

Snapshot evaluation of the Maniapoto Solar Energy Sovereignty Project

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Ngā mihi nui ki a koutou katoa.

We would like to express our thanks and gratitude to the Solar Sense Maniapoto Energy Sovereignty Project (SSMESP) trial partners Solar Sense Limited and Ngāti Maniapoto Marae Pact Trust for entrusting us with the task of evaluating this valuable project. We would also like to thank you the SSMESP participants who gave freely their time and knowledge. We look forward to future developments.

Mauri ora!

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**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI



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Summary

In Aotearoa New Zealand energy hardship disproportionately affects low socio-economic households, those living in rural areas, and Māori. To address energy hardship the Ministry of Business, Innovation and Employment (MBIE) has prioritised funding for renewable energy solution projects that eliminate energy hardship. The Māori and Public Housing Renewable Energy Fund was established in August 2020, to trial small-scale renewable energy technologies; with renewable energy solutions leading the way to improved health outcomes for people in public and Māori housing.

In response to the announcement, Solar Sense Limited (Māori renewable energy company) and Ngāti Maniapoto Marae Pact Trust (Māori NGO mandated by 22 marae within the Ngāti Maniapoto region), with the support of Nau Mai Ra (Kaupapa Māori energy retailer), partnered to co-design a solar energy project that aimed to eliminate energy hardship present in Maniapoto whānau across Aotearoa. The Solar Sense Maniapoto Energy Sovereignty Project (SSMESP) involved the design, development, and build of two small scale solar farms equipped with unique solar tracking technology, strategically located in the local lines network in the Maniapoto King Country area to service n=14 priority households (Maniapoto King Country n=10, Taranaki n=1, Otaki n=1, Wellington n=1, and Ashburton n=1).

This evaluation used a Kaupapa Māori evaluation (KME) mixed-methods strengths-based approach. Data collected comprised of comprehensive observational field notes from the SSMESP trial partners, and hard copy and electronic surveys from the n=14 SSMESP trial participants, to explore factors that shaped participation, engagement, and impact of, the SSMESP trial for end-users.

Responses from the SSMESP trial participants were overwhelmingly positive with most participants highlighting the trial helped with the cost of electricity and alleviated the stress of paying a large power bill. Participants also valued the communication from trial partners.

SSMESP trial partners valued the 'by Māori, for Māori, with Māori' holistic approach that allowed for open and honest reflection, as well as the ability to be agile and responsive to participant need, despite being outside the scope of the SSMESP trial. For instance, addressing issues identified during the trial such as a broken window. With

consent from participants, issues such as these were able to be addressed by NMMPT and was well received by participants.

This report finds that the SSMESSP can be scaled and replicated by other iwi, hapū and marae entities across Aotearoa. This unique approach allows households access to solar energy without the generation asset (solar farm) being on or near their location of residence, for approximately 40% less than a traditional rooftop offering of the same output. The SSMESSP model means iwi, hapū, and marae that invest in solar arrays using this approach have control over energy generation as well as autonomy to determine how energy credits will be disseminated, and to which households. In turn, directly reducing the power bill within the whānau home of their tribal members.

Introduction

The issue of energy hardship, also known as power poverty and interchangeably with fuel poverty, is characterized by high levels of insufficient access to energy sources, accessibility, and difficulties paying energy bills, such as affordability (Brabo-Catala et al., 2022). This can lead to a range of adverse effects, including poor health and reduced quality of life (Clark et al., 2021; Robson et al., 2007). The high levels of energy hardship among Māori are due to a variety of factors, including low-income levels (Brown & Bryder, 2022), a lack of access to energy-efficient housing (Ingham et al., 2019), and the remoteness of many Māori communities (Howden-Chapman et al., 2012) which can increase energy costs. Addressing energy hardship for Māori is important for improving overall health and well-being and reducing inequities within New Zealand (Ingham et al., 2019).

There are current solutions that aim to address energy hardship for vulnerable communities including energy efficiency programmes, that provide access to energy-efficient housing, appliances, and insulation (Bullen et al., 2008). The Government's winter power package provides financial assistance for energy bills and improving access to energy subsidies for low-income households to alleviate the burden of energy costs for vulnerable households (Labour, 2023). Still, O'Sullivan and Viggers (2022) attest that "...the major contributing causes of energy poverty – dwelling design and housing quality that determine the energy requirements of the dwelling, as well as energy source and price – are largely external and outside the control of occupants" (p. 66). As a response to rising electricity prices and the need for greater renewable energy generation, the Ministry of Business, Innovation and Employment (MBIE) established three contestable rounds of funding titled, the Māori and Public Housing Renewable Energy Fund, in 2019, 2020, and 2021 respectively, to trial small-scale renewable energy technologies.

In Europe, local and community energy (LCE) has gained momentum from policy makers and scholars alike and is loosely defined as "...collective engagement in sustainable energy solutions that takes place in civil society arenas and is tailored to local needs and values" (Berka et al., 2020, p. 165). LCE aligns with the articles of Te Tiriti o Waitangi such as:

- Mana Motuhake- Māori determination of how energy solutions will work for Māori. Grounded in Māori leadership with Māori communities, marae, hapū, and iwi.
- Mana Whakahaere- Māori have governance and kaitiakitanga energy solutions
- Mana Tāngata- Energy solutions will be focused and grounded in Māori equity
- Mana Māori- By Māori, for Māori, with Māori.

