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Hard-to-reach energy users: An ex-post cross-country assessment of behavioural-oriented interventions

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ABSTRACT

Hard-to-reach (HTR) energy users encompass individuals who are physically difficult to reach, underserved, or challenging to engage and motivate in demand-side energy programmes. Given a mix of societal challenges (e.g. inequity, energy poverty, decarbonisation, the COVID-19 pandemic), HTR energy users are receiving increasing attention. However, there is a lack of knowledge on the performance of interventions that target (explicitly or implicitly) HTR energy users, particularly from a behaviour change perspective. Our study addresses this knowledge gap, and aims to provide a systematic *ex-post* comparative cross-country assessment of nineteen case studies, implemented in eight countries. From a methodological point of view, our study explores and tests the usefulness of applying the 'Building Blocks of Behaviour Change' (BBBC) in assessing the extent to which interventions employ design and implementation practices that are known to drive behaviour change. Our findings reveal that interventions perform well with respect to the Audience, Behaviour, and Delivery building blocks, but show room for improvement in the Content and Evaluate blocks. Assessing the BBBC framework reveals promising results in terms of credibility, confirmability, transferability, and reliability; however, limitations and uncertainties are also present. Considering the exploratory methodological nature of our study, the results highlight numerous context-specific factors that frame our findings and the suitability of the research approach. We underscore that greater attention must be paid to both the integration of behavioural science methods into HTR interventions, and the systematic analysis of heterogeneity in future HTR-related energy research.

1. Introduction

Hard-to-Reach (HTR) energy users are receiving increasing attention from policymakers, utilities, energy experts, and practitioners. A prominent example in the energy field is the Users-Centred Energy Systems Technology Collaboration Platform, run by the International Energy Agency (Users TCP/IEA),[1] which, in 2019, launched a dedicated Task on the subject. The HTR Task aims to identify barriers, needs and opportunities to effectively engage HTR energy users, and provide recommendations to policymakers and programme managers.

Although there is no consensus in the literature regarding the definition of HTR energy users, most current concepts refer to people who, for example, have limited access to energy services, lack relevant information, are hard to engage in interventions, are socially disadvantaged, and/or who are poorly represented in policy initiatives [1]. The term HTR itself is not new, and has been extensively used in social work

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[1] For details see https://userstcp.org/hard-to-reach-energy-users-task/.

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[2], social marketing [3] and health research [4]. The general HTR literature underscores multiple socio-economic characteristics (e.g. minority, elusive, hidden, underserved or disadvantaged groups). When applied to the energy field, this has led to the identification of a heterogeneous collection of HTR energy users in different countries, including, for example, low-income households with children suffering respiratory problems in Aotearoa New Zealand, high-income households in Sweden, remote rural households in the United Kingdom, small to medium-sized businesses in the United States, and indigenous communities in Canada [5]. In this context, and to ensure no HTR segment are missed, the HTR Task has co-created and broadly defined HTR energy users as "*any energy user from the residential and non-residential sectors, who uses any type of energy or fuel, and who is typically either hard-to-reach physically, underserved, or hard to engage or motivate in behaviour change, energy efficiency and demand response interventions*" [6].

Despite the lack of conceptual clarity, the literature on HTR energy users is growing. It has focused on, for example, energy poverty [7], housing [8], remote communities [9], small businesses [10], low-income households [11], and the rental property market [12]. Driven by various societal challenges (e.g. inequity, decarbonisation, the COVID-19 pandemic, and sharply rising energy prices), several important insights have emerged. For example, 'generic' energy efficiency (EE) interventions (such as programmes, policies, projects and pilots) that provide 'generic' solutions fail to target most HTR energy users, and, consequently, miss opportunities to engage them [7]. On the other hand, a few empirical studies show that interventions that specifically target HTR energy users can achieve greater energy-saving potentials [10,12]. The literature also shows that engaging HTR users is not merely a matter of implementing effective strategies, but also concerns co-creation efforts, and the role of trusted middle actors during programme design and delivery [13]. It is argued that co-creating engagement strategies, such as energy advice, training and support services, is critical to meet the needs of HTR energy users [14]. As a whole, the literature reveals a lack of knowledge in several areas, notably: the extent to which HTR interventions consider the psychographics of users; whether energy behaviours are prioritised; whether interventions are pre-tested (i.e. a given intervention has been tested or evaluated ex-ante to its actual implementation via e.g. a randomised controlled trial); and whether treatment effects persist in the long term [1]. In addition, there is an excessive focus on technology and energy services, while little attention is paid to user needs and behaviours [1,8,13,15]. Overall, there is a dearth of evidence regarding the empirical performance of current interventions that target (explicitly or implicitly) HTR energy users.

Our study seeks to address this knowledge gap with a twofold objective. It first provides a systematic, cross-country assessment of nineteen programmes that address HTR energy users across eight countries: Aotearoa New Zealand (NZ), Canada (CAN), Italy (IT), The Netherlands (NL), Portugal (PT), Sweden (SW), the United Kingdom (UK), and the United States (US) (details in Section 2). We seek to answer the following, overarching research question: *to what extent do HTR interventions consistently consider specific energy users and behaviours, tailored engagement strategies, successful implementation, and evaluation practices*? We present a combined *ex-post* assessment of interventions targeting (implicitly or explicitly) HTR energy users, and practices that are known to spur behaviour change (details in Section 2). Thus, direct quantitative measures of programme performance in terms of behavioural change are outside the scope of our study. Behavioural-oriented HTR interventions are broadly defined as any public and/or industry/utility-driven initiative that aim to promote or encourage energy conservation and efficiency behaviours (defined in the next section) among HTR energy users. The analysed interventions target behaviour change either at the individual or the organisational level, and aims can include both energy and non-energy objectives.

Given the analytical challenges of studying HTR energy users (e.g. major trust barriers, difficulty identifying them, privacy and gatekeeper concerns) [1], the second objective of our study is to explore and test the suitability of a framework that can analyse HTR interventions from a comprehensive, general behavioural perspective. Specifically, our study applies, expands and assesses the 'Building Blocks of Behaviour Change' [16] (BBBC) framework, which is composed of five building blocks with the helpful mnemonic ABCDE: **A**udience, **B**ehaviour, **C**ontent, **D**elivery and **E**valuate (details in Section 2), and is based on a combination of design thinking and methodological best practice in behavioural science [16]. It has been argued that it is useful in guiding and standardising the co-design process in behaviour change field research, with a variety of stakeholders [16], and has been co-designed and used by the HTR Task, from inception to implementation. While it has been used in the co-design and evaluation of several field pilots, with a variety of HTR energy users (vulnerable and marginalised households [17], high/low-income residential utility customers [18], small and medium-sized businesses [19], the Municipality, University, School and Hospital (MUSH) sector [20], and commercial building operators [21]) it has neither been assessed, nor systematically applied before. We thus evaluate it against four criteria that aim to assess the rigour of qualitative research, namely: *credibility*, *confirmability*, *transferability* and *reliability* [22] (details in Section 2). As a whole, the present study explores the flexibility and usefulness of the framework in international research collaborations that combine inputs from different countries, cultures, languages, end-use sectors and scientific disciplines.

Our paper is structured as follows. Section 2 provides details of the methodology. Particular attention is given to the BBBC framework, and the analysed case studies. Section 3 outlines our assessment of the interventions targeting HTR energy users. Each section starts with a summary of the findings followed by detailed results. The evaluation of the BBBC framework is presented and discussed in Section 4. In the light of the energy crisis (particularly in Europe), policy implications are drawn in Section 5. Finally, we draw some conclusions in Section 6.

2. Methodology

2.1. Analytical framework: The building blocks of behaviour change

The BBBC framework was developed by the See Change Institute[2] with the aim of providing a comprehensive understanding of *how* and *for whom* behavioural interventions work best [16]. It is a transdisciplinary, data-driven approach for designing and implementing effective behaviour change programmes [16]. The framework avoids categorising interventions according to, for example, feedback, social norms, defaults and commitment e.g. [23–25] as this approach runs the risk of focusing on specific areas (e.g. a psychological intervention that focuses on individual values and motivations), and providing a limited perspective of the interventions under analysis. Instead, it focuses on key building blocks of interventions that support the continuous development and integration of research findings into their design and implementation [16]. It aims to bring together multi-disciplinary perspectives, and capture the dynamic nature of real-world applications [16]. It is composed of the following building blocks[3]:

- *Audience*: refers to the energy users or segments the programme targets. This could be based on customer type (e.g. residential), demographics (e.g. low-income renters), or those who (should) adopt a specific behaviour (e.g. ensuring that they heat their homes to a comfortable temperature to reduce respiratory illnesses). This is important in order to understand the needs of energy users, market barriers and context. It is also relevant to personalise the intervention. Research shows that the effects of behavioural interventions vary depending on the targeted groups. For example, one study

[2] https://seechangeinstitute.com/

[3] See Karlin et al. [16] for full details of the Building Block framework.

shows that home energy reports are 2–4 times more effective with liberals than conservatives in the United States [26], but another shows that they are ineffective in Austria and even increase consumption in already high-consuming households, being also ineffective in eco-conscious households who already feel they are doing enough [27].

