Raukawa Energy Innovation Project

Baseline phase: Learnings and insights

July 2024

Ara Ake Future Energy Development

Raukawa

University of Otago Ōtākou Whakaihu Waka

The Lever Room

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Preface

In early 2023, Raukawa Charitable Trust (RCT), the governance entity of the iwi, Raukawa, alongside sustainability and social outcomes-focused strategy consultancy, The Lever Room, launched the Raukawa Energy Innovation Project, an initiative focused on addressing energy hardship in the South Waikato.

With funding support from Ara Ake, New Zealand's Future Energy Centre, the project partners were able to begin recruitment of households in energy hardship and install two MonkeyTronics temperature sensors in each participating whānau home to understand their exposure to cold temperatures during the winter months.

This document presents the outcomes of the pre-testing phase of this work, detailing the confronting realities of energy hardship in Aotearoa New Zealand. It also highlights the importance of the energy sector *(and government)* implementing equitable solutions *(and policies)* to ensure that that those in society who are currently being left behind are brought on the journey during the energy transition.

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- Raukawa Charitable Trust
- The Lever Room

The project was led by Raukawa Charitable Trust and The Lever Room, with support from the University of Otago's He Kāinga Oranga – Housing and Health Research Programme and Ara Ake (abbreviated to the project partners). Key project personnel, and their roles, includes:

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Summary

Energy hardship remains a largely unaddressed issue in Aotearoa New Zealand with over 110,000 households reporting that they could not afford to keep their home adequately warm in 2023.[1]

The Raukawa Charitable Trust is developing a project in the South Waikato with the purpose of using data to inform their decision-making surrounding their approach to reducing energy hardship across their rohe (region). The Raukawa Energy Innovation Project looks to innovate on methods to reduce and subsidise power bills and identify what is required of these interventions to generate positive wellbeing outcomes, while also promoting mana motuhake (self-determination) and tino rangatiratanga (sovereignty) for the Raukawa whānau during the sustainable energy transition.

The project has been split into a baseline pre-testing phase and an intervention phase. During the baseline phase, Raukawa whānau were recruited to join the project through a relational approach, based on community knowledge of those most in need. After installing temperature sensors in the homes of these whānau, 98.8% of those recruited were determined to be suffering from energy hardship, experiencing temperatures below the World Health Organisation recommended minimum of 18°C for more than one third of the time during the winter measurement period.

The negative impacts experienced across the cohort due to the level of cold-temperature exposure is clear with:

- Almost three in five households (58.1%) reporting that they put up with feeling cold during winter to keep costs down.
- Nearly half (45.2%) of the participants having their sleep disrupted due to cold indoor temperatures.
- Three of every five households (58.6%) participating cold enough at times during winter that parents reported seeing their child's breath inside.
- Over half (51.4%) of the tamariki requiring a GP visit for a chest infection, asthma, or breathing problems during the measurement period.

Importantly, these impacts are also out of the control of the whānau recruited due to an inability to sufficiently heat their homes because of the energy hardship they face, where:

- 61.5% of participants reporting that they feel stressed, worried, or dread when receiving their electricity bill.
- Over half (52.1%) of the whānau cutting back on groceries or juggling other bills to pay for electricity at least sometimes.
- Around one in eight whānau (13.0%) have a median outstanding electricity debt of $400 (ranging in value from $124 up to $2,000).
- In the past 12 months, one in four (26.1%) whānau have been sent a late payment notice from their electricity or gas company, with 14.9% having made a payment arrangement and 4.6% of homes being disconnected due to late or non-payment.

Following the completion of the baseline study, three subsidy models, scoped to achieve health benefits and enable wellbeing, were co-designed by the project partners to provide financial support to whānau across the coldest winter months. **The implementation of these interventions was scheduled to start in May 2024, however Raukawa have yet to secure funding partners to allow this mahi to continue.**

Raukawa is firmly committed to empowering their whānau to lead healthier lives by eradicating energy poverty. This work demonstrates their strong desire to innovate on methods to reduce power bills and identify what interventions are required to generate health, environmental, community and economic outcomes. If you are interested in learning more about the Raukawa Energy Innovation Project, please contact the Raukawa project team at info@raukawa.org.nz.

Te Reo Māori Glossary

The definitions given below are in the context of this report and may not be generically applicable.

Aroha
Empathy, compassion

Hui
Meeting

Iwi
People, tribe

Kaiāwhina
Helper, contributor

Kaimahi
Worker, employee

Kāinga
Home

Kaumatua
Elder

Kaupapa Māori
Māori approach

Mana
Authority, power

Mana motuhake
Self-determination

Pono
Truthfulness, authenticity

Rohe
Region

Tamariki
Children

Te Ao Māori
Māori world view

Tika
Integrity, fairness

Tikanga
Cultural norms

Tino rangatiratanga
Sovereignty

Uri
Offspring, descendants

Whakamōhio
Acquaint, teach

Whakatau
Prepare, determine

Whakawhanaungatanga
Relationship building

Whānau
Family

Whare
House

Introduction

As we look to transition our economy towards a clean energy future, it is important to consider all aspects of the energy trilemma – sustainability, security and equity.[2]

The sustainability and security corners of the energy trilemma are self-explanatory - we need to use energy sources which avoid and/or mitigate environmental harm and climate change impacts which can also reliably meet demand with minimal disruption due to system or supply chain shocks. The equity element, however, throws in a key challenge, as this also requires accessible energy at a price which is universally affordable. Energy transition aside, equity is something we struggle with in today's energy system.

In a world where those in privileged positions are purchasing residential energy innovations, such as solar PV systems and electric vehicles to reduce their energy bills, many of the most vulnerable in society cannot even afford grid electricity to adequately warm their homes.

Energy hardship remains a largely unaddressed issue in New Zealand. Of the slightly less than two million households across the motu, over 110,000 of them, i.e. one in 20, reported that, in 2023, they could not afford to keep their home adequately warm a lot of the time.[1] In 2017, Stats NZ reported that the same number of New Zealand households (110,000) had a major energy affordability problem, but that over 370,000 households had a problem keeping their home warm at least sometimes during winter.[3] These reports are, among other things, mostly due to a combination of low household income, rising electricity prices and high energy requirements to heat poorly insulated, inferior quality housing.

Since 2000, residential electricity prices have risen 48% according to the Electricity Price Review (2019)[i], which is faster than most other OECD countries. However, due to the fact that many Kiwi homes are not energy efficient, "reducing power bills will be as much about improving housing quality and how electricity is used as lowering prices".[4]

An analysis of the Statistics NZ Household Economic Survey (HES) by Concept Consulting has shown that 20% of households spend over 10% of their after-housing cost income on energy bills (this increases to 21% of after-housing income for the lowest earning 10% of households and conversely, decreases to less than 1% for the wealthiest 10%). Importantly, Concept Consulting note that this is associated with actual spending on energy costs whereas the "amount of required energy to deliver adequate energy service levels would result in many more households breaching this 10% threshold".[5]

While this is an issue that has been discussed for years, the majority of investment has focused on *ambulance at the bottom of the cliff* solutions, such as shallow retrofits and

i Adjusted for inflation to 2019 dollars.

non-targeted subsidies. Despite many policy recommendations to improve our energy hardship crisis, there has been less action on the ground where the focus is at *the top of the cliff*, supporting whānau most in need during the energy transition with solutions which bring them on the journey, rather than continuing to focus on those already privileged enough to do so.