LCE projects have the potential to address energy hardship, particularly for Māori, yet approaches such as these are constrained by factors such as capital investment, public and political support to deliver a fairer distribution of costs, and co-benefits of the transition to renewable energy (Berka et al., 2020). Further, LCE projects are dependent on the motivation of leadership, the degree of wider community engagement, and the business model design (Berka and Creamer, 2018; Devine-Wright, 2019).

In response to the MBIE Round Two 2021 Māori and Public Housing Renewable Energy Fund, Solar Sense Limited (Māori renewable energy company) and Ngāti Maniapoto Marae Pact Trust (Māori NGO mandated by 22 marae within the Ngāti Maniapoto region), with the support of Nau Mai Ra (Kaupapa Māori energy retailer), partnered to co-design a solar energy project that aimed to eliminate energy hardship present in Maniapoto whānau across Aotearoa.

The partnership formed from a common interest, to make solar energy more accessible and reduce the household power bill. Understanding that previous Government and co-designed initiatives have not adequately addressed or included Māori (Came et al., 2020; King et al., 2022; New Zealand Law Society, 2019), the SSMESSP partners designed a project that included:

- Māori communities and perspectives in the planning and implementation of the project,
- Māori beliefs, values, and traditions, and
- Unique characteristics of targeted communities, including location and access to resources.

During the design of the SSMESSP trial, the partners identified the need for an evaluation to ensure the trial not only meets MBIE contractual obligations, but meets the

expectations, and needs, of end-users. Therefore, this evaluation report focuses on the impact of the SSMESP trial. Findings will be used to determine the extent to which the trial was responsive to participant needs as well as enablers and learnings to achieve scalability.

Evaluation aim:

To explore factors that shaped participation, engagement, and impact of, the SSMESP trial for end-users.

Objectives:

Founded on the 'by Māori, for Māori' premise, the SSMESP partners identified the following three objectives to determine what impact the SSMESP trial had on whānau households and focus the data captured within this evaluation.

1. Identify barriers and enablers to eliminating energy hardship,
2. Understand energy usage and prioritisation in households, and
3. Explore how the SSMESP trial impacted participants.

Evaluation Design

This section provides a background of the Solar Sense Maniapoto Solar Energy Sovereignty Project (SSMESP) which led to the evaluation study. This report supports the larger Ministry of Business, Innovation and Employment evaluation of renewable energy for Māori and public housing projects. Together these findings will aid in determining whether the renewable energy projects funded, address energy hardship for vulnerable communities.

Context Solar Sense Maniapoto Energy Sovereignty Project (SSMESP)

The Solar Sense Maniapoto Energy Sovereignty Project (SSMESP) involved the design, development, and build of two small scale solar farms (15kw and 30kw, with the ability to expand to 150kw and 300kw respectively post-trial) equipped with unique solar tracking technology, strategically located in the local lines network in the Maniapoto King Country area to service n=14 priority households (Maniapoto King Country n=10, Taranaki n=1, Otaki n=1, Wellington n=1, and Ashburton n=1).

Figure 1 depicts how the SSMESP model worked. The solar farms allow for power to be generated and injected into the local lines network. Power is sold on the spot market and funds are returned to the array owner to distribute as desired. For the SSMESP trial, SSL managed funds from power sales and these dividends were distributed directly to participant power accounts. Participants had the following retailers: Genesis energy n=6, Frank Energy n=3, Trust Power n=2, Slingshot n=1, Contact Energy n=1, and Just Energy n=1.

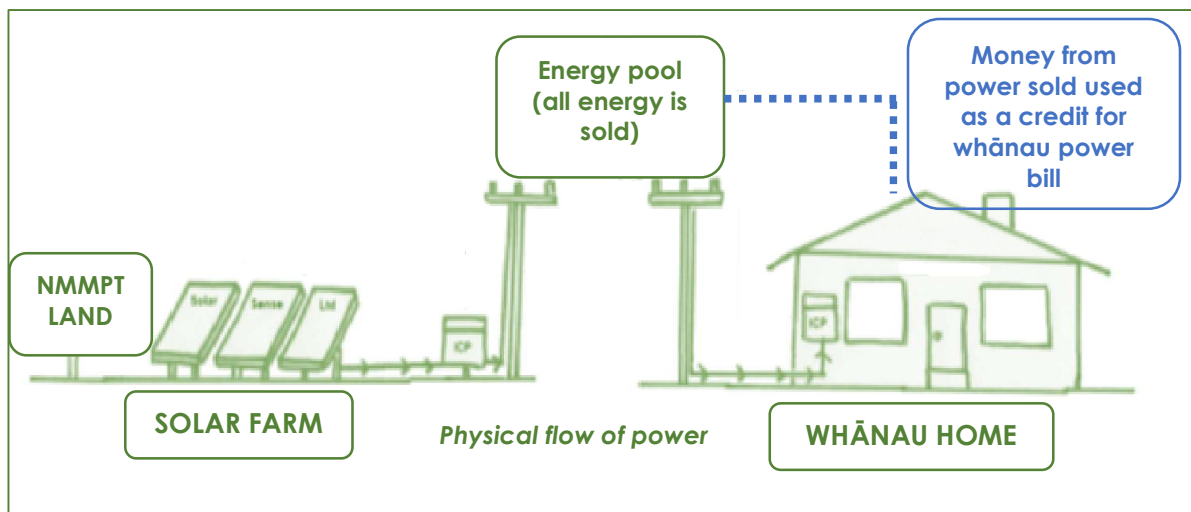


Figure 1- High level overview of how the SSMESP model works.

