors (including research design, statistical methods and others) have been addressed. Projects must be ethical and project plans must be agreed in collaboration with

the Department, taking account of the requirements of ethical committees<sup>38</sup> or the terms of project licences, if relevant.

Significant amendments to the plan or milestones must be recorded and approved by the Department if applicable.

#### **4. Quality control**

The organisation must have planned processes in place to assure the quality of the research undertaken by its staff. Projects must be subjected to formal reviews of an appropriate frequency. Final and interim outputs must always be accompanied by a statement of what quality control has been undertaken.

The authorisation of outputs and publications shall be as agreed by the Department, and subject to senior approval in the Department, where appropriate. Errors identified after publication must be notified to the Department and agreed corrective action initiated.

#### **5. Handling of samples and materials**

All samples and other experimental materials must be labelled (clearly, accurately, uniquely and durably), and retained for a period to be agreed by the Department. The storage and handling of the samples, materials and data must be as specified in the project plan (or proposal), and must be appropriate to their nature. If the storage conditions are critical, they must be monitored and recorded.

#### **6. Documentation of procedures and methods**

All the procedures and methods used in a research project must be documented, at least in the personal records of the researcher. This includes analytical and statistical procedures and the generation of a clear audit trail linking secondary processed information to primary data.

There must be a procedure for validation of research methods as fit for purpose, and modifications must be trackable through each stage of development of the method.

#### **7. Research/work records**

All records must be of sufficient quality to present a complete picture of the work performed, enabling it to be repeated if necessary.

The project leader is accountable for the validity of the work and responsible for ensuring that regular reviews of the records of each researcher are conducted<sup>39</sup>

The location of all project records, including critical data, must be recorded. They must be retained in a form that ensures their integrity and security, and prevents unauthorised modification, for a period to be agreed by the Department.

A recommended checklist for researchers can be found on the UK Research Integrity

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<sup>38</sup> Please note ethical approval does not remove the responsibility of the individual for ethical behaviour.

<sup>39</sup> Please note that this also applies to projects being undertaken by consortia.

Office (UKRIO) website at <http://www.ukrio.org/what-we-do/code-of-practice-for-research>

## Annex C: Mandatory Exclusion Grounds

### **Public Contract Regulations 2015 R57(1), (2) and (3)**

### **Public Contract Directives 2014/24/EU Article 57(1)**

#### **Participation in a criminal organisation**

Participation offence as defined by section 45 of the Serious Crime Act 2015

Conspiracy within the meaning of

- section 1 or 1A of the Criminal Law Act 1977 or
- article 9 or 9A of the Criminal Attempts and Conspiracy (Northern Ireland) Order 1983

where that conspiracy relates to participation in a criminal organisation as defined in Article 2 of Council Framework Decision 2008/841/JHA on the fight against organised crime;

#### **Corruption**

Corruption within the meaning of section 1(2) of the Public Bodies Corrupt Practices Act 1889 or section 1 of the Prevention of Corruption Act 1906;

The common law offence of bribery;

Bribery within the meaning of sections 1, 2 or 6 of the Bribery Act 2010, or section 113 of the Representation of the People Act 1983;

#### **Fraud**

Any of the following offences, where the offence relates to fraud affecting the European Communities' financial interests as defined by Article 1 of the convention on the protection of the financial interests of the European Communities:

- the common law offence of cheating the Revenue;
- the common law offence of conspiracy to defraud;
- fraud or theft within the meaning of the Theft Act 1968, the Theft Act (Northern Ireland) 1969, the Theft Act 1978 or the Theft (Northern Ireland) Order 1978;
- fraudulent trading within the meaning of section 458 of the Companies Act 1985, article 451 of the Companies (Northern Ireland) Order 1986 or section 993 of the Companies Act 2006;
- fraudulent evasion within the meaning of section 170 of the Customs and Excise Management Act 1979 or section 72 of the Value Added Tax Act 1994;

- an offence in connection with taxation in the European Union within the meaning of section 71 of the Criminal Justice Act 1993;
- destroying, defacing or concealing of documents or procuring the execution of a valuable security within the meaning of section 20 of the Theft Act 1968 or section 19 of the Theft Act (Northern Ireland) 1969;
- fraud within the meaning of section 2, 3 or 4 of the Fraud Act 2006;
- the possession of articles for use in frauds within the meaning of section 6 of the Fraud Act 2006, or the making, adapting, supplying or offering to supply articles for use in frauds within the meaning of section 7 of that Act;

