

UKERC Technology and Policy Assessment

**Best practice in heat decarbonisation
policy: A review of the international
experience of policies to promote the
uptake of low-carbon heat supply**

Project Scoping note

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The UK Energy Research Centre (UKERC)

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The Technology and Policy Assessment (TPA) Theme of UKERC

The Technology and Policy Assessment (TPA) theme was set up to inform decision-making processes and address key controversies in the energy field. It aims to provide authoritative and accessible reports that set very high standards for rigour and transparency. Subjects are chosen after extensive consultation with energy sector stakeholders and discussions with the UKERC Research Committee.

The primary objective of the TPA is to provide a thorough review of the current state of knowledge. New research, such as modelling or primary data gathering may be carried out when essential. It also aims to explain its findings in a way that is accessible to non-technical readers and is useful to policymakers.

In Phase III of UKERC the TPA team is developing a new methodology for rapid evidence reviews and current work from the TPA has more emphasis than previously on support for and integration with the UKERC research programme. There is also support for and integration with other UKERC research themes, the wider energy research community and external organisations.

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1 Introduction and background

During 2015 the UK Energy Research Centre (UKERC) Technology and Policy Assessment (TPA) Theme consulted widely over prospective topics for future TPA reviews. This process indicated that a rapid assessment of the available evidence on best practice in international policies aimed at deploying low carbon heat technology in order to draw lessons for UK policy on heat decarbonisation, would be both timely and relevant to UK policy.

Radical decarbonisation of heat supply in the UK will be essential to meeting carbon reduction targets under the Climate Change Act (Chaudry, Abeysekera et al. 2015, Eyre and Baruah 2015), and delivering on commitments made in the Paris Agreement to limit increases in global average temperature well below 2°C above pre-industrial levels (EC 2016). Responding to this heat decarbonisation imperative will be particularly challenging in the UK, which has amongst the lowest national share of energy from renewable sources for heating and cooling in the EU (Eurostat 2015). The UK's high penetration of relatively cheap natural gas for supplying heat to buildings is an important constraint on the deployment of renewable heat technologies and infrastructure (Chaudry, Abeysekera et al. 2015, Eyre and Baruah 2015, Hannon 2015).

The UK also has some of the least energy efficient housing stock in Europe (ACE 2013). Since by far the majority of the UK's existing homes will still be in use in 2050, heat decarbonisation in the residential sector will need to be delivered predominantly as a retrofit, rather than new build solution (Hannon 2015, MacLean, Sansom et al. 2016). Options for supplying heat to residential and non-residential buildings include combined heat and power, district heating and heat networks, electrification of heating and heat pumps, hybrid heat pumps (operating in combination with gas boilers), and repurposing of the gas grid for use with hydrogen or biogas.

Low-carbon heat options often involve financial and non-financial barriers to their uptake. Effective policies are likely to be ones that address or recognise the relevant barriers and are designed to overcome them. These barriers include the issues associated with the infrastructural transitions that are required – such as installing district heating, replacing natural gas boilers or the roll out of heat pumps which may require electricity distribution network upgrades.

This project sets out to evaluate the relative effectiveness of different policy approaches to support heat supply or infrastructure transitions internationally. The research seeks to identify lessons from the international policy experience and assess how relevant these policy lessons might be to the UK context for achieving radical decarbonisation of heat.

2 Project aim and objectives

The main aim of the research is to conduct a rapid evidence review of the international experience of policies and policy packages aimed at boosting take-up of low-carbon heat technology. This will start from the international experience with heat system change and also include policies from the UK and the Devolved Administrations. The overarching research question is:

What policies and other factors have driven change/transformation in heat delivery technologies, fuels and infrastructure?

The research aims to address the following sub-questions:

- What are the factors which determine the success of the policy (including addressing barriers, other regulatory issues, market structure and historical factors)?
- What is the impact of external factors (for example, high fossil fuel prices, heat density, or availability of natural resources)?
- How are the outcomes affected by the aims of the policy?
- Would this policy (or aspects of the policy) work within the contemporary UK energy market context? What are the lessons for UK policy?
- Is there evidence to indicate which is the most suitable delivery/engagement agent, or of the advantages of a particular configuration of national and local action?

3 Proposed approach

In order to provide a timely contribution to inform thinking associated with the UK strategy for heat, a rapid review is required. A first task will be to carry out a *rapid evidence assessment* (REA) to establish what evidence is available in general about policy options employed or discussed internationally to encourage the decarbonisation of heat supply, and what this literature contains. This will provide a quick snapshot of how much is known about heat decarbonisation policies. The REA approach is discussed in more detail below. The project will focus on assessing the evidence base in order to capture:

- the full range of comparable policy approaches used internationally to deliver heat supply/infrastructure transitions;

- the range of metrics that the success of these policies can be measured against; and
- the contextual information that may have influenced the success of particular policy approaches in particular geographical regions or at previous points in history.

