

Hard-to-Reach Energy Users

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1. SUMMARY

Following an intensive review of the literature (Rotmann et al, *forthcoming*), we estimate that a majority of households and businesses could be regarded as “hard-to-reach (HTR) energy users” (following our Annex’ broad definition¹). This is based on HTR audience size estimates in our participating countries reviewed from the literature in Rotmann et al (*forthcoming*), particularly around percentages of vulnerable populations, renters (commercial and residential), and small businesses. There is also strong evidence that this number is very likely to increase due to the COVID-19 pandemic causing extensive vulnerability in households (we will explore this with empirical data from our participating countries in a forthcoming eceee Summer Study paper), and small businesses. These HTR energy users are the people policy-makers, utility programme managers and research experts often struggle to engage for a variety of reasons. This is despite the many efforts and policy interventions aimed at changing behaviours around energy-efficient technology uptake and management, as well as energy consumption. This very large energy user segment is the focus of this Users TCP Annex.

2. EMERGING KEY FINDINGS

- The most-commonly mentioned HTR audiences, from our HTR expert surveys and interviews (Ashby et al, 2020a and b), as well as the in-depth literature review undertaken in Year 1 (Rotmann et al, 2021), are **underserved/vulnerable households** (energy poor, low income, and intersectionalities with other vulnerabilities such as being a minority group or renters), and **small businesses**. This is of importance to policy makers and programme managers focusing on the HTR, as it narrows down the most important user groups to prioritise, as we will do - considering country-specific interests and conditions - in our Year 2 *Cross-Country Case Study Comparisons*.
- That said, country-specific findings also reveal that there are many other groups of identified HTR audiences with high agency and capacity over their energy use (e.g. **high-income households, high energy users, landlords** in residential and non-residential sectors, and **building operators / facilities managers** of large commercial facilities) who are thus also of interest to “Behaviour Changers” (see Rotmann, 2016) in policy, industry, academia and the third sector.
- In addition, several HTR audiences (or specific energy services such as transport and mobility) are of interest to policy makers and third party groups - e.g. from the health or social sectors - who can be important, trusted allies and “Middle Actors” (Parag & Janda, 2015) to better engage such audiences. Examples here are the **physically isolated** (e.g. rural, geographically remote and / or indigenous populations), and **the most vulnerable** (e.g. the mentally or physically disabled, elderly, homeless, ex-convicts, refugees). Energy efficiency and energy savings may not be the primary driver to engage these end users, although it can be an important co-benefit.
- Even though our **working definition** for HTR is very broad, it was necessary to leave it as such in order to accommodate the variety of interpretations across participating countries in the Annex, sponsors and interviewed experts. This was also needed in order to capture all the above-mentioned (and other) target audiences who fit the HTR definition when it comes to (lack of) engagement in behaviour change / EE interventions. This is particularly the case as this is a global research collaboration, and HTR priority groups differ between participating countries and their related policy and market conditions (e.g. in New Zealand and the US, low income are regarded as the highest-priority residential HTR audiences, whereas in Sweden it is the very wealthy with high energy consumption who are of greater importance - due to Sweden’s general lack of energy poverty and its ambitious energy and climate targets).
- We have also collaboratively agreed on a **shared goal**² for this Annex, which further embeds the necessity to prioritise these HTR audiences in order to achieve our global and national energy and climate targets in an equitable, accessible and serviceable way.
- The Annex, in Year 1, has focused on further **narrowing each HTR audience group’s definition and characteristics** (Rotmann et al, *forthcoming*), and provide in-depth investigation into sub-audience demographics and psychographics, barriers and needs, and potential target energy-saving behaviours, as well as estimates of audience sizes in our participating countries. These, much more detailed characterisations of HTR and vulnerable energy users (and their psychographics, barriers and needs in particular) are necessary when targeting them with more tailored policies or programmes.

¹ “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.”

² “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.”

3. OBJECTIVES & DELIVERABLES FOR THE PAST SIX MONTHS

This Task commenced on June 1, 2019 and is on target to deliver planned outputs. We have surpassed our expectations on starting Subtask 4 - field research pilots by finalising our first pilot in Canada already, and have written an extensive 250+ page Literature Review characterising HTR audiences, and a shorter literature review summary (Ashby et al, 2021). The large version is currently being updated with the latest COVID-19 statistics (Rotmann et al, *forthcoming*) and will be submitted to a peer-reviewed publication in May.

