



User-Centred
Energy Systems



Final Country Report HTR Task Phase 1: United States

DOI: [10.47568/3XR129](https://doi.org/10.47568/3XR129)

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December 2023



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Executive Summary

This report outlines the findings from the 4-year Phase 1 of the Users TCP [Hard-to-Reach Energy Users](#) (“HTR Task”), focused on hard-to-reach (HTR) energy user engagement. The overall purpose of this global collaboration was to better define HTR and related terminology, collect and synthesise learnings on effective approaches for engaging vulnerable audiences, and to test these approaches in the field. The behavioural social science model applied throughout this Task was the “Building Blocks of Behaviour Change”, which summarises steps to follow for improved engagement as Audience, Behaviours, Content, Delivery, and Evaluation (Karlin et al, 2021; detailed further below). This Executive Summary highlights the work completed, the overarching learnings, and the approach taken throughout.

Work Completed

During Phase 1 of the HTR Task, participating country experts and the Task Leader:

- Fielded a Qualtrics survey with 120 responses from HTR practitioners and researchers in over 20 countries, including 39 CEE member organisation responses.
- Conducted [in-depth interviews](#) with almost 50 practitioners on better engaging underserved energy users in Sweden, the U.S./CAN, UK, and NZ.
- Developed 19 case studies from 8 countries (U.S., Canada, Sweden, New Zealand, Portugal, Italy, the Netherlands, and the United Kingdom). Analysed the extent to which these case study examples adhered to best behavioural social science programme and evaluation practices through a [cross-country comparative analysis](#).
- Held three international workshops to share international learnings, including in the U.S. in 2019, France (for Sweden) in 2022, and Aotearoa New Zealand in 2023.
- Established an informal network of practitioners, policy-makers, and researchers aiming to better address energy hardship and vulnerability across the globe.
- Published two scientific publications, one book, eleven conference papers, and twenty technical reports and white papers, all linked to in [the Appendix](#).
- Presented at 4 webinars, developed two training programmes, and were invited onto 5 government expert groups and conference steering committees.

What We Learned

Summary main findings from this collaboration to date include:

- **Co-design of programmes and interventions is a key best practice.** Ideally, trusted community actors should be trained to deliver the programmes as well.
- **Fostering trust is a worthwhile investment of upfront time and resources.** Building trusted relationships with multiple stakeholders is crucial, particularly those community and frontline providers directly serving the target audience.
- **Identifying and training trusted intermediaries benefits programmes.** These “middle actors” are already present and trusted in the community and are more likely to be able to deliver in-home advice and interventions.



- **Programmes benefit from a single liaison for stakeholder engagement.** This direct contact can streamline efforts, foster trust, and ensure the time and resources are available to devote to establishing and building community partnerships.
- **Psychographic data is an important complement to demographic data.** With the recognition that challenges in the acquisition of data remain, there is high value in collecting psychographic data to inform programme design whenever possible.
- **Cost-effectiveness hurdles can be mitigated by starting with a subset of the target audience.** For example, in the U.S. it can be cost prohibitive to engage manufactured homes residents in energy efficiency in some jurisdictions, but manufactured homes parks can be a cost-effective starting point.
- **Strength-based approaches can be highly beneficial when engaging Indigenous communities** by identifying, recognising, and reinforcing existing skills, interests, and capacity within those communities to engage in conservation and energy management practices.
- **Scaling up necessitates confirming messages will resonate with new audiences.** The cross-country analysis also identified the necessity of pre-testing messaging content, even when proposed messages have worked well with other audiences. It is valuable to have materials verified by a focus group of individuals of the target audience wherever possible.
- **Targeting messaging through communication channels that the target audience already utilises is efficient and effective.** This necessitates formative research to understand which channels are widely used by the target audience.
- Language barriers may seem easier to rectify than other barriers, but **language barriers are often enmeshed with cultural barriers.** Cultural competence of staff is just as important – if not more so – than linguistic competence.
- **Pilots that do not have specific energy savings targets themselves (e.g. because they focus on wellbeing),** but allow for extensive exploration of the approaches that may be likely to spur future energy savings, can still benefit energy efficiency targets down the road.
- **Programme (co)designers should be representative of the audience for whom they are designing programmes,** so as to avoid making inaccurate cultural assumptions that could undermine programme effectiveness.
- **Beware overreliance on a single member of an Indigenous community as a go-between.** In some Indigenous communities, conversations with energy programme designers may be viewed as “engaging with the enemy”; asking community members to put their credibility on the line to be your messenger is a tall ask. Ideally, strive to build trust with the given tribal nation, and especially its elders, more broadly.
- **Evaluation merits additional attention.** The findings of our cross-country analysis of 19 case studies across 8 countries revealed that interventions performed well with respect to the *Audience*, *Behavior*, and *Delivery* building blocks, but showed room for improvement in the *Content* and *Evaluate* blocks. While 84% of programmes from the cross-country analysis defined a specific behaviour intended to change, only 10% evaluated whether behaviour change had occurred.



Approach

These learnings were gleaned by following the “Building Blocks of Behaviour Change” with the phases of Discover, Define, Design, and Deploy. The framework also includes the “ABCDE” Building Blocks referenced throughout this report; they include descriptions of the intended Audiences and target Behaviours to be performed by participants, Content and Delivery of engagement strategies and messaging, and Evaluation. This Task followed the steps in the Building Blocks of Behaviour Change as follows:

Discover and Define. An extensive [literature review](#) and engagement with stakeholders revealed that an estimated two thirds to three quarters of energy users are HTR, for many reasons. In the residential sector, the most common assumption of HTR energy users is that they are low-income. However, this leaves out many populations, including high-income (and correspondingly high-consuming), the “squeezed middle” (medium to high-income but with no assets), and marginalised and vulnerable energy users. Among these different groups are further sub-segments. The more these intersect, the more “hidden” these energy users become, increasing their chances of falling into deeper hardship. In the non-residential sector, Small & Medium Businesses (SMBs) and the Municipalities, Universities, Schools & Hospitals (MUSH) segment remain largely underserved. These HTR sectors combined are consuming the largest amounts of energy globally, and are also predominantly (except for the high-income and MUSH segments) renters, adding an additional layer of complexity.

Design. A cross-country case study analysis was conducted through the lens of our research framework by evaluating (ex-post) how each of the 19 cases followed the “ABCDE” Building Blocks. The most successful way to engage HTR energy users is to build trusting relationships with community providers to identify, recruit, and engage these audiences. Another key finding is the importance of pretesting message content for intended audiences, which can be used in tandem with collecting and leveraging psychographic data on intended participants to more effectively tailor programme design to underserved populations. Finally, this analysis illustrated the need to consistently incorporate and follow through on measurement and evaluation. While 84% of included programmes defined a specific behaviour intended to change, only 10% evaluated whether behaviour change had occurred.

Deploy. Current methods and approaches to engaging HTR energy users are still inadequate in both their economic feasibility and cultural appropriateness. In Subtask 4, the Building Blocks research process was used when designing, implementing and evaluating programmes and strategies to better engage these audiences. These efforts ranged from a behaviour change training (BEST) course for commercial energy managers and building operators, to focus groups with Municipality, University, Schools & Hospitals (MUSH) energy managers, to improving on a Home Energy Assessment Toolkit (HEAT kit) to better engage vulnerable households. Following the “Building Blocks of Behaviour Change” framework by sub-segmenting audiences, clearly identifying target behaviours, and designing tailored engagement strategies to reach different HTR audiences, ensuring evaluation and re-iteration as needed along the way, proved to be a highly-successful strategy in the field.



Introduction

Purpose

The Users TCP Task on [Hard-to-Reach Energy Users](#) (“HTR Task”) aims to “*identify, define, and prioritise 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.*” Phase 1 of this Task was designed to achieve this goal by addressing five research questions and objectives through four Subtasks.

The first objective was to build on the work of its predecessor, [Task 24: Behaviour Change in DSM – Phase I](#) and [Phase II](#), which was a research collaboration of around 400 behaviour change experts from over 20 countries aimed at demonstrating how to successfully take behaviour change interventions from theory into practice. **Subtask 1** entailed accessing and engaging with this broad international HTR expert network, and dissemination included international expert workshops, two peer-reviewed scientific papers, and an eBook, among other conferences and publications.

The second objective was to explore different definitions and characterisations of HTR energy users globally. After completing an extensive literature review of over 1000 publications and engaging with experts through surveys and interviews, HTR energy users in residential and non-residential sectors were identified, described, and characterised in **Subtask 2**. One key finding is that customers become harder-to-reach as they endure more compounding and intersecting vulnerabilities.

The third and fourth objectives were to estimate the audience size of HTR users and gather insights on interventions and methods with the highest potential to engage these audiences. These were addressed in **Subtask 2** with the case study analyses and development of a cross-country case study comparison. Findings from this analysis suggest that this group is extremely large, encompassing at least two thirds of all energy users. One important strategy for engaging these groups is to build trusted relationships with Middle Actors and use their help to identify and engage vulnerable HTR energy users.

The fifth and final objective was to design and test field research pilots for HTR energy users grounded in a robust social science process. In **Subtask 3**, the Building Blocks of Behaviour Change, co-developed with See Change Institute in Task 24, were tested and used to discover, define, design and deploy better interventions targeted at HTR energy users.

