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ABSTRACT

Energy efficiency (EE) program administrators and policy makers have long encouraged the adoption of efficient technologies and conservation practices across all energy users and sectors. Energy users who haven't yet participated in efficiency and conservation programs despite ongoing outreach are often referred to as "Hard-to-Reach" (HTR). These individuals or organizations can include, for instance, low income or rural audiences on the residential side and small businesses or building operators on the commercial side. More effectively engaging underserved and HTR audiences is key to ensuring everyone benefits equitably from efficiency and conservation interventions.

In June 2019, energy efficiency, behavior change and HTR researchers, practitioners, and policy makers from five countries embarked on a 3-year project in partnership with the User-Centred Energy Systems Technology Collaboration Programme (Users TCP) by the International Energy Agency (IEA). The purpose of this effort is to characterize the diverse audience segments commonly referred to as HTR and to uncover the barriers and behavioral opportunities to more effectively engage them. This paper describes the first of these efforts. We have synthesized data from a global survey (N=110) and stakeholder interviews with 40+ energy efficiency experts striving to better understand and engage HTR in their respective countries. This paper provides initial insights from this data into how HTR energy users are defined across the world and which segments have been prioritized globally for focused outreach. The overarching goal is to use a standardized research process to inform and improve how energy efficiency, behavior change, and demand response programs targeting specific HTR audiences are designed, implemented and evaluated.

Introduction

Background

In 2018, the Consortium for Energy Efficiency (CEE), together with the U.S. Department of Energy, joined the last year of a global behavior collaboration through IEA's Demand-Side Management (DSM) Programme. The project, called IEA DSM *Task 24*, was designed to gather international learnings on successful approaches for using behavioral techniques to more effectively engage energy users in efficiency and conservation efforts. During the stakeholder interviews that were conducted as part of this research, a common theme emerged: participating U.S. and Canadian EE program administrators were particularly interested to more effectively engage energy users who had not benefited from EE programs as much as other audiences. This

interest in "Hard-to-Reach" (HTR) and underserved energy users – and the huge diversity in HTR definitions described by interviewees – led to this 3-year *HTR Annex*. The project seeks to characterize the various audience segments that are commonly, but also vaguely, referred to as "HTR" in both the residential and non-residential (primarily commercial) sectors, and to uncover the barriers and opportunities for more effectively engaging these segments. The countries formally participating in this project include New Zealand (NZ), Sweden (SWE), and the United States (US), with additional in-kind support from the United Kingdom (UK) and Canada (CA).

Drawing upon a global network of more than 300 behavior change and HTR experts, we will develop a common nomenclature for HTR and test and validate a standardized research process for behavior change aimed at engaging specific underserved audiences. A key objective of this effort is to enhance our common understanding of which behavioral interventions[1] have worked well, or not so well, to engage specific HTR audiences around the world.

Objective, Process and Research Questions

The objective of this paper is to provide an initial landscape analysis of HTR audiences across countries participating in the HTR Annex. That is, to provide an early characterization of the diverse audience segments commonly referred to as HTR, including barriers and potential opportunities to (more) effectively engage them. The data gathering process for this project entails collecting survey and interview data, case studies, and literature on which HTR energy users are most commonly mentioned and studied. The key research question (RQ) relevant for this paper is (for the full list of RQs see Rotmann 2019):

- Who are the HTR energy users in each participating country? How can they be defined and described? How materially are these HTR markets underserved?

In this paper, we focus on the initial interview and survey findings of Year 1 of this HTR Annex, paying particular attention to HTR audiences and applicable barriers across participating countries. A detailed literature review which focuses on the top audience groups mentioned by HTR experts surveyed and interviewed here is currently underway (Rotmann et al *in prep*).

Rationale for more effectively engaging HTR in participating countries

In the U.S. and Canada, energy efficiency program administrators aim to better engage HTR audiences for several reasons. First, utility program administrators recognize the moral imperative to ensure that all customers have equitable access to the value their EE programs provide. Additionally, many utilities have mandates specific to serving income-eligible and underserved customers within their service territories. In some cases, these requirements include

[1] For the purpose of this project and this paper, the way we define "energy behavior" and "behavior change (interventions)" is based on the very broad IEA DSM Task 24 definition (see Rotmann & Mourik, 2013): *Energy behavior* refers to all human actions that affect the way that fuels and carriers are used to achieve desired services, including the acquisition or disposal of energy-related technologies and materials, the ways in which they are used, and the mental processes that relate to these actions. *Behavior change* thus refers to any changes in said human actions which were directly or indirectly influenced by a variety of interventions (e.g. legislation, regulation, incentives, subsidies, information campaigns, infrastructural changes etc.) aimed at achieving specific behavior change outcomes.

spending minimums for programs aimed at these audiences. The first step to better serving those customers is defining and understanding these populations.

