

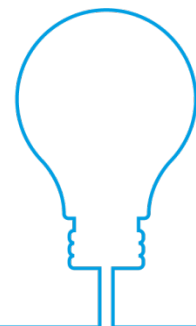


Department for  
Business, Energy  
& Industrial Strategy

# **Domestic Hydrogen Appliance Development Innovation SBRI Competition (Hy4Heat Work Package 4)**

(An SBRI Competition: TRN: 1575/07/2018)

## **Phase 1 Guidance Document**



26 November 2018

**Department for Business, Energy & Industrial Strategy**

**SBRI Domestic Hydrogen Appliance Development Innovation Competition (TRN: 1575/07/2018)**

**Date:** 26 November 2018

As part of the Hy4Heat Programme, the Department for Business, Energy & Industrial Strategy (“BEIS”) has appointed your organisation as one of the contractors to provide Phase 1 Solution Designs for the development of certified domestic gas appliances that can be run on hydrogen as the first part of a pre-commercial procurement competition.

The following document (which should be read in conjunction with the original Invitation to Tender) provides guidance on the scope and application process together with the assessment criteria that will be used to determine which projects will progress to Phase 2a and Phase 2b.

Enclosed are the following sections (described in detail under Contents):

- Sections 1 to 5
- Annex 1

All notifications of updates/clarifications to the competition process or answers to questions raised by potential bidders will be issued by email.

Please read the instructions on the application procedures carefully since failure to comply with them may invalidate your submission.

Your Phase 1 report and application must be received by **12 noon on Friday 15 February 2019**, by email at the following email address:

- [builtenvironmentinnovation@beis.gov.uk](mailto:builtenvironmentinnovation@beis.gov.uk)

Your email must include the following subject line:

- ‘PHASE 1 REPORT: Domestic Hydrogen Appliance Development Innovation Competition’

Further instructions are included in Section 5.

I look forward to receiving your response.

Yours sincerely,

**Steve Loades**

BEIS Programme Manager – Hy4Heat

**Email:** [builtenvironmentinnovation@beis.gov.uk](mailto:builtenvironmentinnovation@beis.gov.uk)

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## 1. Introduction

This Phase 1 Guidance document sets out the scope, application process and assessment criteria for entry into Phase 2a of the Domestic Hydrogen Appliance Development Innovation Competition (Hy4Heat - Work Package 4).

This document is provided further to the Invitation to Tender (ITT) for the SBRI Domestic Hydrogen Appliance Development Innovation Competition and should be considered alongside the ITT.

The total potential value of the Competition is up to £9m (ex VAT) although BEIS may allocate less than this depending on the quality of the applications received. The Competition will be delivered in three main phases:

**Phase 1** – Solution design for a domestic hydrogen appliance. BEIS have appointed a number of suppliers covering a portfolio of appliance types to support and encourage innovation.

**Phase 2a** – Development of a first prototype (1.0) to be provided for demonstration trials. A maximum of £6m will be available in total for Phase 2a in accordance with the breakdown of target funds per project shown in the table below.

**Phase 2b** – Further prototype development (2.0) and full certification. A maximum of £2m will be available in total for Phase 2b projects in accordance with the breakdown of target funds per project shown in the table below.

Appliance category	Appliance type	Target funds for Phases 2a & 2b (£)	% of funds in Phase 2a	% of funds in Phase 2b
Boiler	Combination boiler	1,440,000	75%	25%
	Regular/system boiler			
Cooker	Stand-alone hob	170,000	75%	25%
	Stand-alone oven with grill	270,000	75%	25%
	Integrated freestanding cooker	370,000	75%	25%
Fire	Standard fire	370,000	75%	25%
	Mid-range fire	370,000	75%	25%
Innovative domestic hydrogen appliance		370,000	75%	25%

It is anticipated that between two to three projects per appliance type will be selected to deliver Phases 2a and 2b. The number of projects funded will be dependent on the quality of applications and funding available within the value of the competition.