Roles and responsibilities

Solar Sense Limited (SSL)- Energy Provider:

Solar Sense Limited is a Māori owned and operated R&D company focused on improving accessibility to solar power, reducing energy hardship, and growing the embedded energy generation sector of Aotearoa. SSL led the SSMESSP and was responsible for installing and maintaining the solar arrays at the two solar farm sites.

Ngāti Maniapoto Marae Pact Trust (NMMPT)- Non for profit organisation:

Ngāti Maniapoto Marae Pact Trust is a Māori non for profit organisation mandated by 40x marae within the Ngāti Maniapoto region working directly with whānau in the Maniapoto community in the areas of education, culture, social, recreational and economic needs. NMMPT provided the solar farm sites for the project and recruited the 15x whānau households for the trial.

Nau Mai Ra (NMR)- Energy retailer:

Nau Mai Rā is New Zealand's first Kaupapa Māori Power Company. During the design of the SSMESSP NMR played a key role in identifying power hardship barriers and issues for their customers. These insights played a pivotal role in the design of the evaluation study for the trial. The initial intent of the SSMESSP trial was for whānau households to transition to NMR to receive power credits, however due to unforeseen circumstances, NMR was unable to offer their service in the King Country. Households remained with their current retail provider over the course of the trial.

Dr Nikki Barrett (Ngāti Haua, Ngāti Pōrou) lead evaluator:

Nikki is an experienced health professional. More recently, Nikki has led a number of evaluation and reports on behalf of the University of Waikato for the Ministry of Health, Social Wellbeing Agency, and Barrett Dynamics Limited.

Dr Jordan Waiti Member of evaluation team:

Jordan is currently lecturing in Te Huataki Waiora and is the current (Acting) Principal Kaupapa Māori Researcher at Te Hīringa Hauora – NZ Health Promotion agency. He provided overall advice regarding Kaupapa Māori methodologies and assisted with mentoring of lead evaluator.

Methods

This evaluation uses a Kaupapa Māori evaluation (KME) mixed-methods strengths-based approach. The need for evaluation of interventions is a necessary process for both developers and end-users. For developers, evaluations can ensure accountability and assess the extent of success (Rarere et al., 2019). Kerner (2008) argues that without appropriate evaluation processes in place accountability of intervention outcomes can be misdirected or overlooked. For end-users, evaluations can identify the extent to which the intervention involves, impacts and influences end-user attitudes and behaviours. KME is a process that can be implemented into health intervention programmes to ensure a culturally appropriate assessment is undertaken. Carlson et al. (2017) argue that KME can meet the “aspirations of co-ownership, mutually beneficial outcomes and shared power” (p.1). KME considers evaluation processes that recognise Māori values, self-determination, and aspirations. These elements have shaped the rationale for a KME for the SSMEESP trial.

Participant recruitment

Participants of the evaluation comprised of the trial partners (Solar Sense Limited, and Ngāti Maniapoto Marae Pact Trust) and end-user participants.

End-user participants comprised of 14x Maniapoto households residing across Aotearoa; n=10 Maniapoto King Country, n=1 Wellington, n=1 Otaki, n=1 Taranaki, and n=1 Ashburton. Participants were recruited by NMMPT based on the following criteria:

- one household member whakapapa to Ngāti Maniapoto, and
- have one or more of the following ‘vulnerability’ characteristics-
 - struggle to pay for power,
 - overcrowding,
 - unemployment,
 - health issues,
 - elderly living in the home (40 years and over),
 - children living in the home (15 years and under), and
 - house maintenance issues.

Participants were identified by NMMPT and invited to participate in the SSMEESP trial. Upon successful enrolment into the SSMEESP trial, the lead evaluator contacted

participants inviting them to be part of the evaluation study of the trial. To ensure anonymity, participants were given a pseudonym.

Data collection

Comprised of two methods;

1. Observational field notes from the lead evaluator captured comments from the trial partners in both planned and unscheduled events over the duration of the SSMESP trial. Such notes informed the questions for the end-user surveys and guided data analysis.
2. Two separate surveys, hard copy or electronic, were disseminated to end-user participants at the beginning at end points of the SSMESP trial. For those in the Waikato area, a paper survey was given to participants during the consent phase of the trial evaluation. For those outside the Waikato region a link to a Qualtrics survey was disseminated. The first surveys were disseminated in April 2022. At the conclusion of the trial, a final survey was sent via Qualtrics to participants .

Data Analysis

Survey data were analysed using descriptive statistics and a thematic analysis of open-ended responses. A descriptive thematic analysis was then used for the observational field notes data.