In New Zealand, there is a highly deregulated utility industry. The main impetus behind government efforts to engage HTR is improved health, particularly for vulnerable populations (e.g. Allen + Clarke 2018), as is equity. NZ has a particularly low quality housing stock, which disproportionately leads to poor health and wellbeing outcomes for the most vulnerable (O'Sullivan et al 2011), including Māori and Pacific Island communities (e.g. Howden-Chapman and Tobias 2000). Government insulation subsidy programs, which are free for low-income households, have also been less effective at reaching these groups as compared to other populations (see Barnard et al 2011), and young people living in cold housing are at high risk for fuel poverty (O'Sullivan et al 2017). In addition, vulnerable energy users may suffer from split incentives, as they are predominantly renters, and often face higher pricing relative to their means. A recent *Electricity Price Review* (MBIE 2019) was the first step towards addressing some of these systemic issues. This research effort will support the roll-out of recommendations.

The UK situation is similar to that of NZ in the sense that it also operates a highly deregulated utility sector. Key drivers to engage HTR groups include the moral imperative to promote more equity across different socio-economic groups and reduce the negative health consequences from homes that are cold and unaffordable to heat. The UK has the least energy efficient housing stock in Western Europe and energy prices are high relative to incomes (ACE 2014). The UK's most vulnerable households are more likely to live in the worst performing properties (ACE 2014; Ambrose & McCarthy 2016). Although much work has been done to understand the characteristics of HTR groups (e.g. Ofgem 2013; Ambrose et al 2019), policy initiatives designed to tackle the problem fail to reach those in most need (UKERC et al 2018; CFP 2019). We describe valid criticisms of the HTR terminology, and how it seems to put the onus on energy users, not the "Behavior Changers" (Rotmann 2016) in charge of engaging them, in the literature review which is complementary to this effort (Rotmann et al *in prep*).

In Sweden, the initial discourse to engage with HTR-related research or initiatives builds upon two main aspects. First, and when it comes to direct energy use, there are concerns about growing intra-national energy use disparities. This has led to high-income, high-use groups being mentioned frequently by Swedish Behavior Changers as they are hard to motivate using standard policy interventions (e.g. taxes), but also likely to be using an "unsustainable" level of energy. The behaviors and motivations of this group are also the least understood. Second, and when it comes to indirect energy use, mobility as energy service also deserves more policy attention. Increasing purchasing power, travel frequency and distances travelled have also elevated carbon emissions. Thus, the trends suggest that greater policy efforts to reduce energy use in certain population segments, and resulting consumption-based emissions, are necessary.

Scope

The scope of this HTR project includes energy users in the residential and non-residential sectors. To date, the funding countries have focused on residential low income (including the fuel impoverished), multi-family apartment renters, high income, indigenous communities, the geographically isolated, and the underserved/vulnerable. In the commercial sector, the focus to date has been primarily on small-medium businesses (SMBs), as well as building operators.

Target Audience and Desired Outcome

The target audience for the overall learnings of this project are energy program managers, researchers, practitioners, policy makers, nonprofits and other "Behavior Changers" (see Rotmann 2016 for definitions), with the goal of informing how energy efforts are designed, implemented, and communicated to better meet the needs of specific HTR audiences.

In the US and CA, there are several key objectives program administrators seek to achieve with their efforts to more effectively engage HTR audiences: to increase participation in EE programs, to increase overall energy savings from participation in these programs, and to strive to achieve equitable service to all customers (see VEIC 2019 for a discussion on the lack of sufficient equity measurements in many US clean energy programs).

In NZ, key goals are to increase participation in EE and demand response programs, and especially, to ensure the most vulnerable members of society experience improved health and wellbeing outcomes, even if this sometimes comes at the expense of energy savings. Equity considerations are also important, especially as there has been a marked gap in energy prices for residential (including many small businesses) as compared to industrial customers (MBIE 2019).

In Sweden, the main audiences are policy makers and the academic community. There is growing interest in behavioral-oriented policy interventions (Mundaca et al 2019) and EE has been high on the policy agenda for many years. There is also a need to better understand the HTR concept beyond fuel poverty and direct energy use. A specific goal is to increase knowledge about behavioral barriers and opportunities to more effectively engage potential HTR audiences and learn about other countries' behavioral interventions and policy lessons.