- *Behaviour*: refers to targeted behaviours. They can be simple (e.g. turning off lights), specific (e.g. purchasing or installing a technology), or general (e.g. reducing energy waste). Energy behaviours are context-dependent, and are often defined as actions that (significantly) affect use [28,29]. The HTR Task adopts a very broad definition of energy behaviour, which includes: activities and changes in how energy-efficient technology (software and hardware) is purchased or adopted, used, maintained, repaired and/or cleaned; changes to large-scale investments such as retrofits; and changes due to education, training, or awareness campaigns [1]. Behaviours to be changed or encouraged need to be clearly identified, assessed and prioritised [30].
- *Content*: refers to the engagement strategy, communication and (potential) framing of the message, including the language, design, and images used in communications to promote or encourage targeted behaviours. The way content is designed and communicated to users has been found to be critical in social comparisons [31] and smart metering [32], for example. Particular attention is paid to whether contents are pre-tested and comparatively evaluated *ex-ante*. In addition, and given the growing significance and interest in the co-creation of energy solutions [33,34], this building block also focuses on the co-development of communication contents with stakeholders.
- *Delivery*: refers to the way an intervention is deployed to the target group(s). It includes the medium, channel, messenger, frequency, duration, and timing that the intervention uses to interact with, and address energy users. Delivery is critical for the development of segmented and targeted interventions [35]. Interventions can be delivered in person, via print mail, email, social media, or trusted messengers, among other options. While in-person interactions have been shown to be most effective in many contexts [36], they can be costly, and sometimes infeasible. In a meta-analysis, Karlin et al. [37] identified several variables that moderated the effectiveness of content delivery, including its frequency, medium, duration, and combination with other interventions (e.g. goal setting, economic incentives).
- *Evaluate*: refers to the way (e.g. activities, plans, goals) the (cost-) effectiveness of the intervention is measured, assessed and reported, including (preferably) its non-energy benefits and impacts [38,39]. It relates to internal and/or external efforts to assess the extent to which the intervention is (not) effective in changing targeted behaviours. Evaluation is considered an integral part of intervention design and implementation [40], and can generate timely and valuable feedback for policymakers and programme managers [41].

The theoretical foundations of the BBBC come from different disciplines. For example, the framework emerges from social ecology, which considers the interplay between individual, social, and societal levels of analysis and asks us to always seek to study beyond the borders of individual disciplines when looking to understand or influence behaviour of any kind [42,43]. Based on a review of the empirical research (for details see [44]), the framework also builds upon two primary fields that had been conducting research in this area: psychology and human-computer interaction (HCI). It was found that HCI research focused on user experience and visual design using qualitative methods, whereas psychology research focused on the effectiveness of treatment variables using experimental methods. Froehlich et al. [44] concluded that "perhaps a future goal for HCI should be to initiate collaborations with environmental psychologists" (p.7). The framework also takes into account collaborative governance [45] and design thinking [46], where it is important to identify and align a team or researchers or practitioners on the right question(s) before beginning inquiry. It also rests on the importance of landscape assessment [47,48] and literature review, which is consistent in most scientific disciplines. It is also based on Ajzen and Fishbein's principle of compatibility [49], which states that the relationship between attitudes and behaviour are only as strong as their compatibility in terms of the behaviour, the person, and the context. As such, defining energy users and behaviour compose this step. The supporting methods are mixed between qualitative and quantitative, drawing from disciplines like social psychology [50] which largely draws from quantitative survey research and sociology [51], which largely draws from more qualitative interview research. The framework is also meant to go from the exploratory, often inductive reasoning to hypothesis testing using actual pilots and controlled experiments. Finally, the theoretical foundations of the framework also come from the field of evaluation [52,53], which underlines the importance and significance of assessing interventions and policies for a variety of reasons (e.g. knowledge generation, performance, choice, feedback, learning, and accountability).[4] For further theoretical and conceptual details, see [16].

2.2. Case studies

A case study approach was chosen to provide a detailed examination of HTR interventions, based on the BBBC framework. Case studies are the foundation for evaluation research, and have contributed to the understanding of policy formulation processes [54,55].

Our research focused on 19 case studies that addressed HTR energy users and entailed various interventions in eight different countries (see Table 1 for an overview). For a detailed description of each case study and related data and information, see Ashby [56], Butler [57], Feenstra [58], Mundaca [59], Realini and Maggiore [60], Rotmann [61], and Sequeira et al. [62]. Our selection was based on four criteria: 1) targeted (implicitly or explicitly) at HTR energy users; 2) a focus on energy (efficiency) and/or climate mitigation; 3) the promotion of behavioural or organisational change; and 4) the willingness of case study programme managers and stakeholders to be part of our study, and disclose information. The chosen case studies focus on the residential (e.g. low-income households with other intersecting vulnerabilities such as renters or minority groups) and commercial (e.g. small to medium-sized enterprises [SME]) energy users. However, note that not all interventions were conceived explicitly to focus on HTR energy users. The identification of cases studies was also supported by using a mixed methods approach (e.g. a survey, interviews, a literature review, an expert workshop) based on e.g. the definition of HTR energy users [5,13]. Importantly, we do not claim that our sample is representative of interventions targeting HTR energy users; moreover, our choice was subject to various methodological limitations (e.g. related to external validity), which are identified and discussed in Section 4.

Table 1 reveals that while interventions targeting the commercial sector focused on SMEs, target groups in the residential sector varied, and context-specific arguments were used to justify their implementation (e.g. fuel poverty in the UK). Regardless of the sectoral focus, programme management also differed, with cases from the US and CAN predominantly managed by utilities. With the exception of the ECAS programme (SE) and Warm Fuzzies (NZ), most of the reviewed initiatives have been implemented recently, and all deploy(ed) a mix of interventions that include information, economic, technological and regulatory approaches to promote behaviour change. Many also offer in-home advice, along with the training of, and engagement with, community middle actors and frontline providers.

[4] See [77] for specific disciplines and recent contributions to the field of behavioural insights for sustainable energy use.

Table 1
Overview of analysed case studies addressing HTR energy users.

Country	Case study	Sector(s)	Management	Period	HTR energy user(s)	Main objective(s)	Main intervention(s)
Aotearoa–New Zealand (NZ)	Healthy Homes Initiative (HHI)	Residential	Government (Ministry of Health)	2013 – to present	Low-income, highly vulnerable households	To devise individualised action plans to help create warmer, drier, healthier homes	Expert advice; home energy assessments; provision of free or subsidised insulation, curtains, flooring, ventilation, heating, etc.; support with energy bills
	EnergyMate (EM)	Residential	Association of Electricity Retailers	2019 – to present	Low-income households	To reduce energy hardship by providing in-home budget advice and support	Energy literacy; energy saving tips; provision of adequate tariff plans; connecting households with relevant services (e.g. housing, social services)
	Well Homes (WH)	Residential	Social Enterprise (Sustainability Trust)	2013 – to present	Low-income households	To assist families and build on their pre-existing knowledge of energy behaviour and link them with existing government programmes for insulation and heating	Expert advice; home energy/social assessments; energy saving tips; energy literacy. WH is part of the HHI rollout in Wellington and is funded by the government. WF targets energy users who are outside of the WH eligibility criteria and is funded by the social enterprise arm of the Sustainability Trust.
	Warm Fuzzies (WF)	Residential	Social Enterprise (Sustainability Trust)	2008 – to present	Low-income households		
Canada (CAN)	Indigenous Community Programme (ICP)	Residential	Utility (BC Hydro)	2019–2019	Indigenous communities	To design and deliver demand side management (DSM) programmes in ways that better serve Indigenous customers	Community information sessions; education and training; community energy planning; provision of energy education positions for community members
	Small Business DSM programme (SB-DSM)	Commercial	Utility (FortisBC)	2017 – to present	Small and medium enterprises	To support and promote energy efficiency improvements	Awareness-raising campaigns; expert advice; free energy audits; assistance with sourcing contractors and applying for rebates
Italy (IT)	Assist2gether	Residential	Multi-stakeholder Steering Committee	2017–2020	Vulnerable households; energy poor	To design and implement a standardised intervention to tackle energy poverty	Energy training of 'middle actors' (e.g. social/health workers); expert advice; energy literacy; implementation of efficiency measures
The Netherlands (NL)	Social Housing (SH)	Residential	Municipality (s-Hertogenbosch)	2016–2019	Energy-poor households and tenants of social housing	To create energy-efficiency packages that are easier to install, better to use, and cheaper for the (social housing) market	'Quadruple helix collaboration' (i.e. public-private-academia-civil society partnerships); retrofitting of social housing; development of business models; site-visits; energy training
Portugal (PT)	LIGAR – Energy Efficiency for All	Residential	Government (National Energy Agency)	2017–2019	Energy-poor, vulnerable households	To implement consumer engagement actions to increase energy efficiency in vulnerable homes and reduce energy poverty.	Development of an 'Energy Poverty Vulnerability Index'; selection of priority regions; characterisation of energy-poor households; identification of efficiency measures; 'Energy Brigades'; training sessions; home visits
	Energy Efficiency in Telheiras' Traditional Commerce (EETTC)	Commercial	Academia (NOVA University Lisbon)	2015–2016	Small and medium enterprises	To explore energy-saving potential and understand the drivers and barriers influencing energy-related behaviours and decisions	Characterisation of energy users; energy audits; expert advice; site visits; awareness-raising campaigns
Sweden (SE)	Energy Efficiency Network (EENet)	Commercial	Regional governments	2016–2021	Small and medium enterprises	To support and promote energy efficiency improvements	Expert advice; energy audits; access to technical information; site visits; seminars; peer-to-peer learning; guidance on available economic schemes
	Energy and Climate Advisory Services (ECAS)	Residential and Commercial	Regional governments and municipalities	1977 – to present	Homeowners; housing associations; SMEs; social organisations	To provide impartial, free, technologically neutral and commercially independent advice on energy and climate mitigation matters	Expert advice; in-person visits; seminars; public events
United Kingdom (UK)	Big Energy Saving Network (BESN)	Residential	Government (BEIS) and NGO (Citizen Advice)	2013 – to present	Vulnerable households; energy poor	To raise the awareness of and access to energy-related advice and support	Awareness-raising campaigns; recruitment and training of 'Energy Champions'; training of frontline workers; support with energy bills; energy literacy; guidance on available economic schemes
	Warm Minds (WM)	Residential	NGOs (National Energy Action) and Mental Health North East) and Utility (E.On)	2012–2017	Households with occupants dealing with mental health issues	To mitigate the impact of fuel poverty and support people with mental health issues, and their carers, to reduce energy use, promote more efficient use of energy, and achieve warmer, healthier homes	Training of frontline workers; energy advice sessions; support with energy bills; energy literacy; guidance on available economic schemes

(*continued on next page*)

Table 1 (*continued*)

