



International Energy Agency  
Energy Technology Initiative on  
Demand Side Management Technologies and Programmes



## Subtask 6&7: Case Studies

*Task 24 – Phase II*  
Helping the Behaviour Changers

## NZ Home Energy Audit Toolkits

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*With much help and thanks to Auckland Council's Sustainability Initiatives Team*

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## Executive Summary

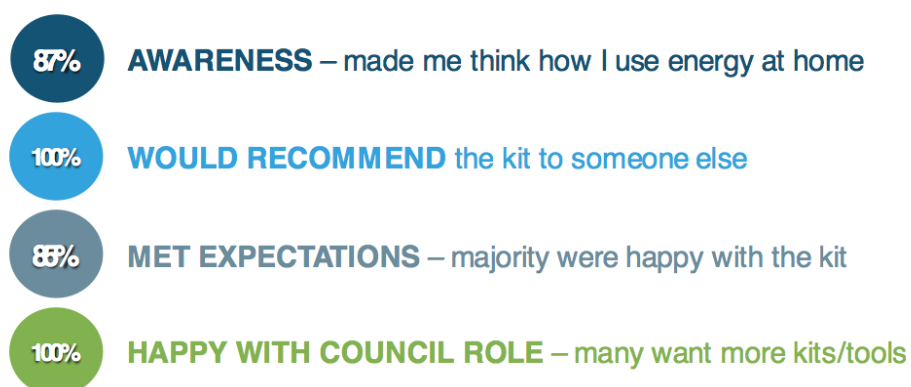
Energy Saving Kit Programmes have enjoyed wide popularity in several countries, and have been part of the behaviour change repertoire for over 2 decades now (see [Task 24 Cross-Country Case Study Comparison](#)). Many have been regarded as highly successful by their programme managers, but few could point to actual, proven behavioural change. One of these programmes, the Auckland Council's Home Energy Audit Tool (HEAT) kit, has been evaluated in this report.

The Auckland Council HEAT kit programme is clearly very successful in terms of how many people have loaned the kits from libraries (over 750 over a one year period) and how long waiting lists were (several months for some). However, in order to know if any actual behavioural change has taken place in Auckland because of the kits we needed to undertake more in-depth evaluation.

From February to April 2018, the Auckland Council and Task 24 Operating Agent collected and analysed data from 77 surveys, 9 interviews and one focus group. However, only relatively few (<10%) people who loaned out the kits responded to the included survey that this evaluation is based on. From the survey, focus group and interview responses it is clear that the people who wanted to provide feedback were among the "early adopter" category and already highly motivated to save energy. This has created an inherent bias in this evaluation but does not detract from the fact that their feedback was overwhelmingly positive, very detailed and clearly showed that at least this highly-motivated group of participants had learned and actioned new knowledge on energy-saving opportunities and energy-efficiency investments in their households. The role of Auckland Council in establishing this programme was widely applauded.

## Snapshot of Findings

We give some high-level snapshot results below, and compare them with a similar evaluation scheme that was undertaken by Task 24 on the Irish [Energy Saving Kit programme](#), where applicable.



## Motivations

**36%** Financial (c.f. 30% in Ireland)  
**36%** Educational (not mentioned specifically in Ireland)  
**16%** Warmth or Home improvement (c.f. 22% each in Ireland)  
**12%** Environmental concerns (c.f. 18% in Ireland, higher in a Sustainable Energy Community)  
*The big country difference on the educational motivations of kit users could be due to more emphasis being placed on the educational value in the NZ toolkit.*

## Intention to act vs actual actions taken

**34%** think about home upgrades (c.f. 60% in Ireland)  
**19%** think about appliance upgrades (c.f. 51% in Ireland)  
**28%** think about habitual changes (not specifically measured in Ireland)  
**13%** think about maintenance/repair changes (not specifically measured in Ireland)  
**7%** think about changing settings (not specifically measured in Ireland)



**160 intended** and **84 actual** actions that were taken were recorded during the NZ evaluation. Most of the people who reported taking actions rather than just intending them were from the focus groups and interviews.

## Top Actions

The top actions that Kiwi respondents mentioned related to **windows/curtains** and reducing **dampness**, followed by **hot water use, insulation, heating and appliance use. Lighting upgrades** were only mentioned 3 times overall in New Zealand. In Ireland, however, the purchase of energy-saving **light bulbs and insulation** were the most commonly-mentioned actions. *These differences between the two countries reflect both, differences in housing stock and the energy-saving tips and guidelines provided in the supporting materials with the kits, as well as the survey design.*

## Awareness

The majority of people heard of kits through the **library, advertising or word-of-mouth**. In Ireland, a large number (28%) of survey respondents heard of the kits in their workplace or Sustainable Energy Community (SEC). *In New Zealand, the kits were only loaned out in public libraries.*

## Emerging energy personas

8 Interviews & qualitative responses from survey and focus groups showed the following energy personas (the first 4 were also observed in Ireland):

- 1. Assessor:** Verifying quality work done
- 2. Savvy:** Confirming suspicions
- 3. Energy saver:** Looking for direction
- 4. Aspirational:** Environmentally conscious
- 5. Educators:** Wanting to talk about energy and teach others

## Evaluation of Kit

*Ease of use of tools* – some tools were regarded as very easy to use (**stopwatch** and **digital thermometer/hygrometer**) but the **plug-in meter** was regarded as the most difficult, and also reported as broken on several occasions. Around 70% of respondents in Ireland found the tools very easy or easy to use. The least useful and most difficult was the **radiator key** (not supplied in NZ) and the **plug-in meter** caused issues as well.

*Which tools were most useful* – by far the most useful tools were thought to be the **infrared thermometer** and **digital thermometer/hygrometer** (both 84%). The **stopwatch** showed the greatest diversity in responses (about half thought it was most, and the other half least useful). Around half regarded the **plug-in meter** as most, and a quarter as least useful. A large majority (82%) liked the record booklet, manual and fact sheets. In Ireland, the **infrared thermometer** (62%) and **digital thermometer** (54%) were regarded as the most useful and the **stopwatch** as least useful (12%). *It needs to be noted that there was a difference in scales in the Irish (6-scale) vs NZ (5-scale) survey, thus showing slightly less positive results in Ireland.*

## Summarised Recommendations for Auckland Council

For the ongoing Auckland Council HEAT Kit Programme, I have the following recommendations (more detailed recommendations to be found in the back of the report):

- (1) **Continue stocking the kits** in all public libraries in Auckland.
- (2) **Increase the number of kits and promotion** of the kits, especially towards the winter months.
- (3) **Re-assess the information materials** provided with the kit, including accessibility for non-English speakers.

- (4) Get a **different plug-in meter** – one that is less difficult to use and read and less prone to fail.
- (5) Provide **on-going training for library staff** and supplies for restocking kits when they are returned.
- (6) Undertake a short pilot with **thermal imaging cameras** as they were found to have some of the highest behaviour change impact.
- (7) Make it more clear that the **infrared thermometer** could also be used to measure **fridge/freezer temperature, door leaks and wall temperature behind the fridge**.
- (8) Undertake a short pilot with a **lumen meter and free LED light bulb** to get people more interested and aware of lighting upgrades.
- (9) **Remove the magnifying glass** – especially if a better plug-in meter with larger display can be found.
- (10) Engage other **Middle Actors** who can promote and loan out the kit and assess which are the most trusted, especially to vulnerable communities.
- (11) Change the survey and adopt the Task 24 **“Beyond kWh”** Pre- and Post-survey methodology used in Ireland instead.
- (12) Let people **go into a draw** for a Bunnings voucher instead of sending out light bulbs (see also Recommendation 6).
- (13) **Partner with SEA** – Sustainable Energy Advice Ltd to develop an improved HEAT kit programme to be piloted in the Auckland Region (see further research and reporting below).

## Background

New Zealand joined [IEA DSM Task 24](#) as sponsor at its inception in early 2012. It was co-funded by **PowerCo**, one of our largest lines companies, [for Phase 2](#), in 2015. We originally planned to undertake a peer-to-peer (P2P) neighbourhood-sharing PV pilot with **PowerCo**, but as the market changed, so did the ability of lines companies to take lead in this emerging technology space. Instead, we decided to focus the ST6 case study still in the residential sector, but on using *Home Energy Audit Tool* (HEAT) kits. In Te Reo, the indigenous Māori language, these are called *Rihi Kete Mātai ā-Ngao i te Kāinga* (Kete HEAT).

Home energy saving kit programmes, where small toolkits with various energy-efficiency and energy-measuring tools are loaned out for free via public libraries, were first trialled in South Australia in the early 2000s. They have since found quite enthusiastic uptake, particularly in English-speaking countries (see Rotmann, 2018 and the [Summary Database](#) of the Task 24 cross-country comparison). The Irish Task 24 funder, the **Sustainable Energy Authority Ireland** (SEAI), chose *Middle Actors in the residential sector* as its ST6 issue and an *energy saving kits pilot* as its real-life case study. As part of the Task 24 research for Ireland, a [cross-country case study comparison](#) was undertaken, where programme managers from several countries (Australia, USA, Canada, Ireland and New Zealand) were interviewed regarding their experiences with the kits. One of them was **Auckland Councils' HEAT kit** programme manager, who subsequently hired Dr Sea Rotmann to undertake the evaluation of their programme. This report focuses on outcomes from this evaluation. Where applicable, some comparisons to the Irish evaluation methodology and results were made (Irish report will be published mid-July on the IEA DSM website).

## Introduction – the Auckland Council HEAT kits





### What is in the Home Energy Audit Tool (HEAT) kits?

The [Auckland Council HEAT kit](#) contains four measurement tools (as well as a magnifying glass and extension cable, both for the plug-in monitor) to assess current energy use, or determining/fixing the (in)efficiency of:

- **appliances** (plug-in energy monitor called “plug-in meter” from now on),
- **insulation, hot water temperature & fridge/freezer leaks** (infrared thermometer),
- **thermal envelope** (digital thermometer and hygrometer)
- **hot water use** (stopwatch to measure water flow in e.g. shower).