The research funders and participants have co-developed a shared goal for this Annex[2]:

"Our shared goal is to identify, define, and prioritize HTR audiences; and design, measure and share effective strategies to engage those audiences to achieve energy, demand response, and climate targets while meeting access, equity, and energy service needs."

HTR Definitions

There are many different, and sometimes conflicting, definitions of what constitutes a HTR energy user, and it is key not to put the onus of better engaging HTR audiences on those individuals and organizations themselves. Thus, participants in this research collaboration began with a broad, draft working definition for our research which was tested during the stakeholder interviews[3]:

"In this Annex, a hard-to-reach energy user is any energy user from the residential and non-residential sectors, who uses any type of energy or fuel, mobility and communications services, and who is typically either hard-to-reach physically, underserved, or hard to engage or motivate in behavior change, energy efficiency and demand response interventions that are intended to serve our mutual needs."

Purpose and Methods

Purpose

[2] See https://userstcp.org/annex/hard-to-reach-energy-users/ for a glossary for terms in this definition.

[3] See https://userstcp.org/annex/hard-to-reach-energy-users/ for a glossary for terms in this definition.

The purpose of this paper is to provide an overview of early findings from this research collaboration, noting that the project is only in Year 1 of a three-year effort. We will provide details on the priority HTR audiences mentioned by interviewees and survey respondents and preliminary data on related barriers and potential approaches to more effectively engage them.

Methods for Data Collection

This project utilized five different data sources:

1. The results of a Qualtrics survey, conducted in August 2019 (n=110 HTR experts from 20 countries). These survey respondents were identified from Task 24 contact lists, 2019 ECEEE Summer Study HTR workshop participation, CEE member outreach, and a list of UK and EU fuel poverty experts.
2. Input received from the CEE members and sponsors of this project through meetings during Year 1, conducted both in person and also over the phone.
3. Input provided by all participants at the in-person HTR Annex workshop, the first of which was hosted by the US and CEE in Sacramento in November 2019.
4. Semi-structured stakeholder interviews conducted with 40+ individuals working to better engage various HTR audiences in the participating countries.
5. A literature review of case studies, gray literature, and peer-reviewed papers.

The first four data sources have been collected and preliminarily analyzed, here. The literature review is currently underway, and will provide complimentary detail when published.

Methods for Data Analysis

Due to the density of information in the stakeholder interviews, a country-by-country inductive content analysis (Thomas 2003) was conducted for each country to identify themes that emerged in the data across interviewees. The collected data from the survey, CEE member meetings, workshop, and stakeholder interviews were aggregated into a spreadsheet which separated the data by HTR audience characteristics, barriers to better engagement, and approaches that had been (or could be) tried to more effectively engage them. This information was reviewed and summarized to identify and quantify common themes in the data.

Limitations

There are several key limitations to note: The data has been provided voluntarily by HTR researchers, practitioners, and policy makers. We have not yet obtained input from members of actual HTR audiences, but will do so in Year 2 for the case study analyses. Most of the data collected so far is from the participating countries, which is a small, Western segment of the broader international community. Moreover, this paper focuses primarily on the findings from the US and CA, where we had the most numerous responses. Most US and CA respondents came from utilities, whereas academics, policy makers and third party representatives were more common in other countries' samples. Thus, the data collected is not comprehensive nor expected to be a representative sample of all HTR efforts currently underway (the literature review will provide a more in-depth analysis of global HTR efforts). As a result, it is important to interpret these initial findings with caution -- they provide a snapshot only, not an extensive list.

Initial Findings: U.S. and Canada

HTR Audiences

In the US and CA, the HTR audiences most mentioned[4] in the data included *residential low income, renters, rural non-native English speakers*, and *underserved*. On the commercial side, the most mentioned audience by far was *small businesses*.