Ethics statement

Ethics was approved on November 29th, 2021 through the University of Waikato Human Ethics Committee. Reference HREC(Health)2021 #83.

Results

Survey one results.

Participant demographics and characteristics

Characteristics of household

Of the 14 participating households, six participants owed their homes. Figure 2 shows the number of people residing in each of the 14 participant households and the number of bedrooms (inclusive of sleepouts or cabins) at the beginning of the SSMEESP trial. Of the 14 households, one dwelling had five bedrooms, two dwellings had four bedrooms, six had three bedrooms, and five had two-bedrooms. 12 households had substantially more people living in the house than bedrooms, with 5 properties noting more than 10 people residing in one dwelling. One participant commented that the day before they completed their survey there were 26x people residing in a four bedroom dwelling and that it was common to have whānau 'come and go'.

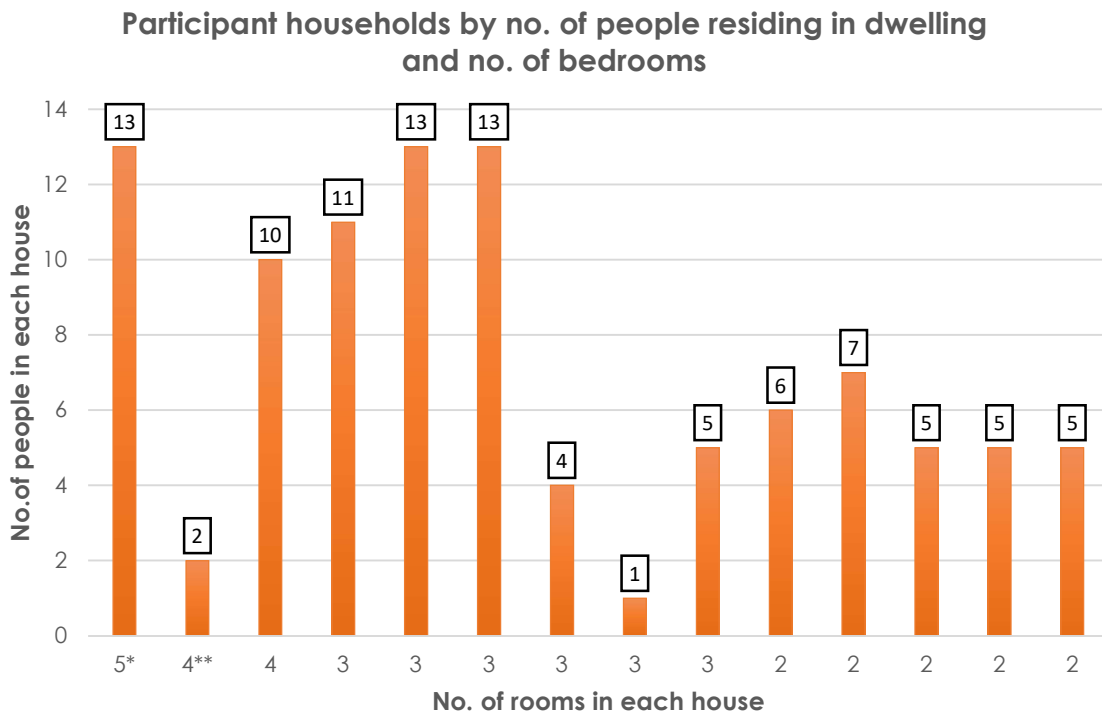


Figure 2- Participant households by no. of people residing in dwelling and no. of bedrooms

*4-bedroom house with a sleep out

**3-bedroom house with cabin

Health and medical issues of households

Participants were asked whether anyone in the household suffers or suffered from, a list of health and medical issues in the past year. Table 1 shows that each household experienced at least one or more health and medical issue. All health and medical issues were breathing and respiratory related.

Health and medical issue identified	No. of households affected
Asthma	9
Repetitive flu	7
Sore throat	8
COVID-19	10
Breathing difficulties	4
Sleep apnea	4

Seven households identified a need to seek urgent medical attention for the medical issues noted in table 1, with a further five households requiring hospital care. Three participants noted a constant need to obtain medical treatment for children and elderly family members in the household.

Experiences of energy usage within households

Figure 3 are responses to a Likert scale questionnaire from the first survey intended to understand if the cost of electricity was a factor related to power usage, and whether this issues extended across other bills.

