DELTA
Energy & Environment

Delta-ee proposal for DECC's Evidence Gathering - Passive flue gas heat recovery Technologies

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Section 1: Technical Approach

1.1 Key methodology proposed

There are six key elements to our methodology. This is made up as follows:

1. Utilise extensive existing expertise from within the team of Delta-ee, Enertek and Roger Webb.
2. Interviews with stakeholders. This primary research will consist of detailed telephone conversations with boiler/passive flue gas heat recovery (PFGHR) manufacturers, relevant industry associations, key industry individuals, installers, social housing provides etc. These interviews will be used to gather evidence.
3. Literature review. This will consist of a full analysis of manufacturer specification sheets for PFGHR technology and other relevant literature, including academic and lab-based research that is publically available.
4. Internal analysis of evidence and interview results by the Delta-ee and Enertek teams. This will include critiquing the evidence and results; ensuring quality control and internal consistency; and the development of the gap analysis.
5. In-depth interviews to test, explore and challenge evidence gathered & hypotheses. We will carry out interviews, where possible face-to-face. Our aim will be to really challenge and test the data gathered from the manufacturers and academic sources to understand the reliability and robustness of data available. We will also challenge and explore the rationale behind our hypotheses.
6. Synthesis of research and development of the draft final report.

1.2 Regular liaison and interaction with DECC

We propose liaising closely with DECC to ensure that, as the collection of evidence, analysis and hypotheses develops, DECC has the opportunity to feed in questions and comments during the report (rather than only at the draft report stage). We also propose agreeing the structure of the draft final report with DECC ahead of its compilation.

We have budgeted for a kick off meeting with DECC, together with a second meeting to discuss initial findings and progress after section (c) below. Further ad-hoc meetings can be held via web meetings or face to face, according to requirements and availability.

1.3 Detailed approach

Below, we present a more detailed approach for how we can meet the requirements of the tender. Note that this approach fully address all the detailed scope in the ITT, but in a slightly revised structure that we feels best meets this scope and the project objectives.

1. <u>Full status review of PFGHR technology and the market</u>
   PFGHR technology originally started out with the Zenex product. Since then, a number of manufacturers have invested in developing their own design. Many of these systems perform a very similar function, but there are key differences in the design of the components. Some manufacturers (e.g. Ideal) have incorporated PFGHR into some of their products; whereas others (e.g. Baxi) offer it as an optional extra. These products originally were designed for new build applications (i.e. sold via specifiers to cost effectively improve the energy performance of new build dwellings), but can also be retrofitted to existing boilers.

   Using existing in-house knowledge, desk-based research and selected interviews with key industry

stakeholders, we will provide:

a) A brief history and timeline of the development of PFGHR technology.
b) A summary of the development of standards for the technology to date, with a view as to how these standards will likely develop in the future. This includes performance standards such as SAP and ERP; together with safety standards such as the Gas Appliance Directive and manufacturer revisions to flue lengths that result from the inclusion of PFGHR in heating system (PFGHR increases the resistance of the flue and therefore retrofitting devices to existing boilers requires careful consideration of flue lengths and the GAD).
c) Detail on the different technical approaches to PFGHR technology and different system architectures.
d) Deep understanding of which parts of the UK market are being targeted (e.g. RSLs vs developers vs owner-occupiers, new build vs retrofit) and why these customers/market segments buy the technology, plus insight on which channels / routes to market are being used, and why.
e) Approximate volumes of sales today & trends in sales (historic and future), with commentary to explain this.

2. Comparison of different system architectures
Fundamentally there is no great variation in how most PFGHR systems are designed. Where the differences do exist, they are in the design of the components within the systems (e.g. in the design of heat stores, heat exchangers, the ability to work with vertical or horizontal flues, the length of flues, etc.). Some products are better designed to be 'add-ons' to existing boilers whereas others are designed to be integrated or incorporated into new boilers.

Using existing in-house knowledge, desk-based research and selected interviews with boiler manufacturers / installers, we will build a detailed understanding of the different system architectures for PFGHR used by different manufactures, and will address the following questions:

a) How do the different architectures vary in terms of their approach to increasing efficiency?
b) How the design and application of each type affect product certification and the implications thereof.
c) Do any approaches favour certain types of applications?
d) Which manufacturers use which approaches?

3. System performance (part 1)
To understand how PFGHR performs in 'real life' installations, we will:
a) Identify and gather available manufacturer and third party monitoring data – including selected RSLs through our networks.
b) Carry out in-house analyse of available data to identify limitations in PFGHR performance, assess comparability of different data sets, and check credibility/impartiality of the data.
c) Develop hypotheses for and against the in-use efficiency improvements suggested from the data gathered, compared to a boiler.