## 2. Phase 1 Output Report

Phase 1 of the Domestic Hydrogen Appliance Development Innovation Competition requires suppliers to deliver a feasibility report that covers the technical detail of the proposed appliance, market demand and timescales to deliver Phase 2a.

The Phase 1 output reports will be assessed for progression of projects to enter Phase 2 of the competition.

**The following list outlines report headings and the minimum required content to be included within the Phase 1 output report.**

### 2.1 Introduction (Weighting 10%)

Where the proposed appliance is based on an existing product, this should be identified, described and its selection justified regarding suitability for development to a hydrogen appliance. This must include:

- Evidence of significant ongoing market demand for the chosen natural gas appliance, including data on market size and installation numbers (historic (last 10 years) and future projections 10-15 years including assumptions);
- An explanation for why this appliance is particularly suited for development into a replacement hydrogen appliance from an engineering and cost perspective.

For innovative domestic hydrogen appliances, where a reference product does not exist, justification of a potential market including relevant market data as well as technical suitability should be made.

### 2.2 Technical Detail (Weighting 40%)

#### 2.2.1 Detail of the hydrogen appliance (15%)

- **Detailed description of the appliance concept.** Clearly describe the proposed hydrogen appliance, including how reliable and safe operation will be ensured.
- **Engineering drawings of the whole appliance, ideally with 3D and exploded views.** For all products (including innovative appliances) it is expected that engineering drawings are provided for the whole appliance particularly the components specifically designed to accommodate hydrogen, ideally with an exploded 3D view.
- **Gas input rate.** Gas input rating should be provided for full and (where appropriate) part load conditions.
- **Parts list including details of:**
  1. Gas valves. Model numbers (including details of gas permeability and resistance to chemical attack)

2. Burner control unit including detailed logic of ignition sequence such as detailed in BS EN 62282-3-100:2012. Part 3-100: Stationary fuel cell power systems – Safety, section 5.10. Hydrogen offers an increased risk from delayed ignition and a full description is required of how successful ignition is to be achieved e.g. proving of pilot burner
  3. Burner or fuel cell itself (concept drawings sufficient) including operating pressure
  4. All primary safety devices for the key risks associated with the proposed appliance
- Evidence of support from suppliers to the provision of ‘fittings’ certified for use with hydrogen.
  - Where a reference appliance has been identified, each component within the reference product should be identified, and the proposed changes detailed.
  - **Dual fuel, adaptable or hydrogen ready appliances:**
    1. Manufacturers must provide a description as to what this means for their product, how the design achieves their definition and a justification as to why this approach was chosen. A full description should be provided as to the components that will remain consistent and those that will require replacement as the gas changes.
    2. Details of any design benefits or compromises including financial, engineering and consumer considerations relating to dual fuel, hydrogen ready or adaptable designs.
    3. Include additional testing requirements and additional safety considerations.
  - **Electricity generation.** Where a proposed product includes electricity generation, attention must be given as to the output of this generation with regard current regulations (for example FIT regulations currently limit mCHP to 2kW) Description should be provided as to how the appliance will operate and the methods used to maintain stable and safe operation.

### **2.2.2 Target NOx and efficiency (10%)**

- **Target NOx and efficiency at full output and 30% load (or other low load reference conditions appropriate to the appliance).** In terms of product efficiency and emissions, the appliances proposed for development should aim to be comparable or better than the natural gas products being replaced. Manufacturers should refer to the appropriate product standards and Ecodesign requirements for the technology being developed and provide detail as to how the proposed design will meet the reference efficiency and emissions limits.
- **Statement of target flue gas temperature at full and part load.**
- **Statement of heat transfer rate kW/m<sup>2</sup> of heat exchanger (combustion side)**

### **2.2.3 Hydrogen Risks and Mitigations (10%)**

- As with all flammable gases, hydrogen presents risks such as fires and explosions and it is known that hydrogen can produce higher overpressures than natural gas. Manufacturers are required to provide detail of the risks associated with the use of hydrogen as a fuel gas and describe how the design of their product mitigates these. It is expected that any spaces within which hydrogen can unnecessarily accumulate are minimised and ventilation requirements are considered. Delayed ignition, gas leaks and flame failure are also particularly important, however consideration and description should be given to all possible risks.