From the Work Plan: Subtask 0 - Admin

- Work plan definition, country and national expert participation
- Overall project coordination, including relationship and risk management
- Attendance of ExCo meetings, IEA Users TCP conferences, and reporting to Users TCP ExCo
- Project management, including time tracking, financial, legal and other administrative issues.

Progress towards Subtask 0 Deliverables

- Annual report 2020 delivered
- Status report drafted and shared with NEs
- Attended virtual ExCo meeting in October 2020 and OA meetings
- Three participating countries (SE, NZ, US), with two more (UK, Canada) supporting in-kind
- All formally participating countries have chosen National Experts who meet remotely on a quarterly basis
- Second NE workshop planned for Sweden in April was postponed to Year 3 due to COVID-19 travel restrictions, and may be instead held adjacent to the Year 3 New Zealand workshop.
- Project management system called *TeamWork* set up and all NEs inducted. Time tracking is underway
- [Legal Annex](#) has been published.
- Special COVID-19 risk assessment was undertaken by OA/NEs for the ExCo. Numerous project activities have been re-designed to cope with the situation.
- All countries have paid for Year 2.

From the Work Plan: Subtask 1 - Expert network and dissemination

- Combine and grow our international expert network, particularly in the field of HTR energy users
- Widespread dissemination of this Annex and its outputs
- Continued ‘matchmaking’ and promotional / supporting activities for members of the expert network.

Progress towards Subtask 1 Deliverables

- Presented HTR Annex in several international conferences including *Young Energy Professionals Conference* (UK), *Otago Energy Research Conference* (NZ), *Behavior, Energy and Climate Change Conference* (US), *Fuel Poverty Research Network Conference* (UK)
- We held our own session on the HTR Annex at the recent BECC conference (Dec 2020)
- We will be well-represented at the upcoming BEHAVE conference (April 2021), with 4 extended abstract presentations; a special HTR Annex session; and Sea (OA) and Luis (NE) will also moderate sessions. Sea will set the scene at another EnR-run session and is the closing plenary speaker.
- Two papers (one full, one extended abstract) were accepted for the 2021 eceee Summer Study.
- Access to an international network of 150+ experts from 25 countries, with another ~200 UK fuel poverty experts via Chief Science Advisor.
- First HTR Annex webinar held on Users Academy, a second planned for later this year.
- Several “matchmaking activities” between experts and stakeholders are already underway, especially in the US, UK, Spain and Canada.

From the Work Plan: Subtask 2 - HTR Definition and Case Studies

- Overarching Annex definition of HTR that encompasses the residential and commercial sectors and all audiences
- Individual country definitions of HTR in the two sectors
- Literature Review
- Participating countries: case study analyses, stakeholder and energy user interviews and / or surveys
- Deciding on priority HTR audiences in each sector for all participating countries.

Progress towards Subtask Deliverables

- HTR definition work completed, we have a mutually-agreed upon [working definition and shared goal](#) and have further honed in on characterising in-depth, sub-groups (including country-specific) of the HTR based on surveys and interviews with HTR experts (Ashby et al 2020a and b) and in-depth review

of >1000 publications (Rotmann et al, 2021), also abridged into a shorter literature review summary (Ashby et al, 2021).

- Mendeley shared library with >500 publications, Master list of almost 900 relevant publications
- Case study analysis template and methodology was co-developed (Rotmann et al, 2021) and case study development and data collection has started in the US, Sweden, Canada, UK and NZ.

From the Work Plan: Subtask 3 - Research Process and Methodology

- Develop a standard, internationally-validated research process for behavioural interventions and field research pilots on HTR energy users in the residential & commercial sectors
- Provide a standardised process to undertake cross-country case study comparisons.

