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BRE Proposal

Alternate delegates for International Energy Agency Technology Collaboration Programmes; Lot 5 – District Heating and Cooling

[REDACTED]

[REDACTED] Department for Business, Energy & Industrial Strategy (BEIS)

Date: 01 September 2022 Proposal Number: P124080-1000

Contents

Our understanding

Our understanding is that the opportunity for this contract arises from the Department for Business, Energy & Industrial Strategy (BEIS) wishes to commission technical experts to act as alternate delegates for ten International Energy Agency (IEA) Technology Collaboration Partnerships (TCPs).

BEIS is looking for experts in their field with a strong network of contacts across their industry to act as an alternate delegate (AD) for the following International Energy Agency Technology Collaboration Programmes.

BRE is submitting an application to **Lot 5 – District Heating and Cooling (DHC)**

Our value

Our ambition is to be the **world's leading innovation, science, and data hub for the built environment**. By developing **science-led solutions** to urgent challenges, we will build a **thriving and sustainable world**. Being owned by a charity, The BRE Trust, BRE is a profit for purpose organisation. With no commercial shareholders, all profits generated are invested into **pursuit of our purpose**, through the development and delivery of our standards, certification, advice services and innovation, providing maximum benefit to our clients, the built environment industry and wider society.

As well as our UK Headquarters, we also operate from regional offices including BRE Global Ireland, which is an approved EU Notified Body for the purposes of providing CE Marking in the areas of Construction Products, Marine Equipment and Transportable Pressure Equipment.

BRE is here to contribute to a thriving and sustainable world, by developing **science-led solutions** to built environment challenges. The ownership structure of the BRE Trust enables us to be held as a national asset on behalf of the built environment industry and its clients. It also gives us responsibilities in respect of the way we work and behave.

We strive to enhance our community, particularly in the areas of:

- **Education:** hosting free interactive school visits to our Watford Campus (particularly the Innovation Park) and organising science-based events at local schools.
- **Sustainability:** setting challenging sustainability targets for our operations, and stimulating our neighbours' interest in sustainability by, for example, offering free access to public Open Days as part of the National Heritage Open Days.
- BRE's **sustainability strategy** (**S-Plan**) was established in 2008 to demonstrate our **commitment to sustainability**, primarily environmental, and focused at our Watford site. In addition, a voluntary group of **S-Plan Champions** was formed from across the business and dedicated to identifying and implementing projects to support the strategy. In 2011, BRE was recognised in the **Sunday Times Best Green Companies Awards** as the **'Best Larger Firm with Low Environmental Impact'**.
- **Volunteering:** as a responsible employer that exists to contribute to a thriving and sustainable world, we fully support colleagues by giving a day a year to carry out volunteering activities. The volunteering program uses the platform **Neighbourly**.
- **Charity:** supporting charitable activities at both individual and corporate levels. For example, we regularly enter the UK Challenge to raise money for the Dame Kelly Holmes Trust.

BRE is committed to returning its profits back into the BRE Trust to be invested into pursuit of our purpose e.g. **5%** of our profit went into **training and development projects** last financial year. Within this figure support is also available for funding external training that will aid development of an individual's role. We have committed the same **5%** for **2022-2023**.

01 – Technical experience in the TCP area

01a – Understanding of the sector in the UK and internationally

The heat markets in the DHC TCP countries are at very different stages. From the developed mature markets in most of Scandinavia to small but growing markets in the UK and Canada. This leads to a breadth of experience within the DHC TCP that helps discussion to focus on replicable and robust research pathways. The UK government seeks a self-sustaining market for heat networks and is committing significant resource to support its emergence.

The emergence of DHC in the UK has been gradual. There was a surge during the post-war regeneration, but the quality was often poor with pipes being damaged by sharp backfill and pipe corrosion. However, with modern installation techniques and pre-insulated pipes, and as recognition of the benefits of aggregating loads has become clearer (better maintenance, load diversity, use of low or zero carbon heat sources that would be difficult to harness in individual buildings, etc.), heat networks are now a key part of a sustainable future energy system. UK government observes that on average heat network consumers are as satisfied overall with their heating system as non-heat network consumers [i]. In addition, they are likely to pay lower bills than non-heat network consumers [ii].