Country	Case study	Sector(s)	Management	Period	HTR energy user(s)	Main objective(s)	Main intervention(s)
	Moving Together (MT)	Residential	Local Housing Energy Agency, National Health Services (Western Isles, Scotland)	2018–2020	Rural and remote communities (Western Isles, Scotland)	To strengthen interagency working to tackle fuel poverty and the social determinants of health	Promotion of interagency work to avoid duplication of efforts; expert advice; energy saving tips; home visits; support with energy bills; energy literacy; guidance on available economic schemes;
	Empowered by Energy (EbE)	Residential	NGO (National Energy Action)	2019 – to present	Refugees	To empower recent or new refugees on energy systems, processes and support mechanisms	Awareness-raising campaigns; energy training sessions; energy literacy
	Promoting Sustainability in Business (PSiB)	Commercial	Academic and non-academic partners	2017–2019	Small and medium enterprises	To develop and promote a set of resources targeted towards intermediaries that work on promoting sustainability among SMEs	Online training; development and implementation of practical toolkit; value-based energy audits
United States (US)	Manufactured Homes (MH)	Residential	Utility (Puget Sound Energy)	2019 – to present	Manufactured home residents (often low-income; low-English proficiency; renters)	To provide rebates via simplified applications and online tools to help customers to manage their energy use	Provision of rebates; home energy assessments; energy literacy; energy saving tips
	Small Business Energy Saver Programme (SBES)	Commercial	Utility (Duke Energy)	2012 – to present	Small and medium enterprises	To improve energy efficiency among small business customers	Expert advice; energy audits; bundling multiple energy saving measures; provision of performance-based financial incentives (up 80 % of total project costs)

2.3. Data collection

First, data collection included a review of both academic and grey literature (e.g. government websites, evaluation reports, publications from non-governmental organisations) that described the design, implementation and evaluation of the case study. Second, we also conducted more than 30 interviews (lasting 20–90 min) with case study programme managers and key stakeholders. Interviewees represented a variety of positions and organisations, notably programme managers, regional/national coordinators, energy advisors, technology providers, evaluators, consultants, project developers, academics, and participants.[5] Interviews were guided by a common protocol (see Annex 1) that focused on the BBBC analytical framework. Whenever possible and/or needed, triangulation [63] was used to strengthen the credibility and validity of the collected information (as discussed in Section 4).

Third, we developed 22 markers to operationalise the BBBC framework in terms of data collection and analysis. Their identification was first guided by the reviewed literature indicated on Section 2.1 and then created from and supported by specific literature associated with e.g. behaviour change, behavioural economics, energy efficiency, energy policy, environmental psychology and policy evaluation. The aim was to capture in a simple but consistent manner, key elements of the BBBC framework across all the analysed case studies. These markers, their rationale and supporting literature are shown on Table 2.

Drawing upon 19 case studies, and the 22 markers listed above, we developed a matrix of 418 cells. Fig. 1 illustrates and summarises the results. All markers have an equal weight of importance. Based on the outcome of our assessment, cells were coded as green (positive evidence = 1) or red (negative evidence = 0). By 'positive evidence' we mean that an intervention has activities, procedures, decisions, measures and/or official information that provide testimony about the different building blocks. On the contrary, by 'negative evidence' we mean that an intervention does *not* have any activity, procedure, decision, measure and/or official information that provides testimony about the building blocks. When no relevant information was available, or conflicting evidence was found, the cell was coded as yellow (inconclusive evidence = unknown).

The process to populate the matrix can be summarised as follows. First, the matrix was preliminarily coded and filled in by a member of the team not involved in the development of a case study, but based on data and information reported in the specific case study. This person acted as an "external evaluator" of the submitted material. For example, if a given case study found and reported that 'target groups are clearly identified' (marker 1), then 'positive evidence' was allocated to that particular cell. On the contrary, if a given case study did not find any activity, procedure or measure leading to knowledge on 'psychographics of target groups' (marker 3), then 'negative evidence' (=0) was allocated to that particular cell. In a second step, the author(s) from each case study checked, modified, confirmed or rebutted the initial findings contained in the matrix. Authors were also asked to provide examples to support cross-checks, findings and/or rebuttals. In certain cases, and to increase the credibility of the findings, case study authors also consulted with interviewees on the veracity of the outcomes generated by the markers. Third, and once the second step was concluded for all case studies, all researchers involved in this study had the opportunity to cross-check, question and refine the results. Finally, the drafting of the results began once the outcomes of the matrix were fully settled. After due completion, case study authors once again had the opportunity to double check all reported results.

[5] Names and their respective organisations can be found in the country reports, available on the project website https://userstcp.org/hard-to-reach-energy-users-task/.

Table 2
Proposed building block markers and main rationale supporting their use.

Building Block	Marker	Main rationale	References (e.g.)
Audience	(1) Are target groups clearly identified?	Justify and tailor energy conservation/efficiency programmes to the needs, behaviours, market barriers and context of target group(s)	[64,65]
	(2) Are socio-economic demographics (for individuals) or firmographics (for companies) known?	Provide key characteristics, attributes and relative importance of target group (s)	[66–68]
	(3) Are the psychographics of target groups known?	Support the identification of motivational and cognitive factors that drive relevant energy behaviours among target group(s)	[30,69]
	(4) Are market barriers/failures affecting target group(s) known?	Detect the mechanisms that hinder sustainable energy behaviours and/or the adoption of profitable energy-efficient technologies	[39,70]
Behaviour	(5) Are energy behaviours clearly identified?	Guide the specification, analysis and evaluation of the behaviours to be changed, encouraged, improved or motivated	[30,71]
	(6) Are energy behaviours prioritised?	Assist the segmentation, importance and integration of target energy behaviour(s) in the intervention and policy context	[29,68,72]
	(7) Are other stakeholders involved in this process?	Enable and promote a joint selection and deeper understanding of target energy behaviour(s) and feasibility of behaviour/organisational change	[34,73,74]
	(8) Do energy behaviours inform the intervention (s)?	Guide (pre-) selection or identification of (potential) measures that are most suitable to address target energy behaviours	[24,30,75]
Content	(9) Do the interventions have a defined engagement strategy?	Support and further advance intervention's content by addressing critical barriers and leveraging motivations and opportunities	[16,76]
	(10) Are interventions pre-tested and evaluated *ex-ante*?	Feedback intervention's design and improve (potential) implementation. Prevent failure and related costs	[16,77]
	(11) Is there any comparative assessment of the intervention and its content?	Identify, compare, assess and select most suitable and (cost-) effective intervention(s) to target chosen energy behaviours	[23,78,79]
	(12) Are interventions co-developed with stakeholders?	Advance design and implementation of intervention(s), including access to and the degree of ownership, trust and future feedback from stakeholders. Includes gaining support from gatekeepers to help identify and recruit target group(s)	[80–83]
Delivery	(13) Do the case studies use multiple channels to communicate their interventions?	Define, analyse and implement the most suitable and effective communication and marketing mix to address target group(s) in ways they will respond to	[76,84,85]
	(14) Do the case studies have a defined timing for delivering those communications?	Identify duration, frequency and/or strategic timing of interventions. Open up opportunities for (gradual) improvements or corrections.	[23,85–87]
	(15) Do the case studies use specific messengers to deliver their interventions?	Support communication strategy and increase trust with and level of engagement of target group(s) by using key or trusted messengers	[83,88–90]
	(16) Do the interventions engage their target group (s)?	Analyse and refine communication strategy to further support the implementation of the intervention(s), this can lead to different strategies for different target group(s)	[89,91]
Evaluate	(17) Do the case studies have defined key performance indicators (KPIs)?	Enable to monitor and understand performance of intervention(s) and support *ex-post* evaluation	[92–95]
	(18) Are the case studies internally evaluated?	Support organisation and management of intervention(s) and provide recommendations and actions for improvement	[96–98]
	(19) Are the case studies externally evaluated?	Convey objectivity, accountability, feedback and (alternative) perspectives to the performance of the intervention(s)	[40,99]
	(20) Do the case studies consider stakeholder feedback?	Support suitability and feasibility of evaluation, and provide input and reality checks about the experience of target group(s)	[100–102]
	(21) Are the interventions effective at generating behavioural/organisational change?	Evaluate the extent to which the intervention(s) produce expected changes in behaviour and addressed the problem(s) and/or opportunity(ies) that justified implementation	[23,31,103]
	(22) Do the interventions generate persistent effects in the long term?	Assert if, why and how treatment effects persist in the long term or after intervention(s) are withdrawn	[104–106]

2.4. Criteria to assess suitability of the BBBC framework

The second objective of our study was methodological, and aimed to explore and test the suitability of applying the BBBC framework to assess *ex-post* interventions aimed at HTR energy users. To that end, we used the following assessment criteria, suggested by Lincoln and Guba [22] that define rigorous qualitative research:

- *Credibility*: refers to the level of confidence that results are true, credible, believable and can support, as far as possible, claims about potential causes and effects. The focus is on internal validity.
- *Confirmability*: refers to the extent to which the outcomes of the analysed case study can be verified or corroborated by other researchers or external parties.
- *Transferability:* refers to the extent to which the results of the case study can be generalised or transferred to other cases and/or contexts. The focus is on external validity.
- *Reliability*: refers to the extent to which the results are repeatable if the investigation was re-run with the same cohort of participants and context. The primary focus is on dependability.

These criteria have the advantage of parsimony, and they are increasingly used in social science and policy research [107]. In the context of energy policy, they have been applied to a variety of contexts, including, for example, comparisons of energy-related research [108], investigations of policy formulation [109], and electric vehicle adoption [110].

In our case, each researcher applied the assessment criteria after her/his/their respective case study(s) analyses were completed. A four-point Likert-type scale (Nil = 0; Low = 1; Moderate = 2; High = 3) was used to measure qualitatively the level of rigour for each criterion. Each researcher was asked to provide arguments and examples supporting their respective scores. To reduce confirmatory bias, all the criteria were first applied individually. Results were then brought together via an average score to provide a unified interpretation of the assessment under each criterion. The results of this exercise, including methodological lessons learnt, are presented and discussed in Section 4.