The Raukawa Charitable Trust (RCT), the governance entity of the iwi Raukawa, is taking steps to address energy hardship in the South Waikato where work is desperately needed. Many of the whānau in the Raukawa rohe are living off lower incomes, living in poor quality homes, have less secure heating sources, and are burning damp and/or toxic wood (as well as other non-typical materials) to stay warm in winter (potentially contributing to poor air quality in the region).[6] As energy prices continue to rise, this problem continues to worsen and becomes more urgent.

Raukawa are observing the impact of energy hardship firsthand as it is so wide-reaching across their community. The inability of a whānau to meet their energy needs impacts how they experience and live in their homes, as well as their economic productivity and day-to-day health (such as mental health, long-term cardiovascular, respiratory health problems).

Partnering with The Lever Room and the University of Otago's He Kāinga Oranga – Housing and Health Research Programme, RCT launched the Raukawa Energy Innovation Project. The project partners' goal was to recruit 420 households suffering from energy hardship to prototype different energy intervention models for residential power use, exploring and identifying which model is the most effective in creating positive outcomes for whānau.

This report provides an overview of the project and presents the outcomes of the pre-testing phase of the work where baseline data was collected from the participating whānau and their homes before any interventions have been implemented, detailing the confronting realities of living with energy hardship in Aotearoa New Zealand.

Project Background

The Raukawa Energy Innovation Project is being developed in the South Waikato by Raukawa Charitable Trust who are seeking to use data to inform their decision-making surrounding their approach to reducing energy hardship across their rohe. This project will advance iwi-led, whānau-centred, and mana-enhancing energy interventions that address energy hardship and health inequities among iwi and community, while also promoting mana motuhake (self-determination) and tino rangatiratanga (sovereignty) for the Raukawa whānau during the sustainable energy transition.

The pilot looks to innovate on methods to reduce and subsidise power bills and identify what is required of these interventions (e.g. the bill reduction amount, the intervention length and/or timing) to generate health, environmental, community and economic outcomes.

Currently, various energy hardship interventions and energy subsidy models are employed in Aotearoa New Zealand – each varying in amount, duration and seasonality. Considerable money, both public and private, is currently invested in these subsidy models. For example, the Winter Energy Payment, provided by Work and Income, will cost the taxpayer an estimated $538 million in 2024 (of which, $205 million in payments may be going to people who don't need it).[ii, 7,8]

Current electricity bill models/subsidies which provide bill support include:

- Winter energy subsidies (e.g. WINZ);[9]
- Hardship funds on application (e.g. Iwi provided funds);[10]
- Fixed electricity rates (e.g. SolarZero);[11]
- Discounted power for whānau in need (e.g. Nau Mai Rā);[12] and
- Winter Energy Price Cap (e.g. Toast Electric, Kāinga Ora).[13,14]

Although these subsidies exist, there is little knowledge regarding which is the most effective. This initiative will test three models, under the same conditions, and identify which subsidy model is the most effective across a broad range of outcomes. This knowledge, gleaned through robust, academically-researched insights, will enable better decision-making across the ecosystem, specifically helping subsidy providers target the best choice of model to employ when combatting energy hardship. This information will also help public and private fund owners when attempting to identify the most effective energy hardship reduction models and initiatives.

Project aims and expected outcomes

The key aims of this initiative are to:

- Reduce the power bills for approximately 420 households in the Raukawa rohe;[iii]
- Test three energy hardship interventions to identify which is the most effective;
- Address household issues related to heating source, ensuring that participating families have an appropriate source of heating in their home now and into the future; and
- Promote behaviour change of participating whānau through energy education to support an understanding of what is an appropriate temperature in a home and how to manage heat, dampness, and mould.

The Raukawa Energy Innovation Project will identify the most effective intervention model to reduce energy hardship, both for this project's participants and other whānau across the motu. With a focus on supporting system-level change and learning, this project proposes to:

- Track and evaluate three interventions. This includes evaluating to what degree paying for power (and by which method) eliminates negative health, social, and economic outcomes;
- Explore how to support communities to move to lower energy costs;

ii Research by not-for-profit Share my Super estimates that 53% of Kiwis receiving NZ Super say they don't need the Winter Energy payment to live comfortably. This group is due to receive around $205 million of payments that they may not need in winter 2024.

iii A study of 420 households will enable the detection of a statistically significant reduction in hospitalisations to be observed over a period of three years.

- Explore how to sustainably pay for the power bills of whānau in hardship through various methods including the potential for community-owned renewable infrastructure. This project will uniquely explore shifting the cost from *ambulance at the bottom of the cliff* with the District Health Board, to funding preventative measures upfront *(on the top of the cliff*); and
- Share learnings from the pilot on the most effective way to address energy hardship.

The project seeks to provide benefit to participating whānau through creating improved physical health, with less respiratory or cardiovascular illness and greater mental and social wellbeing. Whānau are also expected to experience less stress about money and gain increased cognitive capacity and economic stability, allowing for less accumulation of bad debt with more money to spend on other necessities such as housing, food or clothing.

Project phases

The project has been split into two key project phases:

1. Baseline phase
    a. Detailed project design and intervention model development;
    b Whānau recruitment for participation in study; and
    c. Household pre-testing data collection, through fitting homes with temperature, humidity and CO_2 gauges in living rooms and bedrooms.
2. Intervention phase
    a. Implementation of interventions;
    b. Address heat source and insulation issues;
    c. Promote whānau behaviour change; and
    d. Post-testing data collection and analysis.

This report focuses on the pre-testing and survey results produced during the baseline phase, which ran from Autumn 2023 to Summer 2023/24. **The intervention phase, which will be conducted over an expected two - to five-year period, was due to begin immediately following the completion of the baseline phase, however is yet to gain sufficient funding to kick off**. Importantly, the phasing of the project has been done in such a way that baseline outputs will be valuable irrespective of whether the project continues to the intervention phase.

Defining energy hardship

The Ministry of Business, Innovation and Employment define energy hardship (also known as energy poverty) as:

"Energy hardship is the opposite of energy wellbeing. That is, it is the situation when individuals, households and whānau are not able to obtain and afford adequate energy services to support their wellbeing in their home or kāinga."[15]

They go further to also define the ability to obtain and afford as *the affordability and accessibility of energy supply*, energy services as *energy use that services and supports people's lives such as heating, cooking, washing, lighting*, and to support their wellbeing as *enough energy is used to support the physical, social, mental, spiritual and cultural aspects of people's wellbeing*.

For the purposes of the Raukawa Energy Innovation Project, the project partners extended this definition to further specify what is considered as adequate in terms of a household's ability *to obtain and afford adequate energy services to support their wellbeing in their home or kāinga.*

Energy hardship occurs when a household cannot afford or access sufficient energy at home to meet their needs, including maintaining healthy indoor temperatures. The World Health Organisation recommends that:

"Indoor housing temperatures should be high enough to protect residents from the harmful health effects of cold. For countries with temperate or colder climates, 18°C has been proposed as a safe and well-balanced indoor temperature to protect the health of general populations during cold seasons."[16]

They also specify that *there is high certainty that taking measures to warm cold houses will have significant health benefits; there is no demonstrable risk to human health of healthy sedentary people living in air temperature of between 18 and 24°C;* and that *a higher minimum indoor temperature than 18°C may be necessary for vulnerable groups including older people, children and those with chronic illnesses, particularly cardiorespiratory disease.*

Taking the above into account, the project partners used an operational definition of energy hardship as:

"Any household that cannot afford to adequately heat their home such that indoor temperatures stay above the WHO-recommended 18°C threshold."