Countries' regulatory frameworks are important; in many cases these are still structured according to a fossil-fuelled society and impede heat network development. A good example of recognition of this, which has led to corrective action, is UK business rates; district heating pipes have a high asset value but convey a low-value commodity. Relief is now being provided to low-carbon heat networks[iii].

The IEA Secretariat notes in its Net Zero Emissions by 2050 scenario, that 'the combined share of renewable sources and electricity in global district heat supplies together rises from 8% today to about 35% in the current decade, helping to slash heat generation carbon emissions by more than one-third'[iv]. In addition, the IEA's Tracking Clean Energy states that the overall penetration of district heating has remained at 8.5% (though servicing a rise in floor area of 65%, described as 'impressive') but predicts this rising to 20%, while in the UK just 2% of buildings are heated in this way.

The UK's Clean Growth Strategy's illustrative 2050 pathways suggest that this can rise, and that around one in five buildings will have the potential to access a largely low-carbon district heat network by 2050.

The IEA DHC TCP will play a key role in supporting this, for example through its work on low-temperature systems[vi], [vii]; transition strategies[viii], [ix] and digitalization[x].

Low-temperature systems will enable greater penetration not only of renewable heat sources but also sources of heat that would otherwise be wasted (industrial waste heat, sewage water, etc.). An important regulatory issue to observe relates to legionella; the TCP has carried out work on this[xi], but the regulations in each country must be observed.

The transition of systems is primarily concerned with reducing flow and return temperatures; this can often be achieved without replacing internal systems since radiators are often oversized and many buildings have undergone some degree of energy efficiency improvements (or are likely to do so); DHC TCP research has also found that many internal systems are not optimally set up and doing so can go a long way to enabling transition to lower temperature operation. However, successful transitioning will still involve some changes including the design of heat exchangers which will, in future, need to be retrieving outgoing heat at a lower temperature.

Flexibility is another key concept for the future development and improvement of heat networks. Integration of thermal storage increases this flexibility and enables sector coupling with the electricity grid, delivering vital balancing to an electricity market increasingly dealing with intermittent renewable energy sources.

New heat sources that may emerge can be introduced to many buildings simultaneously if they are connected to a heat network. One such source that will come under growing investigation is deep

geothermal, while in the UK heat from disused mines (Seaham Garden Village) and integration of solar thermal and PV (Swaffham Prior), as funded under the UK Government's Heat Networks Investment Project and its successor the Green Heat Network Fund[xii], also demonstrate this flexibility.

Where renewable (solar thermal, geothermal, biomass, etc.) energy sources and recycled energy (industrial and nuclear waste heat, heat retrieved from sewage, disused mines, data centres, rivers, etc.) is at a temperature too low for direct use in heat networks, heat pumps can elevate the supply temperature. For low-temperature networks, this temperature elevation is likely to be small leading to a high heat pump Coefficient of Performance (COP).

In future, these themes may be further extended which might lead to heat networks with multiple sources of energy being supplied by multiple parties, with consumers becoming 'prosumers'. The TCP is conducting research on digitalization and hybrid energy networks, which will at least better enable integration of this kind, and may lead to more fully integrated future energy infrastructures.

The key themes within the TCP's Strategic Work Plan 2021-2026 include Decarbonisation and temperature reduction in DH networks; Improving the business case for DHC including the integration of prosumers; Integration of renewable energy sources; Hybrid energy networks (with thermal energy storage); and Digitalisation for systematic optimisation of DHC.

These themes present substantial challenges, but they also demonstrate the importance of links with other TCPs (on renewables, heat pumps, thermal storage, smart grids). The UK government has also identified the issue of skills and capacity issues impeding acceleration in the development of the heat networks market. This was the subject of a workshop that preceded the international symposium in Nottingham, September 2021. It can also be helped by the research offered by this TCP and can also be a focus for a cross-TCP meeting planned between TCPs for autumn 2022.