Progress towards Subtask Deliverables

- We are co-creating with our U.S. Project Partners, the See Change Institute, a robust social science research framework and process for Behaviour Changers to follow when designing, implementing and evaluating behavioural interventions focused on the HTR. This will be mapped across an updated version of our “Behaviour Changer Framework” to incorporate multiple stakeholder facilitation methodologies based on socio-ecological thinking.
- “Building Blocks for Behaviour Change” process has been developed, and will be reviewed by OA/NEs, to be published in the coming month/s (Karlin et al, 2021).
- “Behaviour Changer Framework” (BCF) has been updated and redesigned and is mapped across the Building Blocks Process (Rotmann, 2021).
- Process has been used to design initial field research pilots and has been taught to commercial energy managers in Ontario (Rotmann & Karlin, 2020). Parts of it (including the *Task 24* BCF) are also going to inform widespread energy manager training in commercial and government institutions across the US and Canada.

From the Work Plan: Subtask 4 - Field Research Pilots

- Proof-of-concept of the research process developed in Subtask 3 in the field
- Evaluation of success of interventions and (shared) learnings
- Using a Collective Impact Approach to facilitate multi-stakeholder collaboration
- Engaging the hard-to-reach and connecting them with the relevant organisations and individuals, policies and programmes that can help them improve their energy use and consumption.

Progress towards Subtask Deliverables

- Two field research pilots in Canada have already used the HTR research process and one has directly engaged with HTR energy users (commercial building operators and energy managers).
- Needs and Opportunities Assessment, Course implementation and Evaluation for *BEST* (Behaviour, Sustainability and Energy Training) course completed (Rotmann & Karlin, 2020)
- BC Hydro residential and commercial energy-saving behaviours (ESBs) inventories completed with Project Partner See Change Institute, this has yielded access to almost 400 residential ESBs (Ehret et al, 2019) and almost 600 commercial ESBs (Chester et al, 2020).
- Trained 17 BECC conference attendees in the research process.
- Via LBNL’s *ISO 50001 Ready* course, we indirectly engaged with energy managers across several U.S. government departments (i.e. they were trained in some aspects of our research process, including the “Behaviour Changer Framework”).
- Have undertaken eight focus groups with 40 low/high-income and low/high-engaged utility customers in the U.S. as part of a subcontract with our Project Partner See Change Institute.
- Have submitted two major funding applications for NZ field research pilots with the NZ government.

Experts meetings/seminars/conferences held in past six months

Experts and stakeholder meetings

Date	Place	# of Experts	Type of meeting	Government	Industry	Academic
Quarterly	Online	6	NE		2	4
Monthly	CEE meetings	4	NE		2	2
October 2020	Online	20	ExCo			
Quarterly	US sponsors	50	SH		50	
Jan 2021	OA meeting	8	NE		1	7

Seminars / Conferences

Date	Place	Participants	Type of meeting
Oct 2020	OERC conference (NZ)	100	Physical and online conference
Nov 2020	YUP conference (UK)	60	Online
Dec 2020	BECC conference (US)	80	Online, special session
Mar 2021	FPRN conference (UK)	75	Online
Apr 2021	BEHAVE conference (SE)	100+	Online, 4 papers, 3 sessions, closing plenary

Reports/papers produced in the past six months

- Rotmann, S. (2021). *Behaviour Changer Framework 2.0: How to use the “magic carpet for behaviour change” in an organisational context*. Subtask 3 - Users TCP HTR Annex: Wellington.
- 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, 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.
- Ashby, K., Rotmann, S. and L. Mundaca (2021). A COLLABORATIVE INTERNATIONAL APPROACH TO CHARACTERISING “HARD-TO-REACH” ENERGY USERS. *BEHAVE Conference*, Copenhagen, April 2021.
- Rotmann, S., Mundaca, L., Castaño-Rosa, R., O’Sullivan, K., Ambrose, A., Marchand, R., Chester, M., Karlin, B. and K. Ashby (2021). *Hard-to-Reach Energy Users: A critical review of audience characteristics and target behaviours*. User-Centred Energy Systems TCP - HTR Annex: Wellington.
- Ashby, K., Rotmann, S., Mundaca, L., O’Sullivan, K. and A. Ambrose (2021). Summary of *HTR Annex Literature Review*. User-Centred Energy Systems TCP - HTR Annex: 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 Annex: Wellington.
- 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.

4. OBJECTIVES & DELIVERABLES FOR THE NEXT SIX MONTHS

Subtask 1

- BEHAVE special session on HTR Annex - all BEHAVE work is finalised in Q3 Y2*.
- 4 BEHAVE papers / presentations.
- BEHAVE paper for Special Issue in *Energy Policy* or another peer-reviewed publication.
- Two online NE meetings.
- eceee Summer Study 2 papers / presentations - Q4 Y2.
- BECC conference presentation and special panel on HTR Annex - Q1 Y3.