Some of these tools are very simple to use (e.g. stopwatch to measure the water flow in the shower) and some require more reading instructions and effort (e.g. plug-in energy monitor). Most are simply to provide insights into the current situation, including showing potential issues like leaks or draughts which would require further investment or the call-out of professional tradespeople. Others can be used to immediately remedy a problem at no extra cost – e.g. turning appliances off at the wall when it is clear that the stand-by power consumption is very high. The kit also comes with an instruction manual and record booklet to easily fill in the results, as well as tips, fact sheets and brochures and a feedback form (see Appendix 1). All 55 public libraries in Auckland now have HEAT kits on loan for residents. The kits were loaned out 750 times during the first year of the programme (March 2017- March 2018).

The Kit contains four tools

			
<b>Infrared thermometer</b> for finding hot spots or cold spots to identify areas of poor insulation or air leaks.	<b>Thermometer/hygrometer</b> - for measuring air temperature and moisture levels in different parts of your home	<b>Stopwatch</b> – for checking your shower flow rate	<b>Power meter</b> – for checking the energy use and running costs of your major appliances such as fridge, freezer etc



*From the Auckland Council HEAT kit manual*

## Research Aims

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*Establish a programme evaluation regime to:*

1. Learn what tools have the greatest impacts on householder's energy efficiency behaviour and feed into any further plans to develop the kit.
2. Establish if the tools can lead to householder action in relation to home energy efficiency upgrades.
3. Ascertain what other support systems or tools are needed to complement the kit.

## Evaluation of the HEAT kit programme

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### Task 24 tools & reports for evaluating behavioural interventions

The importance of evaluating and measuring behavioural interventions has been discussed in depth in Subtask 3. From [Rotmann \(2017\)](#): “Task 24 also addresses the all-important question of how to best evaluate successful long-term behaviour change outcomes from the perspective of the various *Behaviour Changers* who are our target audience. It became clear very quickly that this was the most challenging aspect of Task 24 (see [Karlin et al 2015](#)). In-depth positioning papers ([Mourik et al 2015](#)) looked at the various disciplinary approaches to evaluating behaviour change interventions and discussed the many issues *Behaviour Changers* face when assessing successful outcomes for different stakeholders and end users.

[Karlin, Ford and McPherson-Frantz \(2015\)](#) then developed a toolkit to evaluate behaviour change programmes ‘beyond kWh’ (Subtask 9). This toolkit is open to be field-tested by any interested countries or non-state actors so we can assess cultural and sectoral idiosyncrasies. It is based on the NZ ‘Energy Cultures’ framework ([Ford, Karlin and McPherson-Frantz 2016](#)). It already underwent psychometric testing of a set of scales that can be used to collect self-reported data as a part of evaluation of behavioural interventions building on the preliminary instruments drafted for Task 24. This was done by refining and psychometrically validating the following scales for use in field studies within California ([Southern California Edison, 2015](#)): 1. *Norms* (e.g., efficacy, social norms); 2. *Practices* (e.g., one-time, habitual); 3. *Material culture* (e.g., appliance stock); 4. *Context* (e.g., demographics, housing); 5. *User experience* (e.g., ease of use, engagement). All these different evaluation tools will feed into Subtask 8 (*Toolbox of interventions for Behaviour Changers*).”

### Irish and New Zealand field trials

[Rotmann \(2018\)](#) discusses in detail the Irish *Home Energy Saving Kits Programme*, which is the chosen field research study by the Irish Task 24 funders, **Sustainable Energy Agency Ireland (SEAI)**. This report also outlines a country case-study comparison of different Energy Saving Kit Trials in several states in the US, Canada, Australia, Germany and New Zealand (see also the summary excel sheet attached to the report). **Auckland Council** in New Zealand has a very similar *Home Energy Audit Tool Kit (HEAT)* kit programme (see Appendix 1). The Council also has undertaken some limited post-surveying of participants, but not the more comprehensive pre- and post- “beyond kWh” survey. This report discusses the analysis of surveys, focus groups and interviews of the Auckland Council programme. Some comparisons between the evaluation and results of the two programmes will be made.

### Dublin and Auckland public library surveys (Phase 1)

The original trials were using public libraries in Dublin and Auckland as the *Middle Actors* loaning out the energy saving kits. Unfortunately, both trials were commissioned before the ‘beyond kWh’ Subtask 9 survey tool could be modified to be tested with it. The Irish and Auckland kits both contain a (paper and online) survey for people who have borrowed the kit (to be filled in after they return it), with an incentive of winning €100 shopping voucher (Dublin) or receiving a free LED light bulb (Auckland). The Irish evaluation report will be published on [IEA DSM Task 24](#) soon. The Auckland feedback survey questions and answers can be found in Appendix 1.

**Sample size Dublin:** Aimed for 200 surveys for the public libraries, collected 213 (around 30% of kit borrowers). Also undertook nine interviews, two focus groups and one school workshop.

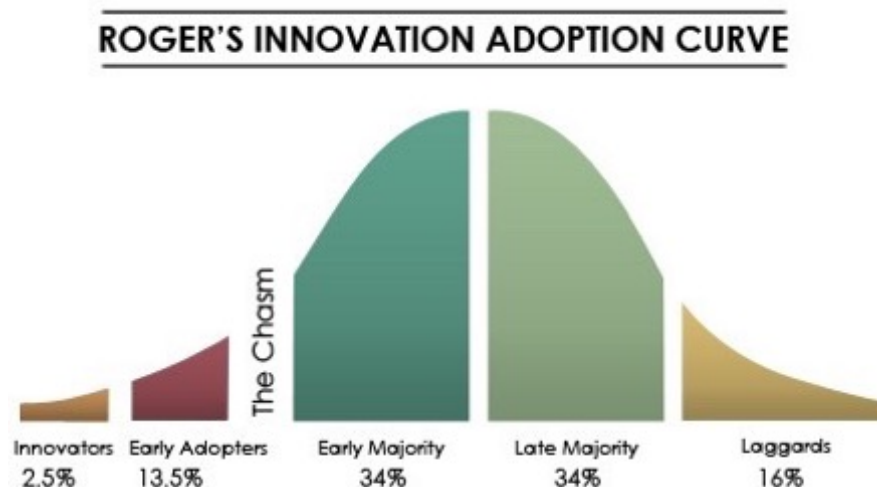
**Sample size Auckland:** Seventy-eight surveys (a little under 10% of kit borrowers) were obtained in the 12 month study period (see Appendix 2). Eight surveys were returned incomplete. The anonymous feedback survey asked users if they were willing to answer further questions. Twenty-six people agreed to be contacted and of these, five attended the focus group held on April 4, 2018 in Auckland (see FG methodology, questions and transcript in Appendix 3) and another eight were interviewed by the author in April and early May, 2018 (full, anonymised answers are given in Appendix 4).

**Survey Type Dublin and Auckland:** basic PROFILING, assessment of MOTIVATIONS, EXPERIENCE, UTILITY and IMPACT of the kits.

**Demographics Auckland:** 55% of the respondents were women, 45% were men and some were not identified by gender. 36% did not seem to have heritage from English-speaking countries (as determined by first and second foreign names). This is high compared with the NZ average (around 15%), but fits with the fact that Auckland is the 4<sup>th</sup> most cosmopolitan (i.e. foreign-born) city in the world. From follow-up phone calls, we could determine that of the respondents (73%) owned their home and 27% rented. We could not get enough information (from follow-up phone calls) what their age groupings were, although the majority of respondents seemed to fall in the 30-55y age range. In Ireland, the 18-30yo age group was also under-represented.

#### *Note of issues with feedback data*

We received a rather low number of survey returns in Auckland (n=78), and even lower numbers of the same respondents were available for focus groups (n=5) and interviews (n=8). Only having one focus group is usually problematic seeing each counts as only one observation, but seeing the same questions were asked in interviews we could triangulate the results somewhat. The people who did respond to more than the survey were highly motivated and had very positive attitudes towards energy saving and the HEAT kit. This self-reported bias will affect the results of this evaluation and needs to be taken into consideration. The people evaluated here seem to firmly fall into the “early adopter” group (see Roger’s (2003) [Diffusion of Innovation](#), Graph below).



Trying to convince the mass of a new idea is useless.  
Convince *innovators* and *early adopters* first.

### Beyond kWh questionnaire (Phase 2 – only in Ireland)

We have created a more in-depth before/after questionnaire for Ireland, which follows the Subtask 9 ‘Beyond kWh’ toolkit. It also differed in audience as it was undertaken in a Sustainable Energy Community (SEC) rather than with library users. Many questions overlap with the library survey, in the hope to triangulate the data from both (see Rotmann and Chapman, to be published). Focus groups (Phase 3, undertaken in April 2018) will also help further triangulate and sharpen the data.

**Sample size in an Irish Sustainable Energy Community (SAGE):** aimed at 40 pre- and post-survey responses, collected 44 PRE- and 39 POST-surveys. Statistical analysis using Bayesian modelling is discussed in Chapman (in prep).

**Survey Type:** The beyond kWh survey adds questions to the ones already asked in the feedback survey. These questions have been psychometrically-validated and include changes in ENERGY



KNOWLEDGE, PERSONAL AND SOCIAL NORMS and CONNECTION & CONCERN (as this is relevant to SECs and their motivations to use the kit). The tool comprises a PRE- and POST survey. Results and detailed evaluation methodology will be published by Task 24 soon.

## Focus Groups & interviews (Phase 3 in Ireland, Phase 2 in NZ)

From [Elliot & Associates \(2005\)](#): “Surveys assume that people know how they feel. But sometimes they really don’t. Sometimes it takes listening to the opinions of others in a small and safe group setting before they form thoughts and opinions. Focus groups are well suited for those situations. Focus groups can reveal a wealth of detailed information and deep insight. When well executed, a focus group creates an accepting environment that puts participants at ease allowing them to thoughtfully answer questions in their own words and add meaning to their answers. Surveys are good for collecting information about people’s attributes and attitudes but if you need to understand things at a deeper level then use a focus group.”

A focus group is thus a method of qualitative data collection. [Morgan \(p. 1,1998\)](#) explains: “Focus groups are group interviews. A moderator guides the interview while a small group discusses the topics that the interviewer raises. What the participants in the group say during their discussions are the essential data in focus groups. Typically, there are six to eight participants who come from similar backgrounds, and the moderator is a well-trained professional who works from a predetermined set of discussion topics.”

We hoped to get 2-3 focus groups in Auckland, but only one was held in the end. We added an additional 8 people’s more detailed interview answers to the HEAT kit evaluation.