Importantly, this quantitative definition should not be used as a standalone measure to determine whether a whānau is in energy hardship, but should be used as a validating measurement alongside self-reported qualitative hardship indicators. The approach to qualitatively identify whānau in energy hardship is elaborated upon in the following sections.

Whānau recruitment

At the outset of the project, it was decided that Raukawa's existing relationships would allow the project partners to operationalise the project's definition of energy hardship and both identify and reach those whānau in need in their community.

The project partners' aim was to first build trust and comfort with these whānau through a relational approach to recruitment, and then verify this approach through observing the experienced temperatures in the home.

This innovative community-led, relational recruitment strategy is expected to be a useful approach for future Kaupapa Māori, and other community-based, energy hardship reduction programmes and/or research.

Principles

To identify whānau households in energy hardship to participate in the project, a systematic approach was developed using a number of specific guiding principles. These principles, established by the project partners, ensured that the programme uplifted whānau, upheld their mana, and aligned with Raukawa's tikanga.

The guiding principles applied to the development process are as follows:

1. **Whānau centered:** Placing the needs and wellbeing of the whānau at the forefront.
2. **Mana enhancing and strength-based:** Empowering the whānau and focusing on their strengths.
3. **Data sovereignty remaining with whānau:** Respecting whānau control over their own data and minimising unnecessary information requests.
4. **Whānau understanding what is being asked of them:** Ensuring clear communication and comprehension.
5. **Tika:** Upholding integrity and fairness.
6. **Pono:** Seeking truthfulness and authenticity.
7. **Aroha:** Approaching the process with empathy and compassion.

Based on these principles, several key decisions were made. These decisions included to prioritise iwi held knowledge; to focus on a relational, conversational approach to whānau recruitment; and to prioritise experiential (i.e. subjective) energy hardship indicators for selecting whānau, whilst collecting a combination of both experiential and objective (income/expenditure) data.

The first step to identifying whānau to participate in the Raukawa Energy Innovation Project was to leverage the existing deep understanding and knowledge base held by Raukawa regarding the wellbeing of the whānau in their rohe. This approach also ensured recruitment via a relational approach consistent with te ao Māori, while also minimising any unnecessary information requests, lessening the burden on any whānau involved.

Importantly, the project programme used a broad definition of energy hardship to help relationally identify and select eligible whānau, before then using a data-driven approach to ensure that this selection strategy was effective in identifying a cohort that is experiencing measurable energy poverty. The key reasoning behind this is that looking at objective indicators in isolation, such as income or home ownership status, may lead to certain whānau being overlooked despite an obvious subjective need. [iv]

iv Self-reported, subjective data may present a different pattern of energy poverty rates from income/expenditure measures due to varying coping strategies that whānau employ when living in energy hardship and objective measures should not dictate whether a whānau is considered to be in energy hardship or not due to other external factors. In the approach taken by the project partners, a whānau with a household income over $200,000 per year who is reporting significant coldness and electricity bill stress is considered to be in energy hardship – considering objective measures alone, this whanau would likely not be recruited.

Methodology

The following steps were taken to recruit whānau for participation in the project and to verify whether they were suffering from energy hardship.

1. **Survey development and recruitment protocol**
    - Ongoing hui between project partners to confirm recruitment protocol and survey content.
    - Determination of subjective and objective measures that align with the guiding principles (and can be linked to national datasets), allowing for potential replication beyond the Raukawa context.
    - Develop the recruitment approach and determine appropriate measures for the Raukawa whānau, ensuring the comfort and suitability of the questions posed by kaiāwhina.
2. **Drafted key measures to be included across different interactions with whānau:**
    - Assess the information already held by Raukawa to identify whānau in need.
    - Development of a pre- and baseline survey questionnaire based on the identified measures and principles.
3. **Verification:**
    - Link the data collected from the baseline survey and discussions to temperature sensor data and information obtained from the energy provider to examine the associations between verbal questions, survey questions, household energy usage, and room temperature.

The baseline survey is provided in Appendix A, detailing the subjective and objective measures associated with whānau recruitment. Eligibility was determined relationally, based on community knowledge, first recruiting whānau Raukawa knew to be in need in the rohe or those who were already clients of their iwi support services. Recruitment was then extended to include other community members in energy hardship as interest in participating in the project spread amongst the community.

As such, there was no threshold of a given objective or subjective measure to be included in the cohort. The recruitment approach taken was consistent with other models for Māori wellbeing, that centre the importance of whakawhanaungatanga (relationship building), as well as the experience of community organisations delivering home energy efficiency and energy hardship interventions in Aotearoa. The process tool for selecting and onboarding a household used by the project partners is provided in Appendix B.

During the recruitment stage of the project, the project partners found that the accurate identification of those in energy hardship required significant collaboration with the community they were aiming to help. The project partners aimed to build on existing trust by using community knowledge and leveraging existing relationships e.g. the initial visits to whanau to undertake the baseline survey and install indoor environmental monitors was conducted by Raukawa kaiāwhina.

This relational recruitment approach described here was highly effective in identifying and then recruiting a cohort of households experiencing energy hardship, and this is clearly demonstrated by both the survey results and the temperature verification data which is detailed in Results section.

Results

The initial indoor environmental measurements (of temperature, humidity and carbon dioxide concentration) commenced in July 2023, with households continuously added over the four-month measurement period. By October 2023, a comprehensive baseline dataset (comprising 2,014,352 valid measurements across 258 households) was built and could be analysed alongside the qualitative surveys. This analysis enabled the project partners to gain a baseline understanding of the ambient conditions experienced by the recruited whānau, and the impact of exposure to these temperatures, during the winter months.

As a reminder, the World Health Organization sets the recommended minimum indoor temperature at 18°C as the evidence suggests above this temperature, healthy adults are protected from the harmful health impacts of cold.[16] Of the cohort identified and recruited by Raukawa to participate in this project, the data shows that (see Figure 1):

- 98.8% experienced temperatures below the WHO-recommended minimum for more than one third of the time (34.3% of measurements fell below 18°C) during the measurement period.
- During sleeping hours (9pm – 8am), cold-temperature exposure increased, with 47.3% of bedroom measurements falling below 18°C, with one in five (21.2%) whānau bedrooms remaining below 18oC overnight for the entire winter.

When considering household temperatures of 12°C (see Figure 2), the threshold for acute respiratory events and cardiovascular impacts: [v]

- 72.9% of whānau homes experienced temperatures below 12°C during the measurement period, with two thirds (66.7%) experiencing these cold temperatures for up to 10% of the time.
- Only one in three (33.5%) whānau bedrooms kept above 12°C overnight during winter and 8.6% of bedrooms experienced temperatures below this threshold for 10%-25% of sleeping hours.

Example average temperatures curves, showing the ambient conditions experienced throughout a winter's day by the whānau in five recruited households, are shown in Figure 3, alongside the average temperature curve for the cohort overall.