Subtask 2

- Publish HTR Lit Review on Annex webpage (once updated with latest COVID-19 stats) - Q3 Y2.
- Publish Summary of Lit Review findings with Palgrave Publishers - Q1 Y3.
- Publish (links to) all accepted conference papers on Annex webpage - Q3 Y2.
- Case study analysis underway, attract other User TCP countries to provide case studies - Q4 Y2.

Subtask 3

- Process published in two papers – one on Building Blocks of Behaviour Change Process; one on redesigned Behaviour Changer Framework (BCF) 2.0. - Q4 Y2.

Subtask 4

- First field research pilot (*BEST - Behaviour, Energy & Sustainability Training* course for commercial Energy Managers and Building Operators) reports published online (ACEEE paper already completed) - Q1 Y3.

- *BEST* (including BCF) components incorporated into and rolled out via LBNL's *ISO 50001 Ready* Training for US government departments. Continuing rollout, our work was completed in - Q1 Y2.
- More possible field research pilots identified, funded and underway (e.g. Sweden and NZ). Q1 Y3.

Experts meetings/seminars/conferences planned in the next six months

Planned Experts meetings

Date	Place
April 2021	Online (ExCo)
June 2021	Online
Sept 2021	Online
Dec 2021	Online

Planned seminars/conferences

Date	Place
April 21-23, 2021	BEHAVE, online
June 2021	eccee Summer Study, online
Nov 2021	BECC conference, online

Reports/papers planned for the next six months

- Status Report (ST0) - Q4 Y2
- Two eccee papers, one peer-reviewed paper (ST1) - Q4 Y2
- Case study analysis finalised (ST2) - Q4 Y2
- Two reports published on research process (ST3) - Q4 Y2
- Field research funding decisions for NZ pilot/s (ST4) - Q1 Y3
- Policy Brief on HTR Literature Review - Q1 Y3.

*Note: Year 2 (Y2) goes from September 2020 to August 2021. Quarter 1 (Q1) Y3 thus starts in Sept 2021 and goes through to December 2021.

5. OUTREACH

High survey completion (N>130 from HTR experts from 30 countries) and 50 interviews with top HTR experts and practitioners from 6 countries were completed. We continue to be accepted to present our work at most major international fuel poverty, energy efficiency and behaviour change conferences in 2021, including to moderate special sessions and give plenary keynotes. Our engagement with industry is particularly strong: our U.S. NE and sponsor, the *Consortium for Energy Efficiency (CEE)*'s membership includes most of the largest utilities in North America. We also have close relationships with retailers and lines companies in New Zealand via the *Electricity Retailers Association of NZ (ERANZ)* "Energy mate" pilot, which will be included as part of our Year 2 case study analysis. We are also supporting the NZ Government in achieving the recommendations from their "Electricity Pricing Review", including with the in-depth literature review recently completed and have applied for funding for two major field research pilots. Our OA and Swedish NE as well as our U.S. Project Partner are all on the technical steering committee of the BEHAVE conference and our U.S. Project Partner is intimately involved in organising the BECC conference. These are the two largest energy behaviour change conferences in the world and our involvement helps set the focus on HTR audiences and our Annex. Both conferences will showcase the HTR Annex in special sessions.

6. IDEAS FOR NEW WORK

There are a lot of potential field research pilots and collaborations in preparation, dependent on co-funding. In light of the COVID-19 pandemic, the plight of vulnerable households and (home-based) small businesses has become more dire, and millions of additional energy users have joined the ranks of the vulnerable, likely becoming even harder-to-reach in the future. We believe that this Annex can contribute towards helping to identify the risks and effects of the COVID-19 pandemic among HTR, and engage them better in future policy and measures (e.g. via economic stimulus packages or behavioural interventions targeted at specific HTR audiences). We may ask our participating countries to consider potentially extending the Annex beyond 2022, particularly if major field research pilots are co-funded and have not yet been completed by the originally planned Annex end date.