The REA will focus on heat supply technologies rather than options to improve the energy efficiency of building fabric. Nevertheless, the review should capture integrated policy approaches, where energy efficiency policy forms part of a package of policies supporting the uptake of any particular heat supply technology / infrastructure – for example enhancing thermal efficiency as part of a whole building approach to maximising performance of heat pumps.

Rapid Evidence Assessment of international heat decarbonisation policy

The REA undertaken in this project seeks to extract a systematically gathered range of findings from the literature including analytical assessment of that literature. A key objective is to determine the range of policy approaches employed internationally or discussed in the literature and their relative success, if indeed such data are available. A key output of the project will be to present a range of policy options measured against a number of metrics for relative policy success (see below).

How to measure policy success

The second stage of the work will be to review the metrics used in the literature to measure policy success. Policy options can then be measured against the typical range of metrics used, and this can form a basis for judgement over which policy options appear to be most successful. Among the aspects that this research will consider are:

- Consumer perspectives – What evidence is there on effective policies which focus on maximising opportunities for consumers to adopt low-carbon building measures?
- Business/ public sector perspectives – What evidence is there on effective policies which focus on maximising opportunities for businesses to adopt low-carbon building measures?
- Policy packages – What evidence is there of policy packages which combine different interventions (e.g. incentives with a regulatory back-stop and measures to address barriers to uptake)?

Discussion and synthesis

The final stage of the work will be to draw together the two strands described above in order to consider what can be learned from the international context on heat policies and their effectiveness, and to what extent these lessons can inform the policy process in the UK, given the various contextual specifics that might influence the success of any given policy approach.

4 Rapid Evidence Assessment process

The Government Social Research Service (GSR 2013) lists six types of review methods in its REA toolkit, ranging from unsystematic literature reviews to highly rigorous and systematic multi-arm systematic reviews. **Figure 1** provides a schematic of the different review methods mapped against rigour and the time needed to conduct them.

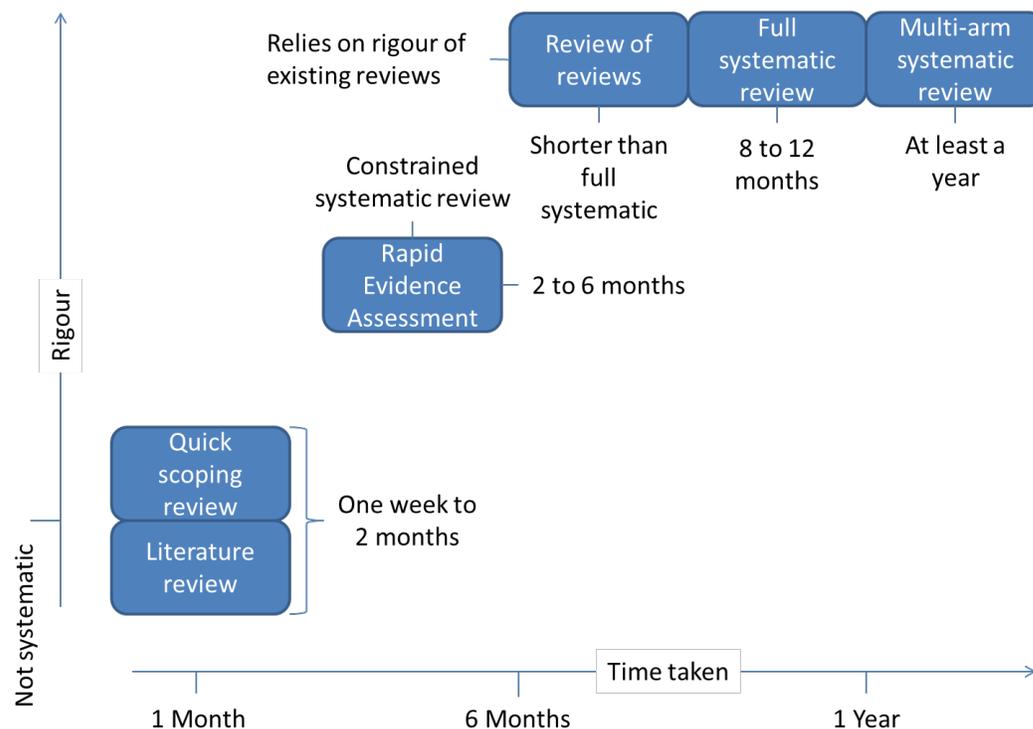


Figure 1: Schematic mapping different types of evidence review methodology (adapted from GSR 2013)

An REA is defined as “a short but systematic assessment on a constrained topic” (GSR 2013). REAs have been designed to maintain the rigour of a full systematic review, but to deliver results rapidly within constraints imposed by cost and time (Hailey, Corabian et al. 2000, Khangura, Konnyu et al. 2012). The proposed approach follows the procedures established in previous TPA assessments, which are directly comparable to

established protocols for conducting REAs (Collins, Miller et al. 2014). As such the REA conducted in this project will involve the following steps:

- Publication of this scoping note on the UKERC website.
- Establishing a small group of experts, representing a variety of opinions and perspectives, to advise the project team; this will be carried out through a streamlined consultation process (i.e. using electronic consultations rather than meetings).
- Categorisation, prioritisation and analysis of the evidence, including an appraisal of methodological quality.
- A systematic search of a clearly defined evidence base using keywords.
- Drafting of a working paper.
- Expert feedback and peer review of the working paper.
- Publication and dissemination through appropriate mechanisms.