3. Results

The application of the BBBC framework revealed a diverse picture (Fig. 1). As a whole, we found positive evidence in 313 cases (75 %),

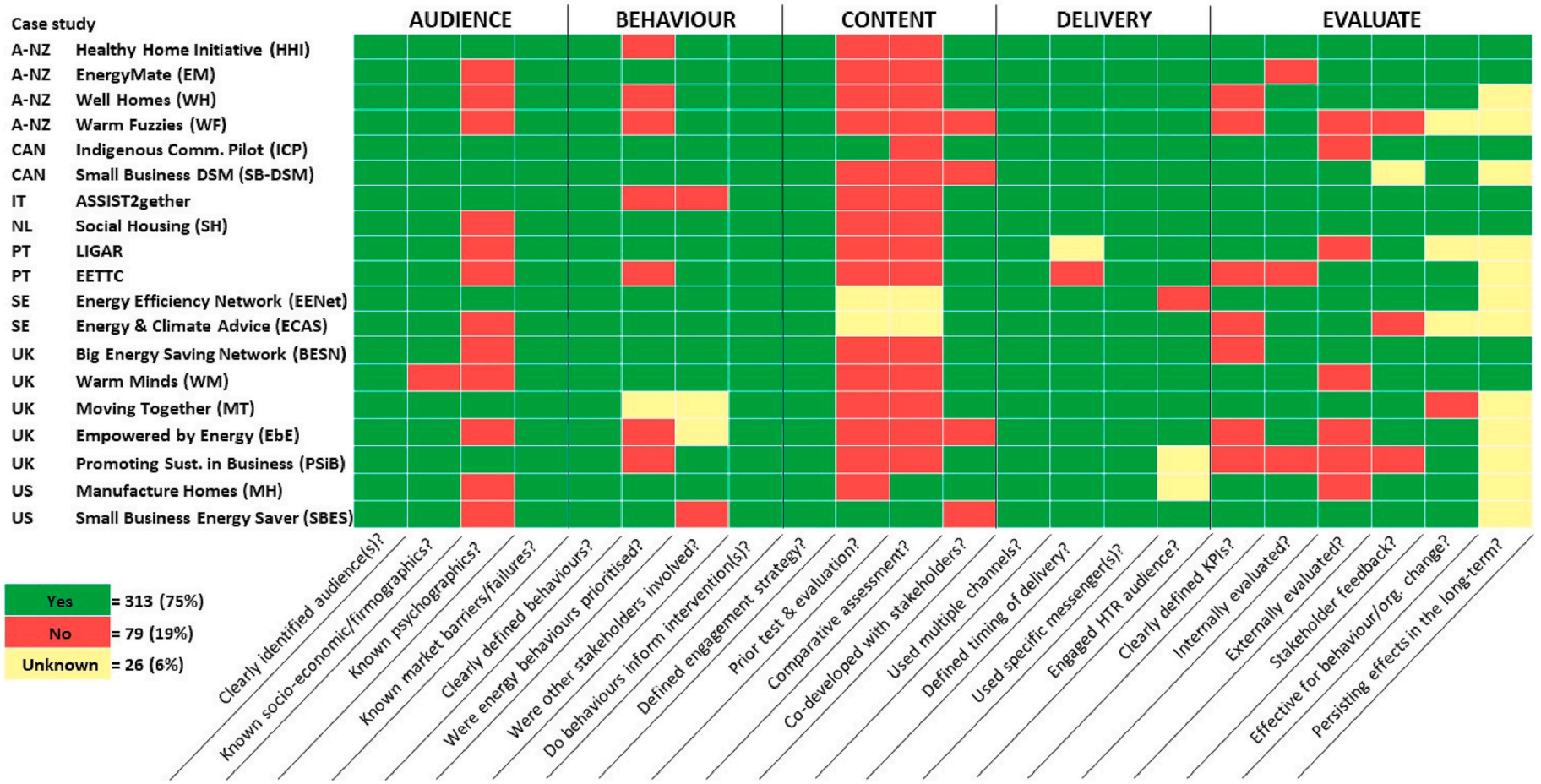

Fig. 1. Overview of the BBBC assessment across all analysed case studies.

negative evidence in 79 cases (19 %), and inconclusive evidence in 26 cases (6 %). Interventions perform well with respect to the Audience (83 %), Behaviour (84 %) and Delivery (93 %) building blocks, but less well with respect to Content (50 %) and Evaluate (68 %). A variety of specific, cross-case patterns also emerged. The following sections provide detailed results.

3.1. Audience

Overall, our findings demonstrate that most case studies performed well with respect to the Audience building block: we found positive evidence in 83 % ($^{63}/_{76}$) of cases, compared to negative evidence in 17 % ($^{13}/_{76}$) cases, mostly due to unknown psychographics. We discuss findings for each individual marker below.

The *target group* is clearly identified in all cases ($^{19}/_{19}$). Case studies target vulnerable (energy poor) groups (NZ, IT, PT, UK), rural and/or remote communities (CAN, PT, SE, UK), migrant groups (US, UK), SMEs (PT, SE, UK), Indigenous communities (CAN, NZ), low-income segments (US, IT, NZ), social organisations (SE), and (social) housing associations (NL, SE). Despite the small sample, there is considerable diversity, along with some overlaps (e.g. Indigenous communities living in remote areas, social housing associations that focus on vulnerable groups). It should be noted that none of the target groups were explicitly labelled as HTR. In addition, we did not identify any case study that targeted high-income households, even though this segment has significant carbon [111] and energy [112] footprints, and has been identified as HTR [1,5,13]. Only two cases (SH, ECAS) focus on renters and/or landlords; these segments have been identified as HTR [1] for whom split incentives prevail [113].

The majority of the reviewed programmes ($^{18}/_{19}$) collected *socio-economic or firmographic* information. For individuals or households, this included age, gender, ethnicity, household type and size, tenure, income, education, and geographical location. In certain cases (e.g. ECAS), however, design features or legislation (e.g. the General Data Protection Regulation [GDPR]) prevented programme managers or energy advisers from collecting specific data (e.g. income). For case studies that target the non-residential sector (e.g. SB-DSM, EENet, EETTC, PSiB) firmographic data were collected, and most elements relate to the size, type, and location of organisations. As a whole, the case studies confirm the importance of knowing the characteristic attributes and relative importance of target energy users [67].

Much less is known about *psychographics*—only $^{7}/_{19}$ cases reported collecting data in this area. This may be because psychographic information is either more difficult to obtain, or is less of a priority. For example, case studies that target individuals or households neglected to study their values, goals, interests, lifestyle choices, etc. Consistent with the literature [75], it is unclear how cognitive and motivational aspects were taken into account, which can be highly detrimental to identifying the specific factors that influence energy behaviours [30]. As psychographics may also explain the choice and use of energy technologies, comprehensive knowledge of energy behaviours and related interventions designed to change them is thus limited. Similarly, for case studies that targeted non-residential energy users, little was known about the organisation's objectives, goals, core values, priorities, decision-making approaches and communication styles. Following Robertson and Wind (1980), we also observed that nothing is known about organisational motivation and resistance to change, and the only available data related to perceptions.[6] We hypothesise that the sensitive nature and resource intensity of attaining psychographic data may have prevented collection and disclosure.

Market barriers and failures were known in all case studies ($^{19}/_{19}$), suggesting that their understanding is essential for the design, implementation and effectiveness of the interventions [114]. The starting point appears to be a set of well-known issues that prevent the efficient or sustainable use of energy; including the adoption of profitable energy efficient technologies. In the residential sector, and consistent with the literature [115], dominant barriers related to split incentives, lack of finance, lack of trust and lack of information. Interestingly, similar barriers were found in the non-residential sector. In addition, interviews revealed a lack of not only of awareness, but also a long-term vision and a strategic approach to energy efficiency barriers.

3.2. Behaviour

Our findings reveal that, overall, most case studies had an understanding of the behaviours that interventions aimed to encourage (84 %, $^{64}/_{76}$ cases). Negative evidence (12 %, $^{9}/_{76}$ cases) was mostly focused on the prioritisation of energy behaviours, and the evidence was inconclusive in 4 % ($^{3}/_{76}$).

In principle, *energy behaviours are defined* in all cases ($^{19}/_{19}$). Case studies specified, to some extent, the behaviours they expect the intervention to influence. The latter range from, for example, simple no-cost or low-cost actions (e.g. adjusting blinds, opening windows, turning off lights, changing clothing), to relatively more sophisticated activities requiring higher investment (e.g. purchasing energy-efficient goods and services; repairing energy-consuming devices) [28,29]. However, many behaviours are context-specific. Some refer to actions that are the aim of the interventions itself (e.g. conservation, retrofitting). Others relate to causes that prevent these actions (e.g. a lack of awareness), or focus on specific elements of the intervention (e.g. educating installers and landlords, increasing collaboration among key stakeholders). Thus, while energy behaviours appeared to be central to the design and implementation of all interventions, the lack of a clear definition or conceptual framework specifying what, exactly, an energy behaviour is, lead to multiple interpretations and thus uncertainties. This situation is consistent with the lack of metatheoretical definitions of behaviour found in various disciplines see [116].

Regarding the *prioritisation of energy behaviours*, only some case studies ($^{11}/_{19}$) made this clear. While some (e.g. EMP, SB-DSM, LIGAR) focused on well-known market barriers (e.g. information asymmetries), and targeted specific behaviours (e.g. energy conservation), others (e.g. EETTC) addressed behaviours more broadly (e.g. insufficient knowledge of EE potentials among the target group). In addition, and given the significant heterogeneity of SMEs in the sample, some case studies (e.g. PSiB, EENet) did not prescribe specific energy behaviours, but instead emphasised value-based discussions (e.g. “transitioning towards Net Zero carbon targets”; PSiB) or overarching practices (e.g. “systematic and structured work on energy issues”; EENet). However, the literature stresses that the prioritisation of behaviours is essential to e.g. focus on those that significantly affect environmental quality and wellbeing [30]. We speculate that this situation could be driven by the lack of a conceptual or policy framework that states what an energy behaviour *is*, together with uncertainties about which behaviours should be prioritised for a specific target group, and/or optimism that interventions are “robust” enough to address multiple energy behaviours at once.