### **Terrorist offences or offences linked to terrorist activities**

Any offence:

- listed in section 41 of the Counter Terrorism Act 2008;
- listed in schedule 2 to that Act where the court has determined that there is a terrorist connection;
- under sections 44 to 46 of the Serious Crime Act 2007 which relates to an offence covered by the previous two points;

### **Money laundering or terrorist financing**

Money laundering within the meaning of sections 340(11) and 415 of the Proceeds of Crime Act 2002

An offence in connection with the proceeds of criminal conduct within the meaning of section 93A, 93B or 93C of the Criminal Justice Act 1988 or article 45, 46 or 47 of the Proceeds of Crime (Northern Ireland) Order 1996

### **Child labour and other forms of trafficking human beings**

An offence under section 4 of the Asylum and Immigration (Treatment of Claimants etc.) Act 2004;

An offence under section 59A of the Sexual Offences Act 2003

An offence under section 71 of the Coroners and Justice Act 2009;

An offence in connection with the proceeds of drug trafficking within the meaning of section 49, 50 or 51 of the Drug Trafficking Act 1994

An offence under section 2 or section 4 of the Modern Slavery Act 2015

### **Non-payment of tax and social security contributions**

Breach of obligations relating to the payment of taxes or social security contributions that has been established by a judicial or administrative decision.

Where any tax returns submitted on or after 1 October 2012 have been found to be incorrect as a result of:

- HMRC successfully challenging the potential supplier under the General Anti – Abuse Rule (GAAR) or the “Halifax” abuse principle; or
- a tax authority in a jurisdiction in which the potential supplier is established successfully challenging it under any tax rules or legislation that have an effect equivalent or similar to the GAAR or “Halifax” abuse principle;
- a failure to notify, or failure of an avoidance scheme which the supplier is or was involved in, under the Disclosure of Tax Avoidance Scheme rules (DOTAS) or any equivalent or similar regime in a jurisdiction in which the supplier is established

### **Other offences**

Any other offence within the meaning of Article 57(1) of the Directive as defined by the law of any jurisdiction outside England, Wales and Northern Ireland

Any other offence within the meaning of Article 57(1) of the Directive created after 26<sup>th</sup> February 2015 in England, Wales or Northern Ireland



## Discretionary exclusions

### Obligations in the field of environment, social and labour law.

Where an organisation has violated applicable obligations in the fields of environmental, social and labour law established by EU law, national law, collective agreements or by the international environmental, social and labour law provisions listed in Annex X to the Directive (see copy below) as amended from time to time; including the following:-

- Where the organisation or any of its Directors or Executive Officers has been in receipt of enforcement/remedial orders in relation to the Health and Safety Executive (or equivalent body) in the last 3 years.
- In the last three years, where the organisation has had a complaint upheld following an investigation by the Equality and Human Rights Commission or its predecessors (or a comparable body in any jurisdiction other than the UK), on grounds of alleged unlawful discrimination.
- In the last three years, where any finding of unlawful discrimination has been made against the organisation by an Employment Tribunal, an Employment Appeal Tribunal or any other court (or incomparable proceedings in any jurisdiction other than the UK).
- Where the organisation has been in breach of section 15 of the Immigration, Asylum, and Nationality Act 2006;
- Where the organisation has a conviction under section 21 of the Immigration, Asylum, and Nationality Act 2006;
- Where the organisation has been in breach of the National Minimum Wage Act 1998.

### Bankruptcy, insolvency

Bankrupt or is the subject of insolvency or winding-up proceedings, where the organisation's assets are being administered by a liquidator or by the court, where it is in an arrangement with creditors, where its business activities are suspended or it is in any analogous situation arising from a similar procedure under the laws and regulations of any State;

### Grave professional misconduct

Guilty of grave professional misconduct

### Distortion of competition

Entered into agreements with other economic operators aimed at distorting competition

### **Conflict of interest**

Aware of any conflict of interest within the meaning of regulation 24 due to the participation in the procurement procedure

**Been involved in the preparation of the procurement procedure.**

### **Prior performance issues**

Shown significant or persistent deficiencies in the performance of a substantive requirement under a prior public contract, a prior contract with a contracting entity, or a prior concession contract, which led to early termination of that prior contract, damages or other comparable sanctions.

### **Misrepresentation and undue influence**

The organisation has influenced the decision-making process of the contracting authority to obtain confidential information that may confer upon the organisation undue advantages in the procurement procedure, or to negligently provided misleading information that may have a material influence on decisions concerning exclusion, selection or award.