References

[i] Competition and Markets Authority. "Heat Networks Market Study." GOV.UK, 7 Dec. 2017, www.gov.uk/cma-cases/heat-networks-market-study

[ii] Department for Business, Energy and Industrial Strategy. "Heat Networks Consumer Survey: Consumer Experiences on Heat Networks and Other Heating Systems." GOV.UK, 7 Dec. 2017, www.gov.uk/government/publications/heat-networks-consumer-survey-consumer-experiences-on-heat-networks-and-other-heating-systems

[iii] "Business Rates Heat Network Relief: Local Authority Guidance." *GOV.UK*, 21 July 2022, www.gov.uk/government/publications/business-rates-heat-network-relief-local-authority-guidance/business-rates-heat-network-relief-local-authority-guidance.

[iv] "Net Zero Emissions by 2050 Scenario (NZE) – World Energy Model – Analysis." IEA, www.iea.org/reports/world-energy-model/net-zero-emissions-by-2050-scenario-nze.

[v] IEA. "District Heating." *IEA*, www.iea.org/reports/district-heating.

[vi] "CASCADE: A comprehensive toolbox for integrating low-temperature sub-networks in existing district heating networks." IEA DHC, www.iea-dhc.org/the-research/annexes/annex-xiii/annex-xiii-project-07.

[vii] IEA DHC. "Annex TS2: Implementation of Low Temperature District Heating Systems." IEA DHC, www.iea-dhc.org/the-research/annexes/2017-2021-annex-ts2.

[viii] "Stepwise transition strategy and impact assessment for future district heating systems." IEA DHC, www.iea-dhc.org/index.php?id=529.

[ix] "Optimized transition towards low-temperature and low-carbon DH systems (OPTiTRANS)." IEA DHC, www.iea-dhc.org/the-research/annexes/annex-xiii/annex-xiii-project-05.

[x] "Annex TS4: Digitalisation of District Heating and Cooling." IEA DHC, www.iea-dhc.org/the-research/annexes/2018-2024-annex-ts4.

[xi] IEA DHC. "Chapter 3: Safe Supply of Domestic Hot Water." Toward 4th Generation District Heating: Experience and Potential of Low-Temperature District Heating, 2014, pp. 33-45, bit.ly/3QR31AZ.

[xii] "Some of Our Successful HNIP Funded Projects." GHNF – Triple Point Heat Networks Investment Management, 29 July 2022, tp-heatnetworks.org/funded-projects/.

01b – Developing research tasks and leading working groups

The DHC TCP was initiated in 1983 as a cost share programme with annexes comprising groups of competitively selected projects. Each annex has a duration of 3 years, comprises 4 – 7 projects, and at any time there is a single annex.

The DHC TCP Annex XIII cost share programme commenced in 2020 and is due to finish in 2023. The cost share programme is a competitively tendered process, where organisations in participant countries are invited to submit proposals by responding to a Request for Proposals (RfP).

The RfP is compiled following a consultation process in each country in order to establish gaps and put forward research priorities. The ExCo member for each country is responsible for carrying out the country consultation in their own country. In the UK stakeholders were contacted and asked to provide a list of priority themes for research. Responses were sought from the UK DHC industry, academia, engineering and building services consultancies, local authorities, NGOs, and government. Respondents were invited to a meeting at BEIS to consider the responses and to work towards a consolidated UK position, whereby the highest priority topics could be submitted to the DHC Operating Agent.

As the UK ExCo member, our proposed Alternate Delegate ([REDACTED] carried out this consultation process and chaired the meeting at BEIS (March 2019).

Once all DHC TCP countries have submitted their research priorities, it is the task of the Chair and Vice-Chair to meet, review all countries' submissions, determine the most commonly occurring topics, and compile a 'straw man' document for discussion at the ExCo meeting, on the basis for which the Request for Proposals can be drawn up.

As the Chair of the DHC TCP, [REDACTED] convened and led the meeting with the Vice-Chair and chaired the ensuing ExCo meeting.