We are in a strong position to gather this data and analysis due to:

- Our excellent links with key individuals in all the boiler manufacturers (via Delta-ee & Enertek networks, plus Roger Webb).
- Indeed our team has supported the development of some product so have direct experience of evaluating system performance.
- Some of the "early promoters" such as Zenex and Alpha will have carried out their own trials.

Later adopters, such as Bosch, always test products very carefully so will have some insight. We have strong contacts with these companies.

- Note - it may be necessary to anonymise data in order to protect manufacturer confidentiality.
- We will carry out an internal team workshop to develop a hypothesis – our excellent technical capability (within Delta-ee; from Enertek; and from Roger Webb) will ensure this is robust.
- Roger Webb and Delta-ee both bring excellent insight into other European heating markets; relationships with European-based manufacturers; and with the European Heating Industry trade body.

4. System performance (part 2)

After gathering and analysing data of PFGHR performance, we will carry out a second stage of research involving in-depth interviews to probe, challenge and build our confidence in the reliability and robustness of this data. We will do this via:

a) In-depth interviews with manufacturers & other key individuals / companies to seek their opinion, and challenges to, our data and to provide any alternative views.
b) Using our experience of product testing and certification to challenge data where appropriate.
c) Exploring the views of these contacts on the hypothesis (for and against) developed in (3-c) above.

We propose carrying out these interviews, as far as possible, face to face, in order to derive better quality discussions and feedback. This will be greatly facilitated by the team's strong relationships within the sector.

5. Conclusion on system performance

Following the in-depth interviews to challenge and test both the data gathered and our hypothesis, we will hold an internal Project Team Workshop (between Delta-ee, Enertek and Roger Webb) to draw together our views and conclusions on:

- The range of potential efficiency improvements that the PFGHR can deliver to boilers and the factors that govern this range.
- What governs and influences the variation across the range of product and system architectures available.
- The level of reliability in the data and the hypothesis that underpin our conclusion.

6. Costs – the current cost breakdown of PFGHR technology and the likely development of these costs over time

We will use our in house and project team expertise, along with the external interviews, to analyse current and future costs. We believe there is the potential for meaningful future cost reductions as current volumes (compared to the boiler market) are very low. We will:

a) Generate a simple cost model of the different system architectures (showing the costs for the different key components of the system).
b) Identify possible improvements that can be made in the design – this will result in a lower cost of materials in the future. **Note** – we will assess the impact that the evolution of standards for PFGHR may have on the development of the technology and which could influence its future

costs.

   c) Assess the costs of compliance with standards and certification and the significance of these.

   d) Identify potential improvements that can be derived from increased sales volumes, and which would also result in a lower cost of materials in the future.

   e) Identify potential reductions of other overheads that would also be generated from increased volumes of sales – this will result in lower future overheads.

   f) Analyse the impact of overall learning rates on cost reduction and come to a conclusion on the potential for cost reduction of PFGHR technology.

Note: We expect to encounter sensitivities in this section of the approach. For example, market prices for this technology are easy to gather, and to compare and analyse. But understanding the margins, and prices for individual components etc., will be harder - and very dependent on the openness of different manufacturers / installers. We will treat individual manufacturer insight confidentially, but through Enertek's development background we will have access to deep knowledge of the cost of heat exchangers, materials, and certain components etc.

7. <u>Market potential and barriers to deployment</u>

We will use our in house expertise, together with our discussions with manufacturers, wholesalers, installers, RSLs, new build, as necessary, to build our view on the potential market size for PFGHR and to identify the key barriers to its deployment. We will do this as follows:

   a) We will segment the market by end user / customer type (e.g. developer new build, RSL new build, RSL retrofit, owner occupier distressed purchase, owner occupier planned, etc.) and provide a brief assessment of the opportunity for sales within each segment.

   b) We will assess the key barriers to deployment within each customer group.

   c) We will also segment the market as relevant to help identify the market potential. This may include by boiler age and type (e.g. condensing vs non-condensing, combi vs system, and where possible by length of flue) to help understand where there is potential for PFGHR to be physically installed (i.e. is there the space to install it?).

   d) We will generate a high level business-as-usual forecast, plus high and low scenarios through to 2025 for how the market for PFGHR could develop, with full supporting explanation and rationale.

8. <u>Overall conclusion and gap analysis</u>

Finally, we will complete a gap analysis and hold an internal Workshop to conclude the research. The gap analysis and conclusions will focus on:

   a) PFGHR cost, including the level of certainty about future cost reductions and gaps in available evidence.

   b) Efficiency improvements, including the level of certainty and gaps in available evidence.

   c) The cost per tonne of carbon reduction today, and in the future, expressed as a range reflecting the level of certainty, with recommendations on how further work could reduce this uncertainty / range.

   d) The addressable market and overall carbon savings, including the level of certainty, gaps in available evidence and recommendations for further work.