## **Additional exclusion grounds**

**Breach of obligations relating to the payment of taxes or social security contributions.**

### **ANNEX X Extract from Public Procurement Directive 2014/24/EU**

#### **LIST OF INTERNATIONAL SOCIAL AND ENVIRONMENTAL CONVENTIONS REFERRED TO IN ARTICLE 18(2) —**

- ILO Convention 87 on Freedom of Association and the Protection of the Right to Organise;
- ILO Convention 98 on the Right to Organise and Collective Bargaining;
- ILO Convention 29 on Forced Labour;
- ILO Convention 105 on the Abolition of Forced Labour;
- ILO Convention 138 on Minimum Age;
- ILO Convention 111 on Discrimination (Employment and Occupation);
- ILO Convention 100 on Equal Remuneration;
- ILO Convention 182 on Worst Forms of Child Labour;
- Vienna Convention for the protection of the Ozone Layer and its Montreal Protocol on substances that deplete the Ozone Layer;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention);

- Stockholm Convention on Persistent Organic Pollutants (Stockholm POPs Convention)
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (UNEP/FAO) (The PIC Convention) Rotterdam, 10 September 1998, and its 3 regional Protocols.

### **Consequences of misrepresentation**

A serious misrepresentation which induces a contracting authority to enter into a contract may have the following consequences for the signatory that made the misrepresentation:-

- The potential supplier may be excluded from bidding for contracts for three years, under regulation 57(8)(h)(i) of the PCR 2015;
- The contracting authority may sue the supplier for damages and may rescind the contract under the Misrepresentation Act 1967.
- If fraud, or fraudulent intent, can be proved, the potential supplier or the responsible officers of the potential supplier may be prosecuted and convicted of the offence of fraud by false representation under s.2 of the Fraud Act 2006, which can carry a sentence of up to 10 years or a fine (or both).
- If there is a conviction, then the company must be excluded from procurement for five years under reg. 57(1) of the PCR (subject to self-cleaning).

## Annex D: Key Performance Indicators

Key Performance Indicators (KPIs) will be used to align the Supplier's performance with the requirements of the contract. The KPIs detailed below will be used throughout the duration of the contract:

- Timeliness of delivery: Work delivered to timescale agreed with the Authority.
- Quality of delivery: Work delivered to the standard agreed with the Authority.
- Risk Register: Up-to-date risk register provided to the Authority.

Scoring methodology for KPIs:

**Green score:** If a green score has been awarded to a KPI then no further action is required from the Supplier, with the exception of continuing activities to maintain this score for the next reporting period.

**Amber score:** If an amber score is awarded, the Contractor should examine and implement measures to prevent this KPI being scored an amber or below in subsequent reporting periods. The Authority will not expect formal improvement measures at that stage. If a single KPI is awarded amber in two consecutive invoice periods, or twice in four consecutive invoicing periods then the Contractor should create a Remediation Plan at their own cost. This should detail how they will change their practices to prevent another amber score being awarded for this KPI. The timeline for producing this Remediation Plan should be agreed between the Authority and the Contractor and should only be implemented following approval by the Authority. The Authority reserves the right to terminate the Contract if a satisfactory Remediation Plan cannot be agreed.

**Red score:** If a red score is awarded, the Contractor should create a Remediation Plan at their own cost. This Remediation Plan should detail how they will change practices to prevent another red score being awarded for this KPI. As above, the Authority must agree to the timelines and contents of the Remediation Plan prior to implementation and reserves the right to terminate the Contract if a satisfactory plan cannot be agreed. If, following implementation of a Remediation Plan, the Contractor scores a red in the same KPI in any subsequent period throughout the duration of the Contract, the Authority reserves the right to terminate the Contract. The Authority also reserves the right to terminate this Contract based on a red score without requesting a Remediation Plan, if it is of the Authority's view that a material default has occurred. The Authority reserves the right to suspend, or partially terminate this Contract, while a Remediation Plan is being developed and agreed, where there is justification to do so.

KPIs must maintain a green rating to demonstrate that the service is being delivered to an adequate quality. The Authority reserves the right to amend the existing KPIs detailed above or add any new KPIs throughout delivery with agreement of the Supplier. A KPI to measure the Social Value element of the contract will be agreed within the first month of the contract. Any changes to the KPIs will be agreed with the Supplier and confirmed in writing.