## Evaluation Results

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### Feedback survey results - summary

The survey was very short and largely asked questions on the **usefulness of the kit**, some **background/demographics** and some **behavioural** questions (see Appendix 2 for questions and detailed results).

### Background/demographics

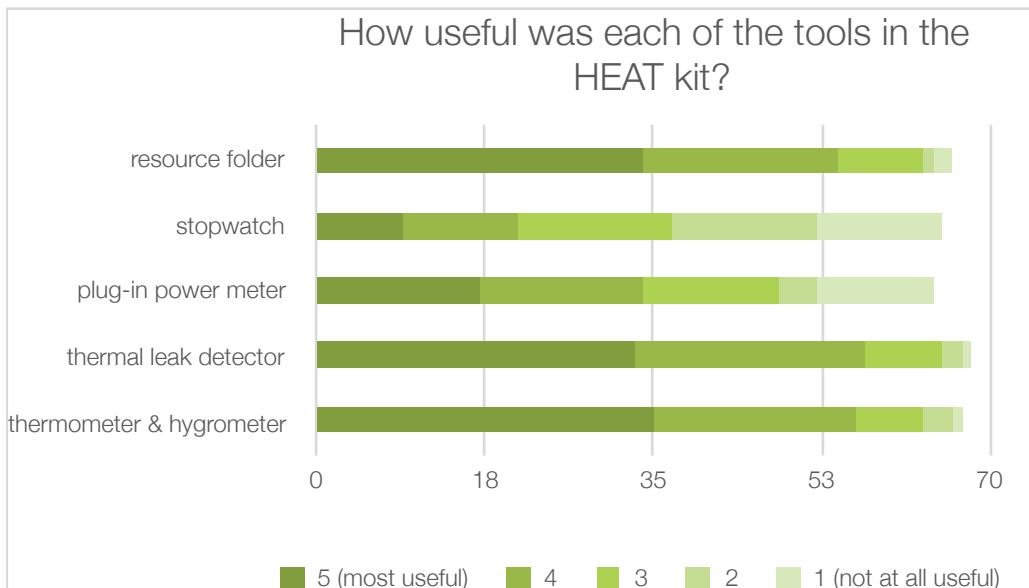
The main background question asked which **type of display** from the plug-in meter people were using. This changed throughout the trial, the original large-display meter (30% of respondents) was replaced with a small-display meter (70% of respondents, one was unsure). Some of the original plug-in meters purchased for the kits were found to be faulty and so some kits used an alternative type of meter with a smaller display. As the font size displaying the units of measurement was smaller and more difficult to read, a **magnifying glass** was added to the kits. The biggest problem people had with the kit related to the **plug-in meter** (see below). There was no difference in **gender** make-up, there seemed to be a **diverse ethnic background** of respondents (36%) and the majority of respondents (where it could be determined) **owned their home** (73%) and were in the **30-55 age** bracket.

### Usefulness of the HEAT kit

The majority of questions in the feedback survey related to the usefulness of the kit, including if people had any problems with using it, or suggestions how to improve it.

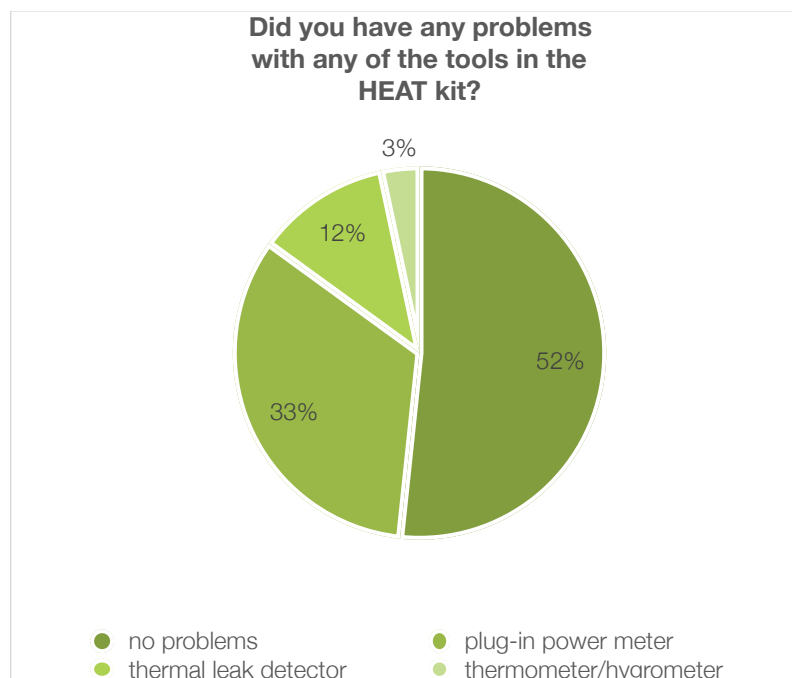
*How useful were the tools in the HEAT kit in helping you identify how to make your home healthier and warmer and save energy? (Please tick one box where 1 is least useful and 5 is most useful)*

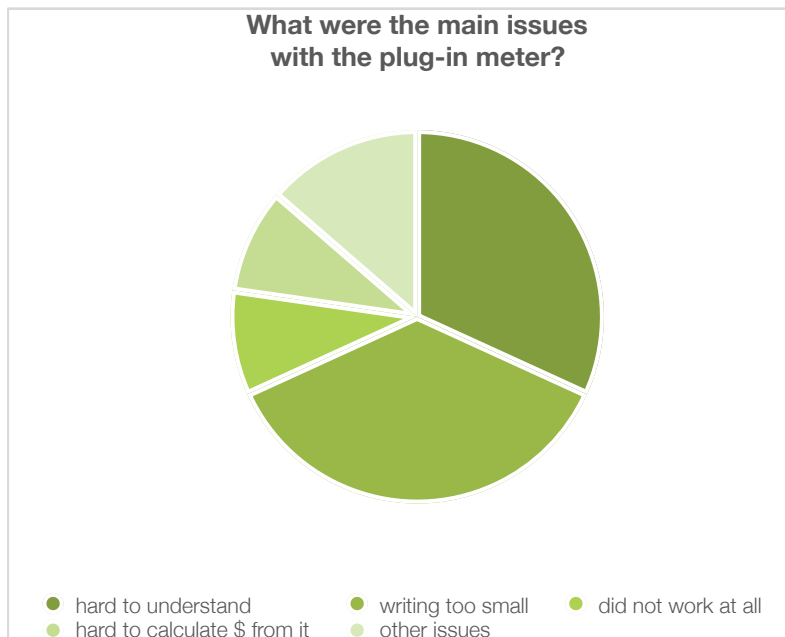
The **digital thermometer/hygrometer** and **infrared thermometer** were regarded as by far the most useful (84% said it was a 5=most useful or 4=very useful), closely followed by the resource folder (82%). These numbers were higher in the group that responded to requests for interviews or focus groups (digital thermometer/hygrometer 94% useful, record booklet 88% and thermal leak detector 83%). The tool that got the most ambivalent votes was the **stopwatch** (32% to 43% most vs least useful). However, the **plug-in meter** divided opinions the most, with 53% finding it most (=5) or very useful (=4) but 25% finding it the least (=1) or not very useful (=2). The full break-down is shown in the Figure below. Possible explanations for these findings are also given below.



*Did you have any problems using any of the tools? Please explain:*

A third of the people who answered this question had issues with the plug-in power meter. Their various issues are shown in the graph below (note: all who said the writing was too small had the small display). Even though a magnifying glass was now provided, from interviews it became clear that most people who complained about the small writing, did not actually use it.





*Do you have any comments or suggestions on how the HEAT kit could be improved?*

Most of the suggestions were around improving delivery of information, the manuals and factsheets (n=12). Most people asked for more data, step-by-step instructions or clear steps of what to do next. Some repeated issues they had with tools, or asked for more kits to reduce waiting time in libraries and for more advertising. A couple mentioned that they wanted to use the toolkit in winter rather than summer and several asked for an infrared camera (see full quotes Appendix 2). Some choice quotes were selected below:

*“The copies of record booklet and fact sheets/brochures provided are great.”*

*“Good, thanks but (for me) I would like to have used it in Winter as that is when I notice the cold..! Very well put together kit, though, otherwise.”*

*“It will be better if I do not need to do setting power meter whenever I move it from one power point to another.”*

*“IR camera and longer to use it. Get a proper foam insert cut rather use the 'cubed' foam.”*

## Actions taken

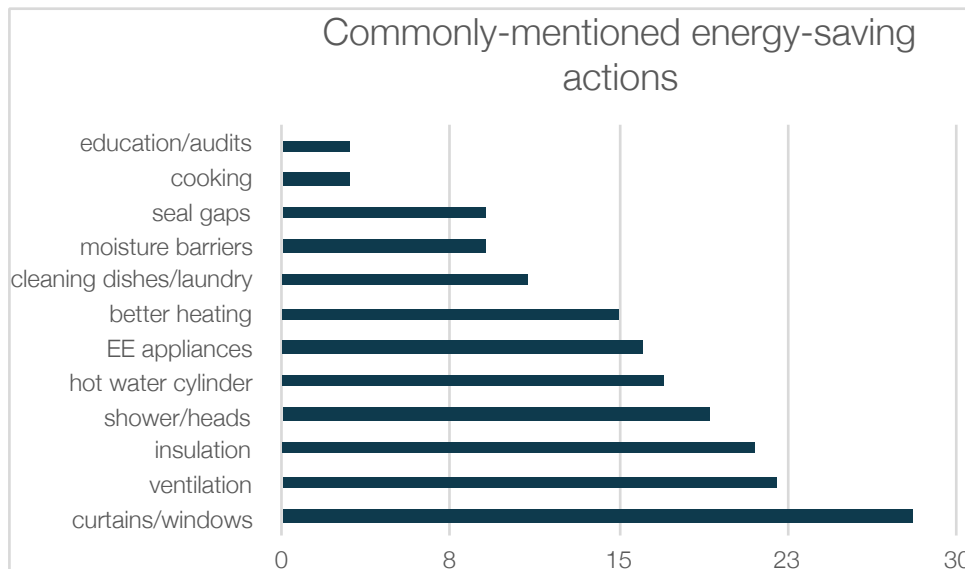
*Please write up to three actions that your household will take to stay warm and save money as a result of using the HEAT kit:*

Detailed reported actions (e.g. “installing insulation”, “wrapping hot water cylinder”) can be found in Appendix 2. As their first action, most people mentioned insulation (n=11) and curtains (n=10), followed by hot water cylinder (n=7), sealing gaps in doors and windows (n=5), heat pump-related, appliance-related and clothes drying-related actions (n=4), and installing a moisture barrier under the house (n=3).