Following the deadline for submission, ExCo members reviewed and scored the proposals; the aggregate scores were used at the next ExCo meeting as the basis for final decisions for successful proposals. As UK Alternate, [REDACTED] carried out the reviews, and as Chair, [REDACTED] also chaired the ExCo meeting at which final decisions were made.

Successful proposals included a project on Artificial Intelligence, a gap articulated at the 2019 UK Research Priorities meeting by the delegate from ThamesWey Energy.

A similar process has been underway more recently for the future Annex XIV, with the slight change that the meeting at BEIS took place (March 2022) as a hybrid with delegates face-to-face at BEIS joined by other delegates online. Several key recommendations articulated at this meeting appear in the Draft Request for Proposals due for launch imminently (for example, 'flexibility as a service to the rest of the energy system could be a major income stream for DH systems'; 'thermal energy storage plus DH networks can be the key to maximising variable renewable electricity generation and can bring advantages not currently factored into economic appraisals'; 'deep geothermal energy could be a vital future energy resource for DHC networks, but technical and commercial barriers need to be addressed').

Each of the projects selected for the cost share annexes are supported by a team of nominated experts, one from each of the TCP's participant countries, effectively a steering panel. BRE's proposed AD is carrying out this role for the Annex XIV DH Business Case 2050 project.

Also, as the Chair of the TCP [REDACTED] successfully led the Request for Extension process which is required every 5 years. TCPs must prepare a Strategic Work Plan for approval by the IEA's CERT committee; in February 2021 CERT approved the 2021-2026 work plan.

In addition to this work, [REDACTED] has been the Chair of the Global District Energy Climate Awards (GDECA). This work involved identifying and securing members for the panel, drawn from UNEP, World Bank, European Commission as well as District Energy practitioners. The task was then to draw

up selection criteria, review the proposals which were submitted, and chair the (online) committee meetings.

[REDACTED] has also previously secured research project contracts that involved participating in and/or leading specific research tasks on district heating: from the EU Save (four projects including one which BRE led) and Interreg III (one project – on Minewater) programmes; and from the BRE Trust (two projects and two PhD studentships). For the studentships, as well as identifying the gaps which justified the submitted research proposals, [REDACTED] was also [REDACTED]

As well as the cost share projects, the DHC TCP has begun to run task share projects. Here, project ideas are brought to the ExCo for approval, but must fund themselves. The first two task shares have concluded, and there are more underway.

Suggestions for new annexes – these would work as task shares; the cost share annexes function as described above.

[REDACTED] has recently carried out the UK country consultation for priority topics for the next cost-share annex (which will comprise approximately six projects). Some of the key priorities have been accepted for the overall TCP Request for Proposals, including the topics of flexibility, digitalization, and transition from fossil-based systems; these are broad topics so depending on the approved projects there may remain further aspects to address. In the meantime, some important topics include:

Acceleration of implementation and expansion of heat networks: this has been identified by BEIS as a key issue for achieving the potential of heat networks, requiring a growth in capacity and skills development as well as innovation, and was the subject of a workshop that took place in 2021. This should also be of interest to other countries (e.g. Germany where sector growth has stalled). It also chimes with the IEA Secretariat Net Zero by 2050 report, where targets for each technology were set out. Advancement of this topic could, therefore, include a cross-TCP sub-task where generic strategies for acceleration could be discussed (these might include decision-making, business case, and procurement issues as well as developing the skills-base). A second sub-task could look at installation (for example, trenchless installation) and connection issues; and a third could focus on why existing networks are not growing more rapidly.

Individual or networked heating? Such a project could investigate where the cross-over point between individual heating solutions and heat networks lies. The answer is always likely to be case-specific, but it could be helpful to try to determine generic issues, and an important part of this would be to examine how these might change in future. This could help to inform the government's intention to proceed with zoning. It could also tackle the conundrum of hard-to-heat buildings (e.g. Victorian terraced housing) which are going to experience extremely high energy bills but have hitherto not generally been connected to heat networks.

Deep geothermal energy for heat networks: Although there are many potential sources of heat that could be integrated into heat networks, deep geothermal is currently exciting considerable interest. Potentially limitless but also expensive to initiate, research is required to examine how viable this could be. A link with the geothermal TCP would be essential.