However, regardless of whether behaviours are prioritised or not, *other stakeholders are involved* in most cases ($^{15}/_{19}$). Stakeholders were a diverse group, ranging from civil society organisations (e.g. EETTC), to local authorities and social workers (e.g. LIGAR), to private companies (e.g. EM), and community representatives (e.g. WF). Engagement also differs. In some cases, it consists of simple consultations (e.g. SH), while in other cases, stakeholders are fully involved as co-designers (e.g. HHI). In two cases (MT and EbE), the evidence was inconclusive.

Finally, reviewed information confirm that *behaviours inform interventions*. In all cases ($^{19}/_{19}$), interventions consider the action(s) that (will) influence the efficient use of energy among target groups. For example (and setting aside differences in connotations or interpretations

[6] For example, networking activities in the context of EENet allowed coordinators and expert advisors to gain an informal overview of the innovativeness of participating companies.

of energy behaviours), 'conservation' informed the need for education or training (e.g. HHI, MS, ASSIST2gether), 'collaboration' informed the need for knowledge exchange platforms (e.g. SH, EENet), and 'repair and retrofit' informed the need for expert advice (e.g. WM, ECAS). However, little is said about the extent to which specific behavioural anomalies or factors (e.g. loss aversion, heuristics, present bias, procrastination, norms) can explain the identified energy behaviours. This area deserves further research.

3.3. Content

Unlike the previous building blocks, the analysed case studies performed less well regarding content. We found positive evidence in 50 % ($^{38}/_{76}$), while negative evidence made up 45 % ($^{34}/_{76}$). Although consistent positive patterns were found for some markers (e.g. *a defined engagement strategy*), most interventions failed in critical areas, notably with respect to *ex-ante* analyses. The evidence is inconclusive in 5 % ($^{4}/_{76}$) of cases.

All case studies ($^{19}/_{19}$) have a *defined engagement strategy* that supported or framed the interventions. Strategies encompass numerous components that went beyond content and highlighted the role that marketing could play [76]. In addition to components that addressed the target groups (see Section 3.1), and delivery (e.g. communication channels, see Section 3.4), there were three others: language and context, messaging, and avenues for communication. Specific language was used with different target groups, reflecting the context (e.g. the term 'energy poverty' was avoided when targeting vulnerable households). Messaging included, for example, the potential benefits of participating in the intervention(s) (e.g. access to rebates, energy savings, better comfort/health), or value-based aspects and (business) practices (e.g. pro-environmental behaviours in the PSiB and ECAS programmes), and was co-designed with stakeholders in certain cases (details below). Avenues for communication related to the platforms that were used to approach the target group, or to implement the intervention (e.g. energy cafés, in-person/site visits, community events, a dedicated project website) (further details are given in Section 3.4). Some cases (e.g. WH, WF, ASSIST2gether) adopted a holistic approach to designing engagement strategies, while others worked with third-party contractors or marketing companies (e.g. SB-DSM, SH).

While details of the intervention (e.g. training, advice, audits, adoption of practices, use of rebates) were given in all cases, most failed to run *ex-ante tests* or *experiments* and assess the potential for behaviour change. This prevented e.g. the generation of evidence-based knowledge, and the reduction of uncertainties and potential failure [77]. Only $^{2}/_{19}$ case studies tested and evaluated the intervention, and $^{2}/_{19}$ performed comparative assessments. With a few exceptions (details below), this pattern was consistent across all case studies. Our evaluation of the two markers *prior test and evaluation* and *comparative assessment* showed that 79 % ($^{30}/_{38}$) of cases neglected to run *ex-ante* tests or perform an *ex-ante* comparison; in 11 % ($^{4}/_{18}$) of cases, the evidence was inconclusive. Consistent with the literature on EE policy evaluation e.g. [40,117] this may be due to, for example, a lack of capacity, limited resources, methodological challenges (particularly for 'information provision' interventions), a lack of evaluation requirements, partners with expertise in technology rather than behavioural sciences, optimism about expected outcomes, and the low priority given to evaluations and the resulting learning. Furthermore, for interventions that were based on experience in other countries and/or sectors, interviews revealed that *ex-post* evidence from these other contexts was (informally) understood as prior testing.

Nevertheless, we found a few exceptions. For example, the MH programme ran a comparative assessment of intervention messages and technologies to identify cost-effective solutions, and explore how to encourage participation. Messaging was pre-tested under the SBES programme, run by Duke Energy. The utility found that the target group was more responsive to language that focused on the opportunity to achieve "energy savings up to 20 per cent", rather than "incentives up to 80 per cent". It should be noted that these two examples come from North America, leading to the hypothesis that experimentation is more common there, particularly in utility-driven programmes [118].

Our analysis of the *co-development of content* marker revealed that most case studies ($^{15}/_{19}$) worked with stakeholders to define their engagement strategy and develop the intervention, including the language, design, and images used in communications. Interviews revealed that stakeholder collaboration was understood by programme managers as content validation, implicitly replacing formal testing or experimentation with the target group. In some cases (e.g. ICP, HHI, LIGAR, EETTC) programme managers worked with communities to better-understand their needs, and improve the design of the engagement strategy or specific interventions. Other case studies relied on insights from professionals and practical expertise within a given sector to construct their contents (e.g. BESN, EENet). In certain cases (e.g. ASSIST2gether, SH, WM, ECAS), the intervention design phase anticipated the involvement of local actors or intermediaries (e.g. installers, business councils, charities, health professionals, municipalities) to develop, adapt or improve the intervention's contents and/or engagement strategies. Finally, some cases (e.g. EM, PSiB, EENet, SH, HHI) had established dedicated co-creation workshops with stakeholders, however, it is unclear whether these collaborative efforts were explicitly implemented to also address trust.

3.4. Delivery

This is the building block where positive outcomes were most dominant (93 %, $^{71}/_{76}$). Negative (3 %, $^{2}/_{76}$) and inconclusive (4 %, $^{3}/_{76}$) outcomes were only identified in a few cases.

All case studies ($^{19}/_{19}$) used *multiple channels* to communicate and/or implement the intervention. These included, for example, social media, home/site visits, websites, written material (e.g. brochures, leaflets, letters, emails, newsletters, advice guides), phone calls, discussion forums, expert-facilitated workshops, online webinars, videos, community events, and advertising via local newspapers, radio and magazines. Some channels (e.g. site/home visits, community events) were used with the purpose of engaging the target group first, before deploying the intervention (e.g. EM, HHI, MH, ASSIST2gether, LIGAR). Interviewees also reported that word-of-mouth emerged as an effective channel (e.g. EETTC, ECAS). For case studies that used face-to-face or door-to-door channels (e.g. BESN, ECAS, HHI, MH), we identified significant challenges during the early stages of the COVID-19 pandemic. Although this provided an opportunity to expand their delivery via virtual or remote tools, it also meant that segments with limited or unequal access to digital technologies (e.g. the elderly, Indigenous communities, vulnerable groups) were negatively impacted.

Regarding *timing*, the majority ($^{17}/_{19}$) of interventions had a defined timing of the delivery but the duration, frequency and/or latency varied considerably. Furthermore, demand for some interventions (e.g. ECAS, EM) peaked at certain times (e.g. early winter when households start to think more about their energy bills) and programme managers planned or adjusted the timing or latency of delivery (e.g. seasonal, before holidays, to meet deadlines for related subsidies). In some cases, the duration of the intervention and that of the case study were also considered the same: examples include the SBES (which has been running since 2012) or ECAS (running since the 1970s). In some cases, it was difficult to distinguish between the timing of the intervention, and the duration of the programme that managed and implemented it. Considering Wade et al. [86], one could argue that a lack of *ex-ante* evaluation or experimental outcomes (as indicated above) may explain the different approaches we identified regarding the duration or timing of the specific delivery varied across the case studies. In fact, *ex-ante* evaluations can support the comparative assessment of strategically-timed delivery. All case studies ($^{19}/_{19}$) used *key messengers* to engage target groups and/or deploy interventions. Gaining trust among target groups was of utmost importance. The latter point was highly illustrated

by the 'Local Partnership of Telheiras'. This initiative, which brings together several local associations and informal groups active in the Telheiras neighbourhood in Portugal, has played an essential role as a trusted middle actor between the EETTC programme and local businesses. Similarly, under the ICP programme, community members, together with the training and hiring of local installers, have been particularly important in gaining the trust of Indigenous communities. Another example is the ASSIST2gether programme, where trained Household Energy Advisors (middle actors, with a variety of economic and social backgrounds) were instrumental in providing expert advice to vulnerable groups. Similarly, trusted middle actors (e.g. churches, community organisations, social service providers) play a critical role in the EM, WH and HHI programmes in NZ. In the context of the UK's BESN programme, 'Energy Champions' (i.e. local frontline organisations that are commissioned to provide energy-related advice), particularly those with strong local networks and partnerships, have played a key role in reaching out to vulnerable groups. These findings seem to be consistent with Parag and Janda [83], who argue that the agency and capacity of middle actors can play a significant role in advancing energy transitions.

Finally, *engagement* with the HTR energy users was considered positive in most cases ($^{16}/_{19}$). Only one negative case was identified. Consequently, delivery was generally understood, or assessed as effective in engaging, motivating, interacting and/or reaching out to the respective target group(s). Engagement was often understood as participation or attendance rates (e.g. in dissemination events and workshops), and it is another important KPI (see the next section). However, some cases (PSiB, MH) did not provide, or collected insufficient data to be able to determine whether delivery has been successful. Importantly, as elaborate in the next section, engagement does not necessarily mean that the intervention has been effective.

3.5. Evaluate

This building block generated the most diverse outcomes. Overall, six markers were used in the analysis, and we found positive evidence in 68 % ($^{78}/_{114}$) of cases. Negative evidence, equivalent to 18 % ($^{21}/_{114}$), of cases refers to various markers. Inconclusive evidence represents 14 % ($^{16}/_{114}$) of cases, and mostly concerns uncertainties about the persistence of effects.