As their second action, most people mentioned energy efficient shower heads/shorter showers (n=10), followed by heat pump-related issues (n=7) and insulation (n=7). This is the first time cooking-related actions (such as “put a lid on pot”) were mentioned (n=4). Their third actions were more habit-based and more technical, but usually only mentioned by one person each. However, hot water cylinders (“wrap HWC” or “turn down temperature on HWC”) were now the most commonly mentioned action (n=6), followed by ventilation, curtains and appliance/use (all n=5) and dehumidifiers (n=3). Interestingly, only three respondents mentioned actions related to lighting (“change to LED bulbs”, “switch off lights”), which is often the first mention that comes to mind when asking people about how to change energy-using behaviours.

Overall, these were the actions most commonly mentioned by respondents:





## Focus Group and Interview results - summary

The focus group (FG) was held in Auckland on April 4 with five of the survey respondents (one dropped out at the last minute). The methodology and transcript can be found in Appendix 3. Each of the participants was extremely engaged, loved the tool kit (“*I thought it was way cool!*”) and wanted to provide feedback and hear more about energy-saving measures. They later also joked that they were hoping to get more free LED bulbs (which they did). They all clearly had a great time and enjoyed talking about energy for 2 hours.

The interviews were undertaken via 20min phone calls in late April/early May 2018. We used the same questions as in the focus group. All interview transcripts can be found in Appendix 4. Some main points that came out of a quick content analysis of interviews and focus groups:

- *Dampness* was by far the most-commonly mentioned issue in people’s homes (mentioned 14 times), and the one they appreciated being able to measure the most (with hygrometer).
- *Hot water, lights, heating, curtains and appliances* were also mentioned very often (9 times each).
- The main motivation for getting the kits were both *energy bills and power consumption* (mentioned 10 times), but also *education*, e.g. of their family or children (also mentioned 9 times). *Warmth and comfort* and *the environment* were specifically only mentioned about 5 times each.
- Most people heard of the HEAT kits from the library or via others who knew about the kits. Some were also aware of *Eco Design Advisors* and EECA’s *EnergyWise* website and had used them in the past. Only a couple of people mentioned hearing it via (social) media but several said it should be advertised more/better.
- Every single person who was interviewed or in the focus group said that they would, and have already, recommended the HEAT kits to others.
- 75% said they found the record booklet useful and still had it filed away somewhere. Four said they wanted to take the HEAT kits out again (one already had!) to compare the measurements before and after making changes, or between seasons. A couple also mentioned that their booklet was already filled out and that it would have been useful to have.
- People also really liked the suitcase that came with the kit. They mentioned its robustness, and that it was “*good to be this robust when it goes through that many hands*”. They also repeatedly said that it looked “serious”, “expensive” and joked that it “*looks like it contains a million dollars, all it needs is handcuffs!*”. Several mentioned how “intrigued” their family and especially the kids were when they saw it: “*It’s really cool! [Laughs.] Cool taking it away and all the different tools, everyone in house was interested what was in it. The kids were really into it. Really good as it makes it easier to get them on board to, like, close the doors when they are cold.*” A library staff member gave this great quote: “*I loved it! Because I didn’t want anything in there to break because of the high cost and because it was so big and bulky, we couldn’t lose it. When we handed it over to customers*

*they got the shock of their lives as they thought it was going to be something tiny. Nobody can steal it from the library either, being so visible. Amongst library staff we call it the "Obama Bag" because it looks like the nuclear codes should be in it."*

- The people who were interviewed or came to the focus group could be grouped into similar "emerging energy personas" as the Irish researchers did (**1. Assessor** (Verifying quality work done), **2. Savvy** (Confirming suspicions), **3. Energy saver** (Looking for direction), **4. Aspirational** (Environmentally conscious)). However, there was also a clear 5<sup>th</sup> emerging persona: **the Educator**. Many of the people who we talked to mentioned the important role of energy education the kit provided to their children and family.

## Main points of interest

From the survey, focus group and interview responses it is clear that the people who wanted to provide feedback were among the "early adopter" category and already highly motivated to save energy. This has created an inherent "bias" in this evaluation but should not detract from the fact that their feedback was overwhelmingly positive, very detailed and clearly showed that at least this highly-motivated group of participants had learned and actioned new knowledge on energy-saving opportunities and energy-efficiency investments in their households. The role of Auckland Council in establishing this programme was widely applauded.

Almost every person who filled in the survey and everyone who did the focus group or interviews had undertaken or thought about at least one energy-saving action after receiving the kits. Thirty-three percent could be grouped as **home upgrades**; 14% as **appliances upgrades**; 6% as **changing appliance settings**; 12% as **maintenance/repair** and 35% as **habitual behaviour** changes. In Ireland, the survey results were coded only into home upgrades (60%) and appliance upgrades (51%), with most awareness being raised around heat loss and optimal settings for appliances and least awareness raised on behaviours related to heating systems.

**Intended vs actual** energy-saving actions reported was 90% vs 10% on the survey and 15% vs 85% on the interviews and focus groups. However, it needs to be noted that the questions asked were differently, with the feedback survey asking about the actions people intended to take as a result of using the kit, and the interviews and focus groups specifically asking for actions taken *after* the kits were borrowed. However, in total, 160 intended actions were recorded and 84 actual actions were taken since receiving the kits.

Some relevant quotes to highlight:

*"I really feel that I have made some progress with my family – I now get the kids to shut down the lights after leaving the room."*

*"I hired the kit twice! The plug-in meter was used the most. I checked all of my appliances such as the kettle and used it as a fun activity with my son. I also wrote all the data down. It made me realise how different costs go against common sense, like that the heat pump was cheaper than other forms of heater. So, I stopped using my column heater completely because of it."*

*"I loved the stopwatch. I had too much of a low-flow showerhead – it took me ages to rinse my conditioner. So, when I found out I only got 3L of water from my shower and tap, I got the plumber in. He changed the main, and now I have 6L at the tap and 9L for the shower."*

*"The hygrometer showed me how damp things got even if when you are airing the house out. It also showed us that we had to buy a good dehumidifier because now we understand the severity of problem."*

*"I found the dehumidifier is best when it's moved around so that it can remove moisture from everywhere...then I could use the moisture meter to show it was good for a few hours."*

*"Since having HEAT kit, I was really interested in using the infrared thermometer on the hot water cylinder. I understood our cylinder was a bit low on temperature, so I used the info in the kit and mentioned it to flat mate who's*

*also owner of the house. She bought lagging for the cylinder, but neither of us are good at DIY so it hasn't been done yet, it just sits in cupboard."*

*"I found out one of our rooms had a lot more moisture than others, so I investigated and found a leaking drain pipe which had soaked the wall. This was a very positive outcome for us as we could fix it now."*

*"It helped me see the moisture issue definitely and now I turn monitors off when I'm away from my computer, and I turn my TV off with button not just on the remote. That came from the booklet and just getting the HEAT kit made me think more about my power usage."*

*"I think I just put in some insulation after using the infrared thermometer... No, I remember! I also bought a flow restrictor for the shower head, so the stopwatch really helped too. But the plumbing shop didn't even know what I was talking about when I asked for one! They only knew about attachments to make more water happen, and didn't know about restrictors."*

*"I wasn't too sure how useful it would be, got it more as a curiosity but I got some really good insights e.g. where we lose temperature and where the moisture problem was. I definitely want to borrow it again to see how the house performs now, especially now that we swapped downlights with LEDs that block the holes."*

*"In two of the rooms I added curtains. A few tips from the HEAT kit were good like getting curtains right to the bottom and changing light bulbs to LEDs. Thing that surprised me the most was that I had to ventilate the house for only 20mins a day. I thought it had to be open all day long when I went to work. It's so much warmer if I don't have to keep it open all day!"*

*"I work in the library, so I learned by observing other people. I was very interested in the HEAT kit because I saw people take some extreme measures! What really spurred me on was having a colleague who used it who made huge savings. One customer even moved house! On the whole, even though he ended up spending more on rent, he saved more money on heating and cooling because the new house had insulation in it."*

*"I feel that sometimes you don't know what you don't know. People that are new to the country or moving house should be advised that these kits are available. I never imagined a kit like this could exist, especially in a country like NZ where houses are so cold and damp – now tenants have the tools to go to their landlord to tell them that their dwelling is not up to scratch. Bills are up to tenants to pay, so it's important to empower them. When people go to the Citizens Advice Bureau and ask about renting they should be told about the kits."*

The **additional fact sheets, manual and record booklet** (Appendix 1) mentioned several energy-saving actions – some directly related to each of the tools in the kit (Manual) and some related to e.g. reducing dampness. The actions *"Use timers and thermostats, efficient shower heads, lag and insulate hot water cylinder and reduce hot water temperature, use extraction fans for cooking and showers, install ground moisture barriers, block draughts in windows and doors and install insulation"* were all mentioned 3 times. *"Dry clothes outside, get rid of un-flued gas heaters, close windows and doors when showering, double glaze windows and install curtains, use clothes line instead of dryer, take shorter showers, switch to efficient hot water heater or heat pump, change temperature setting in fridge/freezer, turn off appliances at the wall and close curtains"* were each mentioned twice in the additional materials. Almost all the energy-saving tips that were mentioned were repeated by survey or interview respondents. The only ones that never came up were: *get rid of un-flued gas heaters, have adequate drainage around your house, limit indoor pot plants and cover fish tanks, check gutters and downpipes for leaks, only boil as much water in kettle as needed, minimise the time the fridge/freezer door is open, adjust fridge/freezer temperatures, cut down baths and check fridge seals.*

## Conclusions

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Referring back to our initial research aims we can conclude the following:

1. Learn what tools have the greatest impacts on householder's energy efficiency behaviour and feed into any further plans to develop the kit.
  - ⇒ The most useful and most easy-to-use tools were the **infrared and digital thermometers/hygrometer**. New Zealanders are very aware, and clearly concerned about thermal leaks and dampness/moisture in their homes. It would be good to make a clearer link when using the infrared thermometer between e.g. measuring hot water temperature and turning the water cylinder down or measuring air leaks around fridge/freezer doors or the temperature on wall behind the fridge in order to repair seals or improve ventilation. The plug-in meter needs to be improved for ease of use.
2. Establish if the tools can lead to householder action i.e. energy efficiency upgrades.
  - ⇒ Yes they can, however, it still largely the most-engaged early adopters who will be taking the most action. In order to make it easier to educate other users of the toolkit why and how they can take immediate actions, a more detailed, tailored and streamlined process (such as a gamified App, see below) is needed.
3. Ascertain what other support systems or tools are needed to complement the kit.
  - ⇒ A gamified App which would lead people through step-by-step instructions could help ensure that the most use is gained out of the tools in the toolkit. Ultimately, we want each tool to prompt one, or several actions the householders can take and guide them through it. Collecting and sharing the data they measure and providing immediate and tailored feedback how to improve their energy efficiency or home's performance based on their circumstances and needs is one of the added benefits of an App.