Details of the risk assessment (as required under the GAR) of the appliance must be provided with special reference to:

1. Soundness of gas circuit
2. Soundness of combustion circuit, especially flue
3. Proof of purge
4. Proof of flame presence prior to main burner operation
5. Discussion of spark restoration and use of volatile and non-volatile lock-out
6. Number of attempted restarts
7. Proof of cross lighting
8. Flash back through any pre-mix system
9. Delayed ignition within combustion chamber
10. Ignition of any hydrogen accumulated within the appliance outer case
11. Risk of overheating of controls and seals
12. Suitability of plastic components for hydrogen service
13. Location and fixing of flue
14. Fixing of outer case, or glass window especially with regard to delayed ignition

### **2.2.4 Conversion Process (5%)**

- Description of the appliance conversion procedure within a property, including a realistic estimation of the time required for the conversion process and the associated costs. This should consider all on-site related activities including pre-visits.

It is fully appreciated that the close of Phase 1 only requires the production of a design which is still to be fully validated, but projects will not be progressed to Phase 2 if any of the required information is not provided. Each and every item relevant to the product must be addressed. Where assumptions have been made, these should be explained and justified.

## 2.3 Timeline (Weighting 10%)

- A detailed schedule of work for Phases 2a and 2b in a Gantt chart including:
  - Milestone schedule as per Section 7 of the ITT and any additional milestones that are identified.

*The Gantt chart may be provided as A3, maximum of 2 pages.*
- A schedule of payments in line with the milestone table detailed in Section 9.1 of the ITT must be provided including the payment amount and date of payment for each milestone.

## 2.4 Project Management (Weighting 15%)

- Description of project team roles including:
  1. Details of project leads and key team members (2 page CVs to be provided as appendix)
  2. Collaboration and communication plans (internally, externally and with Hy4Heat/BEIS)
  3. Assurances of resource allocation to deliver the required work and delivery alongside existing commitments / management plans
  4. Quality assurance procedures including sign off arrangements
- A detailed risk register covering project delivery risks, mitigation plans, impact and likelihood. Risks must cover technical (recognising that these will have been covered in detail in the body of the report), safety and end-user related. To be provided as per the A3 template in Annex 1.
- Details of the type of information you propose to publish outside your organisation, the format you expect this to take and the expected timeframe



### 2.4.1 Cost (Weighting 25%)

**Bid cost for Phases 2a and 2b must be representative of the cost for an individual project in isolation, including a detailed breakdown of costs for the development work.**

Price will be marked proportionately to the target funds detailed in Section 1 for each appliance type, in line with the scoring matrix below.

Score	Mark	Bid cost for Phases 2a and 2b
1	5	>25% MORE than Target Funds
2	10	>5% and ≤ 25% MORE than Target Funds
3	15	≤ 5% MORE and LESS than Target Funds
4	20	>5% and ≤ 25% LESS than Target Funds
5	25	>25% LESS than Target Funds

For example, for target funding of £500k, the allocation of scores would be:

Score	Mark	Bid cost for Phases 2a and 2b
1	5	Bid cost > £625k
2	10	£525k < Bid cost ≤ £625k
3	15	£475 ≤ Bid cost ≤ £525
4	20	£375k ≤ Bid cost < £475k
5	25	Bid cost < £375k

**Significant differences from the estimated Phase 2a and Phase 2b costs provided within Phase 1 bids must be explained.**

Applicants submitting bids for more than one project (appliance type) must indicate what discount they are prepared to offer on their costs for Phases 2a and 2b if they are awarded more than one project to take account of any duplicated work in their multiple proposals. Any discount will not form part of the assessment of the cost but will be applied to the signed contracts.