More than half of the analysed case studies ($^{12}/_{19}$) had *defined KPIs*. For programmes targeting the residential sector (e.g. SH, HHI, ASSIST2gether, MT, LIGAR, HHI), examples included the number of home visits, houses retrofitted, installed EE measures, trained advisors/community members, assisted households, respiratory health outcomes, and energy savings. Qualitative KPIs included customer satisfaction and perceived/experienced indoor comfort (e.g. HHI). For cases addressing the non-residential sector (e.g. EENet, SB-DSM, SBES) KPIs were relatively similar, and target aspects such as the number of business visits, installed EE measures, achieved energy savings, dedicated events, and given energy assessments/audits. Design and implementation issues were the most common explanation for a lack of KPIs. For example, case studies that paid less attention to formal evaluation in the initial phase overlooked KPIs in the design phase. Others (e.g. PSiB, WH, EETTC) focused more on achievements than pre-defined KPIs. In some cases (e.g. ECAS), a lack of KPIs was due to their long duration (some case studies have been running for many decades) and decentralisation (multiple actors with context-specific, and evolving policy agendas).

In most cases ($^{16}/_{19}$) there has been an *internal evaluation*. These assessments were carried out by the same organisation (or partners) responsible for implementation. In some instances (e.g. SH, ASSIST2gether, EENet, EbE) the evaluation was a requirement and funding organisations determine the orientation (e.g. questionnaires, or predetermined outlines) and frequency of reporting. For initiatives with defined KPIs (e.g. ASSIST2gether, MH, SBES, LIGAR, EM), the nature and scope of evaluations were determined by outcomes. For initiatives that did not have KPIs, but did carry out an internal evaluation (e.g. WH, WF, ECAS, EbE), the latter's nature and scope were often guided by a process evaluation, with an emphasis on the undertaken activities, services and operations. For example, the WH programme focused on whether families feel more empowered, and engaged with the community and social support, as a result of the intervention. The ECAS programme underlined the provision of impartial, free-of-charge advice, and why and how this is sought and delivered. We identified a mix of process and outcome evaluations, depending on design elements and the existence of KPIs. Here, both goals, and co-creation processes and activities were assessed (e.g. EENet, SH). We observed that a lack of KPIs was correlated with a lack of internal evaluation in only two cases (EETTC and PSiB).

Regarding *external evaluations*, a small number of case studies ($^{12}/_{19}$) were assessed independently by external actors (e.g. consultancy companies, academics). Consistent with the above observations, the intervention's design and requirements framed whether evaluations were oriented towards outcomes, processes, or both (e.g. HHI, EENet). Depending on the case study's duration, several external evaluations were carried out (up to two or three for HHI and EENet). All external evaluations rely heavily on stakeholder interviews and surveys, while engineering approaches (e.g. the net-to-gross ratio under SBES; a mix of *ex-ante* and random *ex-post* measurements under EENet) were often used in case studies that focused on quantitative elements (e.g. energy and cost savings). Beyond any specific objectives, other critical aspects related to, among others, communication and equity (e.g. HHI, ICP), costs and benefits (e.g. HHI, EM, SBES, EENet), health (e.g. HHI, EM, BESN), learning and knowledge (e.g. EM, EENet, ECAS, ASSIST2gether, BESN, SBES, EETTC), collaboration (e.g. SH, EENet, ASSIST2gether, MT, EETTC), energy hardship and communities (e.g. HHI, MT, EETTC), and market and behavioural barriers (e.g. SH, ECAS, ASSIST2gether, EENet). We observed that a lack of KPIs was correlated with a lack of external evaluation in only three cases (WF, EbE, and PSiB). With very few exceptions (HHI, WH), the reviewed evaluations did not take non-energy impacts into account.

The majority of case studies ($^{15}/_{19}$) reported *stakeholder feedback* in the context of internal and/or external evaluations. The views and experiences of target groups were often captured via, for example, surveys (e.g. SB-DSM), (semi-structured) interviews (e.g. EENet), and focus groups (e.g. HHI). We also found some evidence of informal stakeholder feedback (e.g. MH, EETTC).

We investigated whether evaluations (internal or external) provided evidence that a given case study was deemed effective for *behaviour change* at individual or organisational levels. In most cases ($^{15}/_{19}$), the given answer was yes. However, different case studies had different ways to conceptualise, measure or approach behaviour change, and understandings were highly context-specific. For example, some programmes were deemed to be 'effective' if outcome evaluations revealed that they have achieved their objectives, and/or KPIs were met (e.g. EM, WH, ICP, SB-DSM, EENet, MH, EETTC). In some cases (e.g. ASSIST2gether, HHI), process evaluations were used to qualify success. Under the HHI, for example, the successful co-design and involvement of community partners was used as key argument to assert that the programme has been effective. Likewise, the development of a national 'Household Energy Advisors' network, under the ASSIST2gether programme, and the implementation of further interventions after the programme ended, are considered as evidence of behaviour change. Capacity building (under the EETTC), and the establishment of formal energy management systems (under the EENet) were also taken as evidence of effectiveness. In the UK, the implementation of the 'Cascade Training Model' across several cases (WM, Ebe, PSiB) was used as a key argument to support assertions of success.[7] In three cases (WF, LIGAR,

[7] Under the 'Cascade Training Model', trained actors (e.g. health professionals) returned to their organisations and not only raised the profile of energy vulnerability awareness, but also shared their knowledge, skills, and resources with colleagues and partners.

ECAS), effectiveness was unclear. This was mainly due to a lack of evaluation and/or counterfactuals. In one case (MT), the evidence indicated that the intervention was ineffective—here, most of the documentation focused on the energy performance of properties, rather than the behaviour of their occupants.

Finally, our findings show that the *persistence of intervention effects* was rather uncertain. In most cases ($^{12}/_{19}$) we were unable to assert whether the intervention has had (or will have) lasting effects. This situation was often due to a lack of *ex-post* or follow-up evaluation (e.g. PSiB, SB-DSM, EETTC, LIGAR). We also encountered conflicting information (e.g. verbal claims about persistent effects but lack of quantitative evidence). In cases where an evaluation (internal or external) was carried out, persistence was not measured (e.g. WH, SBES). Interviewees also reported constraints related to a lack of financial and other resources. This is consistent with Frey and Rogers [104] who argue that while organisations (e.g. public agencies, utilities, NGOs) dedicate important resources to promote behaviour change, much less (if any) is devoted to understanding 'when ad why' behaviour change persists. In the few cases ($^{7}/_{19}$) that were considered to generate persistent effects (e.g. HHI, EMP, SH, BSEN), a variety of (mostly qualitative) arguments were used to support the claim. One example related to interventions that have resulted in positive health outcomes; these were considered to improve wellbeing in the long term, under the HHI programme. Likewise, the SH programme claimed that retrofitted houses generate energy savings for decades, which emphasised the importance of technology over behaviour change. In two other cases (EM and ICP), persistence was measured via self-reported behaviour, and captured via surveys and interviews.

4. Discussion: Using the BBBC framework for *ex-post* case study assessments

The following discussion focuses on whether the application of the BBBC framework is a suitable way to analyse and compare, *ex-post*, the selected case studies. Taking into account the exploratory nature of our study, this section focuses on methodological aspects related to limitations and avenues for improvements. The scores listed below represent the team's average evaluation results. As indicated in Section 2.4, scores range from 0 (nil) to 3 (high).

4.1. Credibility

Our experience indicates a moderate to relatively high level of confidence that the results are credible (average score = 2.6). We base this claim on several observations that emerged during and after the research process. In line with Johnson [119], the framework constitutes a systematic guideline for researchers to identify the factual cause(s) of a given issue, with respect to five building blocks. In turn, the specification of markers for each block systematises the search for positive, negative and inconclusive results with respect to a variety of aspects ('detective searching' [119]). The framework also supports the identification of potential causal relationships, by facilitating the visualisation of hypothetical counterfactuals—i.e. what would have happened if causal factor X had not taken place—along with the development of mental comparisons, and/or the identification of saturation points during interviews. It also facilitates the identification of patterns (e.g. unknown psychographics, lack of prior testing), and rival explanations for observed or potential causal relationships. Furthermore, it enables the questioning of source materials, and supports, in principle, the triangulation of inputs provided by programme managers and stakeholders. For cases with established information systems and for which evaluations are available, outputs are either peer-reviewed academic publications that have been assessed, or are multi-author, sometimes multi-partner, non-academic outputs that have gone through similar consultative steps prior to publication. Taken together, these considerations increase the level of confidence that the results obtained by applying the BBBC framework are credible.

However, we also must acknowledge that the analysis is only moderately credible because most programmes were not developed with the BBBC framework in mind. Hence, there is an inherent degree of uncertainty regarding some aspects, particularly about evaluation (e.g. the persistence of effects), which are difficult to capture due to design issues and lack of evaluations. In addition, the framework is geared towards the implementation of evaluation and monitoring activities (e.g. for programme managers) or identification of evaluation practices (e.g. for researchers), but not the specific assessment of an intervention per se (e.g. to undertake an outcome evaluation and determine treatment effects of given intervention). Some case studies were also designed with a high degree of flexibility (e.g. with no strict definition of energy behaviours in order to better meet the needs of target group(s)), and there is relatively less information regarding some building blocks (e.g. Behaviour) than others (e.g. Delivery). In addition, the amount of information related to the different blocks varies according to the available materials and input from interviewees/managers, which could negatively impact credibility. For case studies that lack robust data, information about certain elements (e.g. prioritised energy behaviours) may be more dependent on the experience and/or knowledge of programme managers. Thus, the degree of confidence in claims about causal relationships (e.g. behaviours inform interventions) may be influenced by other factors (e.g. staff turnover) or contextual issues (e.g. lack of evaluation culture).