Subtask 4 entailed identifying and undertaking several field research pilots in New Zealand, the U.S. and Canada in order to apply these theoretical learnings in the field (e.g. Rotmann & Karlin, 2021; Uplight, 2021 & 2022; Rotmann & Cheetham, 2023).



Background

The 3-year [Hard-to-Reach Energy Users](#) (HTR) Task was signed off by the Executive Committee (“ExCo”) of the [User-Centred Energy Systems Technology Collaboration Programme](#) (“Users TCP”) by the International Energy Agency in April 2019 and commenced June 1, 2019. A 4th year extension was granted in April 2022. The detailed work plan can be found [here](#).

This international research collaboration has three financially-participating countries—the United States (U.S.), Sweden (SWE), and Aotearoa New Zealand (NZ)—and received significant in-kind support from Canada (CAN), the United Kingdom (UK), the Netherlands (NL), Italy (IT), and Portugal (PO). The Task has two **Project Partners** (PP), the University of Sheffield Hallam (UK) and the See Change Institute (SCI; U.S.), and a **Chief Science Advisor** (Prof. Aimee Ambrose, UK), and **U.S. Advisor** (Dr Beth Karlin). **National Experts** (NEs) in the financially-participating countries were Kira Ashby (CEE, U.S. and CAN), Prof. Luis Mundaca (Lund University, SWE), and Drs. Kim O’Sullivan (Otago University, NZ) and Sea Rotmann (SEA - Sustainable Energy Advice Ltd, NZ).

U.S. participation in the HTR Task has been supported by the following organisations over the course of Phase 1:

Avangrid	Energy Trust of Oregon	SoCalGas
BC Hydro	FortisBC	Southern Connecticut Gas
Cape Light Compact	Hawaii Energy	Southwest Gas
Commonwealth Edison (ComEd)	National Grid	Tampa Electric
Connecticut Natural Gas	Natural Resources Canada (NRCAN)	Tennessee Valley Authority
DC SEU	New Jersey Natural Gas	United Illuminating
DTE Energy	Silicon Valley Power	US Department of Energy
Efficiency Vermont	Snohomish PUD (SnoPUD)	

Phase 1 of the HTR Task is coming to an end, with this report being the final deliverable. [Phase 2 - Addressing Energy Injustice](#) has been signed off by the ExCo in May 2023, and is commencing November 1, with the same three countries financially-participating. This report summarises the Task’s main highlights and deliverables, with a particular focus on the United States, as per the Scope of Work signed between SCI and CEE ([see Appendix for further detail](#)).



U.S. Involvement in HTR Task

National Expert: Consortium for Energy Efficiency

The Consortium for Energy Efficiency (CEE) collaborated with the U.S. Department of Energy (DOE) to serve as the U.S representative for Phase 1 of the HTR Task. CEE is the binational non-profit consortium of energy efficiency (EE) programme administrators. Its members include electric, natural gas, and dual-fuel companies, who collectively direct nearly 80 percent of the \$9.3 billion USD spent on energy efficiency annually in the U.S. and \$950 million CAD spent annually in Canada (CEE, 2020). National Expert Kira Ashby published a case study analysis including two examples each of U.S. and Canadian energy efficiency programmes aiming to better engage underserved audiences (Ashby, 2021).

The collected findings and synthesis of U.S. and Canada-specific insights and recommendations can be found at the end of this report. Overall findings include the importance of implementing procedural equity by ensuring that the right people are at the table throughout the design and deployment processes. For instance, programmes have benefited from co-designers being representative of the target audience, so as to avoid making inaccurate cultural assumptions that could undermine programme effectiveness. Similarly, HTR efforts often benefit from training members of the target community to deliver the programme rather than having utility staff do so. In the case of Indigenous communities, it can be particularly important to not overly rely on an ambassador from a given First Nation who may be seen as “engaging with the enemy” by serving as the go-between with the energy provider. Additional learnings around messaging and language include that targeting messaging to the channels through which target audiences typically use is an effective way of reaching these groups. Reframing terms and standards to better represent a community’s needs can also be helpful. Lastly, another key finding is that programmes that do not require specific energy savings, but rather allow for an exploration of approaches (e.g. improving health and wellbeing), can still benefit EE and decarbonization targets down the road.

Task Methodology

In an earlier iteration of this Task, the “The Building Blocks of Behavior Change” was co-designed with Project Partner SCI and applied in a variety of ways (Fig 1; for more detail see Subtask 3). The Subtask (ST) deliverables matched, albeit not entirely (e.g. the *Discover Phase* also incorporated parts of the *Define Phase* via HTR Audience Characterisation from both, stakeholder and literature assessment), this framework as follows:

- ST1 - Expert network & dissemination** △ Discover Phase (Stakeholder Analysis)
- ST2 - Literature Review & Case Studies** △ Discover Phase (Literature Assessment)
 - △ Define Phase (Target Audiences & Behaviours)
 - △ Design Phase (Content & Delivery Strategies)
- ST3 - Research Methodology** △ Design Phase (Behavioral Science Methods)
- ST4 - Field Research Pilots** △ Deploy Phase (Pilot & Evaluation)



Chronologically, we approximately followed the Building Blocks framework as such:

Year 1 - Discover Phase (survey, interviews, literature review, pilot)

Year 2 - Define and Design Phases (case studies, interviews, lit review, methodology report)

Year 3 - Design and Deploy Phases (case study analyses, pilots)

Year 4 - Deploy Phase (cross-country case study comparison, pilots and evaluation)

The research framework follows *Design Thinking* but incorporates robust social science methodologies, and both quantitative and qualitative data collection and analysis.

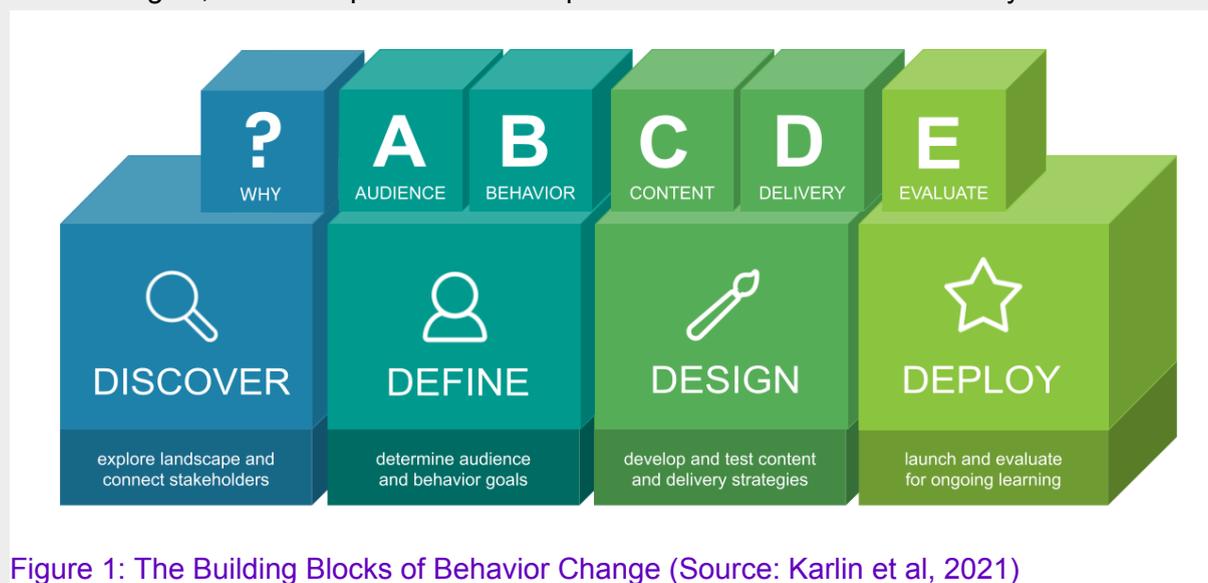


Figure 1: The Building Blocks of Behavior Change (Source: Karlin et al, 2021)

Subtask 1 - Expert network & dissemination

HTR expert network

The HTR expert network spans a global number of experts in fuel and energy poverty¹, the Small-to-Medium Business (SMB) and commercial sector (especially Municipalities, Schools, Hospitals and Universities [MUSH]), and behavioural science. While it is not a formal network, it occasionally liaises and disseminates with some including the [Fuel Poverty Research Network](#) and the EU's Solutions to Tackle Energy Poverty [STEP Project](#), EU [Energy Poverty Advisory Hub](#) (EPAH), as well as global conferences on energy efficiency and behaviour change, such as [Behavior, Energy & Climate Change](#) (BECC), [BEHAVE](#), and the [European Council for Energy-Efficient Economies](#) (ecee) Summer Study.

¹ See our literature review (Rotmann et al, 2020) for a detailed critique and glossary of different terms. The United States does not have a federal definition for energy poverty, as highlighted by Bednar & Reames (2020). In the U.S. and Canada, low-income definitions are typically based on the federal poverty threshold (e.g. anyone is considered low income if their earnings are at or below 200 – 225% of the federal poverty threshold) or the median state income (<60 – 80%). In instances of geographically-concentrated poverty, low-income definitions are sometimes based on zip code and neighbourhood metrics.