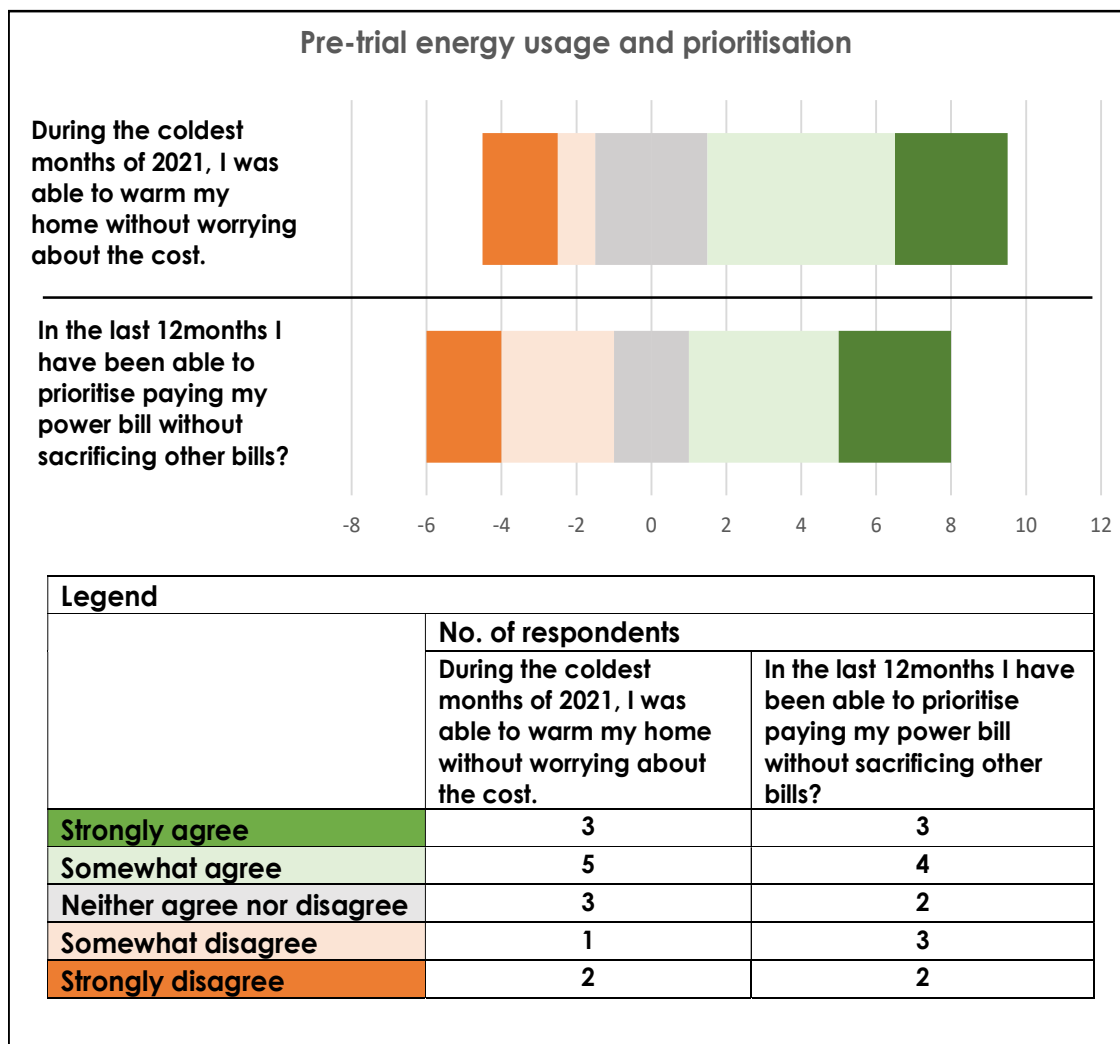


Figure 3- Pre-trial energy usage and prioritisation

Of the three respondents who answered 'strongly agree' to the statement, *during the coldest months of 2021, I was able to warm my home without worrying about the cost*, two respondents provided further information to explain their answers.

Moving to King Country and having to pay a lines bill is terrible. Thankfully we have our power bill paid under employment contract. I am not sure if I would have moved back to King Country without help to pay the power bill.

Another respondent explains:

I pay \$100 a week includes housing and electricity and is offset by wages. I think my boss is losing out on money, I assume my power bill

is \$500 a week. I use the drier whenever I want, lots of power, don't worry about any of that, though know not to be frivolous with this benefit and encourage whānau to turn off power and restrict access.

Participants were asked, *in the last 12 months have you at any time struggled to pay the household power bill?* Seven respondents answered yes while seven responded no. Those that answered yes explained how often this occurred; n=4 three to five, n=2 once or twice times, and n=1 cannot recall the number of times.

Participants were asked, *in the last 12 months have you had to sacrifice paying another household bill or essential item to pay the household power bill?* Eight respondents answered yes while six responded no. Those that answered yes explained how often this occurred; n=4 once or twice, n=3 three to five times, and n=1 cannot recall the number of times.

Nine participants further reported that the cost of electricity was a barrier for heating their home. Factors such as, 'insufficient housing standards i.e. no home insulation or broken windows', 'heat pump and other necessary winter appliances too pricey to operate', and 'too many kids or whānau members having to sleep in garage sleepout due to lack of space' were identified as reasons for why the cost of electricity was a barrier to heat the home. One respondent explained that they intentionally try not to heat their home during the first weeks of winter to save on their power bill.

Participants were asked *if a lack of access to reliable electricity has affected any other aspects of their lives or those in the household?* Six participants responded yes, with most identifying that a lack of access to electricity impacted their children's education and ability for one participant to work from home resulting in lost wages.

Expectations and reasons for participating in the SSMESP trial

Trial participants identified several factors for wanting to participate in the SSMESP trial. One or more responses included, 'the ability to participate research', 'feel like I am being helpful', 'trust in NMMPT who recommended the trial' and 'hope to lower household power bill'.

