Databases searched and search strings used for each database

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S1: Databases searched

Ten databases and compendia of publications were identified, which, when taken together, cover the main sources of relevant documents that are in digital form. A brief description of each is given in Table S1 along with the review, international or UK, for which they were accessed.

Table S1: Databases and sources used in the systematic evidence review

Database	Description of content[1]
UK and International search	
Scopus	The largest abstract and citation database of peer-reviewed literature from various fields. Contains over 60 million records including more than 21,500 journals, 7 million conference papers and 116000 books. The database is updated daily.
Compendex	An interdisciplinary engineering database with over 9 million records referencing over 5,000 engineering journals and conference materials dating from 1969.
Google Scholar	An online, search engine which searches a variety of sources including academic publishers, professional societies and university repositories. Includes journal and conference papers, theses and dissertations, academic books and pre-prints.
UK search only	
Civil Engineering Abstracts	Includes over 1 million records of technical reports, trade journals, conference papers, books etc. from all aspects of civil engineering such as construction, energy and environmental.
Organisations and Networks	Construction Information Service (CIS): provides full text access to technical standards, legislation and technical guidance for construction industry professionals. Publishing partners include professional bodies and independent research organisations such as Building Services Research and Information Association; Building Research Establishment, Chartered Institute of Building, British Standard Institution; etc.
	Department of Energy and Climate Change publications.
	Transforming Energy Demand through Digital Innovation Network, which is a research network addressing the challenges of reducing energy demand in buildings, the web-site lists more than 200 outputs, including journal articles and conference proceedings and book chapters.
International search only	
Science Direct	A database of physical science, social science and health and life science research. It hosts over 12 million 'items' from 3,500 academic journals and 34,000 e-books.
Academic Search Elite	A resource spanning many academic subjects with thousands of full-text journals and abstracted and indexed journals.
Energy Citations	A database of unclassified material produced by the U.S. Department of Energy and its predecessor agencies the Atomic Energy Commission and the Energy Research and Development Administration.
Proquest	A collection from 90,000 authoritative sources, with 6 billion digital pages. Includes the world's largest collection of dissertations and theses; 20 million pages of global, national, regional and specialty newspapers; scholarly journals and periodicals; and more than 450,000 e-books.
Policy Search Only	

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[1] A precis of the statement of content as given by the database custodians.

	The Precourt Energy Efficiency Centre at Stanford, USA.
Organisational websites	The Chartered Institution of Building Services Engineers, UK.
	ADENE Agência para a Energia-Portuguese Energy Agency.
	EnergieWende, Germany.
	Building Services Research and Information Centre, UK.
	Odyssee-Mure, European Commission.
	Fraunhofer Institute, IBP, Germany.
	EU Architects Council of EU workgroup.
	Better Energy, Ireland.
	American Soc. of Heating, Refrigerating and Air-Conditioning Engineers.
Conference proceedings	European Council for an Energy Efficient Economy.
	Behaviour, Energy & Climate Change.
	American Council for an Energy-Efficient Economy.
	European Conference on Behaviour and Energy Efficiency.

S2: The UK evidence search

After conducting preliminary searches to assess the effectiveness of different search terms, the search strings reported in Table S2 were developed and use to interrogate the databases.

It was not possible to use complex search strings similar to those used for searching Scopus, Engineering Village, Civil Engineering Abstracts and Google Scholar when searching CIS, DECC and TEDDINET. This was because these websites or publication libraries' search engines do not allow use of complex search strings.

The CIS website was searched by adopting various identified keywords used in the search strings of other databases but this did not result in finding any documents which met the inclusion criteria (Table 3 of paper). Therefore, this database was removed from the list of databases at this point.

The DECC website was found to produce a manageable list of documents using the search term: "heating+control". This search term produced the most relevant documents compared to other search terms tested initially, which in some cases had resulted in irrelevant or an unmanageable number of results.

Some search strings also contained words less directly related to the energy efficiency, cost effectiveness and usability of heating controls such as fuzzy,

The TEDDINET website had a limited number of documents (around 200) which were all listed on the output page of the website. All these documents were assessed manually against the inclusion and exclusion criteria, described in Table 3.

S3: The international evidence search

Evidence that related to countries with climatic zones similar to current and projected UK climate conditions (Jenkins et al., 2010) was searched and reviewed. This was assumed to be regions in Köppen-Geiger (Kottek et al., 2006) climatic categories Cfb (maritime temperate) Csa and Csb (hot and warm Mediterranean). Evidence relating to countries that fell entirely outside these selection criteria was recorded and stored pending further investigation if deemed of particular value. Evidence relating to countries that fell entirely outside these selection criteria was recorded and stored pending further investigation if deemed of particular value.

Counties within these climate zones for which relevant documents were discovered included German, USA, Ireland, New Zealand, Portugal, Australia and Chile, and some additional documents relating to the UK.

After conducting preliminary searches to assess the effectiveness of different search terms, a pilot test was undertaken by three researchers using a few search strings on a sample of databases, to ensure the same number of search results (and the same results) was obtained. The search strings finally used are listed in Table A2.