In the U.S., the expert network encompasses members of CEE (particularly the 16 utilities from the U.S. and Canada currently co-funding this Task), as well as the extensive network of experts of one of the Project Partners, SCI. The U.S. Department of Energy has been involved from the outset and has funded U.S. participation of Phase 2, beginning in 2023. Informally-participating experts have contributed in a variety of ways:

- In Year 1, at the Task kick-off workshop at the 2019 eceee Summer Study, a Qualtrics survey was distributed that received over 120 responses from practitioners and researchers in over 20 countries (including 39 CEE member organisation responses).
- The results of this survey, as well as [in-depth interviews](#) with almost 50 experts in Sweden, the U.S./CAN, UK, and NZ, led to two publications spearheaded by the U.S. NE (Ashby et al, 2020a & b).
- Participants from NL, IT, PO, UK also contributed to the Case Study Analyses (CSA), which encompassed 19 case studies from 8 countries, as well as the Cross-Country Case Study Comparison (CCCSC).
- In Years 3 & 4, another two Task workshops were held–The Swedish Energy Agency hosted a workshop at the eceee Summer Study in France in June 2022, which was attended by 33 participants from 9 countries. The Ministry of Business, Innovation, and Employment hosted a workshop in March 2023 in Wellington, New Zealand, was attended by 63 people from 6 countries.
- Participation has also been high at various Task workshops, conferences, seminars, and webinars. These are described in more detail below.

Dissemination

National Experts met quarterly throughout the Task, and monthly with the U.S. National Expert and U.S. Project Partner. International conferences and workshops included eceee Summer Studies, ExCo meetings, the BECC conference, BEHAVE conference, and HTR Task workshops, among others, such as the Users Academy webinar series. A large number of publications were authored, including (but not limited to) two scientific publications, one book, eleven conference papers, and twenty technical reports and white papers. For a detailed list of international conferences and workshops, published scientific papers & technical reports, and webinars & other dissemination, [see the Appendix](#).

ST2 - Literature review and case studies

Literature review

Following an intensive review of the literature, which was published as an eBook (Rotmann et al, 2020), it is estimated that the majority of households and businesses could be regarded as HTR energy users–particularly when following the Task’s broad definition of this audience group. This assertion is based on audience size estimates in participating countries from secondary research. It takes into account the large numbers of vulnerable, or

rather, *priority* populations (e.g. minorities, chronically-ill, single parents, elderly, geographically-remote), renters (commercial and residential), small and micro businesses, commercial energy managers and building operators outside of the office sector, and high-income segments. These audiences are critically underserved by tailored policies and programmes, and under-researched in the dominant technology-focused EE literature.

We have found strong evidence that this number has increased due to the COVID-19 pandemic (Rotmann et al, 2021), which caused extensive vulnerability, particularly for renters, and (often home-based) small and micro-businesses. These are the people that policy-makers, utility programme managers, and research experts often struggle to engage with for a variety of reasons. One of the biggest issues is the terminology itself, which seems to put the onus of engagement on those energy users, rather than the “Behavior Changers” tasked with engaging them. Another is a lack of understanding of the characteristics, barriers, and needs of these audiences, and their (lack of) energy and technology literacy.

Additionally, the characterization as “HTR” certainly goes beyond low-income households, which is what usually comes to mind when hearing the term. In fact, as we have learned, low-income communities may even be easier-to-reach in certain cases (Fig 2). As people become more vulnerable, the more “hidden” they are to policymakers, programme managers and researchers, increasing their chances of falling into deeper hardship (leading to marginalisation, stigmatisation, and criminalisation). Phase 2 will focus on these audiences.

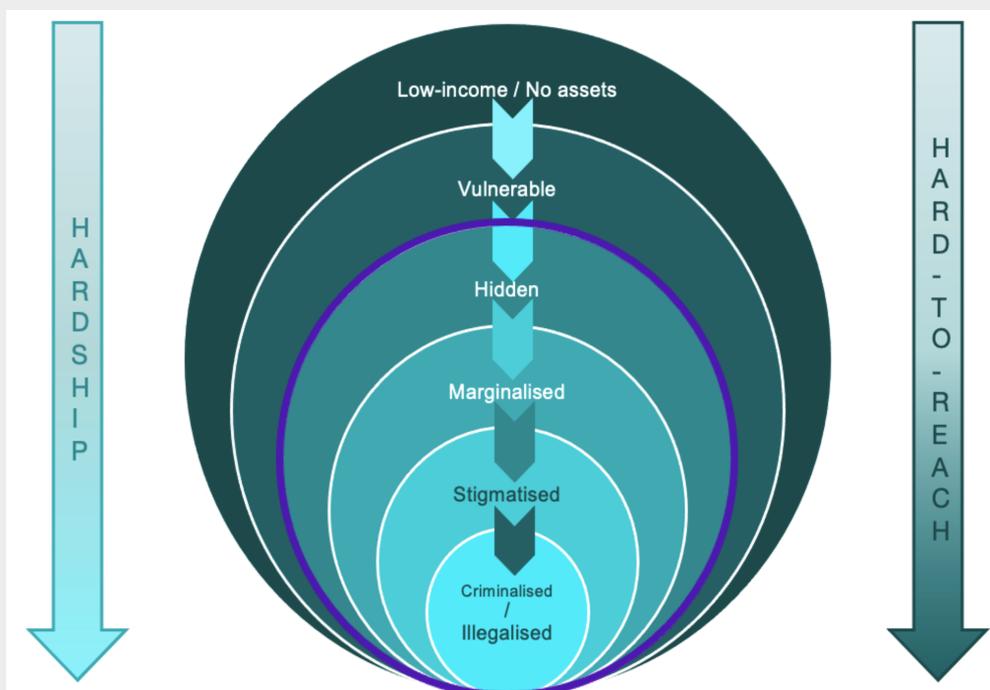


Figure 2: Diagram showing increasing levels of hardship and increasing levels of difficulty in reaching residential energy users. Purple circle outlines the “hidden” segments we will focus on next. (Source: HTR Task Phase 2 Work Plan)



Case study analyses and cross-country comparison

Year 2 focused on the engagement strategies and interventions used in a variety of countries, accomplished through case study analyses (CSAs). The methodology for *ex post* analysis was based on the “Building Blocks of Behaviour Change” framework (Karlin et al, 2021). Each of the 19 case studies from 8 countries (Aotearoa, Canada, Italy, the Netherlands, Portugal, Sweden, the UK and the U.S.) were analysed following the “ABCDE” building blocks—i.e. descriptions of target Audiences and Behaviours, Content and Delivery of engagement strategies and messaging, and Evaluation. It was then assessed how well each case study followed the four design thinking phases—Discover, Define, Design, Deploy—of the framework. Some components, such as clearly defining target audience and behaviour characteristics in the *Define Phase*, and pre-testing messaging content strategies in the *Design Phase*, were less well developed than others (Karlin et al, 2022).

The majority of case study authors regarded the Building Blocks framework as a useful framework for exploring ex-post behaviour change. Commentary from the case study authors showed the importance of placing focus on this initial goal-setting and co-creation process—in some programmes, this step was highlighted as being crucial to their development or success. The case studies also revealed **trust** as a critical success factor. Building close and trusted relationships with multiple stakeholders—particularly those community and frontline providers directly serving the target audience—has become a common and important insight from the reviewed HTR programmes to-date, as well as the field pilots undertaken in Subtask 4. This is significant as building trust is critically missing in many EE programmes, as it can be logistically and financially difficult to devote the upfront time and financial resources necessary to do this process justice.

These case studies have been synthesised into a peer-reviewed *Cross-Country Case Study Assessment* (Mundaca et al, 2023), which shows similar findings (see Table 1). From a methodological perspective, this study explored and tested the usefulness of applying the Building Blocks framework in assessing the extent to which interventions employ design and implementation practices that drive behaviour change. The findings revealed that case studies performed well with respect to the *Audience*, *Behavior*, and *Delivery* building blocks, but showed room for improvement in the *Content* and *Evaluate* blocks. Assessing the Building Blocks framework revealed promising results in terms of credibility, confirmability, transferability, and reliability; however, limitations and uncertainties were also present.

Overall learnings from the case studies and cross-country case study analysis include:

- The importance of fostering trust from the outset of a programme
- The value of collecting psychographic data to inform programme design
- The key role of pre-testing messaging content, even when proposed messages have worked well with other similar audiences
- The need to consistently incorporate (and follow through on) measurement and evaluation; 84% of included programmes defined a specific behaviour intended to change, only 10% evaluated whether behaviour change had occurred.



involve helping people with their energy bills by encouraging them to take certain low- or no-cost energy-conserving measures.

- The cost-effectiveness hurdles often associated with expensive high-touch approaches can be addressed by **starting with a subset of the target audience**. For example, one U.S. case study explored how Puget Sound Energy focused only on manufactured home customers in manufactured home parks to maintain a consistent, face-to-face outreach strategy, as opposed to aiming to engage all manufactured homes residents throughout their service territory.

Barriers:

- More research into better **understanding the target audience's barriers** to engagement (e.g. a 'split incentive' problem with landlords and renters - although the barriers to engagement are different for both audience segments) can better inform which behavioural interventions are best to use.
- Some households may have **intersecting vulnerabilities**. For example, older homeowners in Aotearoa are often dependent on government pensions for daily living expenses and therefore have less to spend on housing modifications and repairs. These intersecting vulnerabilities (i.e. age, medical needs, rental status) may make them harder to reach.