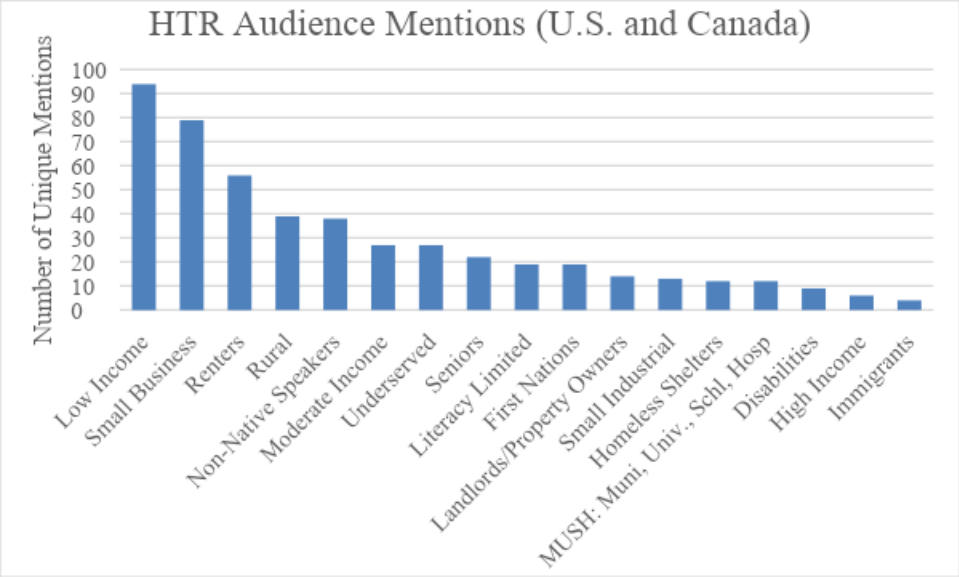

Figure 1. Unique mentions of HTR energy user audiences. *Sources*: CEE 2019 HTR Survey, 2019 IEA HTR Workshop, 2019-2020 stakeholder interviews, and CEE member meetings.

Barriers

Given the myriad energy users who could be considered HTR, we hypothesized that there would be a similarly diverse set of barriers believed to hinder engagement. However, the data collected thus far indicate that there is a group of key barriers that is common to a variety of HTR audiences. Barriers around *trust, access* (in various contexts, such as physical access to geographically-isolated individuals, individuals' access to technology, and access to energy decision makers in commercial contexts), *language and literacy, knowledge or efficacy*, and *competing life priorities* applied to an unexpectedly large number of HTR audiences. Indeed, just three barriers (*competing life priorities, cost* of efficiency measures, *language/literacy*, and *trust*) accounted for over a third of all the barriers mentioned across all audiences.

However, in some cases, certain barriers were reported in connection with specific HTR audiences. For instance, for *low income* customers, the barriers that were most commonly reported included *trust, competing life priorities*, and *access* to internet and computers. Participants in the project also raised the issue of misalignment between the heterogeneity of targeted audiences and the relative *lack of diversity* in program designers. This may contribute to suboptimal program design and marketing to potential participants. For *small businesses*, the

[4] Most survey respondents and interviewees mentioned more than one HTR audience, which is why the total HTR audience mentions here exceeds the total number of individuals providing input on HTR audiences.

most reported barriers included *access to the property owner*, the *costs* of energy efficiency upgrades, *language and cultural differences*, along with *trust* concerns.

Approaches Explored

U.S. and Canadian utilities reported a variety of different approaches to more effectively engage their elusive HTR customers, but several common themes emerged. In an effort to address the key barrier of *trust*, one common approach – reported far more than any other – was *partnering with community organizations*. In some of these partnerships, community organizations provided a "foot in the door" with given households or businesses that allowed program staff to directly install new efficiency measures. In other cases, such as in programs targeting *indigenous* communities, the utility hired and trained trusted community members to deliver interventions. Utilities noted that *in-person engagement* and *community events* can be beneficial for a variety of audiences, but particularly so with *indigenous* communities.

Partnerships outside the community organization context (e.g. real estate agents, retailers or food pantries) were also mentioned. Additionally, many HTR engagement approaches included using *enhanced incentives* targeting specific HTR audiences, *modifying the messaging* (and *outreach channels*) of existing programs to resonate with one or more particular HTR audiences, and using a *mobile-optimized interface* to improve access to more energy users.

Initial Findings: Sweden

HTR Audiences

For the residential sector, HTR audiences that were most commonly mentioned during the expert interviews were *high-income households*. They are considered HTR due to *lack of interest* in energy efficiency improvements, given their relatively higher net disposable income and corresponding *larger demands* for energy services, both direct (e.g. electricity use) and indirect (e.g. mobility). It is known that net income and total expenditures are critical factors explaining high energy use at the micro-level (Nässén 2014), and that there is a significant correlation between 'affluence', energy use and (net imports of) carbon emissions at the macro-level (Mundaca et al 2015). High-income households are also less likely to adopt energy efficiency measures than middle-income segments (Nair et al 2010).