Whare A is an example of the few homes in the cohort (1.2%) with mostly consistent healthy temperatures based on hourly mean measurements. However, the kaumatua living alone in this home reported spending over 50% more than she could afford to keep her home warm. In contrast, the other four households plotted represent homes which only achieved healthy temperatures for short periods on the warmest days during the measurement period.

One of the coldest homes in the cohort, designated as Whare E (represented by the light blue line in Figure 3), failed to reach the minimum 18°C threshold for the entire winter and recorded living room and bedroom temperatures of less than 5°C during cold mornings in August 2023. This household comprises of three adults, supporting themselves on a household income of less than $20,000. During the measurement period, they received a late payment notice from their electricity retailer and had to make a payment arrangement. Their house does not meet the healthy homes standard, has substantial mould problems, they can often see their breath inside and the house stays cold enough in winter that one vulnerable household member reports a constant struggle to sleep.

Whare B, C and D fall in between these two extreme cases, however the occupants find their homes typically colder than they would like, yet they put up with feeling cold a lot of the time in winter to keep costs down. This remains the case even with occupants of these houses sometimes shivering and seeing their breath inside. Although they can't afford to spend more to sufficiently heat their homes, they sometimes have to either cut back on groceries or juggle other living costs so that they can pay their electricity bill.

v An acute respiratory event includes an asthma attack, an episode of wheezing, as well as diseases such as chronic obstructive pulmonary disease (COPD).

Figure 1: Proportion of measurements below 18°C across the homes during the entire measurement period (left) and during sleeping hours (right).

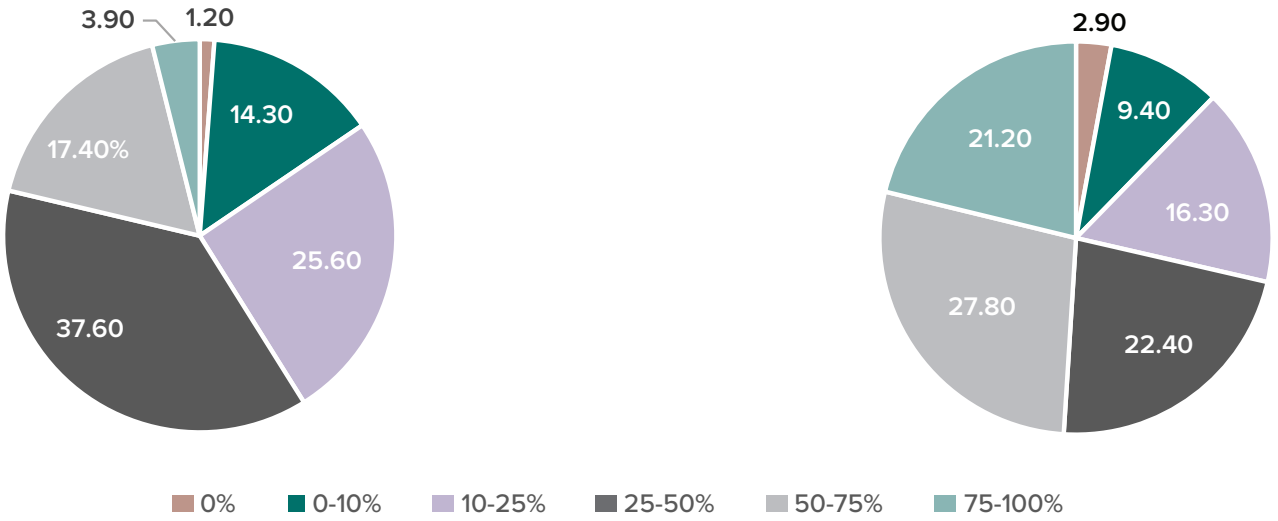


Figure 2: Proportion of measurements below 12°C across the homes during the entire measurement period (left) and during sleeping hours (right).

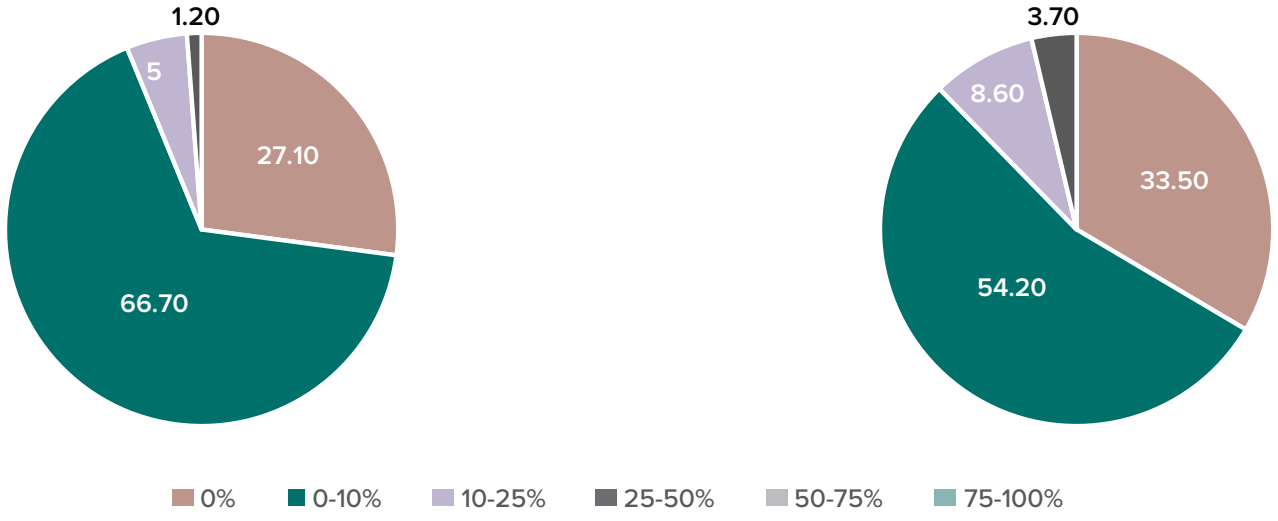
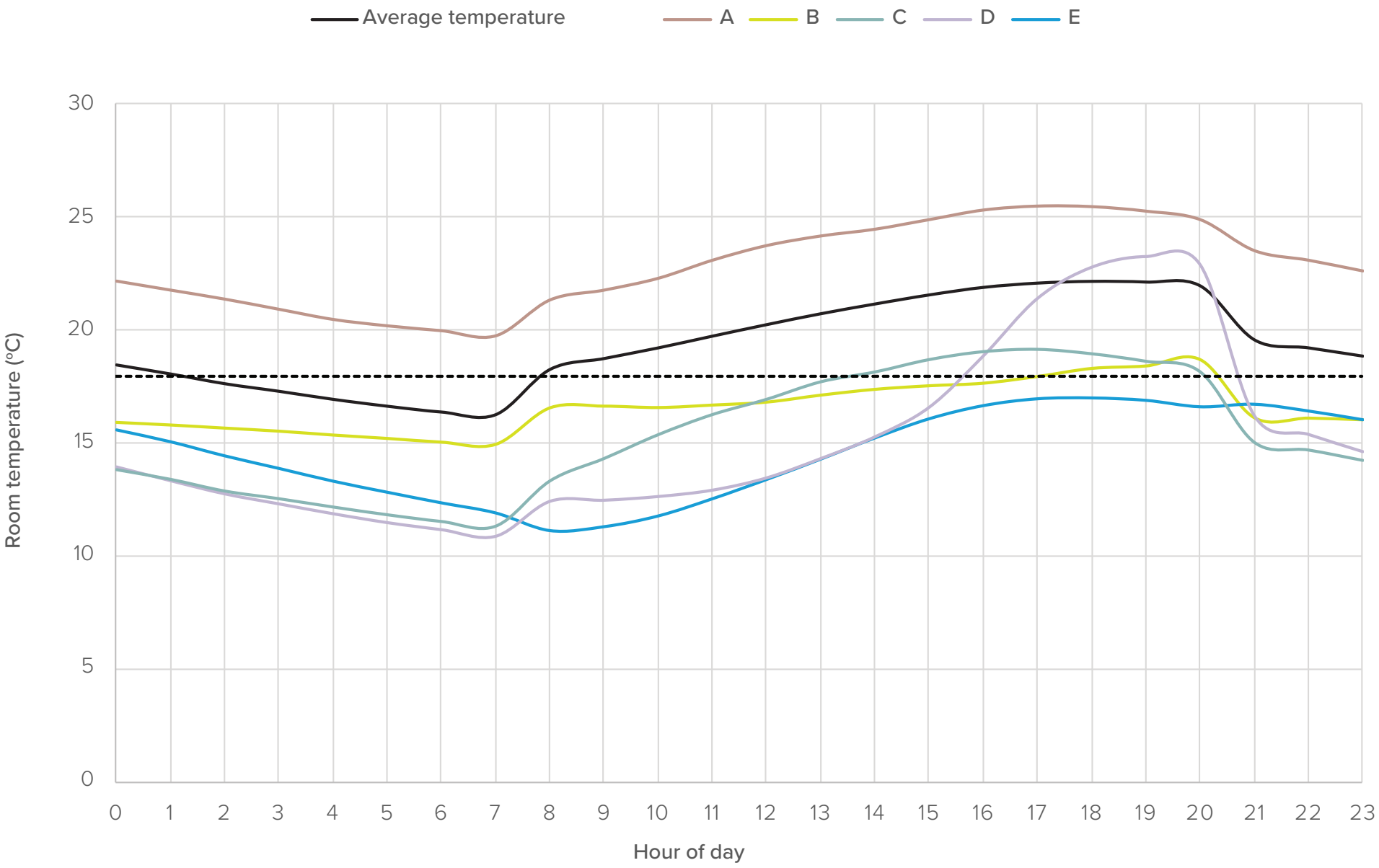