Design:

- A '**values-based**' programme design approach can be beneficial. The focus is not on changing individuals' values, but instead tailoring what appropriate responses to climate change may be for those individuals' sets of values (i.e. shift away from individual actions and capabilities towards understanding the motivations behind the target audience's behaviours).
- **Strength-based approaches** have proven highly beneficial when engaging Indigenous communities by identifying, recognising, and reinforcing existing skills, interests, and capacity within those communities to engage in conservation and energy management practices.
- Case studies conducted in the UK demonstrated the significance of having a **single point of contact** in the programme. A liaison can act as a trusted direct contact for HTR groups, and having a single agency to, for example, oversee the delivery of a programme can help coordinate efforts from several organisations involved in delivery around shared goals and objectives.

Messaging and Resources:

- Using a suite of **publicly-available resources** that include insights from programme evaluations and that draw from extensive experience from EE projects has proven useful.
 - It is beneficial to craft programme content from professional or practical sector expertise on which engagement strategies have the greatest success and how to best optimise content, rather than using behavioural science or theoretical insights.
 - Resources that can be **shared electronically or printed** are highly valuable. Printed resources can be taken away and used after training or advice sessions.



- The content of resources is incredibly important. It is valuable to have **resources verified by a focus group of individuals** of the target audience and to have **appropriate language imagery**. This is especially critical when engaging target audiences with learning disabilities.
- Targeting communications and messaging through **communication channels that the target audience already pursues** and utilises is efficient and effective. This necessitates understanding which channels are widely used by the target audience and which are not.

Delivery and Trusted Middle Actors:

- **'Middle Actors' or 'navigators'** (as they told us they prefer to be called) who are already present and trusted in the target community can provide more tailored in-home delivery of advice and interventions, and can promote or widen the referral pathways into greater support for the project. On the other hand, they can prove to be powerful gatekeepers restricting access to community members if they distrust our intentions. A UK case study on the 'Glusad Còmhla' (Moving Together) project noted the success of community events and the introduction of a self-referral mechanism (alongside other referral mechanisms) for increased engagement.
- **Dedicated training** is crucial for the navigators to conduct in-home assessments and tailor support with understanding of underlying engagement barriers in the target community.
- Involving a **strong partnership of already-established networks** and associations in the target community since the beginning of the project has proven highly beneficial and successful in the *ASSIST2gether* project in Italy, involving private sector knowledge and capacity building companies and public institutional actors.
- Establishing **clear, standardised processes** for referral and assessment can prove to be beneficial in reaching the priority audience, especially when there is a barrier of mistrust.

Evaluation:

- **Informal evaluation activity** can be useful as long as it is adequately measured. For example, evidence of use and impact from workshops for SMEs was found via a LinkedIn community created for those workshop participants in a programme in the UK.
- While expensive to adhere to, **programmes should have evaluation activity built in from the beginning and throughout the duration of the project**. This can help shape the critical stages of programme design and delivery through **iterative, data-driven processes**. This evaluation activity can be beneficial in instances where there is a lack of programme funding, as funding can be spent on supporting and reaching more HTR households and businesses.
- However, there is a need for an **in-depth, longitudinal evaluation**, as well as **more diverse evaluation methods** (i.e. not just surveys or interviews but also the use of gamification and craft-based approaches, especially for those with mental health issues and limited- or non-English speakers).



ST3 - Standardised & validated research process

The third Subtask entailed testing the usefulness of the standard research framework co-developed with the See Change Institute, which is based on Design Thinking and combined with robust social science methodology. For details on the theoretical and disciplinary background as outlined in Mundaca et al. (2023), [see the Appendix](#). The four main phases are described below (see also Figure 1).

Discover. During the first phase of programme development, key stakeholders are identified and engaged, and (shared) programme goals are refined via co-creation. This work underpins the collective “Why” a programme is undertaken. An initial landscape analysis can help put the proposed programme or policy in the wider context of similar endeavours. Alongside this exploratory analysis, stakeholder mapping can be used to identify key groups to connect with, inform the most appropriate relationships to develop, and determine effective channels for communication. Stakeholder engagement activities, in the context of the wider landscape analysis, help to define and refine the overarching goal of the programme, which is a critical stage-gate for moving into the *Define Phase*.

HTR Task deliverables that informed this phase:

- 2019 Expert survey (n=120)
- 2019 Expert interviews (n=50)
- HTR Characterisation report and ACEEE paper (2020)
- 2020 Literature Review

Define. The goal of this phase is to define the target Audience and Behaviours for the programme. It is composed of energy user research where the objective is to assess the opinions and thoughts of potential target audiences in an inductive fashion. Gaining insights directly from one’s target audience can guide programme planners in selecting strategies or messages that tap into people’s motivations and help overcome barriers to action. Moving beyond assumptions about how people behave requires collecting information about the target audience. This phase serves to generate hypotheses and inform methods to test them in the subsequent *Design Phase*.

HTR Task deliverables that informed this phase:

- 2019 Expert interviews (n=50)
- 2020 Literature Review

Design. In this phase, the programme is designed to meet the goals defined in the *Discover Phase* and strategies are selected based on insights derived in the *Define Phase*. A key aspect of the *Design Phase* also includes the iterative testing and refining of intervention content and delivery strategies. Qualitative usability (UX) testing can be used to gain insights into the subjective experience of a programme, and quantitative experimental (AB) testing can be undertaken to compare versions of a programme (or programme element) to identify



whether changing a single variable leads to meaningful changes in outcomes. Through this iterative design and testing process, programme components can be developed and refined using a data-driven process, coupling behavioural theory with real-world insights.

Regardless of the type of programme, this testing process can help identify pitfalls and shortcomings in an initial research plan.

HTR Task deliverables that informed this phase:

- 2021 Case Study Analyses (19 case studies from 8 countries, including interviews)
- 2022 Process matters methodology review
- 2023 Cross-Country Case Study Assessment

Deploy. The final phase involves deployment and evaluation of the programme to facilitate ongoing learning and optimisation. Successfully defining, designing and deploying a programme involves considering these processes in parallel: To deliver an evaluable programme, it is important to establish measurable key performance indicators (KPIs) at the outset that align with programme objectives and have consensus among stakeholders about how they will be measured. The best evaluations are an integral part of the programme design, and can provide timely feedback to understand not only the overall impact, but how it can be improved over time. This process is both multi-disciplinary and iterative. While the benefits of individual elements are recognised by researchers and practitioners alike, they are often used in isolation rather than as part of a holistic, programmatic, systematic approach. Thus, its unique strength lies in how various methods can work together and inform one another. Evaluation results from the *Deploy Phase* can inform ideas for programme optimisation. For example, findings might show that certain materials were more successful for engaging one group than another, at which point one can go back to the literature (Discover), talk to more users (Define) for clues on relevant group differences, and/or redesign and test new materials with these insights in mind (Design).

HTR Task deliverables that informed this phase:

- Several field research pilots in Aotearoa, U.S. and Canada (see below).

ST4 - Field research pilots

A significant amount of field research co-funded by government, industry (retailers, generators and distributors) and software companies servicing utilities in Aotearoa, Canada and the U.S was completed for the fourth Subtask. This field research and piloting follows the Building Blocks research process when designing, implementing and evaluating targeted engagement strategies and programmes aimed at clearly-identified and characterised segments of target audiences. The different audiences that were engaged in qualitative field research (interviews, focus groups, surveys, multi-stakeholder workshops, and/or in-home interventions) are as follows:



- **Commercial energy managers and building operators.** We designed and piloted a behaviour change training course for them, called the “BEST course,” see [Rotmann & Karlin, 2020](#).
 - *Countries:* U.S. / Canada
 - *Co-funded by:* IESO (independent systems operator of Ontario), LBNL
 - *Partnered with:* See Change Institute (SCI)
 - *Timing:* Finished at the end of 2020, although the materials continue to be disseminated, e.g. via the BECC Conference and Lawrence Berkeley National Labs (in their [ISO50001 Ready Navigator](#) training for U.S. government employees)
 - *Presented at:* ACEEE Summer Study 2020, BECC conference 2019, ongoing U.S. government agency training.
- **Commercial energy managers in the MUSH (Municipalities, Universities, Schools & Hospital) Sector.** We undertook focus groups with 40 of them in Canada and the U.S., asking specifically about their experience with utilities (Rotmann et al, 2021; [Uplight, 2021](#)).
 - *Countries:* U.S. / Canada
 - *Co-funded by:* Uplight (major software company servicing utilities)
 - *Partnered with:* SCI
 - *Timing:* Finished 2021.
 - *Presented at:* 2021 BECC conference, industry conferences (with Uplight).
- **Small to medium businesses (SMBs).** This research, focusing on their experience with utility rate offerings, was developed in two Phases: Phase 1 did 20 in-depth interviews with SMB owners around the U.S. (Rotmann et al, 2022; [Uplight, 2022](#)); Phase 2 co-designed and end user-tested rates offers and explainers.
 - *Countries:* U.S. / Canada
 - *Co-funded by:* Uplight
 - *Partnered with:* SCI
 - *Timing:* Finished December 2022
 - *Presented at:* Industry conferences (with Uplight), 2023 BECC conference.
- **High and Low-Engagement / High and Low-Income Households.** SCI undertook a nationwide survey (see [Uplight, 2021](#)), which was then complemented with focus groups co-led by the Task Leader.
 - *Countries:* U.S.
 - *Co-funded by:* Uplight
 - *Partnered with:* SCI
 - *Timing:* Finished 2021.
- **Vulnerable Energy Users** (low-income with at least 3 compounding or intersecting vulnerabilities e.g. related to age, minority status, geographic remoteness or tenancy). We improved on a [Home Energy Assessment Toolkit](#) (HEAT kit) intervention, which has been successfully field-tested with 45 households in the Wellington Region by partnering with various community and frontline organisations.
 - *Countries:* Aotearoa NZ (Wellington, Ontario municipality followed, Ireland is next)