Ambient temperature networks: This could focus on a comparison of ambient networks versus the best that existing heat network technologies (including low-temperature networks) can achieve for a range of heat sources and scale of system. There is an implicit link with heat pumps which also means that the optimal integration of heating and cooling systems, to minimize emissions and costs, can also be examined.

Appendix A includes a CV of BRE's proposed alternate delegate ([REDACTED] including a summary of his key skills and experience.

02 – Links with community in the technology area

[REDACTED] these organisations have distributed information through newsletters and have provided presentation time and display space for reports and brochures at their internal and public events.

Through our extensive work in, and collaboration with, the sector and related stakeholders we have developed a significant network of contacts. This presents an opportunity to develop a formal stakeholder contacts database (subject to appropriate GDPR compliant processes using established BRE processes).) Collectively this could be regarded as a wider National Team. The contact list comprises those who have expressed interest in the DHC area, and/or attended events, and it is divided into several categories: DH industry, consulting engineers, academia, local authorities, and NGOs. [REDACTED] also conveys information that is also sent to other UK TCP Chairs, and government contacts.

This activity has led to a wide range of suggestions for future research work from a range of different target audience groups, and great assistance with distilling these suggestions into coherent recommendations for future DHC TCP annexes at the Research Priorities meeting (this could be regarded as an inner National Team) where delegates' varying backgrounds provide a deeper perspective for decision-making. The latter meeting comprised delegates from engineering; academia; government; three other TCPs; and local authority vanguards.

When the pandemic hit countries across the globe it initially presented a dilemma for international research. However, rapidly improving techniques for online communication meant that important project meetings (usually taking place in-person) and industry workshops (already sometimes taking place remotely) moved online. Through contact with the networks above (the wider National Team), numbers recorded revealed that UK delegate attendance at online DHC TCP webinars exceeded the numbers from any other country.

The DHC TCP oversees the biennial International Symposium on District Heating & Cooling. Established by the Nordic countries in the 1980s, the symposium came under the wing of the DHC TCP from 2016 with Korea taking on the first, and the second taking place in Hamburg (2018). In 2017 [REDACTED] alerted UK universities to this new opportunity to host a future symposium.

While other universities showed some tentative interest, Nottingham Trent University (NTU) expressed their strong interest and, having followed this through with a formal submission to the ExCo, received approval to host the 2020 symposium, and this was duly announced at the end of the Hamburg symposium. The symposium was postponed to 2021 due to the pandemic and eventually took place as a hybrid event due to the resurgence of infections).

This followed NTU's determination to develop this area of work. [REDACTED] had attended a UK DHC TCP event hosted at BRE and was convinced of the importance of the topic. Subsequently, [REDACTED] provided advice on request, attending workshops at NTU to help bring this to fruition. Consequently, not only has NTU hosted the symposium, but they have also developed relevant coursework, participated in DHC TCP projects, and secured an EU project REMOURBAN focusing on low-temperature networks. A letter of support from Professor [REDACTED] is provided in Appendix B.

Also, important to note was the involvement of the local district heating company in Nottingham, one of the UK's biggest with several thousand residential customers as well as many non-domestic connections, and support from Nottingham City Council.

While the symposium was by its nature international, and despite the ongoing travails of the pandemic, delegates from ten countries attended in person. It also provided the opportunity for a UK-based workshop the day before the symposium started. [REDACTED] and Professor [REDACTED] (NTU) were working on a potential programme, but at a meeting with BEIS contacts, a request was made by BEIS to consider

shaping the programme to address key concerns on skills and capacity building. This was done so that the overall effect of the workshop and the symposium was to widen discussion and feedback on both international and national issues.

[REDACTED]

Partly because of hearing from [REDACTED] about the DHC TCP research, the energy retailer SSE came up with the idea of a zero carbon homes development [REDACTED] supplied by a small district heating system that integrated solar thermal, biomass and thermal storage. A former member of [REDACTED] team at BRE was recruited to analyse the data, and also participated in the Annex TS1 task share project on low temperature district heating, and the scheme was highlighted in the DHC TCP project report 'Low temperature district heating for future energy systems.' A letter of support from [REDACTED] (formerly SSE, now Carbon Alternatives) is provided in Appendix B.