Figure 3: Overall average temperatures (black coloured line) and five selected homes by hour of day using bedroom temperatures overnight (sleeping hours, 21:00 to 08:00) and living room temperatures during the day (waking hours, 08:00 to 21:00). The dashed line represents a temperature of 18°C.



Although Whare B through E seem to represent particularly dire examples of energy hardship across the cohort, the breadth of the negative impacts experienced due to the level of cold-temperature exposure is clear when simply considering the averages across the cohort, reflected through the qualitative surveys:

- Almost three in five households (58.1%) reported putting up with feeling cold during winter to keep costs down.
- Sleep for whare occupants was sometimes disrupted by cold indoor temperatures for almost half (45.2%) of the participants. This increased to 58.6% for the tamariki in the cohort.
- Three out of five (62.9%) children in the cohort shivered indoors at least sometimes this winter.
- Three of every five households (58.6%) participating were cold enough at times during winter that parents reported seeing their child's breath inside.
- Respiratory health was of concern, with over half (51.4%) of the tamariki requiring a GP visit for a chest infection, asthma, or breathing problems during the measurement period.
- Most of the tamariki in the cohort (78.8%) had days off school during the winter (June-Sept) due to illness, with the average number of days off sick at 12 days, totalling more than two school weeks. The New Zealand average was four days off during Term 3 2023.[vi,17]

Importantly, these impacts are out of the control of the whānau recruited due to an inability to sufficiently heat their homes because of the energy hardship they face:

- The median weekly household self-reported electricity expenditure was $75, but when asked what the household could comfortably afford to spend on electricity, the median reported amount was $50 per week.
- 61.5% of participants reported that they feel stressed, worried, or dread when receiving their electricity bill.
- Over half (52.1%) of the whānau reported cutting back on groceries or juggling other bills to pay for electricity at least sometimes.
- Around one in eight whānau (13.0%) had a median outstanding electricity debt of $400 (ranging in value from $124 up to $2,000).
- In the past 12 months, one in four (26.1%) whānau have been sent a late payment notice from their electricity or gas company and 14.9% have made a payment arrangement. Despite this, 4.6% of homes were disconnected for late or non-payment (the national average for disconnections recorded by the Electricity Authority is 0.36%, excluding those on prepay. ConsumerNZ estimates this is closer to 2% when accounting for all customers).[18,19]
- Just under half (47.7%) of the cohort reported that someone in the household receives the Winter Energy Payment, but this subsidy is clearly failing to address energy poverty and support whānau to achieve adequate heating.

Among the most stunning observations when considering the above results is when comparing the household income distribution of the whānau participating in the project to the general New Zealand population (see Figure 4).

The concentration of household incomes within the $20,000-$40,000 bracket is around 10% higher for the Raukawa cohort compared to the national distribution (22.6% compared to 9.9% in the 2018 Census). However, the recruited whānau show a wide range of incomes. The proportion of household incomes between $40,000 and $100,000 are effectively the same for the Raukawa whānau and the general population (43.7% and 44.0%) and over one in 10 (12.1%) participating households have incomes exceeding $150,000.