7. FINANCE

Budget has been impacted by COVID-19 and the loss of our dedicated Annex PhD student (due to terminal illness) to lead the Literature Review in Year 1. The OA has taken on this work instead, which significantly increased her person hours in Year 1. This also led to a 3-month time overrun of Year 1 deliverables, which we hope to mostly catch up on during the Case Study Analysis in Year 2. All financially-participating countries have paid for Years 1 & 2.

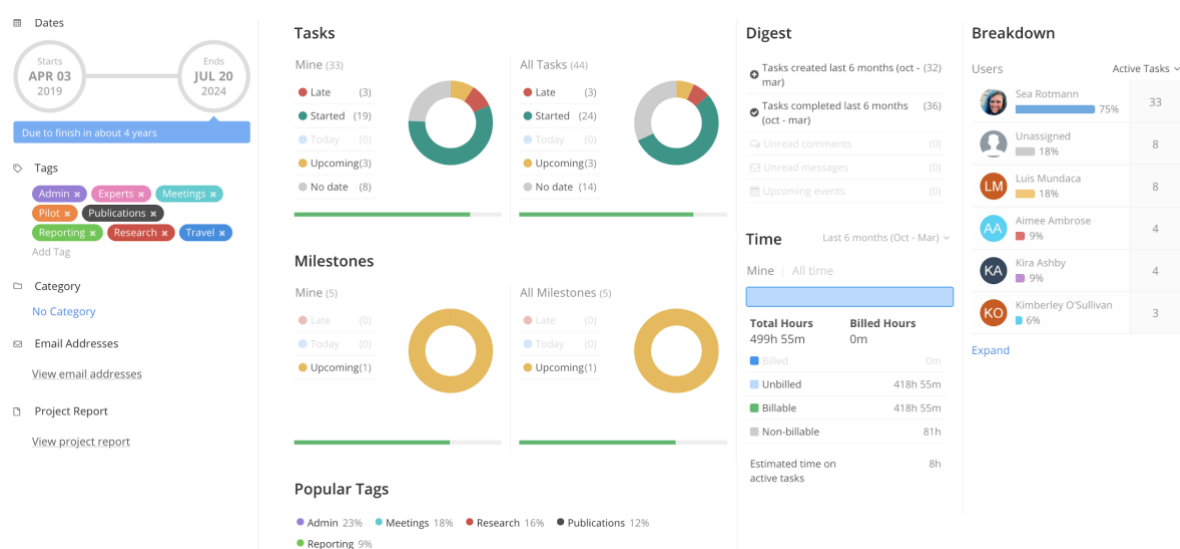
Neither the UK nor Canada are formally joining the Annex, but one Canadian utility partner is represented via the U.S. sponsors (CEE), and our UK team consists of Chief Science Advisor and Project Partner Prof. Aimee Ambrose from Sheffield Hallam University, and her team. We have a lot of opportunities for collaboration and synergy with researchers from the *Fuel Poverty Research Network* which she chairs. We take particular care, in fairness to our participating countries, for no OA time to be used for Canadian or UK-specific work, unless it is paid or co-funded. We highlight such co-funded work as “unbillable” in our *TeamWork* project management software. To date, the OA has spent a total of 2140 hours (1850 billable, which amounts to >90% of the funding received from the countries to date - at €90 p.h.) on this Annex, with another ~ 1100 hours provided by National Experts (also amounting to >90% of time [200 hours per year per NE] allocated to date) or paid via co-funding (Project Partner hours are not captured here, but they are in the 100s as well).

We have received significant in-kind support and field research co-funding to the tune of >CAD150,000 (CAD130,000 were spent on developing the *BEST* course, with some minor income from LBNL’s use of videos related to our Behaviour Changer Framework. There was also CAD15,000 co-funding for a commercial energy savings behaviour inventory and USD 5000 for 1-day *BEST* training course at BECC. In addition, our UK HTR project partner team is providing in-kind support (including access to postdoc students) to the tune of >GBP70,000 and by giving us access to the largest fuel poverty expert network, who provide in-kind support, such as peer reviews and co-authoring reports. Our See Change Institute project partner is also supporting us in-kind to the tune of USD30,000, in addition to letting us use and test their IP as our research process.

8. ACTIVITY TIME SCHEDULE

Minor changes to the initial timeline, with a 3-month overrun of Year 1, which we hope to mostly make up in Years 2 and 3. Project management details can be found on *TeamWork*. Overview of Tasks, Milestones (including on Gantt chart) and breakdown of time between researchers, below.