- *Co-funded by:* SEEC Fund by MBIE (NZ government funded via the [Support for Energy Education in Communities](#) Programme)
- *Partnered with:* SEA - Sustainable Energy Advice Ltd
- *Timing:* Finished May 2023, but a cross-NZ multi-stakeholder consortium has applied for 3 years of funding to scale up and roll-out the HEAT kits nation-wide and to specific target audiences. This will form part of the field research in Phase 2.
- *Presented at:* eceee Summer Study 2022, BEHAVE 2023, 3rd HTR Task Hui 2023, ExCo meeting Halifax 2023, Energy Hardship conference 2023, Energy Advisors Meeting 2023, Energy Authority and Vector Energy seminars 2023.
- **“Hidden” Energy Users.** Following the Building Blocks research framework we focused on the *Discover, Define & Design* phases via three multi-stakeholder workshops, as well as community provider surveys (n=39), frontline customer care staff (n=15) interviews, and empathy interviews with vulnerable customers (n=15).
 - *Countries:* Aotearoa NZ
 - *Co-funded by:* Mercury and Genesis Energy (two largest NZ gentailers)
 - *Partnered with:* SEA - Sustainable Energy Advice Ltd and Beacon Pathway
 - *Timing:* February 2024
 - *Presented at:* Downstream 2023, Energy Hardship Conference, 3rd HTR Task Hui, Energy Authority and Vector Energy seminars 2023, ExCo meeting Halifax 2023, Users Academy and EnAct webinars 2023.

Insights, recommendations & policy implications

General challenges and insights

The extensive 4-year examination of HTR energy users in the commercial and residential sectors has yielded the following **main challenges and insights**:

- Energy users who can be regarded as HTR by those trying to engage them are **much more common** than we initially hypothesised - at least two thirds and maybe three quarters of global energy users fall into this category, according to our estimates².
- These energy users are HTR for **myriad different reasons**, and have very different barriers, needs and motivations, thus increasing the complexity of designing broad-scale or national engagement strategies.
- Our **current methods and approaches** to engaging those HTR energy users are still inadequate in both their economic feasibility and social / cultural appropriateness.
- Accordingly, **we need to do better to sub-segment audiences**, clearly identify target behaviours, and design tailored engagement strategies to reach different HTR audiences, ensuring that we evaluate and re-iterate, as needed (i.e. follow our *Building Blocks of Behaviour Change Framework*).

² Based on our [broad definition](#) of HTR Energy Users



- In the **residential sector**, the most common assumption of HTR energy users is that they are *low-income households*. However, focusing solely on low income energy users leaves out many members of vulnerable populations; it can be helpful to also differentiate:
 - *High-income and high-consuming* energy users
 - The “*squeezed middle*” (medium to high-income households, who have no property assets), and
 - *Marginalised and vulnerable* energy users (often low-income but with compounding and intersecting vulnerabilities)
- Among these different groups, which are all HTR for different reasons, are **further sub-segments** (e.g. between *marginalised / forgotten; stigmatised / ostracised; and criminalised / illegalised* vulnerable groups), which commonly intersect.
- **Distinct engagement strategies** are necessary when looking at high-income (e.g. via other trusted Middle Actors, such as realtors, property associations, business developers, insurers, banks, investors, and luxury goods salespeople) households, or early technology adopters (e.g. smart or renewable technology).
- Even more complex are those non-asset-owning households in the “**squeezed middle**,” who are now in danger of becoming the “working poor.” They and their plight need to be researched in order to be included in programmes that currently exclude them (e.g. due to income eligibility criteria, or because they fear the stigma of struggling with their bills and thus engage in unhealthy energy-saving or financial behaviours).
- In the **non-residential sector**, the only energy users who are well-researched and understood are those working in office buildings and settings (Chester et al, 2020). North American utilities, for example, largely focus their energy efficiency programmes on residential and large commercial & industrial (C&I) customer segments, which means that the 99% of Small & Medium Businesses (SMBs) are largely underserved and urgently need more attention (see e.g. work for Uplight in 2022-2023).
- Another underserved and under-researched non-residential sector is the largely-public, and extremely-complex and diverse **Municipalities, Universities, Schools & Hospitals (MUSH)** segment (See our Uplight work in 2021). Our pilot Behaviour, Energy & Sustainability Training (BEST) course showed how high the appetite was for behaviour change training among energy managers and building operators from this sector (Rotmann & Karlin, 2020). Aspects of it are still being taught to public servants across U.S. departments, and we continue to collaborate with some of the participants in the 2019 workshop (e.g. on HEAT kits).
- These HTR sectors combined are **consuming (by far) the largest amounts of energy globally**, and are also predominantly (except for the high-income and MUSH segments) **renters**, adding an additional layer of complexity. More research needs to be done on how to better engage both tenants and landlords, in both the residential and commercial sectors.
- One important aspect for all these sectors is providing **targeted knowledge and tailored energy and behaviour training** (such as our BEST course for commercial



energy managers and building operators, or the [Healthy Homes: Making Energy Work for Whānau](#) training we offered for frontline collaborators in Aotearoa).

- Many of these barriers stem from **historic and systemic injustices arising from the Eurocentric worldview** on which our energy, academic and governance systems are built (see McIntosh, 1989; Rotmann et al, 2020; Walker, 2022, Sovacool et al, 2023). It is impossible to achieve the “fair, orderly and equitable energy transition away from fossil fuels” recently decided at COP28, without first addressing these interwoven structural inequities. That means delving into the complex and highly-sensitive topic of “decolonisation,” or better, “**re-indigenisation**,” in a way that is practical and applicable in the field and actually addresses and mitigates energy injustice. We will focus in Phase 2 on how to incorporate traditional ecological knowledge, methods and approaches, especially when reaching out to, and engaging with Indigenous and other minority communities.

Programme Recommendations

Based on our findings, we present below a set of recommendations for programmes and programme managers that wish to practically integrate behavioural science methods into their programme design while also meeting real-life budget, competency and timeline constraints:

- **The single-most successful way of engaging the most vulnerable and HTR energy users is using trusted community and frontline providers to help identify, recruit and engage them.** However, many of these providers are not energy, behaviour, and/or healthy housing specialists; they are extremely under-resourced and often operate in silos; and most are also very HTR—unless trusted relationships have already been established and nurtured.
- **Co-design of programmes and interventions with those trusted community actors (and, preferably, end user representatives) is highly-recommended.** Ideally, trusted community actors should be **trained to deliver** the programmes as well, as they are much better-positioned within their communities than “outsiders”.
- All of this work should not be expected to be free or voluntary, it is imperative to **acknowledge and respect their expertise, community status, and time** adequately (including financially).
- **Defining target audiences is imperative**—as much as a review of similar programmes is helpful, actual audience research (e.g. via pre-programme surveys, interviews or focus groups) is highly recommended. It is important to collect **psychographic data** on intended programme participants to more effectively tailor programme design and home in on the more relevant communication channels (**medium**), **messengers**, and **timings** for a given audience.
- The role of pre-testing message content with underserved audiences is often taken for granted, and messages that have been previously tested in other contexts or are otherwise assumed to be effective are often not vetted with the specific intended audience. **Earlier testing can facilitate more nimble design improvements.**



“Failing fast and early” is a useful motto, and field pilots are useful mechanisms to ensure successful scale-up and roll-out of programmemes.

- Input from middle actors is also highly-recommended when **defining target behaviours**. Focusing solely on energy efficiency (kWh savings) or financial savings can cause perverse outcomes in highly-vulnerable audiences (e.g. they often already conserve as much energy as possible, and may under-heat their homes at detriment to their health). **Health and comfort improvements in particular are useful co-benefits** to target messaging with those audience groups. Also beware of any unintended consequences, including non-energy costs (e.g. time, inconvenience).
- Finally, there is much to be learned from these real-life examples and how we can apply (some) behavioural methods to improve programmes, without losing sight of what matters most: **helping hard-to-reach and underserved energy users to get much-needed support and empowering them on their energy journeys**.

U.S. / Canada-specific insights & recommendations

- HTR efforts benefit from **training members of the target community** to deliver the programme rather than having programme delivery accomplished by utility staff.
 - BC Hydro successfully accomplished this with its pilot in Indigenous communities, and also with its programme with newcomers (immigrants) to Canada.
 - Consider how third-party evaluation can be practically accomplished ideally without re-introducing “outsiders” (it may be practically more difficult to train community members in evaluation than in programme delivery).
- Language barriers may seem easier to rectify than other barriers, but **language barriers are often enmeshed with cultural barriers**.
 - CEE members report that removing language barriers alone (via translating materials and/or providing a phone option in a target audience’s primary language) often did not lead to changes in programme uptake to the extent anticipated, if at all.
 - Cultural competence of staff is just as important – if not more so – than linguistic competence. We will further explore this in the field with Californian CCAs in Phase 2.
- **Cost-effectiveness hurdles** with HTR audiences aren’t always insurmountable if a subset of the intended target audience is used as a starting point.
 - Puget Sound Energy found that manufactured homes residents overlap a great deal with LI, non-native English speakers, and renters; PSE found it practically only cost-effective to aim to engage this audience when they are in manufactured homes parks, as opposed to distributed throughout a community.
- **Targeting communications and messaging to the channels through which target audiences already seek information** can be both efficient and effective.