Based on these limitations, there are various ways to enhance the credibility of the BBBC framework for the type of *ex-post* assessment we have conducted. For example, explicit guidance could be provided regarding triangulation (both data and methods) to systematically cross-check information via multiple independent routes [63]. The integration of process tracing would support the methodical identification of diagnostic evidence (i.e. causal-process observations) to enhance the robustness of descriptive inferences about causal explanations [120]. It would also be advisable to identify a statistically representative sample of interviewees to better capture the characteristics of stakeholders involved in intervention design, administration and development. Systematic efforts should be made to capture direct feedback from actual participants, in order to verify any insights [119]. Whenever possible, attempts should be made to theorise, measure or report data regarding potential moderators (e.g. pro-environmental behaviours) for each HTR (sub) segment [121]. Attention also needs to be paid to other policy interventions (e.g. energy taxes/subsidies) that could explain the (in) effectiveness of HTR programmes. Ongoing engagement and observations with participants would increase the credibility of future studies [122]. Finally, none of the programmes in our sample had adopted the BBBC framework. It can be argued that if this had been the case, credibility could have been tested in the field.

4.2. Confirmability

Confirmability refers to the extent to which the outcomes of the case studies can be verified or corroborated by other researchers. Here, our assessment leans towards a moderate level (average score = 2.2).

On the one hand, cases from the NZ and UK reported a high level of confirmability, indicating that several requirements were met and be confirmed by external parties. First, the majority of the analysed documents and data sources were either official and/or publicly available. Second, data and observations were collected via interviews, which, in most cases, were recorded. Data collected in this way can be confirmed by other researchers if made publicly available, or provided upon request. Third, 'member checking' [123] ensured that findings were reviewed and confirmed by interviewees prior to publication. In some cases (e.g. NZ, SE, UK), even reports with a single author included contributions from the project team; the latter discussed and reviewed the output, which was subsequently reviewed by internal colleagues prior to publication. Finally, previous evaluations (either internal or

external) were also used to confirm the validity of outputs.

However, a moderate level of confirmability (e.g. PT, SE) reflects the fact that there were (potential) language barriers, and data access restrictions. Some interviews were conducted in their respective native language, posing a challenge for multilingual confirmability. In addition, raw, unpublished data were sometimes used to support findings. Data restrictions (e.g. confidential SME information) prevented the verification of specific aspects, particularly with respect to the Evaluate building block.

Furthermore, we also found a low level of confirmability due to unreliable or subjective information sources. Case studies that lacked robust information systems were more likely to rely on informal information provided by, for example, programme managers. High staff turnover also limited access to this source of information, and made it more difficult to confirm. The problem was most likely amplified if programmes did not adopt the BBBC framework from the outset, and/or have been running for a long time. Furthermore, it was sometimes difficult to clarify or know which phase of the programme a stakeholder or researcher was referring to, and/or confirm what happened years ago, under different staffing arrangements.

Based on our experience, we recommend two approaches to enhance the confirmability of findings generated with the BBBC framework. First, as for any other research method, the framework needs to be transparent and implement good practices [cf. 124]. For example, data management should follow FAIR principles (be findable, accessible, interoperable and reusable).[8] To that end, researchers must overcome multiple obstacles related to legal, ethical and data storage requirements [125]. 'Prolonged engagement' should be adopted as standard practice, as this would allow researchers to reflect upon any potential bias during data collection and analysis [126]. Second, and when possible, confirmability could be strengthened by the use of external evaluations and cross-sector stakeholder reviews for each specific building block. Programmes that adopt the BBBC framework enable other researchers to confirm their findings—particularly if information systems follow a similar structure, and an 'inquiry audit' or 'audit trail' is established [cf. 127]. In this process, one should still accept that different researchers may produce dissimilar constructions with the same observations and data for a given building block; however, it is imperative to be able to trace constructions back to their source [122]. Finally, we learnt that the framework could be supplemented with calibrated language to communicate the precision of findings (e.g. high agreement, robust evidence; low agreement, limited evidence).[9]

4.3. Transferability

The extent to which the results of our analyses can be generalised or transferred to other cases and/or contexts ranges from low to moderate (average score = 1.6). Case studies, let alone behaviours and contexts, are indeed very specific, thus external validity is likely limited.

Different contexts, intervention designs, and the small sample size are the reason for a low level of transferability. As Section 3 underlines, energy behaviours are context-dependent, and are likely to be unique to the combined policy, market, technology and socio-demographic conditions in which a HTR intervention is implemented. In addition, we selected cases where there was sufficient case study information, and that targeted specific HTR energy users. Certainly, these cases are unlikely to be representative of interventions that target behaviour change more broadly. The small number of case studies, their specific engagement strategies,[10] and the multitude of target group profiles make it difficult to transfer the results to other contexts.

However, and with due caution, some moderate generalisations are possible. For example, findings could be transferred to countries with similar contexts (e.g. a very poor housing envelope, or high levels of energy hardship and chronic respiratory disease). Thus, we argue that it may be more productive for policymakers or researchers interested in transferability to ask in which contexts results can be reasonably transferred [128]. Some interventions are designed to be replicated[11] and generalisability may simply depend on the contexts, resources and/or experience of those involved (e.g. funders, management). With due limitations, one could argue that the BBBC framework and the chosen markers proved to be relatively well-suited to the identification of patterns, which could then help to develop hypotheses regarding shared strengths and shortcomings in other behaviour change interventions located elsewhere. Together, these aspects can inform current and future interventions that target similar HTR energy users.

Transferability can thus be improved by examining more case studies. In addition, the investigation should be refined, and focus on for example different typologies of identified energy users, behaviours, contents, delivery strategies, and evaluation approaches. This would increase the resolution of the analysis and, in turn, provide a deeper understanding about the feasibility or extent to which results can be transferred to other contexts. Furthermore, a rigorous adoption of the BBBC framework is likely to improve cross-country and -context transferability, especially with respect to metrics, KPIs, and methods [15]. These considerations seem to be in line with Malterud [128], who argues that a detailed presentation of the context and the method is needed for policymakers and researchers elsewhere to be able to ascertain in which other contexts results might be valid and useful. That said, we must also acknowledge that transferability may not always be the main goal of research and policymaking focused on HTR energy users.

4.4. Reliability

In general, reliability ranged from moderate to high, while a low level was found in two cases (average score = 2.2).

A moderate-to-high level of reliability is based on several considerations. First, each case study, and our cross-country analysis was based on a systematic search of the literature. This material was duly identified, analysed and reported for each case study.[12] Markers were another straightforward approach to guide data collection, code our results and facilitate replication in the future. Second, each case study followed the same interview protocol, interviewees were explicitly acknowledged and interview transcripts were generated.[13] If repeated with the same cohort of participants, in the same context, we argue that interviews should deliver similar results. In any case, the results of interviews, along with the respective markers, must be considered complementary to document analyses (e.g. *ex-post* external evaluations). Third, reliability was considered to be better in short-term interventions, or those that were managed by one member of staff at each organisation.

On the other hand, staff turnover decreases reliability. Importantly, as we experienced, replication becomes difficult if interventions do not have systematic, updated and transparent information systems, or if they have been running for a long time. Consistent with the confirmability arguments presented above, it may be difficult (or impossible) for

[8] For details see https://force11.org/info/the-fair-data-principles/.

[9] Similar to the guidance given to IPCC Lead Authors for the consistent treatment of uncertainties. See [132].

[10] For example, word-of-mouth proved to be an instrumental engagement strategy in the EETTC case study, while local authorities played a role in LIGAR. These approaches might not be well-suited to other contexts.

[11] For example, the Swedish EENet built upon 'Learning Energy Efficiency Networks' implemented in Germany and Switzerland.

[12] As indicated in Section 2, all case study reports are publicly available at https://userstcp.org/hard-to-reach-energy-users-task/.

[13] Quotations were used whenever interviewees gave their permission.

other researchers to, for example, clarify which phase of the intervention our results refer to, and uncover historical information about what happened under an earlier management team. Furthermore, it must also be noted that our case studies were conducted around the time of the COVID-19 pandemic, which is likely to have shaped the views of interviewees about the operation and performance of some programmes. It is unlikely that the COVID-19 context can be repeated in the future.

Based on these limitations and uncertainties, we propose some avenues to enhance the reliability of the BBBC framework and generated outcomes. Following Lincoln and Guba [129], any practices that aim to increase credibility and confirmability (e.g. prolonged engagement, persistent observations, data/method triangulation, inquiry audit) will also enhance reliability [see also 130]. Data sources, notably a list of interviewees, must be made explicit. Building blocks must be clearly defined to avoid potentially different interpretations across cultures, languages and research cultures and settings. For a cross-country analysis, this means that researchers must follow the same protocols, and share the same ontological understanding of the subject area. Interview guides can be designed for different target groups (e.g. programme managers, beneficiaries, external evaluators). A larger sample of interviewees will reduce uncertainties, particularly if the framework is applied to HTR interventions with high staff turnover. Heterogeneity can be addressed by over-sampling HTR (sub) segments to increase the power of moderation tests [121]. Although making data public increases transparency, disclosure must comply with legislation (e.g. GDPR in Europe) and ethical considerations. Here, we note the work of Pratt et al. [130] who state that "tying transparency tightly to replication" can be problematic in qualitative research. For example, publishing interview transcripts can allow the general public to know the identity of the interviewee; a practice that is unlikely to be approved by an ethical review panel [130]. Trust and confidentiality must therefore be taken into consideration when using the BBBC framework to increase the reliability of findings [cf. 130,131].

5. Policy implications

From a policy perspective, and in the light of the energy crisis (particularly in Europe), the analysis of the case studies reveals various implications. First, the energy crisis (and its global market ramifications) has intensified fuel poverty and energy inequity among some HTR segments (e.g. low-income households and small businesses), many of whom had never experienced vulnerability of this kind before (e.g. as in Sweden). For a just, clean and equitable energy transition, the findings highlight the importance for policy makers of constantly and proactively understanding, monitoring and assessing current or new interventions addressing vulnerable households. Whereas the crisis has imposed numerous challenges on them, the analysed case studies also revealed learning opportunities for strengthening the (co-)design and implementation of interventions targeted towards new, or previously underserved energy users. Working with HTR energy users also involves establishing new practices, resources, and mechanisms of engagement, as well as time to understand the needs, behaviours and barriers faced by HTR energy users, and the support networks that may exist outside of energy-related environments (e.g. via health workers). The experience in the UK and NZ suggests that this work is very often time-consuming and challenging, but an essential investment for meaningful design and effective implementation by building ongoing trusted relationships with community and frontline providers.