As mentioned in the previous section, each of the DHC TCP projects selected for the cost share annexes is supported by a team of nominated experts, one form each participant country, effectively forming a steering panel. These experts report the benefits both at a technical and networking level; [REDACTED] refers to this in his letter of support.

ThamesWey Energy (Woking) have been an enthusiastic supporter of the programme, putting forward suggestions for future research. They were recently in touch, seeking support for a Horizon 2022 proposal they are leading. [REDACTED] provided a letter of support. [REDACTED] acknowledgement of support is included as an unsolicited letter of support in Appendix B.

[REDACTED] participated in the Energy Technologies Institute (ETI)-funded project on Heat Infrastructure Development (2016) that was led by AECOM. [REDACTED] role involved devising a questionnaire that he distributed among international colleagues, compiling their responses, and picking out the most relevant parts of the recent DHC TCP program and its constituent projects.

[REDACTED] also participated (2020) in the Sweco project for the GLA, aimed at identifying credible delivery roles that the GLA could undertake to accelerate the penetration of heat networks in London.

Currently, [REDACTED] is a member of the advisory board for an EPSRC project consortium VTESS (Variable Temperature Thermochemical Energy Storage System and Heat Networks for Decarbonising the Buildings Sector), based at the University of Nottingham and Aston University, on decarbonizing heating and cooling in the UK, involving developing energy storage for district heating systems and understanding technical and non-technical barriers.

Finally, [REDACTED] is also currently involved with the potential setting up of a geothermal energy conference; a meeting is being set up in early September convened by a member of the International Geothermal Association.

03 – Knowledge transfer plan

[REDACTED] The main purpose of this has been to transfer awareness of DHC TCP developments, including news of any forthcoming webinars, new projects being developed, and new reports for projects just finishing.

There has also recently been a new development [REDACTED] to share current and likely future work streams and explore the relevance of DHC TCP activities to those work streams. To move the knowledge transfer to the next level it is recommended that the monthly meetings between the AD and BEIS representatives, which have hitherto been online, should sometimes be face-to-face and with a longer time allowance in order to give more detail, for example when there is a new project report.

A key strength of the TCP is that different countries are at different stages of DHC market development; the Country Reports presented at ExCo meetings provide a vivid perspective of potential market trajectories. Spring 2020 Country Reports were conveyed to the BEIS contact at the June meeting, also for passing to colleagues.

DHC TCP webinars and project reports are a good way to gain an understanding of the technology and how it is improving. Many of the webinars are available to view at the TCP website www.iea-dhc.org. All projects produce a summary report and overall project slide deck; these provide a quick way to determine project outcomes without having to read the full report.

BEIS staff attended the 2021 symposium in Nottingham and were able to network with researchers, hear about their project work, and visit the city's district heating system and a state-of-the-art low-temperature pilot project. The next such symposium (2023) will take place in Beijing, but there is also yearly Smart Energy Systems conference hosted by Aalborg University. The latter is not part of the DHC TCP programme but the presentations are of state-of-the-art developments in the field and invariably include DHC TCP project work, and can consequently assist understanding and shaping future research possibilities. Euroheat & Power also stage events; these range from single issue seminars to their conferences. Within the UK, events staged by ADE and UKDEA are good sources of national opinions and discussion.

The DHC TCP was traditionally a cost-share programme but has latterly been undertaking task-share work as well; it is the latter model within which potential new project ideas can be put forward to the ExCo. The DHC TCP has completed 2 task share projects and has others underway. It is recommended that the AD, together with BEIS representatives and industry stakeholders, meet to explore potential ideas. The possibility of a formal annual National Team event could be a good platform to achieve this, and to highlight new TCP outputs.