The search for policy experiences was undertaken by issuing 'call for evidence' to key organisations and individuals within them, and then also contacting individuals recommended by those that responded. The organisations, countries and number of individuals that provided evidence and direction to relevant literature are listed In Table A3.

Table S2: Search strings used in the UK evidence review

Database / Source	Search String / Method
Scopus	TITLE-ABS-KEY (heating OR hydronic) AND TITLE-ABS-KEY (control OR controls OR thermostat* OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR fuzzy OR trv OR (boiler AND (timer OR programmer))) AND TITLE-ABS-KEY (dwelling* OR residential OR home* OR domestic OR apartment OR hous*) AND TITLE-ABS-KEY (energy OR cost* OR usability OR user OR occupan* OR behaviour OR behavior OR interaction OR reaction OR practice) AND NOT TITLE-ABS-KEY ("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR air-con*)
Engineering Village (EI Compendex)	((((((heating OR hydronic) WN KY) AND ((control OR controls OR thermostat* OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR fuzzy OR trv OR (boiler AND (timer OR programmer))) WN KY)) AND ((dwelling* OR resident OR home* OR domestic OR apartment OR hous*) WN KY)) AND ((energy OR cost* OR usability OR user OR occupan* OR behaviour OR behavior OR interaction OR reaction OR practice) WN KY)) NOT (("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR air-con*) WN KY))
Civil Engineering Abstracts	(ab(heating OR hydronic) AND ab((control OR controls OR thermostat* OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR fuzzy OR trv OR timer OR programmer)) AND ab((domestic OR residential OR dwelling* OR home* OR apartment OR hous*)) AND ab((energy OR cost* OR usability OR user OR occupant* OR behaviour OR behavior OR interaction OR reaction OR practice)) NOT ab((heat pump OR wind OR non-domestic OR non-residential OR district OR demand response OR cfd OR Air-con*)))
Google Scholar	allintitle: heating domestic control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating residential control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating home control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating dwelling control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating house control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating apartment control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic domestic control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic residential control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer

Google Scholar	allintitle: hydronic home control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic dwelling control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic house control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic apartment control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating homes control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating dwellings control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating houses control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: heating apartments control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic homes control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic dwellings control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic houses control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer
Google Scholar	allintitle: hydronic apartments control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR fuzzy OR trv OR timer OR programmer

Table S3: Search strings used in the international evidence review

Database / Source	Search String / Method
Scopus	Repeat part 1 Search: TITLE-ABS-KEY (heating OR hydronic) AND TITLE-ABS-KEY (control OR controls OR thermostat* OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR fuzzy OR trv OR (boiler AND (timer OR programmer))) AND TITLE-ABS-KEY (dwelling* OR residential OR home* OR domestic OR apartment OR hous*) AND TITLE-ABS-KEY (energy OR cost* OR usability OR user OR occupan* OR behaviour OR behavior OR interaction OR reaction OR practice) AND NOT TITLE-ABS-KEY ("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR air-con)
	Additional terms/countries Search: TITLE-ABS-KEY (heating OR hydronic) AND TITLE-ABS-KEY TITLE-ABS-KEY (heating OR hydronic OR "hot water") AND TITLE-ABS-KEY (control OR controls OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR "time proportional integral control*" OR fuzzy OR (trv AND (programmable OR manual)) OR ("thermostatic radiator valve*" AND (programmable OR manual)) OR (thermostat* AND (room OR boiler OR "modulating room" OR "load compensating" OR programmable) OR geolocation OR geofencing OR "central timer*" OR "communication protocols" OR "learning algorithms" OR automation OR optimisation OR "weather compensation" OR "outdoor reset" OR "occupancy sensors" OR (boiler AND (timer OR programmer))) AND TITLE-ABS-KEY (dwelling* OR residential OR home* OR domestic OR apartment OR house*) AND TITLE-ABS-KEY (energy OR cost* OR usability OR user OR occupant* OR behaviour OR behavior OR interaction OR reaction OR practice OR policy) AND TITLE-ABS-KEY ("uk" OR "united kingdom" OR california OR chile OR australia