- FortisBC uncovered which of their customers regularly use or are responsive to which channels (e.g. radio vs. print media vs. billboards), allowing them to disseminate specific messages to targeted HTR audiences
- BC Hydro found that, in many Indigenous communities, postal mail arrives at a community centre and may be picked up as infrequently as every few months; thus, snail mail is not an appropriate programme delivery channel in this context.
- BC Hydro also found that many members of Indigenous communities get their information from community events, a model BC Hydro was able to mimic with events as part of their own pilot, which included energy-focused opening remarks from a tribe elder.
- **Pilots that do not have specific energy savings targets themselves**, but allow for extensive exploration of the approaches that may be likely to spur future energy savings, can still benefit energy efficiency targets down the road.
 - BC Hydro’s initial pilot with Indigenous communities did not have specific energy savings targets. This provided an opportunity to collect substantial intel about relevant frames of reference, best channels for outreach, and other factors with implications for subsequent energy efficiency programmes; ultimately this pilot led to the development of several programmes that did increase both programme participation and also energy savings.
- International approaches to advancing equity relevant to U.S. and Canadian programmes demonstrate the importance of programme designers being **representative of the audience for whom they are designing programmes**, so as to avoid making inaccurate cultural assumptions that could undermine programme effectiveness.
 - This learning informed planning for the 3rd Task Workshop (Hui) in Aotearoa, which included active facilitation, presentation, and participation from members of Māori and Pasifika communities. It also changed the way the workshop was conducted, especially on the second day, where 3h were used to properly introduce ourselves, share stories and connect on a deeper level.
- Programme design can be more effectively tailored to underserved populations by **collecting and leveraging psychographic data on intended participants in tandem with pre-testing messaging content** to facilitate design improvements.
 - These learnings emerged from the Task’s peer-reviewed cross-country analysis distilling all 19 case studies from eight contributing countries.
 - The analysis also demonstrated the benefits of clarity and specificity on programme’s intended behaviour changes early on in the design process.
- **All tribal nations are distinct**—“if you know one tribe, you know one tribe”—and shouldn’t necessarily assume that lessons learned will be transferable to another.
 - The Hui’s findings also indicated that while programme co-design is common, in some Indigenous communities, conversations with programme designers may be viewed as “engaging with the enemy”; asking community members to put their own credibility on the line to be your messenger can thus be a tall ask. Differences in privilege and status should at least be acknowledged.



- **Reframing terms and standards to better represent a community's needs** can be helpful, such as reframing “funding for community energy projects” instead as an “investment in the community”.
 - The NZ government also redefined “energy hardship” to “energy well-being” instead, to focus on the positive and the outcome they were striving to achieve. This framing did not necessarily work for the Māori and Pasifika community, however, as we found in the ST4 hidden hardship field research.
 - One insight from the 3rd Workshop was that “professionalism” standards can unintentionally exacerbate Western biases in EE programmes.
 - We also need to become comfortable to be uncomfortable when honestly engaging marginalised communities and asking why there is such injustice.

Policy implications and recommendations

From a policy perspective, and in the light of the energy crisis, the cross-country analysis of 19 case studies from 8 countries reveals various implications. First, the energy crisis (and its global market ramifications) has intensified energy poverty and 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). To achieve a just, orderly and equitable energy transition, the findings highlight how important it is for policy makers to **constantly and proactively understand, monitor and assess current or new interventions addressing vulnerable communities.**

Whereas the crisis has imposed numerous challenges, 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 while this work is often time-consuming and challenging, it is an essential investment for meaningful design and effective implementation.

Second, the energy 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 or generate HTR energy users. In addition, our findings 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, unsustainable energy behaviours are found among high-income earners, who have also been HTR 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. in Sweden). One way to address this problem is to **clearly define, e.g. “energy hardship,” and what eligible criteria or metrics to use when identifying households suffering from it** (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., 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 (LI) customers. As a result of stringent regulation, many utilities are mandated to meet specific cost-effectiveness requirements, with occasional allowances only for programmes aimed at LI 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 often 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 finding to the ongoing energy crisis could suggest that allowing space for 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 and community navigators 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 community groups, and co-creating and delivering community energy pilots with them (e.g. like EnergyMate in NZ or the Task’s pilot on hidden customers). 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.



Conclusions and Next Steps

This Task aimed to identify HTR energy users and to share successful approaches for better engaging them. This process began with the *Discover Phase* by bringing together and building upon a global network of experts and leveraging their insights. During the *Define Phase*, an extensive literature review was completed in order to define and characterise HTR energy users. The *Design Phase* entailed conducting a cross-country case study analysis to measure the size of HTR energy users, analyse existing methods of engaging this audience, and develop guidelines on how to better engage them. In the final *Deploy Phase*, the Task was successful in designing and field-testing its own research process. Overall, these learnings aim to aid the development of future programmes and engagement strategies tailored to specific HTR audiences based on a robust social science process.

Through this work, it has also become clear that the surface has just been scratched on better understanding HTR energy users and how to engage them. For instance, while this Task pointed to engagement with trusted community and frontline providers as a good method of reaching HTR users, oftentimes these “navigators” are hard-to-reach themselves and have valid concerns and distrust about data collection on vulnerable and marginalised groups who may prefer to remain hidden on purpose. These systemic energy injustice issues stem from the socio-economic and political environment we live in.

As a result, to home in on the cause, rather than the symptoms of poverty, Phase 2 of the HTR Task will focus on better understanding systemic energy injustice, and how we can actually achieve a fair and equitable transition away from fossil fuels. This process will include identifying the hidden, underserved and unengaged energy users that energy injustice impacts, and the community and frontline navigators who are supporting them. It also means “*acknowledging the inherent power and knowledge inequities stemming from a Eurocentric worldview and energy system, and working towards ‘re-indigenising’ our research methodologies, engagement strategies, and thought processes.*”³

We hope many of our collaborators in Phase 1 will join us to continue this journey in Phase 2. We want to thank and acknowledge all of our funders, national experts, contributing experts and other collaborators, especially those in HTR communities.

³ Rotmann, S., (2023). [Proposal for HTR Energy Users Task Phase 2 - Addressing Energy Injustice](#). User-Centred Energy Systems TCP - HTR Task: Pūponga.



Appendix

Dissemination Efforts

INTERNATIONAL CONFERENCES & WORKSHOPS

National Experts met quarterly throughout the Task, and monthly with the U.S. NE and PP. The list below is not exhaustive (e.g. does not include country stakeholder meetings):

2019:

- **Consortium for Energy Efficiency, Board of Directors Meeting**, Long Beach, California, January 2019:
 - Presented a HTR Task update to 20+ US/CA EE executives from utilities
- **eceee Summer Study**, France, June 2019:
 - [Kick-off workshop](#)
 - [Survey](#) dissemination
- **CEE, Board of Directors Meeting**, Boston, June 2019:
 - Presented a HTR Task update to 20+ energy efficiency executives from utilities across the U.S. and Canada
- **ExCo Meeting**, Melbourne, October 2019:
 - Presented [1st HTR Task Status Report](#)
 - HTR Task Leader was on an [HTR energy users panel](#) at the Energy Efficiency Expo
- **IESO Ontario**, Canada, November, 2019:
 - **Pilot #1: [Behaviour, Energy, Sustainability Training \(BEST\) course](#)**
 - Included several stakeholder presentations to IESO
- **BECC conference**, Sacramento, November 2019:
 - BEST course workshop
 - [HTR Task presentation](#)
- **[1st HTR Task Workshop](#)**, Sacramento, Nov 2019:
 - National Experts from U.S., Sweden, UK, NZ and CEE members from U.S. and Canada co-developed our shared goal⁴ and HTR Energy User definitions⁵ since used in this Task.

2020 (interrupted by COVID-19, Aotearoa was locked down completely for 2 years):

- **CEE, Board of Directors Meeting**, Long Beach, California, January 2020:
 - Presented a HTR Task update to 20+ EE executives from utilities across the U.S. and Canada
- **ExCo Meeting**, online, April 2020:
 - Presented 2nd HTR Task Status Report

⁴ “Our shared goal is to identify, define, and prioritise 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.”

⁵ “In this Task, 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, 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 that are intended to serve our mutual needs.”



- **ACEEE Summer Study**, online, August 2020, two papers presented:
 - HTR Characterisation
 - BEST course
- **Otago Energy Research Council (OERC) Conference**, online, October 2020:
 - HTR Task presentation on [COVID-19 impacts](#) on HTR energy users
- **ExCo Meeting**, online, Nov 2020:
 - Presented [3rd HTR Task Status Report](#)
- **Young Energy Professionals Conference**, UK / online, November 2020:
 - [HTR energy users in residential and commercial sectors](#)
- **BECC Conference**, online, December 2020:
 - Special Panel for [HTR Task on international insights](#).