A further opportunity would arise from the (already mentioned) cross-TCP meeting that UK ADs have been discussing and would like to hold during the Autumn, with a view to exploring opportunities for joint initiatives. Potential cross-TCP projects would be in keeping with the aspirations of both the TCPs and the IEA Secretariat and could range from bilateral initiatives (e.g. development of deep geothermal that would need to be integrated with heat networks; the cross-over point(s) between individual and network solutions) to the need to move towards future integrated and mutually supportive energy infrastructures (e.g. for balancing of renewably based electricity supply, and for development of systems that can accommodate multiple heat sources).

04 – Service delivery

Our proposal for delivering the requirement is as follows, with reference to the tasks mapped out in Section 2 of the ITT:

General tasks – We confirm that the General tasks will be carried out within 11 days, as set out in the Pricing scenario (Section 16.2).

Attendance to ExCo meetings: [REDACTED] would attend all ExCo meetings; recently these have included both face-to-face and (with the onset of the pandemic) online meetings, with the most recent (May 2022) set up as a hybrid as there were still some countries that were unable to attend. The next meeting will be face-to-face, with more countries now able to attend in person, but can switch to hybrid if required. The value of face-to-face meetings is well recognized among the members of the DHC TCP ExCo. However, the ExCo also believes that there is merit in considering online ExCo meetings where the agenda is less demanding.

Gathering information for an annual report: The DHC TCP has decided to include in its ExCo meetings a Country Report PowerPoint presentation from each participant country on a yearly basis at an ExCo meeting, and a brief update at the other ExCo meeting. The information collected outlines new policy initiatives, sectoral growth, opportunities and/or barriers, details of new or planned new networks including their size, composition and heat source(s). Relevant information arises both from contact with stakeholders and online sources, together with the monthly meetings with the BEIS contact at which [REDACTED] will enquire about specific recent or forthcoming developments that are likely to be of interest to TCP members.

TCP administration, meeting minutes, invoicing: The majority of TCP administration takes place at ExCo meetings. However, from time-to-time ExCo members are asked to carry out other tasks. Twice yearly, following each ExCo meeting, draft meeting minutes are distributed for perusal by ExCo members. Also, the IEA Secretariat occasionally requests the ExCo to review drafts of intended publications such as the Energy Technology Perspectives and Tracking Clean Energy. We will review these materials within 3 working days; they are nearly always circulated with a tight review schedule.

Invoicing for the DHC TCP is twofold: BRE invoices would be presented on a 6-monthly basis. The annual country subscription is paid directly from BEIS to the DHC TCP Operating Agent to avoid VAT issues. Consequently, even though these transactions will not be visible to BRE [REDACTED] will check that the payments have been made to ensure no budgetary problems arise.

Co-ordinating a National Team and relevant ad-hoc meetings: [REDACTED] would continue to send information to the contact list and to the trade associations and other stakeholder groups; emails will include appropriate data privacy information and/or opt-in links to enable new stakeholders to join the distribution lists. Hitherto, as well as sending news of new projects, new reports, webinars, and industry workshops, [REDACTED] has invited all these stakeholders to put forward suggestions for future research, and then invited all those putting forward suggestions to a face-to-face meeting at BEIS. [REDACTED]

Although [REDACTED] has mentioned the National Team concept at some of these events, this has not been formalised as such. He would like to discuss with BEIS how this can best be developed, perhaps as an annual event.

Prior to this bidding process, several UK TCP Alternates (including DHC) had begun planning for a cross-TCP joint event in Autumn 2022. This was in part catalysed by an IEA Secretariat initiative involving all the buildings-related TCP, and the emergence of the IEA's Net Zero Report. It would enable this to be conveyed to stakeholders and provide a springboard for joint actions.

Pre-pandemic [REDACTED] These meetings provide a good opportunity to describe up-to-date information about the programme and to determine opinions on future research. Many of these opportunities are now online.

Producing a report of TCP activities for BEIS: A report will be produced for BEIS (one draft issue and one final issue after collating one round of client feedback) at the end of each business year; monthly catch-up meetings will also carry on, and important developments will be forwarded as soon as they emerge.