## Detailed Recommendations

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For the ongoing Auckland Council HEAT Kit Programme, I have the following recommendations:

- 1) **Continue stocking the kits** in all public libraries in Auckland.
- 2) **Increase the number** of kits but also **promotion** of the kits, especially towards the winter months. Inform people to put a hold on them if they want to reduce waiting time in winter.
- 3) **Re-assess the information materials** provided with the kit, for example, do some short "How to" videos with subtitles in te reo Māori, Samoan, Northern Chinese and Hindi, translate the written materials into the same top 4 spoken languages and undertake some user testing to improve message framing. Link the tools to a bigger action, such as **undertaking a home audit or applying for an insulation subsidy**. Highlight the educational potential of the kit and ability to include the whole family in the home assessment. *All of this would form part of the development of an App to go with the kit (see Recommendation 12).*
- 4) Undertake some research to get a **different plug-in meter** – one that is less difficult to use and read and less prone to fail. This means finding one with a [larger display panel](#), preferably one that does not need to be re-set between appliances and provide batteries in case it runs out. There is also [a more expensive option](#) which reduces the need to provide an extension cord and gives more accurate readings and it projects savings out over a year without having to do the calculations yourself. Any new option should be pilot tested with a few volunteers, or in one library only, where feedback is actively sought after the trial, first. Having a little ["how-to" video like this one](#) from the Irish Energy Saving Kit would be good too.
- 5) Provide **on-going training for library staff** to ensure all librarians are aware of processes for checking and restocking kits when they are returned. Ensure they can explain the more difficult tools for people who come back to ask.
- 6) Several people asked for **thermal imaging cameras**. Their usefulness in visualising thermal leaks or building stock inefficiencies is well known. International research, such as highlighted by Task 24 ([Goodhew et al, 2014](#)), showed that householders who received a thermal image reduced their energy use after a 1-year follow-up, whereas householders who received a carbon footprint audit and a non-intervention control demonstrated no change. In a second study, householders were nearly 5 times more likely to install draught proofing measures after seeing a thermal image. The effect was especially pronounced for actions that addressed an issue visible in the images. [BRANZ 2013](#) mentioned some caution, for example, that the best time for image surveys is winter and that they are less reliable in spring and autumn. However, seeing most kits are loaned out in winter months, and the relative ease-of-use and effectiveness of such cameras suggests that it may be good to stock one or two [smaller ones](#)

in some main libraries. A slightly cheaper option that [attaches to smart phones](#) is also possible but may present more technical difficulties for users. Either way, a small user-testing pilot with several volunteers should be undertaken before committing to purchase.

- 7) Make it clear that the **infrared thermometer** could also be used to measure **fridge/freezer temperature** (as not many respondents seemed to know about, or have used it accordingly), wall temperature behind the fridge and to check leaky door seals.
- 8) Seeing only three survey respondents mentioned improvements to **lighting** at all, it may be useful to include a **lumen meter and LED light bulb** (which people can keep), similar to the Canadian kit used in Edmonton (Rotmann, 2018). An easier solution could be to [provide a link to an App](#) that lets you measure the difference in light output by an LED vs an incandescent light bulb. In the Irish survey evaluation, lighting was the single most commonly-mentioned action people took after borrowing the kits (40% of respondents). In New Zealand, despite providing links to the EECA [Energywise section on lighting](#), it does not seem to be regarded as prominent an action to take – despite it being relatively easy and cheap and having significant saving potential.
- 9) **Remove the magnifying glass** – especially if a better plug-in meter with larger display can be found. Even people who complained about readability of the smaller display did not use the magnifying glass that was provided, or said it didn't help them.
- 10) Find other **Middle Actors** who can promote the kits (e.g. realtors or the *Citizens Advice Bureau*). Seeing Auckland Council is in the process to engage with community centres and groups such as environmental and housing organisations, financial literacy and budgeting service groups, it is important to design a small evaluation programme to assess which Middle Actors (if any) are the most trusted and useful to promote (correct use) of HEAT kits, especially to vulnerable communities.
- 11) Change the survey and adopt the Task 24 **“Beyond kWh”** Pre- and Post-survey methodology used in Ireland instead. Do a small pilot where some people go into a draw for a Bunnings voucher instead of sending out light bulbs (see also *Recommendation 6*). The Irish survey had 3x better response rate than the Auckland one. This could be due to their bigger incentive, or because they also provided the kits in some work places of some of their associated Behaviour Changers (*Codema*). Trying a different incentive and different Middle Actors will help us hone into the best method for improving feedback (*though the App, see Recommendation 12 below would take care of that as well*).
- 12) **Partner with SEA** – *Sustainable Energy Advice Ltd* to develop an improved HEAT kit programme to be piloted in the Auckland Region (see *details in further research and reporting below*). This would include identifying and partnering with **more Behaviour Changers** and employing the **Collective Impact Approach** highlighted by Task 24 research, including in Ireland (Rotmann, 2018). That means involving partners from industry (e.g. an Auckland utility or lines company who might be willing to co-sponsor the kits/App or provide some tools), government (e.g. EECA), service sectors (e.g. EDAs), research experts (e.g. SEA, see also Recommendation 13) and the third sector (e.g. EnviroSchools or Community Energy Network, CEN) to re-design a more comprehensive kit. It also means attracting more co-funding and the ability to “close the loop” by tailoring next step actions to kit users' individual needs and circumstances.

## Further reporting and future research

Both, the Irish and New Zealand case studies will be written up as part of the Subtask 6&7 reports for IEA DSM Task 24. The international case study country comparison is now published (Rotmann, 2018) and the Irish and NZ evaluation report will be published end of June. In addition, a [BEHAVE conference](#) paper was accepted and will be presented as part of a panel on Demand-Side Information (DSI) programmes (Rotmann and Chapman, 2018). At the largest [Behavior, Energy and Climate Change](#) conference (BECC, 2018), this work will be presented as part of a special session on Task 24 and evaluation. We also plan to publish a more technical, peer-reviewed paper which will investigate the different approaches to analysing Energy Saving Kit programmes (quantitative, qualitative, different types of surveys...), which this report data will contribute to.

Finally, we are planning to propose a new research project based on the learnings from these Energy Saving Kit programmes, hopefully with Auckland Council as a pilot partner. This research proposal will include further development of these kits, and their evaluation programmes, to close the loop between the intervention and educating end users and empower actual behaviour and

habit changes. We also want to close the loop between the end user, the *Middle Actors* and the other “Behaviour Changers” (particularly policy *Decision-makers* and industry *Providers*). This is to ensure that the many excellent programmes, policies, subsidies and interventions that are available and often under-utilised can be tailored and targeted at the most relevant end user needs.

For this, we envisage developing an App that will aid end users who borrow the kits to 1) be guided through an easy step-by-step process how to use the tools; 2) measure their energy knowledge, attitudes, behaviours etc. before and after the intervention; 3) help them record and share their home energy data; 4) use a decision-making tree to provide the most appropriate, targeted measures to improve their homes, tailored exactly for their needs. This can include links to government subsidy programmes, utility interventions, energy auditors or energy-saving trusts and other community platforms etc. This project will also develop, collaboratively with relevant Behaviour Changers and using the Task 24 toolkit, a roadmap for national scale-up and roll-out of these educational programmes, targeted at *EnviroSchool* school(kids).

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### Poster



# Switch onto savings

Save up to \$1000 a year on your  
power bill

Use the FREE Home Energy Audit Toolkit to work out where you are using the most energy in your home.




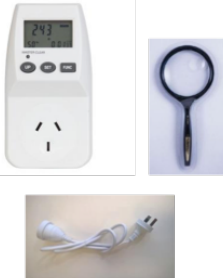
The HEAT kits contain practical tools and tips to help make your home healthier, warmer and environmentally friendly while saving money for your family.

Find out more: visit  
[aucklandcouncil.govt.nz](http://aucklandcouncil.govt.nz) and search  
"HEAT"

## Cheat sheet

### HOME ENERGY AUDIT TOOLKIT (with small display power meter)



			
<p><b>Infrared thermometer</b> For finding hot spots or cold spots to identify areas of poor insulation or air leaks.</p>	<p><b>Thermometer/hygrometer</b> For measuring air temperature and moisture levels in different parts of your home</p>	<p><b>Stopwatch</b> For checking your shower flow rate.</p>	<p><b>Power meter + extension cord + magnifying glass</b> For checking the energy use and running costs of your major appliances such as fridge, freezer, etc.</p>

**Library staff – search “HEAT” on Intranet for guidelines on how to check if each item is working correctly before issuing**

Issuing period = 2 weeks. Note that customers will be billed \$265 for replacement cost of kit if not returned within one month.

### Resource Folder Contents



Before issuing check the Resource Folder contains the following:

- Instruction Manual \*
- Record Booklet (insert into pocket on back side of front page)
- Feedback Form
- Factsheets (Eco-design Advisor series)
  1. Insulation factsheet
  2. Insulation effectiveness factsheet
  3. Heat pump factsheet
  4. Windows and curtains factsheet
  5. Heat pump water heaters factsheet
  6. Moisture and condensation factsheet
  7. Installing a ground vapour barrier factsheet
- Retrofit Your Home brochure

\*Apart from the Instruction Manual, copies of the other resources may be taken by the customer from the folder.