The methodological lessons that emerge from this project will also help inform the TPA team's approach to further rapid evidence reviews during Phase III of the UKERC programme.

5 Identifying evidence

Given the short timescales available and the status of the study as an REA, evidence will be identified through keyword searches of two databases: Elsevier Science Direct (for academic literature) and Google (for grey literature), using Boolean combinations of relevant terms. Google will be employed as a first step in identifying grey literature and specific websites which host relevant material, upon which additional searches of grey literature hosted within identified websites can be performed.

For the database searches, technology/infrastructure keywords will be combined with policy, policy evaluation and market deployment keywords identified from a preliminary search of literature related to renewable heat technologies and policy (see Table 1). The search terms will be revised as necessary during the course of the project.

Returned results will be filtered for relevance based on their title and abstract. If this is not sufficient to determine relevance, further inspection of the main text will be performed. The criteria for relevance is that, in relation to change/transformation in heat delivery technologies, fuels and infrastructure, the document considers some or all of the following:

- policy approaches used internationally to deliver heat supply/infrastructure transitions;
- metrics that the success of these policies can be measured against;

- contextual information that may have influenced the success of particular policy approaches in particular geographical regions or at previous points in history.

Following the filtering of retained search results, key descriptive information from each of the relevant results will be captured, namely:

- Country / geographic region;
- Technology / technologies / infrastructures targeted;
- Customer segment targeted (residential/commercial/public sector);
- Policy intervention(s), aims and details;
- Agents involved in policy delivery;
- Study methodology;
- Metrics to assess policy effectiveness;
- Findings on policy effectiveness;
- Factors influencing policy effectiveness (including contextual/external and historical factors);
- Transferability to UK context.

Table 1. Keywords used to identify relevant literature in Science Direct and Google.

Keyword categories			
Technology / infrastructure	Policy	Policy evaluation	Market deployment
biogas AND heat “biomass gasification” biomass AND heat “combined heat and power”/ CHP “district heating” “electric heating” “fuel cell” AND heat “heat electrification” “heat pump” “heat networks” hydrogen AND heat “natural gas” micro-CHP “renewable heat”	policy education grant incentive label loan marketing promotion R&D RD&D regulation standards subsidy/subsidies feed-in support	evaluation assessment effectiveness success failure analysis impact	uptake deployment “roll out” installation development implementation growth expansion adopt/adoption market

6 References

ACE. (2013). "Fact-file: The cold man of Europe." Retrieved 11 May 2016, from www.ukace.org/wp-content/uploads/2013/03/ACE-and-EBR-fact-file-2013-03-Cold-man-of-Europe.pdf.

Chaudry, M., M. Abeysekera, S. H. R. Hosseini, N. Jenkins and J. Wu (2015). "Uncertainties in decarbonising heat in the UK." *Energy Policy* **87**: 623–640.

Collins, A., J. Miller, D. Coughlin and S. Kirk (2014). *The Production of Quick Scoping Reviews and Rapid Evidence Assessments: A How to Guide – Beta Version 2*. Defra, Joint Water Evidence Group.

EC. (2016). "Paris Agreement." Retrieved 11 May 2016, from http://ec.europa.eu/clima/policies/international/negotiations/paris/index_en.htm.

Eurostat (2015). "Share of energy from renewable sources for heating and cooling."

Eyre, N. and P. Baruah (2015). "Uncertainties in future energy demand in UK residential heating." *Energy Policy* **87**: 641–653.

GSR. (2013). "Rapid evidence assessment toolkit." *Civil Service* Retrieved 31st March 2014, from <http://www.civilservice.gov.uk/networks/gsr/resources-and-guidance>.

Hailey, D., P. Corabian, C. Harstall and W. Schneider (2000). "The use and impact of rapid health technology assessments." *International Journal of Technology Assessments in Healthcare* **16**: 651–656.

Hannon, M. (2015). *Raising the temperature of the UK heat pump market: Learning lessons from Finland*, Elsevier.

Khangura, S., K. Konnyu, R. Cushman, J. Grimshaw and D. Moher (2012). "Evidence summaries: the evolution of a rapid review approach." *Systematic Reviews* **1**: 10.

MacLean, K., R. Sansom, T. Watson and R. Gross. (2016). "Managing heat system decarbonisation: comparing the impacts and costs of transitions in heat infrastructure." *Final report*. Retrieved 12 May 2016, from <http://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/icept/Heat-infrastructure-paper.pdf>.