Second, the crisis has also triggered new policy efforts (e.g. energy price compensations, retrofitting subsidy packages) addressing energy users that have not been effectively (previously or) reached, supported or engaged in the past. However, we notice that there is a risk that ongoing interventions may be confined to one-off financial or technology-oriented measures that focus on the short-term impacts on energy bills. This situation has the potential to overlook significant long-term structural socio-economic and demographic inequities or injustices that characterise, frame or generate HTR energy users. In addition, our findings also reveal the importance of policy mixes, as HTR interventions do not work in isolation (e.g. the need for energy literacy and awareness raising campaigns to support HTR interventions, as in Italy). Thus, there is also a risk that policy interventions that address the crisis (e.g. tax rebates) have not been duly integrated into the mix of other policy interventions, which may have been further constrained by the urgency of tackling the crisis. Such reactive interventions, if not assessed and co-designed through an energy equity lens, may lead to unintended consequences (e.g. increased energy demand and higher inflation) and deepen energy injustice.

Third, much more attention needs to be given to participation requirements, energy footprints (e.g. per capita energy use instead of area-normalised energy use), and income groups. On the one hand, high and unsustainable energy behaviours are found among high-income earners, who have been also hard to engage and remain largely unaddressed by energy and climate policies. Interestingly, high-income households have been in the position to claim energy price compensations as a result of the energy crisis (e.g. as in Sweden). One way to address this problem is to clearly define, for example, 'energy hardship' and what eligible criteria or metrics to use when identifying households suffering from it (e.g. like in NZ). On the other hand, income status alone is unlikely to capture all those who need to be targeted. In the U.S., for example, residential HTR energy users often face overlapping and intersecting vulnerabilities so it is common for any given individual to fall into more than one of HTR categories (e.g. minority, elusive, hidden, underserved or disadvantaged groups), yet utilities are typically only mandated to prioritise low-income users. As a result of stringent regulation, many utilities are mandated to meet specific cost-effectiveness requirements, with occasional allowances only for programmes aimed at low-income customers. Expanding the types of programmes beyond low-income would allow programme administrators to better engage HTR energy users to also encompass other (underserved) energy users.

Fourth, policy makers also need to encourage bottom-up co-design, flexibility, early experimentation (or piloting) and due evaluation. For example, in Canada, utilities are typically owned by the government and are usually considered crown corporations. While often held to strict regulatory requirements, the intervention approach for the Indigenous community case study benefited from early freedom from the requirement to achieve specific energy savings. Ultimately, the pilot later led to the development of several interventions that increased both programme participation and energy savings. Applying this to the ongoing energy crisis, the freedom to explore potentially beneficial approaches before energy-savings requirements must be achieved has the potential to open the door to more substantial energy savings in the long term.

Finally, the analysed case studies (e.g. PT and NZ) also suggest that actions with the support of trusted middle actors can be successful, strengthening the argument for targeted and tailored interventions at the local scale. Some utilities have focused their efforts on reducing energy hardship for their customers, including by reaching out to and co-creating and delivering community energy pilots (e.g. like EM in NZ). While some countries (e.g. NL) have opted for a decentralised policy approach to mitigate energy poverty, spatial energy inequality and related HTR issues may be exacerbated if local actors (e.g. municipalities) lack the resources and capacity to design, implement and evaluate (*ex-ante* and *ex-post*) policy interventions.

6. Conclusions

The objectives of our study are twofold. First, we provide a systematic, cross-country assessment of case studies that explicitly or implicitly target HTR energy users. We focus on several areas related to behaviour change. Second, we assess the ability of the Building Blocks of Behaviour Change framework to capture the dynamics and complexities of behavioural-oriented HTR interventions.

Our *ex-post* assessment shows that the case studies perform relatively

well regarding Audience, Behaviour and Delivery building blocks, but less well regarding Content and Evaluate blocks. Our findings highlight heterogeneity with respect to multiple dimensions (e.g. energy users, behaviours, contexts, market barriers). Although psychographic knowledge of HTR energy users can improve intervention design and resulting outcomes, this data is not routinely collected. While energy behaviours are both context-specific and clearly defined, a lack of prioritisation leads to a lack of focus, and the suboptimal allocation of limited resources. Furthermore, despite clear engagement strategies, the vast majority of the interventions fail to test their content, and learn from *ex-ante* evaluations, which is another area where improvements can be made. Regarding Delivery, how interventions are communicated and disseminated among HTR energy users appears comprehensive. Nevertheless, prior testing and better knowledge of psychographics would avoid an inefficient, all-out communication strategy, and help to determine the most effective channels, messengers and timings. Regarding the Evaluate block, our assessment revealed heterogeneous outcomes. Consistent with the energy (efficiency) policy evaluation literature, our results confirm that evaluation (whether *ex-ante* or *ex-post*) is not a top priority for policymakers or programme managers. In some cases, it generates uncertainty about actual behaviour or organisational change, either in the short or the long term. Multiple factors limit the provision of timely and valuable feedback regarding design and implementation activities.

From a methodological perspective, the BBBC framework allowed us to identify a variety of complexities, challenges and uncertainties associated with HTR initiatives and the design, implementation and evaluation of interventions. However, the approach is very resource intensive if used for *ex-post* assessment purposes, and to effectively evaluate all of the building blocks, data must be available, reliable, timely and useful. Considering the exploratory nature of our study in methodological terms, results indicate various limitations but also reveal avenues for improvement, including systematic triangulation, process tracing, and a calibrated language for certainty levels. Our experience strongly suggests that the credibility and transferability of programme outcomes would be improved if they were designed around the framework itself. A common design approach based on the BBBC framework can also make comparative assessments more feasible. Depending on the specific objectives of evaluation studies, future research could also explore the application of the framework based on markers weighted by e.g. importance. Although our results are highly context-dependent, the application of the framework illustrates that rigorous and comprehensive evaluations are needed to understand how, why, when and for whom, HTR interventions work best.

Overall, our *ex-post* assessment highlights the need for systematic integration and analyses of heterogeneity in future HTR-related energy research. Our study underscores the value of evidence-based evaluation in supporting the design, choice and implementation of behavioural-oriented interventions that target HTR energy users. It also emphasises the value of integrating behavioural science methods, together with holistic evaluation approaches at an early stage in the design of HTR programmes.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

All case study reports that feed and support the analysis are available online. For details see https://userstcp.org/hard-to-reach-energy-users-task/.

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Annex 1. Interview protocol

General questions on WHY the intervention was designed and implemented

- What was the main motivation or justification to implement this initiative?
- Did you identify and bring together various stakeholders who could help you with the project design, implementation and/or evaluation before starting?
  - o If so, how did you identify and facilitate these stakeholders?
- Did you clearly decide with your stakeholders on shared goals and objectives?
  - o If so, can you share them here please?
- Did you return to this shared objective and change/reiterate it in any way?
  - o If so, why/how?
- Did you undertake any type of analysis before starting to design your project/programme/pilot?
  - o If so, what form did this take? E.g. lit review, market or landscape analysis, talking to other programme managers doing similar interventions…
- Did you assess any regulatory and/or ethical obligations or barriers?

Questions about the Building Blocks of Behaviour Change framework

1. AUDIENCE

- Who was your target audience(s)?
- Would you regard this audience group as hard-to-reach?
  - ■ Yes/No, why?
- Did you aim to choose any specific HTR audience segment(s)?
- How was your target audience chosen/prioritised?
- How was your target audience identified, defined, and characterised?
  - ■ Did you undertake any socio-economic, demographic/psychographic, needs or barrier analyses?
- Were there any inclusion/exclusion criteria (e.g. income, level of energy use) used for your target audience?
- Please provide any information on audience definition or research conducted, as available (e.g. via official document, publicly available information)

2. BEHAVIOUR

- What were the chosen target behaviour(s) for the intervention?
- How were they chosen/prioritised?
- Who was involved in that prioritisation process?
- What is it that the intervention wanted people to do/change?

3. CONTENT

- How did you decide on the approach? (Please describe overall approach here)
    - Can you provide us with any case study reports, materials or examples?
    - Are they publicly available/able to be published by this Annex?
- What engagement strategy and messages were used in the intervention? (e.g. was it a competition/pledge?)
- Was this content tailored to the intended audience?
    - If yes, how?
- How was the messaging strategy created/decided upon?
- Was there any prior test, evaluation or comparative assessment?
- Who was part of this decision-making process (e.g. internal marketing team or consultants/designers?)
- What materials were created and shared with the target audience?
    - Please provide examples, as available.

4. DELIVERY

- What mediums/media were used to communicate the intervention to your target audience? (e.g. mass email/radio ads/in person visits/website/text message)
- What messenger(s) were used for your intervention? (i.e. who did the messaging come from - utility/researcher/government agency/community NGO/peers)
- How was the intervention timing decided? What was the frequency and duration of the intervention messaging? (E.g. was it scheduled around the holidays/following a news article/after a new policy announcement?)
- Did you conduct any pre-market message or strategy testing?
    - If yes, what adjustments were made as a result?
- Was this programme decided as a once-off or is it scalable for wider roll-out?
    - Please provide examples and any other research conducted, as available.
- Is the deployment of the programme considered to be effective in engaging the target audience(s)?
    - Yes/no, why?

5. EVALUATE

- Has the intervention been evaluated?
    - If so, what were the metrics/indicators/goals/methods of evaluation?
    - Was it a process/impact/outcomes/goal-based evaluation?
- Who was involved in evaluation decisions, and when?
    - Who were the evaluators? Internal and/or external?
    - Were they included in the intervention design or added later?
- Has the programme considered stakeholder feedback during the evaluation process?
- What were the evaluation findings and lessons learned? What changes (if any) were made to the pilot or intervention as a result?
- Have you evaluated any effectiveness and persistence in the long-term?
    - Yes/no, why?

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