Other respondents' comments were:

- *I'm hoping the benefits of solar energy will enable our whānau to become more self-sufficient.*

- *Want to support looking into alternative [energy] options.*
- *Because I'm always un trouble with my power regular dishonour fees & disconnections.*
- *Support our Iwi initiatives.*
- *A profile of accessibility to information regards feasibility of solar energy supply being cost effective and potentially profitable from a collective set up for supply at co-op rates.*
- *benefit as a whānau/household and or in the management of energy costs. Sustainable energy.*
- *I hope the study finds that power is expensive for whānau to pay but it is an essential part of everyday lives fir all whānau.*
- *To better Health & Wellbeing, to make everyday living expenses more affordable for our whānau.*

Survey two results.

13 participants completed the final survey of the SSMESP trial.

Participant demographics and characteristics

Characteristics of household

Three participants noted a change to the number of people residing in the dwelling.

Health and medical issues of households

Majority of participants noted similar health issues as highlighted in the first survey but only one participant noted a household member requiring a hospital visit during the SSMESP trial.

Experiences of energy usage within households

Figure 4 are responses to a Likert scale questionnaire from the final survey intended to understand if the SSMESP trial impacted the cost of electricity, and in turn power usage. The majority of SSMESP participants reported they 'neither agree nor disagree' or 'somewhat disagree' with the statement '*during the coldest months of 2022 I was able to warm my house without worrying about the cost*'. However, since the SSMESP trial commenced, most participants indicated they have been able to prioritise paying their power bill without sacrificing other bills.

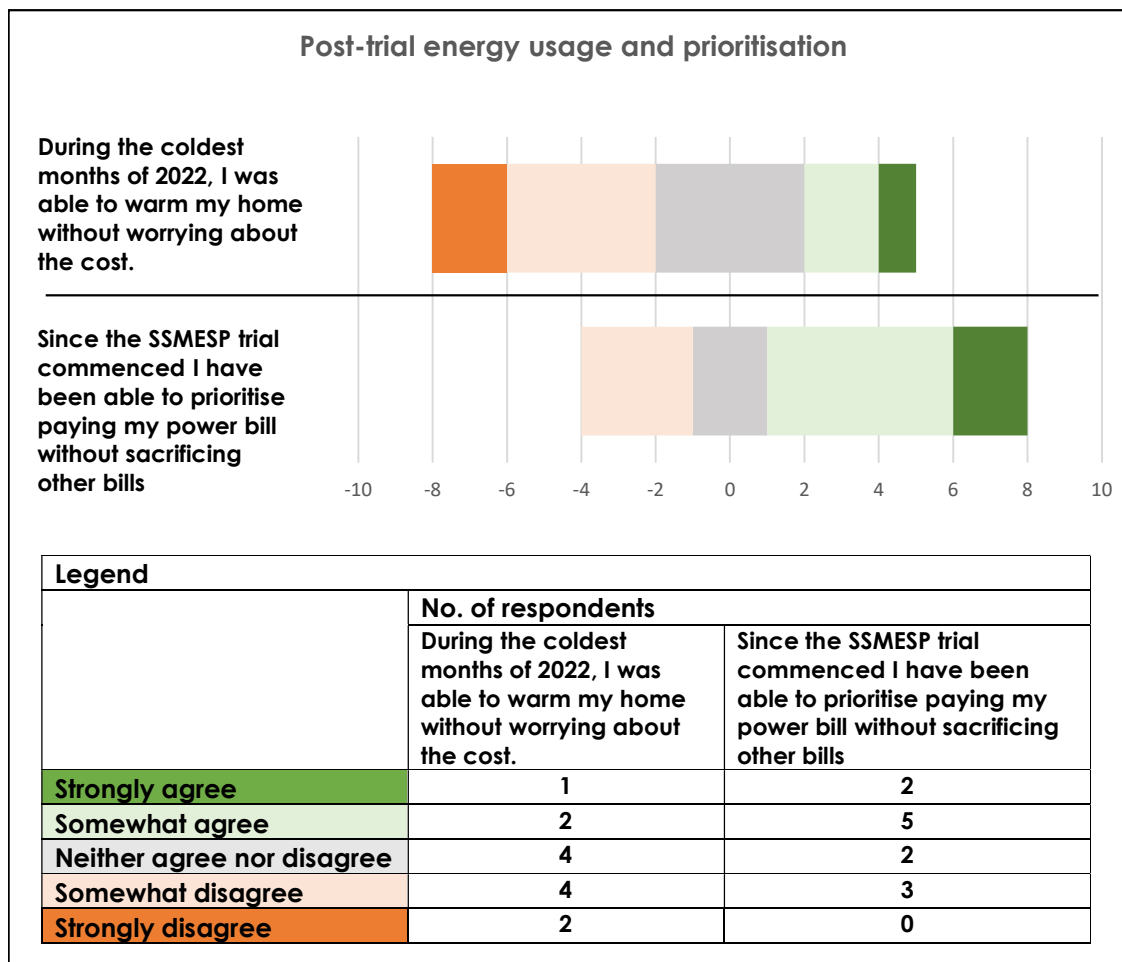


Figure 4- Post-trial energy usage and prioritisation

This result is supported by responses to the following question, *has the trial helped with the cost of electricity for heating your home?* Figure 5 shows that the SSMESSP trial has helped 'a lot (n=7 respondents)' and 'somewhat (n=4 respondents)' with the cost of electricity to heat their home. Indicating that the SSMESSP has had a positive impact in regard to the cost of electricity for the majority of participants.