**Librarians please ensure the folder is restocked with at least one copy of each take-away resource before issuing the HEAT kit. PDF's of all resources are on the HEAT kit page on the Intranet and also set up for printing on DSF.**

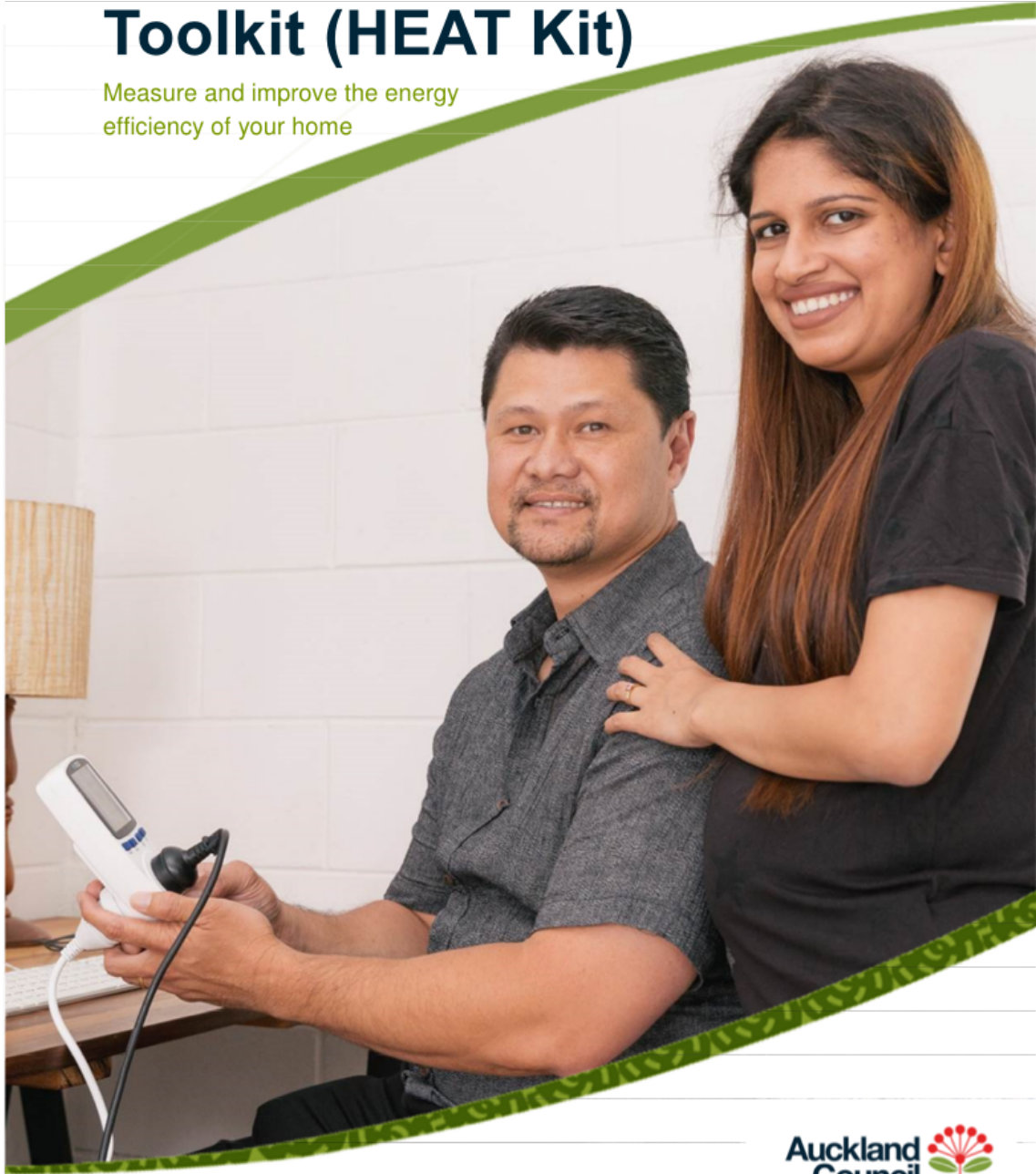
Please encourage customers to let us know about their experience using the HEAT Kit by **completing the hardcopy feedback form** in the kit or the electronic version via the HEAT kit page on the Council website.

Customers who send feedback will receive a free LED energy saving light bulb (retail value approx \$17).



# Home Energy Audit Toolkit (HEAT Kit)

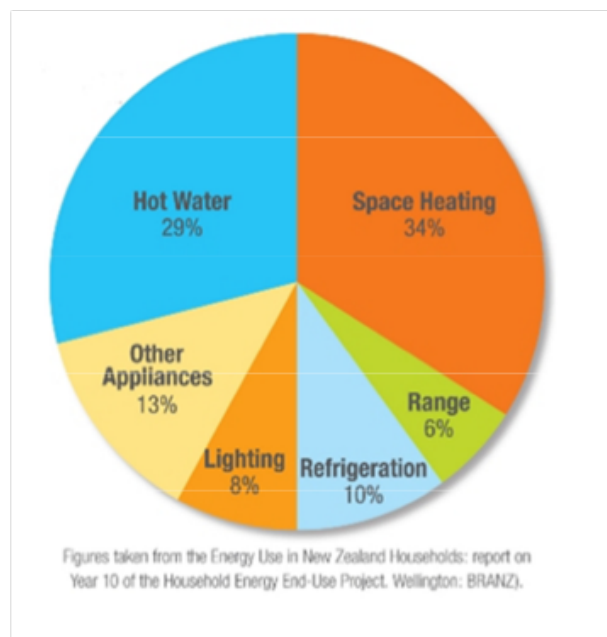
Measure and improve the energy  
efficiency of your home



## Introduction

If you're living in a typical Auckland home, chances are your home is not very energy efficient, likely causing you to have either a damp, cold house and/or high energy bills. With this do-it-yourself toolkit you'll be able to figure out exactly which areas of your home are using the most energy and where you can make changes to make your home healthier and warmer, save on your power bills and reduce your carbon footprint.

This pie chart shows the average energy use in a New Zealand home. When saving energy start by focussing on the largest energy uses first. Did you know that 60% of your energy use is hot water and heating your home?







Using this kit will help you spot those savings!

- Keep your home warm
- Keep your home dry
- Save on hot water
- Save on appliances

An average NZ house spends around \$2,500 per year on energy and heating. With the help of this kit you could save up to \$1000 a year on your power bills.

### The Kit contains four tools

			
<b>Infrared thermometer</b> for finding hot spots or cold spots to identify areas of poor insulation or air leaks.	<b>Thermometer/hygrometer</b> - for measuring air temperature and moisture levels in different parts of your home	<b>Stopwatch</b> – for checking your shower flow rate	<b>Power meter</b> – for checking the energy use and running costs of your major appliances such as fridge, freezer etc

Contained in this folder are:

- **Instructions** on how to use the devices in the tool kit and what the measurements mean
- **Top three tips** on things you can do to make your home warmer and healthier and save on your power bills
- A **Record Sheet** where you can record your measurements and energy saving actions
- **Links** to websites where you can find further information
- **Factsheets and brochures** you may keep
- A **feedback form** so you can tell us about your experience using the HEAT kit



## Keep your home warm

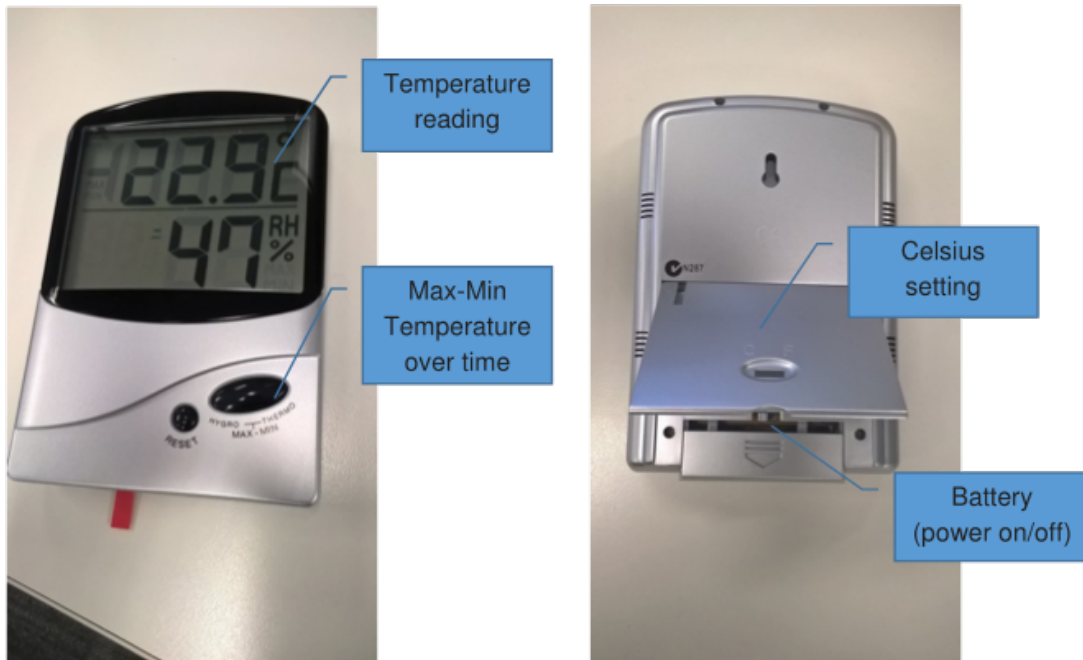
Heat is expensive, so save money by keeping the cold air out and the warm air in.

- ▶ Start by measuring the indoor air temperature especially in the winter, and identifying areas of poor insulation or air leaks.



### Tool : Thermometer/Hygrometer

Use the thermometer to measure indoor air temperatures in different rooms, over the course of a day.



### How to use the tool

1. If the screen is blank, to make it work slide open the battery door at the back and remove the small red strip of battery insulation tape. Slide the battery door back in place. The unit will turn on automatically. If the insulation tape is missing, take out and re-insert the battery and ensure it is positioned the correct way.
2. Check the switch on the back is on "C" for displaying in degrees Celsius
3. Press the reset button to clear the memory from previous use.
4. Allow the temperature reading to steady before taking the reading. This could take up to 5 minutes.
5. Leave the unit on in various room of the house (e.g, kitchen, bathroom, bedrooms, living room) for a period of 24 hours. The next day, push the button marked "Thermo max-min." This will show the maximum and minimum indoor temperature of the period from the last reset. Press reset before making the max-min measurements in another room.