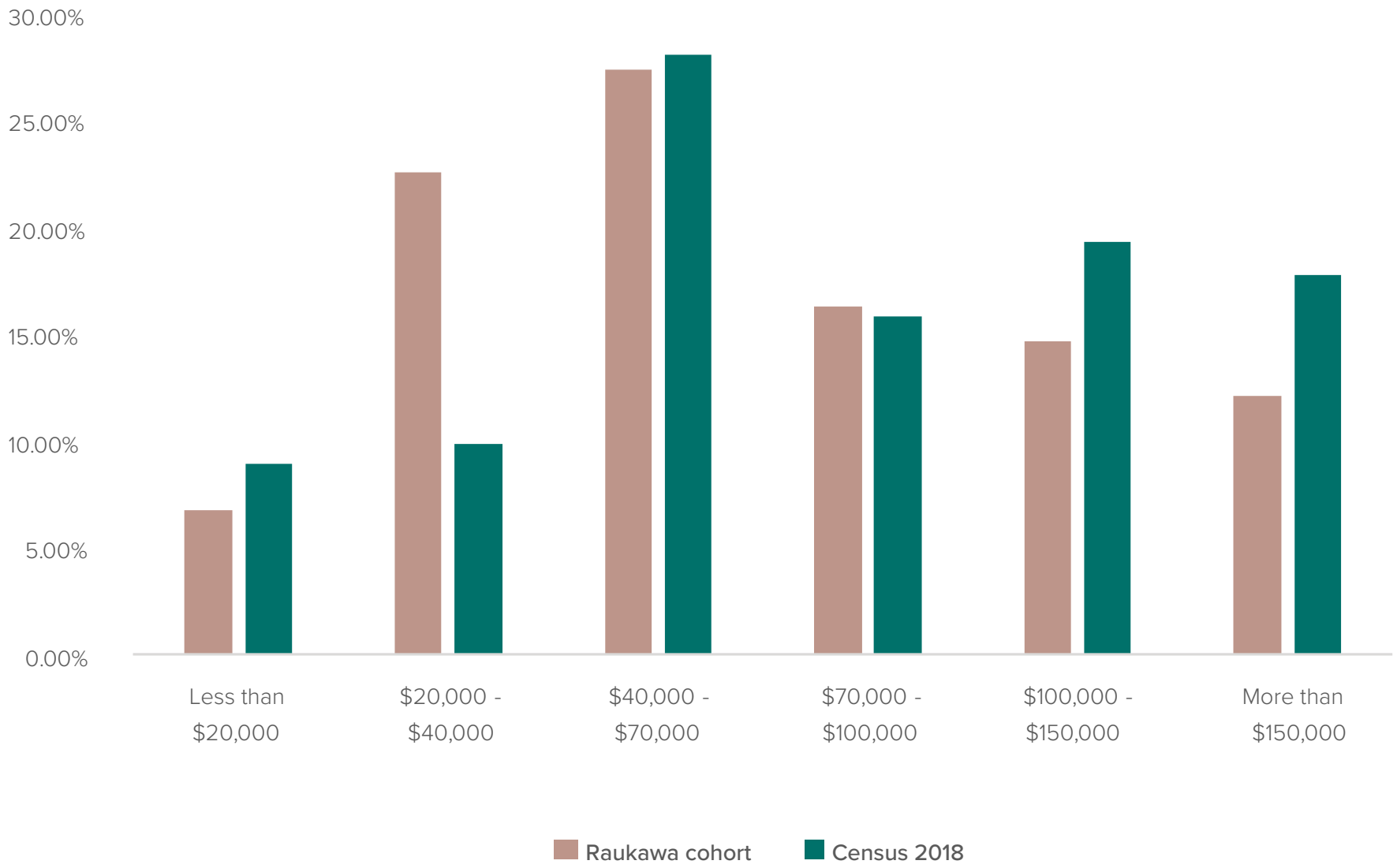
Similarly to household incomes, it is also noteworthy to consider that most whare (58.2%) in the project are owned by the occupants, with 34.1% of the participants living in private rental and 7.7% in public housing. This shows, that although they may be contributing factors, neither household income or home ownership status alone dictate whether or not the occupants of a whare are suffering from energy hardship.[vii]

The survey data detailed above verifies Raukawa's community-focused methods for identifying whānau in energy hardship. The indoor temperature monitoring results demonstrate that the cohort identified as being in energy hardship using Raukawa's knowledge have significant exposure to cold temperatures that do not meet World Health Organization recommendations based on the best scientific evidence for protecting health.

vi Justified absences, of which the majority (>90%) is classified 'Absent due to short-term illness/medical reasons'.

vii If we consider the Concept Consulting analysis, only the lowest earning 20% of households (i.e. an annual household income of less than $40,000, according to Figure 3) were considered to be in hardship due to spending >10% of their after-housing income on energy costs. Of the Raukawa cohort, of which 98.8% are considered to be in energy hardship, 70% are above this income threshold.

Figure 4: Household income distribution of the Raukawa cohort compared to the 2018 Census.



Conclusion and next steps

Data collected during the baseline phase of this study during the winter of 2023 underscores the evident need among Raukawa whānau. This evidence unequivocally demonstrates that the homes in the cohort are consistently too cold with 98.8% of the households unable to maintain healthy indoor temperatures above 18°C.

The Raukawa whānau need support to enable them to move into a state of household energy wellbeing where they have sufficient home energy to meet their needs. The intervention phase of the Raukawa Energy Innovation Project plans to address this through the interim measure of providing energy subsidies. The project partners expect that these interventions will improve health and wellbeing indicators for both adults and tamariki in the cohort. Additionally, they anticipate that household budgets will be freed up, enabling whānau to better afford essential food and housing costs, as well as their energy bills.

Three proposed subsidy models, scoped to achieve health benefits and enable wellbeing for the recruited whānau, have been co-designed by Raukawa, The Lever Room and He Kāinga Oranga. Although designed, it is important to note that the project partners have decided that the nature of these subsidies will not be presented publicly until the implementation of the intervention stage in order to uphold the mana of the recruited whānau.

The co-designed subsidies are all expected to provide around the same monetary value to whānau across the coldest winter months (for the period between May and September for approximately three years). When combined with ongoing measurements of indoor temperature and whānau wellbeing, the intervention phase will enable the project partners to answer their primary research questions to understand:

- which of the subsidy models is most acceptable and easiest to understand for the participants?;
- how do the subsidies impact measured indoor temperatures in the households?; and
- what improvement is observed in regard to whānau respiratory symptoms, mental health, and other physical health?

Consent for linking the Raukawa cohort's data to the Statistics NZ Integrated Data Infrastructure (IDI) has been obtained and this will allow future work to look at the impact of the intervention on health, education, employment and other outcomes.[viii, 20] The project partners will also undertake a cost benefit analysis of the subsidy models. This will include a direct comparison of indoor temperature management to deep home retrofit solutions, guiding an evidence-based approach around optimising value of home retrofits (such as those conducted through the Healthy Homes Initiative).

In parallel with characterising health impacts, the data from this project will provide deeper understanding of how much energy whānau require to achieve indoor temperatures associated with a healthy home. This information has not been adequately ascertained before (noting that previous data-driven analyses on energy hardship in New Zealand have been conducted based upon what a household can afford rather than what amount of energy they actually need to adequately heat their homes) and is crucial when considering electricity generation requirements to effectively meet the needs of **everyone** on the demand-side.[5]

In the longer term, evidence from the project will assist Raukawa in their efforts for continued intervention within their iwi and rohe. Raukawa's Vision 2030 starts with the rollout of appropriate subsidies to reduce energy bills, while they proceed with the development of distributed renewable energy resources to supply sufficient electricity for all their whānau. Ultimately, the goal is to prevent Raukawa uri and future generations from the harm of energy poverty.

The Raukawa Energy Innovation Project will provide a scalable template for short-term subsidy relief and will enable long term sustainable solutions to be implemented by other iwi, a number of which have already expressed their interest in learning from Raukawa. By sharing this knowledge widely to other communities and to government agencies involved in the climate transition, and delivering energy hardship interventions, it can be ensured that the programmes they design can meaningfully shift the dial and improve wellbeing and environmental outcomes across Aotearoa.

Raukawa is firmly committed to empowering their whānau to lead healthier lives by eradicating energy poverty. This work demonstrates their strong desire to innovate on methods to reduce power bills and identify what interventions are required to generate health, environmental, community and economic outcomes. The intervention phase of the project, was scheduled for implementation in May 2024, however Raukawa are continuing to look for funding partners to allow this mahi to continue.[ix] If you are interested in learning more about the Raukawa Energy Innovation Project, please contact the Raukawa project team at info@raukawa.org.nz.