Has the SSMESSP trial helped with the cost of electricity for heating your home?

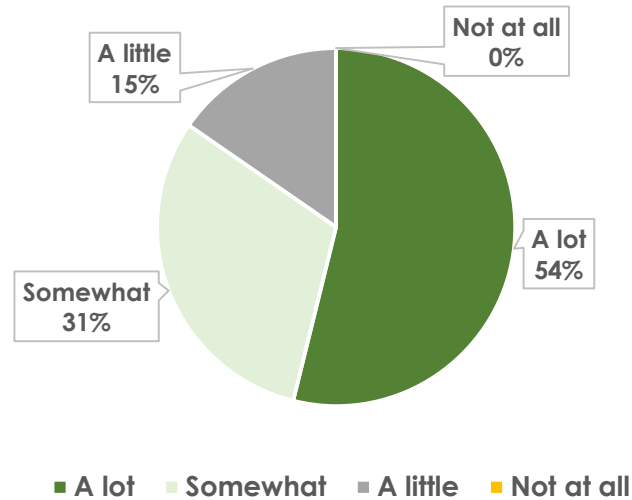


Figure 5- Has the SSMESSP trial helped with the cost of electricity for heating your home?

Participants were given three options when asked how they used their power credit?

- money set aside by household for power bill was then used for other household items or bills n=7,
- let credits accrue n=4, and
- did not notice anything n=2.

Impact of the SSMESSP trial

When asked if the SSMESSP trial has met any or all of your expectations, respondents reported the following. Six responded yes, five somewhat, and two did not notice anything.

Some participants elaborated further.

- *This scheme has helped keep my home warm over the winter period without the stress of paying the power bill it has given extra funds to put towards other household costs.*
- *I don't worry about power as much as I did. I'm more relaxed not worried.*
- *Good having extra money for high power bills*
- *Relief from excessive power bills*

- *I haven't noticed huge power bills like I'm use too*

One participant noted that it is currently summer and would like to wait until winter to see the full impact of the trial.

SSMESP trial partners

Highlights of the trial

The synergies of the partnership between SSL and NMMPT were identified through during multiple interactions and engagements witnessed by the lead evaluator. Communication with, and amongst the partners and trial participants was accurate and timely. Participants noted and valued the communication from SSL, NMMPT, and the lead evaluator.

The relationship allowed for issues that arose with participants to be addressed even when out of scope of the SSMESP trial scope. For instance, when a housing maintenance issue was raised by participants with the lead evaluator. The lead evaluator would ask for consent to pass details back to NMMPT to have the issue resolved. This genuine 'by Māori, for Māori, with Māori' approach', meant that issues were dealt with immediately despite being outside of the scope of contractual obligations.

The trial allowed for each partner to leverage of the strengthens of the other. NMMPT worked with whānau in Maniapoto daily and understand the realities of whānau. This insight was invaluable to the design and implementation of the SSMESP trial. Participants highlighted the trust they had in NMMPT on multiple occasions, such as when the lead evaluator would contact participants or in the data collected via the surveys.

Key learnings

The SSMESP trial partners underwent numerous learnings to make their vision a reality. Below is a high-level overview of the learnings the trial partners experienced over the course of the SSMESP.

1. How to prioritise whānau for future energy projects. Though the sample size of participants was small (this is discussed further in the limitations section), the number of people who owed their home, number of household members, and other characteristics varied across participants. This shows there are a range of 'vulnerability' factors that affected different households. The autonomy of how,

and which households to prioritise is a delicate matter and needs further consideration.

2. From a technical perspective there was a significant gap in knowledge and information regarding how the New Zealand energy sector functions. This complexity is experienced by both new entrants and experienced energy experts.
3. Leveraging off those with high standing in the energy sector was a must. Establishing relationships with generators, retailers, lines companies, academics, was a necessity to bringing the trial to fruition. Often these entities or organisations were non-Māori however, many were advocates of achieving equity and open to new innovation and approaches.
4. The energy sector is quite siloed. Often energy generators, lines companies, metering companies, and retailers operate in opposition to one another, yet all play a key role in energy distribution. These entities also differ across each region of Aotearoa. This results in a lack of consistency when applying for electrical connections within different lines companies. Solar regulatory requirements, metering data access, and integrating our solution with various energy retailers and in the majority of cases a lot of these entities would contradict each other. In response, SSL designed a quick reference guide to building solar arrays targeted for the each of the lines networks operating in the Waikato and greater Waikato region.
5. SSL, had to develop and design several technical solutions in-house, which was one of the reasons for the extended project timeline. Because the SSMESSP solution is unique, some solutions did not exist or the solutions we tried/requested were not responsive to our needs. An example of this was the initial plan to use Nai Mai Ra as an energy retailer and use there trading platform to track the generation from our solar farms, and redistribute to whānau, whilst also selling excess energy that was not consumed. We were unable to test this in the SSMESSP trial as Nau Mai Ra faced challenges and delays entering the lines company network that operates in the King Country.