### What do the measurements mean?

The World Health Organization recommends minimum indoor daily temperatures of 18 C for adults and 20 C for households with children, elderly, or the infirm, and a minimum of 16 C in your bedroom overnight. Temperatures below this raise the chances of respiratory illnesses.



### Tool : Infrared Thermometer

Use the Infrared Thermometer to detect hot spots or cold spots on walls, ceilings, floors, fridges, and window seals, to identify areas of poor insulation or air leaks.




### How to use the tool

The infrared thermometer measures the surface temperature of whatever it is pointing at. Take your measurements at a time when inside temperatures are very different to outside- e.g. on a cold evening, with your house heated to comfortable temperatures.



**DO NOT POINT THE LASER INTO SOMEONES FACE.** A laser can cause permanent eye damage if shone into someone's eyes. For this reason young children should not be allowed to use the infrared thermometer

1. Point the device at the surface being measured (e.g wall, ceiling) and hold down the trigger. Two red points should show up on the surface you are pointing at. If the laser is not working, to turn it on first release the trigger and then press the left button (with the ) once.
2. Move towards the area being measured until the two lasers converge together, and read the temperature from the screen. If you cannot get close enough to the surface for the points to converge, the temperature reading will just represent a wider surface area and not be quite as accurate.

### What do the measurements mean?

- **Ceiling** - Within each room the infrared thermometer should show the same ceiling temperature (within a few degrees) across the whole room. If part of the room has cooler ceiling temperatures, it is a clue that the insulation above the cool section has been dislodged or poorly installed. Check several areas of the ceiling since insulation levels may be different in different sections of the ceiling. Problem areas in the ceiling are often around recessed light fixtures and attic access doors. When checking the temperatures around lights, make sure they are off and have been off long enough to cool down to avoid false readings.
- **Floors** – as for ceilings, if part of the room has cooler floor temperatures, it is a clue that the underfloor insulation below the cool section has been dislodged or poorly installed.
- **Walls** – measure the difference in surface temperatures between an interior wall (both sides are inside) and exterior wall (one side is indoors and one is outdoors) within the same room. The difference in temperatures is an indication of how well the walls are insulated.
- **Around windows and doors** - check for leaks in the seal by slowly moving the laser pointer around the seal on the edges of windows and doors. Any leaks will show up as cooler spots.

### What can I do to make my home warmer?



#### 1. Upgrade/ Install effective insulation

Insulation will make your home easier and more affordable to heat to comfortable temperatures. Ceiling and underfloor insulation are first priority and can reduce heat loss by up to 50%. Wall insulation is best retrofitted during renovations.

For more information see <https://www.energywise.govt.nz/at-home/insulation/> and find out whether you are eligible for any assistance with funding insulation: <https://www.energywise.govt.nz/at-home/insulation/installation-funding/>

**Funding assistance** for insulation and clean heating is available through the [Council's Retrofit Your Home programme](#).

#### 2. Block up draughts

Make sure your windows and doors fit their frames. Use draught stopping tape around windows and doors and draught excluders or door snakes along the bottom of doors. This could save up to 20% of your heating bill.

Watch the video on how to fit a draught excluder to your door:

<https://www.energywise.govt.nz/at-home/draught-stopping/>

### 3. Close curtains

Shut curtains in late afternoon to retain heat or install lined curtains if you don't have any. Also consider DIY window-film kits – these can cut heat loss through windows by half and are a fraction of the cost of double-glazing.

**For more low cost tips see**

<https://www.energywise.govt.nz/at-home/simple-ways-to-lower-energy-bills/#Keepyourhomewarm>

#### **Factsheets**

Help yourself to any of the following factsheets in the resource folder. These are also available at <http://www.ecodesignadvisor.org.nz/factsheets/>

- Insulation
- Comparing insulation
- Windows and curtains
- How to operate heat pumps



## Keep your home dry

*Get rid of moisture and dampness in your home, especially when you're cooking and washing.*

▶ Start by determining the moisture levels in different parts of your home. Winter is when cold and dampness are the worst providing the ideal conditions for mould to grow, so this is the best time of year to take your measurements.



**Tool: Thermometer/Hygrometer**



Relative humidity reading

Max-Min humidity over time

### How to use the tool

Refer to instructions on page 3.

Try leaving the unit on in various room of the house-eg kitchen, bathroom, bedrooms, living room for a period of 24 hours. Also, take measurements under your house as this can be where the most moisture can come from.

The next day, push the button marked "Hygro max-min" to show the maximum and minimum indoor relative humidity temperature of the period from the last reset. Press reset before doing the same measurements in another area.

### What do the measurements mean?

In Auckland indoor relative humidity levels of 40 – 65% are satisfactory. Levels over 65% or more mean that mould and dust mites can thrive, and respiratory illnesses may be aggravated.





### What can I do to make my home dryer?

1. **Install a groundsheet** if you have an area of bare ground under your floor. Dollar for dollar, installing a polythene moisture barrier is one of the best things you can do to improve the health and comfort of your home. By putting a cap on rising damp, you can lower the moisture level in your home. This will reduce condensation and mould, making the air more comfortable and your home easier to heat. If you do it yourself, the cost will come in just over one dollar per square metre.
2. **Install extractor fans** or open windows in the kitchen and bathroom to remove moisture.
3. **Avoid adding moisture** by putting lids on pots when cooking, avoid drying clothes on airing racks indoors, avoid u-flued gas heaters. Air your house every day - open a few windows and doors for 10 minutes or more to let moisture escape, even in winter.

#### For more low cost tips see

<https://www.energywise.govt.nz/at-home/simple-ways-to-lower-energy-bills/#Keepyourhomedry>

Watch the video on how to fix dampness in your home:

<https://www.energywise.govt.nz/at-home/dampness/>

**Funding assistance** for extractor fans is available through the [Council's Retrofit Your Home programme](#).


#### Factsheets

Help yourself to any of the following factsheets in the resource folder. These are also available at <http://www.ecodesignadvisor.org.nz/factsheets/>

- Moisture and condensation
- Ground Moisture Barrier Installation Guide

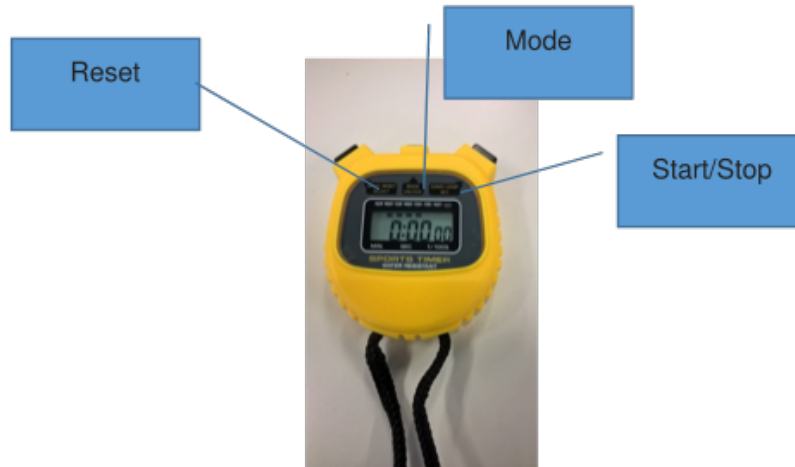
## Save on hot water

Hot water accounts for approximately one third of a typical households energy use. It isn't just about energy savings - if your water is metered, every litre you save is also saving you money on your water bill.

 Start by working out your shower flow rate, and check whether your hot water cylinder is working efficiently.



### Tool: Stopwatch



### How to use the tool

In addition to the stopwatch in the kit you will also need a 10L bucket (the regular size of a cheap plastic bucket you can buy at a supermarket or hardware store).

Press mode unlock until the display shows all zeros. Turn the shower on full at normal showering temperature and use the start/stop button to time the amount of time it takes to fill the bucket. Press reset to run another test.

Calculate your shower flow rate as follows:

Time it takes to fill a 10L bucket (seconds)	Flow rate (Litres per minute)
30	20
35	17
40	15
45	13
50	12
55	11
60	10
65	9

A simple test is just to let the bucket fill for a minute, and if it overflows then you know the flow rate is more than 10 litres per minute.

### What do the measurements mean?

If your shower fills a 10 litre bucket in less than a minute, it's wasting water and energy. The quicker it fills the bucket, the bigger the waste and the greater the potential cost saving in switching to an efficient showerhead or installing a flow restrictor into your existing shower hose or head.



### Tool : Infrared Thermometer



Use the Infrared Thermometer to test whether your hot water temperature is set correctly, and if your hot water cylinder is losing energy.

#### How to use the tool

Using the instructions on pg3, point the device at the side of your hot water cylinder to measure the temperature of the surface of the cylinder.

You can also use the infrared thermometer to measure the temperature of your hot water. Run the hot tap on full for about 30 seconds with the plug out until the temperature stabilises. Point the laser thermometer into the centre of the water flow at the point where the water is hitting the bottom of the sink, and record the temperature.

### What does the measurement mean?

If the surface temperature is greater than 25 °C, your HWC could benefit from a cylinder wrap to prevent it losing heat into the surrounding air.

Hot water temperature at the tap should ideally be 55 °C, or at least somewhere between 50 and 60 °C. Temperature above 55 °C are unsafe as you could get burnt (children are particularly vulnerable). A tap temperature less than 50 °C could mean that the temperature inside the cylinder is too low, presenting a risk that harmful bacteria may grow. Note that continuous flow gas systems will typically deliver hot water between 38 and 55°C and this is not a problem.

### What can I do to use hot water efficiently?



1. **Replace your shower head for one with a more efficient flow rate** of 9 litres a minute or less will cut your hot water use significantly. Or, you can install an inexpensive shower flow restrictor. Even reducing the flow rate by 1 litre per minute could save a household of three around \$80 per year. Refer to the table below to calculate your potential savings.