At the same time, households with relatively *low income* were also mentioned as a HTR audience. With this audience, the issue is a lack of financial means for investments in new energy technologies. The literature reveals that low-income households are more likely to undertake *only* energy conservation measures, as compared to higher income segments that have the financial means to (potentially) invest in efficient technologies (Nair et al 2010).

Other HTR audiences identified were *renters or tenants* in multi-dwelling buildings, *housing associations* (particularly small cooperatives), people with *lower education levels* and IT literacy, and *non-native speakers*. To a lesser extent, *disabled* people and *rural* dwellers were also indicated. Interviewees indicated that rural (or isolated) communities are currently much more aware of their energy use, efficiency measures and even self-sufficiency practices (e.g. via solar PV). However, as certain rural areas face population losses and economic challenges, there are concerns that they may become HTR in the future or underserved because critical energy infrastructure (e.g. district heating) may no longer be financially feasible.

On the commercial side, the most commonly-mentioned audience in SE were *small*

businesses. However, it must be noted that the SMB sector is a much more heterogeneous group and, as such, there is also a high degree of uncertainty about its energy management practices. In fact, the majority of studies addressing EE in SE have focused on the *energy-intensive sectors* and knowledge about non-energy intensive sectors is limited (Rohdin and Thollander 2006). To a much lesser extent, *big businesses* and *multinational corporations* and businesses who are *unconcerned with their energy bills* were also considered HTR in the commercial sector.

Barriers

Data collected from the interviews up to this point indicate several market barriers and failures, hindering the engagement of HTR energy users in the Swedish residential and commercial sectors. Behavioral anomalies, or "irrationalities", such as *heuristics, limited attention, loss aversion, status quo bias*, etc. were marginally indicated.[5]

In the residential sector, various market barriers were commonly reported. First, low priority given to energy issues ("*lack of awareness*") combined with relatively *low energy prices* were identified. This is because the relatively lower energy prices do not seem to convey the proper incentives to high-income households to use energy more efficiently. The views are consistent with studies that show unchanged price elasticities[6] over time (Nässén et al 2008), and high correlation between energy pricing and stagnant efficiency improvements in the sector (Nässén and Holmberg 2005). Second, a *lack of access to capital* was also mentioned, which is particularly relevant for *low-income* customers because it constrains technology investments. Third, *language barriers* for non-native speakers are also a factor preventing awareness of and engagement in EE programs. Given that new technologies also involve some degree of risk or uncertainty, *loss aversion*, particularly among risk averse households, could also play a role.

That said, two specific market failures were also identified. Interviewees mentioned *lack of information* - insufficient or incorrect information can drive households to inaction, and *weak knowledge sharing* was also mentioned, which is consistent with the literature (Vogel et al 2016). Second, *split incentives* (or principal-agent problem) were often mentioned, particularly for *multi-family dwellings*. Overall, interviewees highlighted that there are split-incentives to consider between renters, housing associations, and property owners; there's a disconnect between who make decisions and who benefits from EE investments.

In the commercial sector, most identified barriers pertained to *small businesses*. For instance, *hidden costs and risks* (e.g. business disruptions) of new technologies seem to play an important role. A *lack of available personnel* and *financial resources* to invest in EE interventions as well as *imperfect information and communication barriers*, which may require intermediaries to bridge the gap between academics/researchers and general audiences. *Big businesses and multinational corporations* were also considered a potential HTR audience. Barriers there *include lack of awareness* and *low prioritization of energy efficiency*. In specific types of businesses, such as *building construction,* crucial factors influencing this segment were *trust* and *familiarity*.

Approaches Explored

[5] See Mundaca et al. (2019) for a review of behavioral anomalies in the Scandinavian context.

[6] Simply understood as the ratio of a proportional change in quantity supplied or demanded to a proportional change in price.

The interviews do not reveal any specific behavioral approaches to effectively engage HTR audiences (e.g. via *social norms, defaults, framing* techniques). Acknowledging the limited number of interviews (11 in total), they suggest that *sharing knowledge platform*s that bring together private actors, municipalities, building companies and state authorities are critical for the residential sector. These platforms already exist and seem to address barriers related to *information asymmetries* and *trust* (cf. Smedby and Neij 2013) but it is unclear how well they are able to identify, develop and implement behavioral approaches to specifically engage HTR energy users. That said, a *strong regulatory framework* for *high energy-using industries* in the commercial sector was indicated as an important policy intervention.