	OR japan OR germany OR portugal OR france OR netherlands OR denmark) AND NOT TITLE-ABS-KEY ("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR "air-con")) AND TITLE-ABS-KEY (dwelling* OR residential OR home* OR domestic OR apartment OR hous*) AND TITLE-ABS-KEY (energy OR cost* OR usability OR user OR occupan* OR behaviour OR behavior OR interaction OR reaction OR practice OR policy) AND TITLE-ABS-KEY ("uk" OR "united kingdom" OR california OR chile OR australia OR japan OR germany OR portugal OR france OR netherlands OR denmark) AND NOT TITLE-ABS-KEY ("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR "air-con")
Compendex	Repeat part 1 search: ((((((heating OR hydronic) WN KY) AND ((control OR controls OR thermostat* OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR fuzzy OR trv OR (boiler AND (timer OR programmer))) WN KY)) AND ((dwelling* OR resident OR home* OR domestic OR apartment OR hous*) WN KY)) AND ((energy OR cost* OR usability OR user OR occupan* OR behaviour OR behavior OR interaction OR reaction OR practice) WN KY)) NOT (("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR air-con*) WN KY))
	Additional terms/countries Search: (with and without AND(countries): (((((((heating OR hydronic) WN KY) AND ((control OR controls OR remote OR zonal OR compensator OR compensation OR automat* OR tpi OR "time proportional integral control*" OR fuzzy OR (trv AND (programmable OR manual)) OR ("thermostatic radiator valve*" AND (programmable OR manual)) OR (thermostat* AND (room OR boiler OR "modulating room" OR "load compensating" OR programmable)) OR geolocation OR geofencing OR "central timer*" OR "communication protocols" OR "learning algorithms" OR automation OR optimisation OR "weather compensation" OR "outdoor reset" OR "occupancy sensors" OR (boiler AND (timer OR programmer))) WN KY))AND ((dwelling* OR resident OR home* OR domestic OR apartment OR hous*) WN KY))AND ((energy OR cost* OR usability OR user OR occupan* OR behaviour OR behavior OR interaction OR reaction OR practice OR policy) WN KY))AND (("uk" OR "united kingdom" OR california OR chile OR australia OR japan OR germany OR portugal OR france OR netherlands OR denmark)WN KY))NOT (("heat pump" OR wind OR "non-residential" OR "non-domestic" OR "district" OR "demand response" OR "cfd" OR air-con*) WN KY))
Proquest (inc Ante and Avery)	AB,TI(heating) and AB,TI("Time Proportional Integral" or tpi or controls or control or ((remote or zonal or "hot water") and control) or "Thermostatic Radiator Valve" or (trv and (programmable or manual)) or (thermostats and (room or boiler or "load compensating" or "modulating room" or programmable)) or thermostat* or (central and timer*) or "on/off switches" or "weather compensation" or "outdoor reset" or "learning algorithm" or automation or optimisation or optimization or "communication protocols") and AB,TI(dwelling* or residential or home* or domestic or apartment) and AB,TI(energy or cost* or user or occupant*) and not AB,TI("heat pump" or wind or "Non-residential" or "Non-domestic" or "District" or Air-con*) and YR(2010-2016)
Google Scholar	Part 2 search repeats part 1 searches changing "heating" for "hydronic" and "domestic" for "residential" or "home" or "dwelling" or "house" or "apartment" or "homes" or "dwellings" or "houses" or "apartments" with extension of additional "OR" terms as follows: allintitle: heating domestic control OR controls OR thermostat OR remote OR zonal OR compensator OR compensation OR automat OR tpi OR trv OR timer OR programmer OR programmable OR manual OR weather OR compensation OR outdoor OR reset OR radiator OR valves OR communication OR protocols OR occupancy OR sensors OR switches OR room OR geolocation OR geofencing OR hot OR water
Energy Citations	allintitle: heating residential control; thermostat; allintitle: heating house control; thermostat;
Academic Search Elite	AB heating OR AB thermostat AND (AB domestic OR AB residential OR AB apartment or AB dwelling) OR AB trv OR AB tpi AND AB controls or (AB zonal and AB control) OR (AB weather and AB compensation) OR (AB outdoor or AB reset)

Science Direct	Part 2 added database and terms search: tak(heating) and tak(tpi or controls or control or ((remote or zonal or (hot and water)) and control) or "Thermostatic Radiator Valve" or (trv and (programmable or manual)) or (thermostats and (room or boiler or "load compensating" or "modulating room" or programmable)) or thermostat* or (central and timer*) or "on/off switches" or "weather compensation" or "outdoor reset" or "learning algorithm" or automation or optimisation or optimization or "communication protocols") and tak(dwelling* or residential or home* or domestic or apartment) and not tak("heat pump" or wind or "Non-residential" or "Non-domestic" or "District" or Air-con*)

Table S4: Overview of organisations, countries and people contacted as part of the International policy review

Organization	Country	Number of people contacted
Agencia para a Energia (ADENE)	Portugal	3
Deutsche Energie-Agentur GmbH (DENA)	Germany	1
Centre for Sustainability, Univ. of Otago	New Zealand	1
EDF – R&D Département ENERBAT	France	4
UC Davis	USA (Cal.)	2
Energy Trust Oregon	USA (Oregon)	1
Norwegian Univ. of Science & Technology	Norway	2
Lawrence Berkley National Laboratory	USA (Cal.)	3
University of Sydney	Australia	1
University of Wellington	New Zealand	1
IEA Demand Side Management Programme	France	2
EU Alliance of Companies for Energy Efficient in Buildings	Europe	1
Architects Council of Europe	Europe	2
Institute for Applied Research Germany	Germany	1
Aalborg University AAU	Denmark	1
Independent researcher	Chile	1
Jyukankyo Research Institute	Japan	1
IEA Demand Side Management Programme	Italy	1
Independent researcher	Belgium	1
Zurich University of Applied Sciences	Switzerland	2
Energimyndighten (Swedish Energy Agency)	Sweden	2
Duneworks	Netherlands	1
Better Energy	Ireland	2