## Annex E: List of Abbreviations

ACoP	Approved Code of Practice
ACS	Accredited Certification Scheme
BBSRC	Biotechnology and Biological Sciences Research Council
BEIS	Department for Business, Energy and Industrial Strategy
BSI	British Standards Institution
DEFRA	Department for Environment, Food and Rural Affairs
ECV	Emergency Control Valve
EFV	Excess Flow Valve
EUS	Energy and Utility Skills
GAAR	General Anti – Abuse Rule
GDNO	Gas Distribution Network Operator
GDPR	General Data Protection Regulation
GSR	Government Social Research
HMRC	Her Majesty’s Revenue and Customs
HSE	Health and Safety Executive
IGEM	Institution of Gas Engineers and Managers
IP	Intellectual Property
ITT	Invitation to Tender
KPI	Key Performance Indicator
NERC	Natural Environment Research Council
NZIP	Net Zero Innovation Portfolio
PAS	Publicly Available Specification
PCR	Public Contract Regulations
QA	Quality Assurance
REA	Rapid Evidence Assessment
WP	Work Package

## Annex F: List of Related Standards

**ASTM F2138-12 (2017)** Standard Specification for Excess Flow Valves for Natural Gas Service

**BS 746:2014** Specification for gas meter unions and adaptors

**BS 5440-1:2008** Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Specification for installation of gas appliances to chimneys and for maintenance of chimneys

**BS 5440-2:2009** Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Specification for the installation and maintenance of ventilation provision for gas appliances

**BS 5546:2010** Specification for installation and maintenance of gas-fired water-heating appliances of rated input not exceeding 70 kW net

**BS 6400-1:2016** Specification for installation, exchange, relocation, maintenance and removal of gas meters with a maximum capacity not exceeding 6 m<sup>3</sup>/h. Low pressure (2nd family gases)

**BS 6400-2:2018** Specification for installation, exchange, relocation, maintenance and removal of gas meters with a maximum capacity not exceeding 6 m<sup>3</sup>/h. Medium pressure (2nd family gases)

**BS 6400-3: 2007** Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m<sup>3</sup>/h. Low and medium pressure (3rd family gases)

**BS 6501-1:2004** Metal hose assemblies. Guidance on the construction and use of corrugated hose assemblies

**BS 6891:2015+A1:2019** Specification for the installation and maintenance of low pressure gas installation pipework of up to 35 mm (R1<sup>1</sup><sub>4</sub>) on premises

**BS 7671:2018/A1: 2020** Requirements for Electrical Installations. IET Wiring Regulations

**BS 8449:2005** Building and construction sealants with movement accommodation factors greater than 25%. Method of test for determination of adhesion/cohesion properties at variable temperatures

**BS EN 331:2015** Manually operated ball valves and closed bottom taper plug valves for gas installations for buildings

**BS EN 751-1:1997** Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water. Anaerobic jointing compounds

**BS EN 1057:2006+A1:2010** Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications

**BS EN 1254-8:2021** Copper and copper alloys. Plumbing fittings. Press fittings for use with plastics and multilayer pipes

**BS EN 10242:1995** Threaded pipe fittings in malleable cast iron

**BS EN 13349:2002** Copper and copper alloys. Pre-insulated copper tubes with solid covering

**BS EN 14129:2014** LPG Equipment and accessories. Pressure relief valves for LPG pressure vessels

**BS EN ISO 9453:2020** Soft solder alloys. Chemical compositions and forms

**BS ISO 14687:2019** Hydrogen fuel quality – Product specification

**IGEM/H/1** Reference Standard for low pressure hydrogen utilisation

**IGEM/UP/1 Edition 2 +A:2005** Strength testing/tightness testing/direct purging of industrial and commercial gas installations

**IGEM/UP/1A Edition 2 +A: 2005** Strength/tightness testing/purging of small, low pressure industrial and commercial installations

**IGEM/UP/1B Edition 3 +A: 2012** - Tightness testing and direct purging of small Liquefied Petroleum Gas/Air, NG and LPG installations

**IGEM/UP/2 Edition 3** Installation pipework on industrial and commercial premises

**IGEM/UP/10 Edition 4 +A:2016** Installation of flued gas appliances in industrial and commercial premises

**IGEM/UP/11 Edition 3** Gas installations for education establishments

**IGEM/UP/16 Edition 2** Design for natural gas installations on industrial and commercial premises with respect to the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)

**PAS 4444:2020** Hydrogen-fired gas appliances. Guide