Initial Findings: New Zealand

HTR Audiences

In NZ, a smaller but diverse number of stakeholders was questioned about their definition of HTR (n=19). As in the US and CA, the most commonly mentioned audience, by 74 percent of respondents, was *low income*, followed closely by *indigenous* people (68%), *renters* (63%) and *rural dwellers* (57%). *SMBs* were the most commonly-mentioned commercial audience (53%). Unlike the US and CA respondents, *homeless (shelters)* were the next highest audience (53%). The high emphasis on very vulnerable populations in the residential sector is supported by research into NZ's poor housing stock and its disproportionate impacts on population health and wellbeing (e.g. Howden-Chapman et al 2012).

Barriers

Similar to the US, some key barriers emerged around *trust*, which was mentioned as a particularly important barrier for *Māori and Pasifika* populations but also for the *homeless, the formerly incarcerated*, and *other vulnerable* populations. Additional main barriers included *competing life priorities* -- especially for *single mothers, low income* and *mentally or physically disabled* people, and *cultural* differences (also pertaining to the indigenous population of NZ). *Cost* was a bigger issue in the non-residential sector and *split incentives* were mentioned in relation to tenants in both sectors. Pertaining to *high income* people, a major barrier to engagement was that "*they simply do not care about EE*."

SMBs, and especially *small businesses running out of residential properties*, face particularly intransigent barriers: it is often unclear if they fall under the residential or commercial sector, they face strong *split incentive* issues, and their *energy costs are often small* compared with other costs. In addition, they also face *competing priority* issues, especially when they are already fighting to keep their businesses afloat. The lack of any targeted government or utility interventions for this vast majority of NZ businesses, adds to the sizable problem.

Approaches Explored

Again, very similar to experiences reported from the US and CA, NZ stakeholders also predominantly mentioned the importance of *collaborating with trusted messengers*, or middle actors, especially from the community or NGO sector. According to Parag and Janda (2014), due to their position between top and bottom actors and between technology and implementation,

middle actors play crucial functions in the transition process.

The importance of *health and wellbeing* as a driver, rather than just a co-benefit of EE improvements, has been made abundantly clear by all NZ interviewees. As a result, the New Zealand government has several national programs where health, social, housing, and energy agencies collaborate to target the most vulnerable audiences. Most use *mass marketing campaigns* and *social media*, but without *trusted middle actors* who can engage directly with these audiences (preferably in their own home), these efforts are less successful.

Potential Remedies

Ambrose et al 2019 propose a series of recommendations for effective engagement based on evidence from a series of interviews with HTR individuals and workshops with stakeholders with relevant experience in the UK. We have combined the recommendations in this research report together with the insights gleaned from the stakeholder interviews for this project from all participating countries. Key recommendations include:

- **Work through trusted professionals embedded in communities** such as health professionals, housing officers, budget advisors, repair teams, etc.
- **Design programs to intentionally tackle known barriers** faced by a specific HTR audience, using highly customized programs relevant to small subsets.
- **Foster sensitivity to, and awareness of, the potential stigmas** of being associated with various HTR audiences - and include members of these HTR audiences to co-create interventions that work for them.
- **Maximize synergies between field research and behavioral policy interventions**. Policy experimentation and evaluation can play a crucial role in uncovering behavioral barriers and opportunities. Practitioners and policy makers need to collaborate more.

Concluding Thoughts

The results presented in this paper only begin to scratch the surface of the highly complex topic of HTR energy users. A key theme that emerged was the potential disconnect between the characteristics and perspective of various HTR communities and those of the Behavior Changers designing and implementing programs aimed at these audiences. Further investigation is also necessary to better understand how the perceived barriers reported by the practitioners and researchers through the interviews, survey, and workshop align—or do not align—with the hard numbers around engagement successes and failures. Admittedly, these findings represent just the first, exploratory step in this three-year international collaboration to better understand the barriers faced by both HTR energy users and the Behavior Changers offering them programs, and how to effectively overcome these barriers.

That said, there is a recognition that better engaging HTR energy users is not simply a matter of more effectively marketing existing programs. Rather, we can perhaps increase our prospects for success in two ways. Firstly, by carefully co-creating programs with specific audience subsets and, secondly, by partnering with community organizations or other trusted middle actors during program design and delivery. This will help ensure that the program offerings are of value to their intended audience, and that any scale-up efforts are more likely to resonate.

Looking ahead to the second year of this effort, we will assess the efficacy of specific

HTR approaches and efforts through the collection of more diverse audience perspectives and case studies, to be shared in future publications.

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