This section will also synthesise all our analysis, data and the key results of the Study.

1.4 Quality Assurance

We will utilise the ten-point quality assurance approach detailed in our proposal for the overall Lot 18 Framework Contract. This approach places considerable emphasis on:

- Ensuring research is perfectly aligned with project objectives
- Internal review and challenge of all research and findings
- Upfront identification of risks and critical paths, and strategies to mitigate these risks and to manage the critical paths.

This project brings some specific challenges:

- Whilst all PFGHR products have undergone laboratory testing, we do not expect to find independently validated in-use data.
- Volumes deployed in the field are relatively low.
- Most insight and any in-use data will be from manufacturers who have a vested interest in promoting their own products.
- There are likely to be some diverse views within the industry on the opportunity and benefits from PFGHR.

We will address these specifically through:

- Challenging any in-use data that is available to us to ensure that we fully understand possible biases – for example in the type of houses / systems the products were tested in, how the data was gathered, what the system boundaries were etc. We will develop a set of 'influencing factors' and will assess these factors for each data-set we gather.
- Developing hypotheses that support and challenge the efficiency savings from PFGHR and use these to challenge manufacturers and other key stakeholders.
- Use our team's extensive industry contacts to ensure we leave no stone unturned in gathering evidence from the right stakeholders and individuals.
- Use our teams' engineering expertise to independently evaluate data from third parties.

1.5 High level summary of proposed project plan

The Gantt chart below summaries how we will deliver 8 parts of the above approach. This allows for submission of the draft report in week 13 (w/c 12th October); and submission of the final report and presentation in week 15 (w/c 26 October). Note that we require comments from the DECC on the draft report five working days after submission of the draft report.

The kick-off meeting will be held in week one; and we propose an interim meeting with DECC around week 6.

	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Status of PFGHR technology and the market	■	■	■												
2. Comparison of different system architectures	■	■	■												
3. System performance (part 1)			■												
4. System performance (part 2)				■	■										
5. Conclusion on system performance						■	■								
6. Cost – current cost breakdown of PFGHR technology						■	■	■							
7. Market potential and barriers to deployment									■	■	■				
8. Overall conclusion and gap analysis											■	■			

Section 2: Experience of Project Team

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Section 3: Pricing Schedule
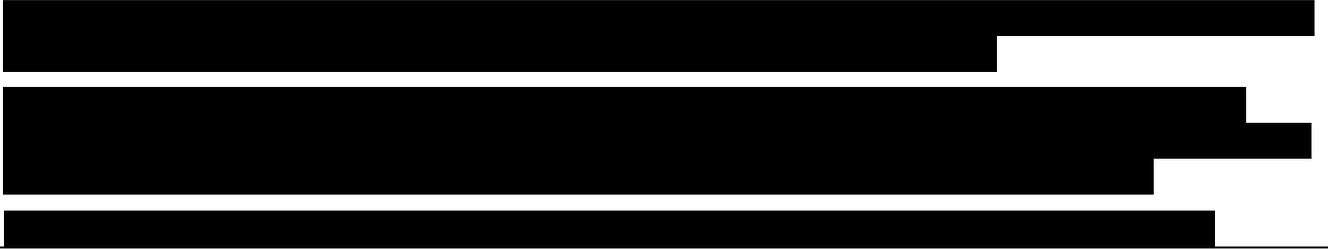
Delta-ee proposal for DECC ITT: Evidence Gathering - Passive flue gas heat recovery Technologies

Annex A – Resource & Pricing Structure Template

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Table 2: Summary Pricing Structure

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Annex B – CVs for the project team

provides insight into key technology, policy, and customer drivers shaping future heat pump markets. This includes market analysis and forecasts, policy development and market tracking, and in-depth research on critical heat pump business opportunities

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Section 4: Signature and Declarations

4.1 Sign off of this proposal to DECC

Signed   *Jon Slowe*
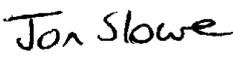
Name   Jon Slowe

Position   Director, Delta-ee

Date   17 July 2015

Declaration 1: Statement of non-collusion

To: The Department of Energy and Climate Change

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.

Signed   *Jon Slowe*
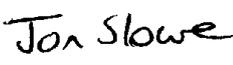
Name   Jon Slowe (Director)

On behalf of: Delta Energy & Environment

Date   17 July 2015

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   *Jon Slowe*

Name   Jon Slowe

Position   Director, Delta-ee

Date   17 July 2015

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

•   Other potential conflicts of interest mentioned in the ITT

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 DECC 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.