Additional tasks: As requested these are included in the pricing, even though at the moment they are not called upon. We confirm, that should these be invoked, they will be carried out within a maximum of 13 days, as set out in the Pricing scenario (Section 16.2).
[REDACTED] is the current Chair but has not needed to call upon BEIS for support for this role; election for Chair will take place at the November ExCo meeting. 'Developing a Programme of Work for a new research project' is certainly of interest and could be the subject of a meeting with BEIS and stakeholders. Such a project would most likely be developed as a task share; the ideas presented in Section 1b could be used as starting point for discussions. 'Active participation in a sub-task' could also take place; again, this is relevant to the task share part of the programme (although there are also nominated experts who provide steering guidance to cost share projects). [REDACTED] would be very happy to participate in person, but hitherto he has tried to spur interest among stakeholders so that the most relevant people can assess the benefit of participating. For example, [REDACTED] alludes in his letter of support (Appendix B) to his participation in the Low Temperature District Heating project with the Greenwatt Way project in Slough featuring.

Overall, [REDACTED] would continue to be able to offer 2 days per week (Wednesdays and Thursdays) for delivery of the required services. Not all these days are required for the service, so that other consultancy tasks will be also carried out, but the key dates (ExCo meetings; monthly reporting to BEIS; communication with the National Team) will be arranged within this time window and given priority, and the full requirement of up to 24 days will be available for this service.

[REDACTED]

[REDACTED]

We hope to be given the opportunity to continue with important and fascinating work about which [REDACTED] and BRE is passionate, and in doing so contribute to the growth of successful, energy-efficient heat networks based on low carbon and renewable energy sources. In pursuit of this we will work flexibly, with the BEIS delegate, and we are happy to discuss and agree a relevant mix of time/tasks to achieve greatest impact

Social Value

At BRE we have committed to regenerative sustainability and stewardship of the environment is central to that. We hold ISO 14001 Environmental Management System Certification. In 2011, BRE was recognised in the Sunday Times Best Green Companies Awards as the 'Best Larger Firm with Low Environmental Impact'.

BRE attracts people that are passionate about sustainability and the environment, and this matches our product and service offerings in addition to our vision.

BRE launched its Sustainability Strategy – the 'S-Plan' – in 2008. It set out 17 overarching sustainability targets and 131 milestones to reduce BRE's environmental impacts, initially up to 2012. Some of the key accomplishments of the original S-Plan include:

- Achieving the zero non-hazardous waste to landfill target.
- Achieving our target to reduce CO2 emissions from travel per employee per year by 40% or less than 1 tonne.
- Reducing our electricity consumption by 14% compared with 2008 levels and reducing our gas consumption by 17% compared with 2008 levels.
- In subsequent years, the S-Plan continued to make impressive improvements.
- In 2016 we achieved a reduction in energy consumption at the Watford site, compared to our baseline energy in 2010.
- A 47% reduction in water use.
- CO2 emissions from BRE staff commuting to work was 48% less in 2016 than 2010.
- We achieved an overall 4% reduction in waste materials in 2016 over the previous year, with 60% of waste segregated on site, 2% recycled off site, 48% sent to energy for energy recovery and 0.01% sent to landfill.

We achieved our pledge that "by 2020 we will halve our environmental impact compared with the 2010 level". Supporting the UK Green Building Council Climate Pledge initiative.

The present S-Plan operates across energy, resource use, waste, transport, health and wellbeing, water, and biodiversity. Each of these themes has a champion and a working group.

Over the last 13 years, S-Plan has helped establish a culture of sustainability in how we operate and empowering employees so they can contribute to reducing overall impacts. It has enabled establishment of core values and behaviours, linked to sustainability; enabling us to demonstrate compliance with ISO 14001.

Sustainability, decarbonisation, and innovations are vital components of much of our built environment research and testing which means we interface with and share and received learning from a wide variety of partners organisations and SMEs many of whom we support on our innovation park demonstration site.

On-going campus building improvements at BRE Watford will include better sustainability features and promote step change reductions in primary energy use and water use.

Prepared by	Authorised by
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Appendix A – CV of Proposed Expert

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[REDACTED]


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Appendix B – Letters of Support demonstrating links with the DHC community


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