Limitations of the evaluation

This trial is unique and possess many positive qualities. There are limitations however with this evaluation. First the sample size is small and cannot accurately reflect the generalised population. The period of the trial was also shortened to eight months. The

intention of the trial partners was to have the evaluation take place over a 12-month period. However, due to COVID-19 supply chain disruptions that delayed the build of the two solar farm sites, the trial was inevitably shorted.

Other methods of data collection were initially included in the evaluation such as temperature and humidity data collection. The use of an unintrusive device that records and sends information around the temperature and humidity of primary living space (lounge) in participants home via a wireless internet connection link over the study period. As well as semi-structured whānau interviews via zoom or face to face at the conclusion of the SSMESSP trial period. The former data collection method was excluded as the data was incomplete. It would only be useful over a 12-month period. The latter data collection was excluded as whānau received no more credits after the final survey. It was determined that a whānau interview would not a hinderance for participants rather than added value. Instead, participants were contacted via text and/or phone by the lead evaluator for an informal conversation to determine whether participants had anything else to add to the evaluation of the SSMESSP trial.

Future Directions

The SSMESSP agree this approach is a solution for whānau, marae, hapū, and iwi, to have energy sovereignty. This report finds that the SSMESSP can be scaled and replicated by other iwi, hapū and marae entities across Aotearoa. This unique approach allows households access to solar energy without the generation asset (solar farm) being on or near their location of residence, for approximately 40% less than a traditional rooftop offering of the same output. The SSMESSP model means iwi, hapū, and marae that invest in solar arrays using this approach have control over energy generation as well as autonomy to determine how energy credits will be disseminated, and to which households. In turn, directly reducing the power bill within the whānau home of their tribal members.

References

- Berka, A. L., MacArthur, J. L., & Gonnelli, C. (2020). Explaining inclusivity in energy transitions: Local and community energy in Aotearoa New Zealand. *Environmental Innovation and Societal Transitions*, 34, 165-182.
- Bullen, C., Kearns, R. A., Clinton, J., Laing, P., Mahoney, F., & McDuff, I. (2008). Bringing health home: householder and provider perspectives on the healthy housing programme in Auckland, New Zealand. *Social Science & Medicine*, 66(5), 1185-1196.
- Came, H., O'Sullivan, D., Kidd, J., & McCreanor, T. (2020). The Waitangi Tribunal's WAI 2575 report: Implications for decolonizing health systems. *Health and Human Rights*, 22(1), 209.
- Carlson, T., Barnes, H. M., & McCreanor, T. (2017). Kaupapa Māori evaluation: A collaborative journey. *Evaluation Matters—He Take Tō Te Aromatawai*, 3, 67-99. <https://doi.org/10.18296/em.0023>
- Clark, I. K. H., Chun, S., O'Sullivan, K. C., & Pierse, N. (2021). Energy poverty among tertiary students in Aotearoa New Zealand. *Energies*, 15(1), 76.
- Ingham, T., Keall, M., Jones, B., Aldridge, D. R., Dowell, A. C., Davies, C., Crane, J., Draper, J. B., Bailey, L. O., & Viggers, H. (2019). Damp mouldy housing and early childhood hospital admissions for acute respiratory infection: A case control study. *Thorax*, 74(9), 849-857. <https://doi.org/10.1136/thoraxjnl-2018-212979>
- Kerner, J. F. (2008). Integrating research, practice, and policy: What we see depends on where we stand. *Journal of Public Health Management and Practice*, 14(2), 193-198. <https://doi.org/10.1097/01.PHH.0000311899.11197.db>
- King, P., Cormack, D., Edwards, R., Harris, R., & Paine, S.-J. (2022). Co-design for indigenous and other children and young people from priority social groups: A systematic review. *SSM-Population Health*, 18, 1-10. <https://doi.org/10.1016/j.ssmph.2022.101077>
- Labour. (2023). *Chris Hipkins: Prime Minister's Statement 2023*. https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1
- New Zealand Law Society. (2019). *Waitangi tribunal report finds primary health care breaches Treaty*. <https://www.lawsociety.org.nz/news-and-communications/latest-news/news/waitangi-tribunal-report-finds-primary-health-care-breaches-treaty>
- Rarere, M., Oetzel, J., Masters-Awatere, B., Scott, N., Wihapi, R., Manuel, C., & Gilbert, R. (2019). Critical reflection for researcher–community partnership effectiveness: the he Pikinga Waiora process evaluation tool guiding the implementation of chronic condition interventions in indigenous communities. *Australian Journal of Primary Health*, 25(5), 478-485. <https://doi.org/10.1071/PY19022>
- Robson, B., Harris, R., & Te Rōpū Rangahau Hauora a Eru Pōmare. (2007). *Hauora: Māori Standards of Health IV. A study of the years 2000–2005*. Te Rōpū Rangahau Hauora a Eru Pōmare.