The energy transition provides an unprecedented opportunity to tackle energy inequality and health disparities by eradicating energy hardship. Initiatives such as the Raukawa Energy Innovation Project are a critical stepping stone towards achieving this. From the perspective of Raukawa, if they do nothing now, many of their whānau will be left behind, living in cold, damp and unhealthy houses. Without intervention, they will be left in a position where they are only able to watch those in a more privileged position pass them by.

viii The Integrated Data Infrastructure (IDI) is a large research database which holds de-identified microdata about people and households. The data is about life events (such as education, income, benefits, migration, justice, and health) and approved researchers use the IDI to conduct cross-sector research that provides insight into our society and economy to help solve complex issues that affect New Zealanders. Data in the IDI is de-identified which means that information like names, dates of birth, and addresses have been removed to protect the privacy of individuals and whānau.

ix Ara Ake are not continuing to fund the project to implement the intervention stage.

Appendix A: Surveys

Raukawa

Internal Form

Phase 1: Baseline Household Questionnaire Form

- This form is to be completed by a Raukawa kaiāwhina while talking to an adult who can speak for the household. Adults include all those 13 years of age or over (born before June 2010).
- Ensure you complete:
  - One household questionnaire per household;
  - An adult questionnaire for each adult present in the whare when visited; and
  - A child questionnaire on behalf of each child that is part of the household whether present or not.

Preliminary Information

Household ID

Continuing to complete this questionnaire indicates that you have been given the information about the project, had all your questions answered, and you consent to take part:

- ☐ Yes, I have been given information about the Raukawa Energy Innovation Project, and consent to take part
- ☐ No, I do not consent – Please do not complete this questionnaire.

Raukawa kaiāwhina's name

With your permission our research team would like to look at the long-term effects of the Raukawa Energy Innovation Project by using linked government datasets available on the Integrated Data Infrastructure such as health, education and employment. If you agree we will add your deidentified data so that we can look at the changes made by the Raukawa Energy Innovation Project on the government datasets.

I consent to my data being de-identified and linked to Statistics New Zealand's Integrated Data Infrastructure.

- ☐ Yes
- ☐ No, I don't

Please see next page >

Raukawa

Internal Form

Phase 1: Baseline Household Questionnaire Form

Ngā mihi nui ki a koe, thank you for answering these questions.
These first questions tell us a bit about the whare and who lives here:

Including yourself, how many people usually live in your household?

Of the people usually living in the household, how many are...

- Children under 5 years old:
- Children aged 5 to 17 years old:

Who owns the whare/building that you live in?

- ☐ You or someone else who lives in the whare with or without a mortgage, or a family trust
- ☐ Private person, trust, or business
- ☐ Local authority or city council
- ☐ Kāinga Ora (formerly known as Housing New Zealand) (Iwi, hapū, or Māori land trust
- ☐ Other community housing provider
- ☐ Other state-owned corporation or state-owned enterprise, or government department or Ministry
- ☐ Don't know

How would you describe the condition of your dwelling? Is it...

- ☐ Excellent – No immediate repair and maintenance needed
- ☐ Good – Minor maintenance needed
- ☐ Average – Some repair and maintenance needed
- ☐ Poor – Immediate repair and maintenance needed
- ☐ Very poor – Extensive and immediate repair and maintenance needed

Does your home meet the Healthy Homes Standard (insulation, heating, and ventilation)?

- ☐ Yes
- ☐ No
- ☐ Don't know

Please see next page >

Raukawa

Internal Form

Phase 1: Baseline Household Questionnaire Form

Can you see mould in any part of this dwelling, that in total, is larger than an A4 sheet of paper?

- Mould (mildew) may grow on the walls, ceiling, floor, doors, window frames, curtains or blinds.
- Mould can be black, white, green, brown, red, etc.
- An A4 sheet is the size of 1 page of this form.

- ☐ Yes – always
- ☐ Yes – often
- ☐ Yes – sometimes
- ☐ No

Is this dwelling damp?

A damp whare or dwelling may feel or smell damp, or have damp patches on the walls, ceiling, floor, or window frames

- ☐ Yes – always
- ☐ Yes – sometimes
- ☐ No
- ☐ Don't know

Which types of heating are used most often in this dwelling?

- ☐ Heat pump
- ☐ Electric heater (including bar, panel, oil-filled, or fan)
- ☐ Fixed gas heater
- ☐ Portable gas heater
- ☐ Wood burner
- ☐ Pellet burner
- ☐ Coal fire
- ☐ Other _____
- ☐ Don't know
- ☐ None

How do you feel when visitors come to your whare?

- ☐ I try and avoid visitors because of the state or condition of my whare
- ☐ I feel a little shy about the state or condition of my whare
- ☐ I feel okay about the whare and having visitors here
- ☐ I'm pleased to have visitors and don't feel shy about my whare
- ☐ I'm proud of my whare and feel happy to have people visit

Please see next page >

Raukawa

Internal Form

Phase 1: Baseline Household Questionnaire Form

Firstly, we acknowledge that the cost of living, including the cost for electricity, is out of control and that many whānau across the country are struggling to meet these increased costs.

These next questions are about your household's experiences of paying for electricity bills:

In the last 12 months, what was your total household income, before tax or anything was taken out? Please do not count loans as income.

- ☐ Less than $20,000
- ☐ $20,000 – $40,000
- ☐ $40,000 – $70,000
- ☐ $70,000 – $100,000
- ☐ $100,000 – $150,000
- ☐ $150,000 – $200,000
- ☐ More than $200,000

Does anyone in your household receive the Winter Energy Payment?

- ☐ Yes
- ☐ No
- ☐ Don't know

Which electricity company do you use?

☐

How much does your household spend on electricity?

$ ☐ per week or per month

(please select week or month)

- ☐ Week
- ☐ Month

How much do you feel your household could comfortably afford to pay for electricity?

$ ☐ per week or per month

(please select week or month)

- ☐ Week
- ☐ Month

Please see next page >

Raukawa

Internal Form

Phase 1: Baseline Household Questionnaire Form

Does your household ever cut back on groceries or juggle other bills to pay for electricity?

- ☐ Yes – always
- ☐ Yes – sometimes
- ☐ No
- ☐ Don't know

Does your household put up with feeling cold in winter to keep costs down?

- ☐ Not at all
- ☐ A little
- ☐ A lot

Does your household feel stressed, worried, or dread about your power bill?

- ☐ Yes
- ☐ No
- ☐ Don't know

In the last 12 months has your household:

- ☐ Received a late payment notice from your electricity or gas company?
- ☐ Been disconnected from electricity or gas services for late or non-payment?
- ☐ Been in contact with your electricity or gas company about a payment arrangement?
- ☐ No, none of these happened

Does your household current have any outstanding electricity debt?

- ☐ Yes, please tell us how much? $ _____
- ☐ No
- ☐ Don't know

Kia ora,

Thank you for completing the household questionnaire. We now need to complete the adult questionnaire for every person 13 years old and over who usually lives in the whare and is at home now to answer the questions, and the child questionnaire for every child (0 – 12 years) that usually lives in the whare.

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Adult Questionnaire Form

- This form is intended for consumers taking part in the Raukawa Energy Innovation Project.
- This form needs to be completed individually by every adult household member aged 13+ (born after June 2010) who is at home at the time of the visit by our kaiāwhina.