**Applicants should clearly state where cost savings are being provided compared to exclusive development contracts<sup>1</sup>.**

NB – For the Boiler category only, the assessment of bid cost will be made using the combined pricing for a regular/standard boiler and a combination boiler including any discounts, compared against the target funding detailed in Section 1. The score obtained for the pricing will then be added to the individual technical/quality score for

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<sup>1</sup> Exclusive development means that the public purchaser reserves all the results and benefits of the development (including Intellectual Property Rights or IPRs) exclusively for its own use.

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each appliance individually to achieve overall separate scores for the regular/standard boiler and combination boilers.

BEIS reserves the right not to award any contracts, in particular if BEIS is not satisfied by the proposals received or if the funding assigned to the scheme is required for other, unforeseen, purposes.

## 3. Scoring

Phase 1 Output Report Section		Weighting
1	Introduction	10%
2	Technical Detail	40%
	2.1 Detail of the hydrogen appliance (15%)	
	2.2 Target NOx and efficiency (10%)	
	2.3 Hydrogen risks and mitigations (10%)	
	2.4 Conversion process (5%)	
3	Timeline	10%
4	Project Management	15%
5	Cost	25%

### 3.1 Scoring Method

Each question will be scored from one to five. The following illustrates the meaning of each score:

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

Entry to Phase 2 will be awarded to the highest-ranking proposals, which achieve a **minimum pass mark of 60%**, in order of ranking (based on the total score), however, the number of Phase 2 projects funded depends on the range of solutions proposed and the quality of the proposals and BEIS may allocate less than the total budget depending on the quality of the applications.

## 4. Competition Timetable

<b>Phase 1 – Solution Design</b>	
Phase 1 Start / Finish	26 November 2018 – 15 February 2019
Phase 2a application deadline (Phase 1 Output Report)	15 February 2019 (12 noon)
Phase 2a presentations (if required)	w/c 18 February 2019
Notification of Phase 2a results	15 March 2019
Standstill period	16 – 25 March 2019
<b>Phase 2a – Prototype Development 1.0</b>	
Phase 2a Start / Finish	1 April 2019 – 31 March 2020
<b>Phase 2b – Prototype 2.0</b>	
Phase 2b Start / Finish	1 April 2020 – 31 March 2021

It should be noted that progression to Phase 2b earlier than April 2020 may be allowed if Phase 2a outputs are successfully delivered earlier in the timeframe.

## 5. Application Process

### Submitting an application

Completed reports should be submitted electronically in **pdf format** and emailed to the following email address:

- [builtenvironmentinnovation@beis.gov.uk](mailto:builtenvironmentinnovation@beis.gov.uk)

with the following subject line:

- 'PHASE 1 REPORT: Domestic Hydrogen Appliance Development Innovation Competition'

The maximum size email you can send is 10 MB. If your application is larger than 10MB please break the submission down into smaller sizes and ensure the subject line of each additional email takes the following format:

- 'PHASE 1 REPORT: Domestic Hydrogen Appliance Development Innovation Competition – (name of lead applicant) – email x of y'

### Report documentation / limitations/ requirements.

Phase 1 output report - maximum 30 A4 pages for each project, Arial font minimum size 12pt with single spacing and minimum 2.5cm margins).

For report submissions of multiple projects, report sections or pages that are common to more than one project should be stated in the page footer where possible.

The following items will be assessed but do not form part of the 30-page limit:

- Engineering drawings
- Gantt chart – A3 maximum 2 pages
- Risk Register – A3 maximum 2 pages

# Annex 1

## Risk Register Template

Ref	Risk description	Likelihood (H/M/L)	Impact (H/M/L)	Mitigation