2021:

- **CEE, Board of Directors Meeting**, online, January 2021:
 - Presented a HTR Task update to 20+ EE US/CA executives from utilities
- **Making decarbonisation fair conference**, UK / online, March 2021:
 - HTR Task presentation on [international perspectives](#)
- **BEHAVE Conference**, online, April 2021: Task Leader was on Technical Steering Committee
 - [Closing plenary](#)
 - [HTR lit review](#)
 - [COVID-19 Impacts](#)
 - [Commercial Energy Users](#)
 - [HTR Task Workshop](#)
 - Plenary session on [vulnerable energy users](#) run by EnR
- **ExCo Meeting**, online, April 2021:
 - Presented [4th HTR Task Status Report](#)
- **SEAI Public Sector Conference**, Ireland / online, April 2021:
 - Plenary on [engaging people in decarbonization via behavior change](#)
- **eceee Summer Study**, online, June 2021:
 - [COVID-19 and HTR](#) audiences (given by Prof. Ambrose)
- **CEE, Board of Directors Meeting**, Boston, June 2021:
 - Presented a HTR Task update to 20+ US/CA EE executives from utilities
- **Centre for Energy Advancement through Technological Innovation (CEATI) DSMP Conference**, Canada / online, Sept 2021:
 - [HTR energy users](#) - who are they and why are they so hard to reach?
- **ExCo Meeting**, online, Oct 2021:
 - Presented [5th HTR Task Status Report](#)
- **BECC Conference**, online, Nov 2021:
 - Special session on HTR Task - [international insights & case studies](#)

2022:

- **ExCo Meeting**, Vienna / online, April 2022:
 - Presented [6th HTR Task Status Report](#)
- **CEE, Board of Directors Meeting**, Boston, June 2022:
 - Presented a HTR Task update to 20+ US/CA EE executives from utilities



- **eccee Summer Study**, France, June 2022:
 - [2nd National Expert Workshop](#) (led by Prof. Mundaca)
 - [Process matters](#) (talk by Dr. Karlin)
 - Informal session on [how to engage the HTR](#)
 - [HEAT kits](#) (talk by Dr. Rotmann)
- **IEA Energy Efficiency Working Party Special Workshop on Reducing Energy Demand with Behaviour and Awareness Campaigns**, Sept 2022:
 - [Sea's talk starts at 2:45:37](#)
- **ExCo Meeting**, online, Oct 2022:
 - Presented [Phase 2 Task Extension](#)
- **OERC Conference**, Dunedin, Nov 2022:
 - [Talk on hidden hardship](#)
- **BECC conference**, virtual, Nov 2022:
 - [Understanding MUSH Customers: Qualitative Insights](#).

2023:

- **CEE, Board of Directors Meeting**, San Francisco, January 2023:
 - Presented a HTR Task update to 20+ US/CA EE executives from utilities
- **Third HTR Task Hui**, Wellington, March 2023:
 - All talk links can be found in the [Hui Report](#)
- **Downstream Conference**, Wellington, March 2023:
 - [Protecting the most vulnerable: Continuing to eradicate energy hardship](#)
- **ExCo Meeting**, Nova Scotia, May 2023:
 - [Talk on effective campaigns](#) (highlighting our Y4 pilots)
 - Presented [Phase 2 Task Workplan](#)
- **EEA Conference**, Christchurch, May 2023:
 - [Engaging consumers, enabling DERs, and realising flexibility](#)
- **Energy Hardship Conference**, New Plymouth, May 2023:
 - [Addressing energy injustice](#) (recording)
- **CEE, Board of Directors Meeting**, Boston, June 2023:
 - Presented a HTR Task update to 20+ US/CA EE executives from utilities
- **20+ lunchtime talks, community hui and Board presentations** throughout 2023, to Mercury, Genesis and Vector Energy, the Energy Authority, and MBIE (NZ), as well as ongoing meetings with the Energy Reference Panel and Energy Wellbeing Evaluation Working Group
- **BECC Conference**, Sacramento, Nov 12-16, 2023
 - [Uplight SMB Rates Research talk](#)
- **LBNL Workshop on Demand Flex**, Sacramento, Nov 16, 2023
 - [Can we achieve a just transition?](#)
- **OERC Conference**, Dunedin, Nov 24-25, 2023
 - [Are the majority of energy users really HTR or are we not trying hard enough?](#)
- **BEHAVE Conference**, Maastricht, Nov 28-29, 2023
 - [Successfully reaching the HTR with HEAT kits](#)
 - [Are the majority of energy users really HTR?](#)



SCIENTIFIC PAPERS & TECHNICAL REPORTS

Scientific Publications:

- Mundaca, L., Rotmann, S., Ashby, K., Karlin, B., Butler, D., Sequeira, M.M., Gouveia, J.P., Palma, P., Realini, A., Maggiore, S., Feenstra, M. (2023). Hard-to-Reach Energy Users: An ex-post cross-country assessment of behavioural-oriented interventions. *Energy Research and Social Science*.
<https://www.sciencedirect.com/science/article/pii/S2214629623002657>
- Malik, J., Hong, T., Wei, M., Rotmann, S. (2023). To decarbonize our buildings we need to focus on energy sufficiency. *Nature Behaviour*. [Free link here](#).

Books:

- Rotmann, S., Mundaca, L., Castaño-Rosa, R., O'Sullivan, K., Ambrose, A., Marchand, R., Chester, M., Karlin, B., K. Ashby, Butler, D., and J. Chambers (2020). *Hard-to-Reach Energy Users: A Literature Review*. Prepared for User-Centred Energy Systems TCP – HTR Task. Published by SEA – Sustainable Energy Advice Ltd: Wellington. 252pp. ISBN: 978-0-473-64983-8 E-book version available for free at [mebooks](#) (registration required) or for \$0.99 on [Amazon](#)

Conference Papers:

- Ashby, K., Smith, J., Rotmann, S., Mundaca, L., Reyes, J., Ambrose, A., Borelli, S., Talwar, M. (2020). [Who are the hard-to-reach energy users? Segments, barriers, and approaches to engage them](#). ACEEE Summer Study on Energy Efficiency in Buildings: Monterey, August 2020.
- Rotmann, S. and B. Karlin (2020). [Training commercial energy users in behavior change: A case study](#). ACEEE Summer Study on Energy Efficiency in Buildings: Monterey, August 2020.
- Ashby, K., Rotmann, S. and L. Mundaca (2021). A Collaborative International Approach To Characterising “Hard-To-Reach” Energy Users. *BEHAVE Conference*: Copenhagen, April 2021.
- Chester, M., Karlin, B. and S. Rotmann (2021). *A Gap Analysis Of The Literature On Energy-Saving Behaviours In The Commercial Sector*. BEHAVE Conference: Copenhagen, April 2021.
- Rotmann, S., Ambrose, A., O'Sullivan, K., Karlin, B., Forster, H. and L. Mundaca (2021). To What Extent Has Covid-19 Impacted Hard-To-Reach Energy Audiences? *BEHAVE Conference*: Copenhagen, April 2021.
- Rotmann, S., Mundaca, L., Ambrose, A., O'Sullivan, K. and K.V. Ashby (2021). An in-depth review on Hard-to-Reach Energy Users. *BEHAVE Conference*: Copenhagen, 2021.
- Karlin, B., Rotmann, S., Hamilton, O., Mundaca, L., Ashby, K., Sequeira, M.M., Gouveia, Realini, A., Maggiore S., J.P. and P. Palma (2022). [Process Matters: Assessing the use of behavioural science methods in applied behavioural programmes](#). eceee Summer Study: Hyeres, June 2022.



- Rotmann, S. and V. Cowan (2022). [Piloting Home Energy Assessment Toolkits \(HEAT kits\) to Empower Hard-to-Reach Energy Users](#). *eceee Summer Study*: Hyeres, June 2022.
- Rotmann, S., Silk, J., Willis, S. (2023). Engaging consumers, enabling DERs and realising flexibility - a decade of practitioner insights in Aotearoa. *EEA Conference*: Christchurch, May 2023.
- Rotmann, S. (2023). Are The Majority Of Energy Users Really “Hard-To-Reach” Or Are We Not Trying Hard Enough To Reach Them? *BEHAVE Conference*: Maastricht, November 2023.
- Rotmann, S. and Cheetham, E. (2023). Successfully Reaching The Hard-To-Reach By Improving Home Energy Assessment Toolkits With The Help Of Frontline & Community Providers. *BEHAVE Conference*: Maastricht, November 2023.