Tasks and Milestone breakdown



Year 2 Gantt Charts

	October					November			December		
NAME	1-2	5-9	12-16	19-23	26-30	2-6	9-13	16-20	23-27	1-4	7-11
Sea	Trying to get it published	OERC abstract			ExCo meeting	SMART IDEAS proposal due 25/11 (for Year 3 field research in NZ)			CSA Template		Research process draft
Aimee*								OERC conference Nov 19-20	SMART IDEAS		
Kim								Workshop Year 3 postponement			
Luis				NE meeting 23/10 Decide on Priority Audiences for CSA	BEHAVE abstracts due 31/10			Prioritization		BECC conference panel, also NES review CSA template	CSA template finalised
Kira / Erik								BBoBC white paper		Check template	Research process draft
Beth*											Holidays!
Raul*											
* Project Partners											
Lit review (Year 1)											
1. Research Process											
2. Case Study Analysis											
3. Prioritization (US)											
4. Workshop (SWE)											
5. Year 3 SOW (US)											
Publication Deadlines											
Other											
	January	February	March	April	May	June	July	August			
CSA	Methodology										
Lit review published											
Conferences				BEHAVE		ECEEE SS					
ExCo meetings				April 26-29							
Deadlines for papers		BEHAVE SI		ECEEE SS?							
Research process published											
BCF published							YEAR 3?				
	January			February			March			April	
NAME	4-8	11-15	18-22	25-29	1-5	8-12	15-19	22-27	1-5	8-12	15-19
Sea	Back Jan 6	FINALISE	CEE meeting / EXCO Annual Report	Away Jan 26	Back Feb 3	SEEC proposal				EXCO status update	Revise and FINALISE
Aimee*											
Kim											
Luis	Status	Feedback on methods / template	Feedback finalised	Start CSA		ECEEE SS abstracts due Feb 11					
Kira	Completed?										
Beth*			CEE meeting	Help Kira prioritise US case studies		Completed?					Prepare talk for BEHAVE
Raul*											
Danielle*	Help Sea with Lit Review / Cliff notes turned into academic paper?										EASTER
* Project Partners											
Lit review (Year 1)											
1. Research Process											
2. Case Study Analysis											
3. Prioritization (US)											
4. Workshop / BEHAVE											
5. Year 3 SOW (US)											
Publication Deadlines											
Other											
HOLIDAYS											

Impact of COVID-19 on HTR Annex

This Annex has suffered minor impacts from the COVID-19 pandemic, mostly through having to postpone our face-to-face Workshop 2 in Sweden this year to (hopefully) be combined with Workshop 3 in New Zealand in 2022. We also had to change over to virtual-only conferencing although that has worked out quite well, all things considered. Our Task Leader was able to join more international conferences this way than she would have been able to do in normal years. We have fortunately not lost any of our NEs or Project Partners because of COVID-19.

We have pivoted some of our data collection to study the impacts of the pandemic on HTR and vulnerable energy users. A paper with our cross-country findings will be published in the eceee Summer Study Proceedings 2021 (Rotmann et al, in prep.). Generally, we want to highlight just how deeply our specific target audience has been affected by this pandemic - via unemployment, furloughs, evictions, school closures, lockdowns, key essential workers being more likely to be HTR and from vulnerable population groups etc. Researching impacts on, and how to improve engagement with, and support for, this plurality of energy users (see Rotmann et al, 2021 for audience size estimates) should be a high priority for all of our ExCo countries and members going forward.

9. MATTERS FOR THE EXCO

- We recommend that the ExCo approve this HTR Annex Status Report.
- We would also like to invite other User TCP countries to participate in our Year 2 *Case Study Analysis* (either via providing in-kind national expertise or a one-off fee of €4,000 per country to make up for OA time) by providing HTR case studies for the residential (likely identified by *income* and an added intersectionality such as *race / ethnicity* and/or *gender*) and non-residential (e.g. *small businesses*) sectors. The methodology / template for this work can be found [here](#).

10. PARTICIPATING COUNTRIES

USA

New Zealand

Sweden

In-kind collaborators (via Project Partners):

Canada
UK

Supporting experts (for individual deliverables such as Literature Review and/or Case Study Analysis) from:
Spain
the Netherlands