Preliminary Information

Household ID _____

Date of birth of respondent ☐☐ ☐☐ ☐☐ (D D M M Y Y)

Continuing to complete this questionnaire indicates that you have been given the information about the project, had all your questions answered, and you consent to take part

- ☐ **Yes**, I have been given information about the Raukawa Energy Innovation Project, and consent to take part
- ☐ **No**, I do not consent – Please do not complete this questionnaire

These first questions are about your health and wellbeing:

On a scale of 0 to 10, where 0 is completely dissatisfied, and 10 is completely satisfied, how do you feel about your life as a whole?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

In general, would you say your health is excellent, very good, good, fair, or poor?

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

Have you had attacks of wheezing at any time this winter so far (June, July, August, September)?

☐ Most days a week ☐ Several days a week ☐ A few days a month ☐ Only with chest infections ☐ Not at all

Have you coughed, at any time this winter so far (June, July, August, September)?

☐ Most days a week ☐ Several days a week ☐ A few days a month ☐ Only with chest infections ☐ Not at all

Have you had shortness of breath, so far this winter (June, July, August, September):

☐ Most days a week ☐ Several days a week ☐ A few days a month ☐ Only with chest infections ☐ Not at all

How many colds or flus have you had so far this winter (June, July, August, September)? _____

Please see next page >

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Adult Questionnaire Form

In the past 12 months, have you seen or talked to a GP, or been visited by a GP, about your own health? By health we are referring to emotional and mental health as well as your physical health.

☐ Yes ☐ No ☐ Don't Know ☐ Prefer not to say

This winter have you had sick days off paid work or study?

☐ Yes
____ If yes, how many days

☐ No, did not have days off

☐ No, not in paid work or study

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks.

	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
I have felt cheerful and in good spirits?	☐	☐	☐	☐	☐	☐
I have felt calm and relaxed?	☐	☐	☐	☐	☐	☐
I have felt active and vigorous?	☐	☐	☐	☐	☐	☐
I woke up feeling fresh and rested?	☐	☐	☐	☐	☐	☐
My daily life has been filled with things that interest me?	☐	☐	☐	☐	☐	☐

Over the past two weeks, have you felt that you can think clearly and make decisions?

☐ Yes -always ☐ Yes -often ☐ Yes- sometimes ☐ No

Please see next page >

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Adult Questionnaire Form

The next questions are about your experiences of your home in winter:

In winter, is your house or flat colder than you would like?	☐ Yes -always	☐ Yes -often	☐ Yes- sometimes	☐ No
In winter, does your house or flat get cold enough that you can see your breath?	☐ Yes -always	☐ Yes -often	☐ Yes- sometimes	☐ No
In Winter, does your house or flat get cold enough that you shiver inside?	☐ Yes -always	☐ Yes -often	☐ Yes- sometimes	☐ No
In winter, do you ever have a hard time sleeping because of the cold?	☐ Yes -always	☐ Yes -often	☐ Yes- sometimes	☐ No
In summer, is your house or flat warmer than you would like?	☐ Yes -always	☐ Yes -often	☐ Yes- sometimes	☐ No

These last questions, tell us a little more about you:

Are you -*

☐ Male ☐ Female ☐ Other

Which ethnic group or groups do you belong to? *

☐ NZ European ☐ Sāmoan ☐ Tongan ☐ Chinese
☐ Māori ☐ Cook Island Māori ☐ Niuean ☐ Indian

Other (such as Dutch, Japanese, Tokelauan). Please state

Feel free to specify your iwi

Tau kē! Thank you for filling out our survey!

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Child Questionnaire Form

- This form is intended for consumers taking part in the Raukawa Energy Innovation Project.
- This form needs to be completed by an adult household member on behalf of every child normally living in the house who is aged 0–12 years (born after June 2010).

Preliminary Information

Date of birth of child ☐☐ ☐☐ ☐☐ (D D M M Y Y)

First, we've got a couple of questions about your child's health and wellbeing:

In general, would you say your child's health is: ☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

I'd like you to think in general about how your child is doing. Please include all areas of life for your child. Where zero means 'extremely badly' and 10 means 'extremely well', how would you rate how your child is doing these days? 0 1 2 3 4 5 6 7 8 9 10

In winter, does your house or flat get cold enough that you can see your child's breath? ☐ Yes –always ☐ Yes –often ☐ Yes– sometimes ☐ No

In winter, does your house or flat get cold enough that your child shivers inside? ☐ Yes –always ☐ Yes –often ☐ Yes– sometimes ☐ No

In winter, does your child have trouble sleeping because of the cold? ☐ Yes –always ☐ Yes –often ☐ Yes– sometimes ☐ No

So far this winter (June, July, August, September) has your child had days off school/ kura kaupapa or kōhanga reo/ preschool because of illness? ☐ Yes ____ If yes, how many days ☐ No, did not have days off ☐ No, does not attend school/kura kaupapa or kōhanga reo/preschool

Did your child have whistling or wheezing in the chest at any time this winter so far (June, July, August, September)? ☐ Yes ☐ No

Please see next page >

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Child Questionnaire Form

How many attacks of wheezing has your child had so far this winter (June, July, August, September)? ☐ None ☐ 1 to 3 ☐ 4 to 12 ☐ More than 12

Has your child had a dry cough at night, apart from a cough associated with a cold or chest infection at any time so far this winter (June, July August September)? ☐ Yes ☐ No

Now we've got a couple of questions about healthcare your child may have accessed so far this winter:

Did you talk to a GP for health care or advice about your child for a chest infection, asthma or breathing problems so far this winter (June, July, August, September)? ☐ Yes ☐ No ____ If yes, how many times?

The final few questions tell us a little more about your child:

Which ethnic group or groups do you belong to? * *Mark the space or spaces which apply to your child*

☐ NZ European ☐ Sāmoan ☐ Tongan ☐ Chinese
☐ Māori ☐ Cook Island Māori ☐ Niuean ☐ Indian

Other (such as Dutch, Japanese, Tokelauan). Please state

Feel free to specify your child's iwi:

What sex is your child? ☐ Male ☐ Female ☐ Other

Tau kē! Thank you for filling out our survey!

Appendix B: Process tool

Whakatau (pre-existing)

- Establish meaningful connections and relationships with the whānau being assessed.
- Engage in whanaungatanga.

Identification of households

- Review a list of households in the uri against several considerations, utilizing iwi-held knowledge and data. This includes considering income levels and experiences of poverty, as well as the condition of the home.

Whakamōhio

- Engage in a conversation providing clear and accessible information about the mahi.
- Respectfully explain the purpose of the programme and seek the whānau's consent to proceed.

Whakarongo

- Following enrolment in the programme, kaimahi visit the whānau's home. Over a cup of tea, a safe environment is created for whānau to share their experiences.
- In discussion with kaimahi, a pre-survey is run through with whānau, recording these experiences in a non-intrusive and efficient manner. The pre-survey includes secondary measures of energy hardship.
- Actively listen to the whānau's perspectives, concerns, and challenges regarding energy access and affordability.
- Whānau are encouraged to share what they feel comfortable sharing, without any pressure to provide specific answers.

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If you are interested in learning more or supporting the Raukawa Energy Innovation Project, please contact the Raukawa project team at info@raukawa.org.nz

Ara Ake
Future Energy Development

Raukawa

University of Otago
ŌTĀKOU WHAKAIHU WAKA

THE LEVER ROOM