Technical Reports, eBooks and White Papers:

- Ashby, K., Rotmann, S., Mundaca, L., Ambrose, A. (2020). [HTR Characterisation](#). HTR Task: Wellington. 17pp.
- Karlin, B., Forster, H., Rotmann, S., Sheats, J. and D. Chapman (2021). [The Building Blocks of Behavior Change: A Scientific Approach to Optimizing Impact](#). The See Change Institute: Venice.
- Ashby, K., Rotmann, S., Mundaca, L., O’Sullivan, K. and A. Ambrose (2021). [Summary of HTR Task Literature Review](#). User-Centred Energy Systems TCP - HTR Task: Wellington.
- Rotmann, S., Mundaca, L., Ashby, K., O’Sullivan, K., Karlin, B. and H. Forster (2021). [Subtask 2: Case Study Analysis Methodology Template for National and Contributing Experts](#). User-Centred Energy Systems TCP - HTR Task: Wellington.
- Rotmann, S. (2021). [Subtask 2: Case Study Analysis - Aotearoa New Zealand](#). HTR Task: Wellington.
- Mundaca, L. (2021). [Subtask 2: Case Study Analysis - Sweden](#). HTR Task: Lund.
- Ashby, K. (2021). [Subtask 2: Case Study Analysis - U.S. and Canada](#). HTR Task: Boston.
- Butler, D. (2021). [Subtask 2: Case Study Analysis - United Kingdom](#). HTR Task: London.
- Sequeira, M.M., Gouveia, J.P. and P. Palma (2021). [Subtask 2: Case Study Analysis - Portugal](#). HTR Task: Lisbon.
- Feenstra, M. (2021). [Subtask 2: Case Study Analysis - the Netherlands](#). HTR Task: The Randstad.
- Realini, A., Maggiore S. and Varvesi, M. (2021). [Subtask 2: Case Study Analysis - Italy](#). HTR Task: Milan.
- Uplight (2021). [Bridging the Gap: Driving Energy Customer Action](#). Uplight Research Series: 21pp.
- Uplight (2021). [Getting to Yes with Municipalities, Universities, Schools and Hospitals. Research into the MUSH Sector](#) (partnered with See Change Institute). Boulder, Colorado: 26pp.



- Uplight (2022). [Six Reasons Why Most SMBs Don't Switch Rates. Research into the SMB Sector](#) (partnered with See Change Institute). Boulder, Colorado: 21pp.
- Rotmann, S. (2022). [Memo to Ministry of Business. Innovation & Employment \(MBIE\) summarising international research on energy hardship programmes.](#) SEA – Sustainable Energy Advice Ltd, Wellington: 6pp.
- This research includes an [online database](#) of 68 energy hardship programmes and interventions in 4 regions (North America, EU, UK and Australia).
- Rotmann, S., Ashby, K., Sullivan, L. (2023). *Final Country Report HTR Task Phase 1: U.S. Final country report for Consortium of Energy Efficiency*, HTR Task: Pūponga.
- Rotmann, S. (2024). *Research Into Hard-To-Reach Customers Living In Hidden Hardship*. Report for Mercury and Genesis Energy. SEA - Sustainable Energy Advice Ltd: Pūponga.
- Mundaca, L. (2023). *Policy Lessons and Reflections on Interventions addressing 'Hard-to-Reach' Energy Users – with a focus on Low-income and Vulnerable households*. Final country report for the Swedish Energy Agency, HTR Task: Lund.
- Rotmann, S. (2023). *Hidden Hardship Hui Report*. Minutes from the 3rd National Expert meeting in Wellington, March 2023.

ExCo Status and Annual Reporting:

- [1st HTR Task Status Update](#) (Melbourne, Fall 2019)
- [Users TCP Annual Report 2019](#)
- [2nd HTR Task Status Update](#) (virtual, Spring 2020)
- [3rd HTR Task Status Update](#) (virtual, Fall 2020)
- [Users TCP Annual Report 2020](#)
- [4th HTR Task Status Update](#) (virtual, Spring 2021)
- [5th HTR Task Status Update](#) (virtual, Fall 2021)
- [Users TCP Annual Report 2021](#)
- [6th HTR Task Status Update](#) (Vienna, Spring 2022)
- [7th HTR Task Status Update](#) (virtual, Fall 2022)
- [Users TCP Annual Report 2022](#)
- [8th HTR Task Status Update](#) (Halifax, Spring 2023)
- [9th and Final Phase 1 Status Report](#) (Delft, Fall 2023)

WEBINARS & OTHER DISSEMINATION

- **Users Academy Webinars:**
 - #7: [Introducing the HTR Task](#), April 2021
 - #20: [Hard to decarbonise and hard-to-reach](#), Sept 2021
 - #24: [How to engage HTR energy users](#), Jan 2022
 - #39: [Are the majority of energy users HTR? Or are we not doing enough to reach them?](#) July 2023
- EnAct webinar series “Connecting with Middle Actors”, Nov 6, 2023
- [ISO 50001 READY Navigator](#), online training for U.S. government departments, 2020-21. BEST course components were incorporated into the training tool developed by Lawrence Berkeley National Lab (LBNL).



- Appointed to advise the NZ government's [Energy Hardship Expert Panel](#) as part of an *Energy Hardship Reference Group* (2021 - end 2023)
- Appointed to *Energy Wellbeing Evaluation Consortium* (NZ)
- Appointed on Technical Steering Committee of *BEHAVE* 2021, 2023

Theoretical & disciplinary background outlined in Mundaca et al. (2023):

The theoretical foundations of the framework 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. Based on a review of the empirical research, 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.

The framework also takes into account *collaborative governance* and *design thinking*, 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* and *literature review*, which is consistent in most scientific disciplines. It is also based on Ajzen and Fishbein's *principle of compatibility*, 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 audience (or energy users) and behaviour compose this step. The supporting methods are mixed between qualitative and quantitative, drawing from disciplines like *social psychology* which largely draws from quantitative survey research and *sociology*, 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*, 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).

Client Reports (confidential):

The Task Leader has co-authored research and confidential client reports both in her role as CEO of *SEA - Sustainable Energy Advice Ltd*, and Senior Research Liaison of the *See Change Institute*. Even though the data and internal reporting is confidential, the insights have significantly influenced the HTR Task, particularly from the U.S. and Canadian utility perspective. Many of these insights have been summarised and disseminated publicly in e.g. Uplight eBooks (see section above for links).



- Rotmann, S., Bowles, O., B. Karlin (2019). *Behaviour, Energy & Sustainability Training (BEST): IESO Needs & Opportunities Assessment*. SCI: Venice Beach.
- Karlin, B. and S. Rotmann (2020). *Behaviour Energy and Sustainability Training (BEST): Course Evaluation Report*. SCI: Venice Beach.
- Forster, H., Rotmann, S., Karlin, B. (2020). *Customer Engagement: Qualitative Insights from Focus Groups*. SCI: Venice Beach.
- SCI (2021). Memo to Oracle: *Understanding special populations*.
- Chester, M., Rotmann, S., Rosenblum, A., Karlin, B. (2021). *Commercial Energy Behaviour Opportunities Assessment*. SCI: Venice Beach.
- Rosenblum, A., Rotmann, S., Chester, M., Karlin, B. (2021). *Behaviour Inventory Coding Guide: Commercial Energy Efficiency*. SCI: Venice Beach.
- Rotmann, S., Cowan, K., Forster, H. (2021). *Energy Management in the MUSH Sector: Qualitative Insights from Focus Groups*. SCI: Venice Beach.
- Rotmann, S., Hibbert, C., Ward, D., Karlin, B. (2022). *SMB Research Phase 1: How to better engage SMB customers with rate offering and tools*. SCI: Venice Beach.
- Forster, H. and S. Rotmann (2022). *Utility Engagement and DERs: Qualitative Insights - Residential Customer Awareness, Attitudes, and Behaviors*. SCI: Venice Beach.
- Rotmann, S. (2022). *EnergyMate Phase 3 Evaluation*. Client Report for Energy Retailers Association New Zealand (ERANZ). SEA – Sustainable Energy Advice Ltd, Wellington: 42pp.
- Rotmann, S. & Cheetham, E. (2022). *Hidden Hardship Hui Report. Client Report for Mercury and Genesis Energy*. SEA – Sustainable Energy Advice Ltd, Wellington: 23pp.
- Rotmann, S. & Cheetham, E. (2023). *Hidden Hardship Hui #2 Report. Client Report for Mercury and Genesis Energy*. SEA – Sustainable Energy Advice Ltd, Wellington: 28pp.
- Rotmann, S. (2023). *Hidden Hardship Hui #3 Report. Client Report for Mercury and Genesis Energy*. SEA – Sustainable Energy Advice Ltd, Wellington: 16pp.
- Rotmann, S., Ward, D., Karlin, B. (2022). *SMB Research: Phase 2 - How to better engage SMB customers with rate offering and tools. User Experience & Journey Mapping*. SCI: Venice Beach.
- Rotmann, S. and E. Cheetham (2023). *Home Energy Assessment Tool (HEAT Kits) for Whānau. Final Report for the Support for Energy Education in Communities (SEEC) Fund*. SEA – Sustainable Energy Advice Ltd, Puponga: 66pp.
- Rotmann, S., Ward, D., Karlin, B. (2023). *Energy Behavior Programmes Literature Review*. See Change Institute for the Canadian Standards Association.
- Cowan, K., Rotmann, S., Karlin, B. (2023). *Topline Interview Report of Energy Behavior Experts*. See Change Institute for the Canadian Standards Association.
- Rotmann, S., Ward, D., Karlin, B., Cowan, K. (2024). *CSA Behavioural Energy Efficiency Report*. See Change Institute for the Canadian Standards Association.
- Rotmann, S., Syropolous, S., Zaval, L., Karlin, B. (2023). *San Jose Community Energy Disconnection Mitigation: Behavioral Science Audit*. Client Report for SJCE.
- Zaval, L., Syropolous, S., Rotmann, S., Karlin, B. (2023). *SCJE Late Payment Notice (LPN) - Testing Design Brief*. Client Report for SJCE.