### Annual energy cost savings from fitting an efficient shower

No. of showers taken per day in this shower	New shower flow rate	Flow rate of existing shower [L/min] (at normal showering temperature)						
		10	11	12	14	16	18	20
1	7.5 L/min	\$66	\$92	\$118	\$170	\$223	\$275	\$328
	9.0 L/min	\$26	\$52	\$79	\$131	\$183	\$236	\$288
2	7.5 L/min	\$131	\$183	\$236	\$341	\$446	\$550	\$655
	9.0 L/min	\$52	\$105	\$157	\$262	\$367	\$472	\$577
3	7.5 L/min	\$197	\$275	\$354	\$511	\$668	\$826	\$983
	9.0 L/min	\$79	\$157	\$236	\$393	\$550	\$708	\$865
4	7.5 L/min	\$262	\$367	\$472	\$681	\$891	\$1,101	\$1,310
	9.0 L/min	\$105	\$210	\$314	\$524	\$734	\$943	\$1,153
5	7.5 L/min	\$328	\$459	\$590	\$852	\$1,114	\$1,376	\$1,638
	9.0 L/min	\$131	\$262	\$393	\$655	\$917	\$1,179	\$1,441
		60 sec	55 sec	50 sec	43 sec	38 sec	33 sec	30 sec
Time taken to fill a 10 litre bucket (at normal showering temperature)								

Watch the video on how to check your shower flow rate and save on your energy bill

<https://www.energywise.govt.nz/at-home/water/saving-money-on-hot-water/>

**Funding assistance** for water saving devices is available through the [Council's Retrofit Your Home programme](#).

#### 2. Adjust your thermostat, wrap your hot water cylinder and hot water pipe.

- Depending on your cylinder, if your hot water temperature at the tap is not within 50-60 °C you may need an electrician or plumber to adjust your thermostat – it should be set to 60 °C.
- Pre-2005 electric hot water cylinders aren't insulated very well, and should have a cylinder wrap. You should also insulate the first 1-1.5 m of hot water pipe coming off your hot water cylinder by putting lagging around the pipes.

#### 3. Use less hot water.

Cut down on baths, take shorter showers and use a cold wash for your laundry. Unless you have an especially dirty load, modern washing machines and detergents clean well using cold water.

**For more info on how to save on hot water see:**

<https://www.energywise.govt.nz/at-home/water/saving-money-on-hot-water/>

<https://www.energywise.govt.nz/tools/water-heating/>

#### Factsheets

Help yourself to any of the following factsheets in the resource folder. These are also available at <http://www.ecodesignadvisor.org.nz/factsheets/>

- Heat pump water heaters

## Save on appliances

*Household appliances accounts for approximately one quarter of a typical households energy use. The majority of this is for the appliances you run all the time such as fridge and freezers.*

▶ Start by checking how much energy your major appliances use and make sure that your fridge and freezer are working efficiently.



### Tool: Power meter



This handy device measures how much electricity various appliances are using in your home. You can work out how much different appliances cost to run and how much you could save if you use the appliances efficiently.

The screen display font is quite small and a magnifying glass is included in the kit to assist you to read the display.

### How to use the tool



Always turn off the electricity at the power point when plugging appliances into the Power Meter and when unplugging appliances. Use only with mains power and do not use with appliances totalling more than 2.4kW. (The Power Meter overload message will be displayed.) Do not use where the Power Meter could become wet.

#### 1. Before you start

Find out the “unit cost” per kilowatt hour (KWh) from your electricity bill. The variable rate charge is based on how much power you use, which is the part you have control over. The other part of your electricity bill is a fixed rate per day which varies between pricing plans. If you don't know the unit cost, assume a NZ average unit cost of 25c/KWh.

#### 2. Set the power cost per unit

Connect the 3-point pins at the back of the unit to the extension cord, and plug the extension cord into a nearby power source. When the device turns on, programme the power meter with the unit cost you pay for electricity as follows;

1. Press the **FUNC** button repeatedly until the **VOLTac** symbol appears in the top right hand corner of the display.



2. Press and hold the FUNC button until the display changes to **COST/Kwh**.
3. Press the SET button to begin editing the cost per unit. The **SET** symbol will now appear in the top right hand corner of the display. Use the UP button to set each digit, use the SET button to move to the next digit. Examples: For a KWh unit price of 25 cents set \$0.25.
4. Now press SET to accept the position of the decimal point.
5. Next are the days of the week as shown by three flashing dashed lines on the bottom right of the screen. Most users will be paying the same price every day of the week so press the UP button 14 times until "MO TU WE TH FR SA SU" appears in the display. Press the SET button when complete.
6. Press the FUNC button to complete the price setting operation. (There is no need to set the correct clock time and day of week)
7. Wait 30 seconds until you are returned to display mode automatically.



### 3. Plug in and measure

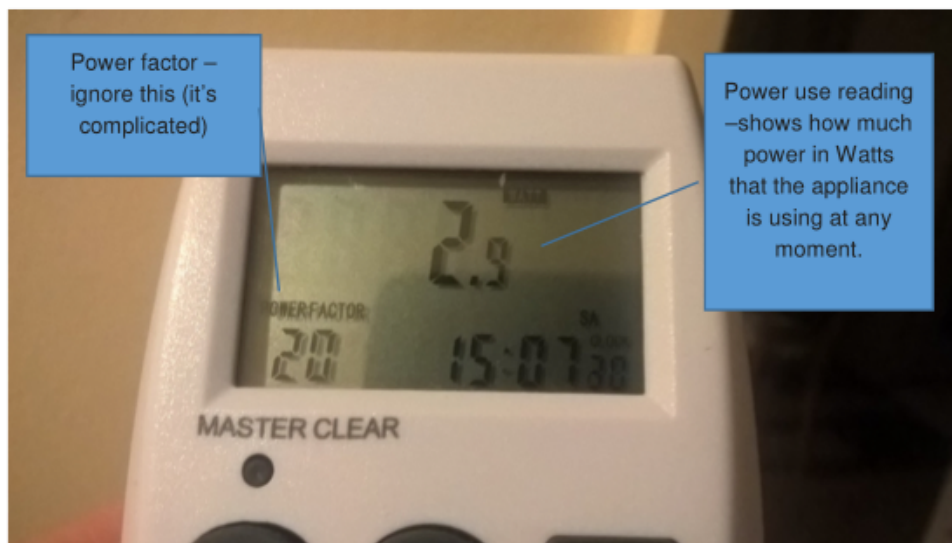
Plug the appliance you wish to monitor to the 3-point socket on the FRONT of the power meter. Turn on the appliance. From here you can cycle through various display modes using the FUNC button.

Some appliances switch motors or heating elements on and off automatically (e.g. a fridge or a dishwasher) so just measuring the power used at any single moment does not tell you the whole story. Leave the power meter plugged in for a full day (eg fridge/freezer) or cycle (eg washing machine, dryer, dish-washer) to find out how much electricity was used for the full cycle and how much per day/ per cycle it's costing you to run.

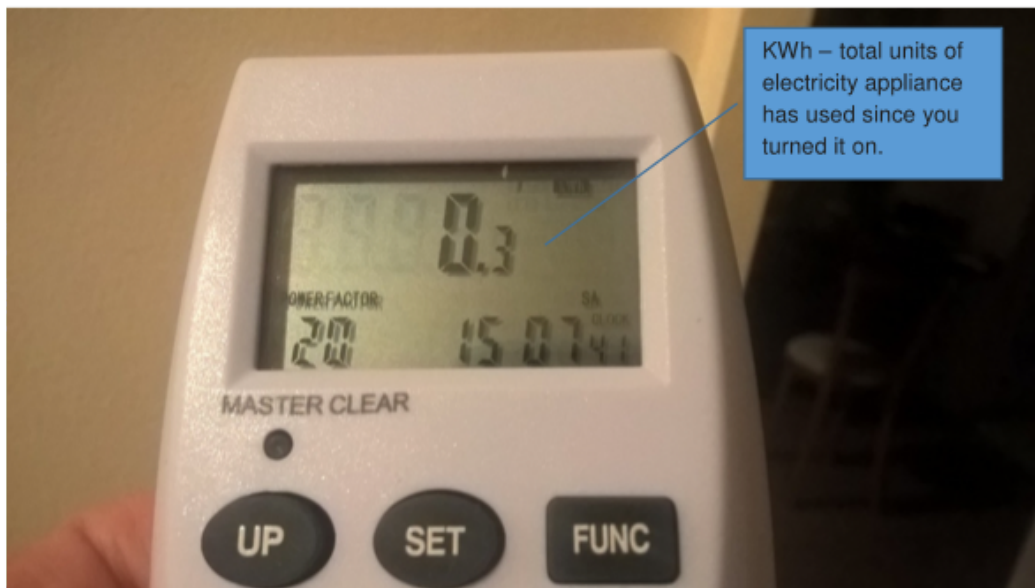
**VOLT<sub>ac</sub>** - when this symbol appears in the top right hand corner of the display you are on the first display screen. Electricity throughout New Zealand is supplied at a nominal voltage of 230 volts and 50 hertz so this screen will show a similar reading no matter what appliance you have it connected to.



**WATT** Press FUNC button two times to get an instant reading of how many watts the appliance is using.



**KWh** Press FUNC button once more to get a reading of how many units of electricity your appliance has used since you turned it on.



The device will not display anything less than 0.1KWh, so some appliances may not use sufficient energy to give a reading on this screen. Even if the KWH screen shows 0.0 (ie less than 0.1 KWh of electricity used) the price function will still calculate the cost based on actual KWh used.

Press FUNC button once more to get the **cost (Total Price)** of electricity your appliance has used since you turned it on.





#### 4. Clear recorded data

After measuring power use for an appliance reset the KWh counter before measuring the next appliance. Press FUNC to view **KWH** screen as above, then press and hold the FUNC button to clear the data.

The cost information you programmed will still be stored for the next appliance.

#### 5. Measure standby power consumption

One of the best uses of the power meter is to check the standby power of appliances. A surprisingly large number of electrical products eg TVs, microwave ovens, sound systems, cordless phones, answering machines etc, cannot be switched off completely without being unplugged. These products draw power 24 hours a day, often without the knowledge of the consumer. We call this power consumption "standby power." An individual product may draw relatively little standby power but a typical home has many products constantly drawing power. Together these may amount to 10% of household electricity use.

To measure standby power draw, attach the power meter to the appliance when it is in its lowest power mode. For appliances with a power switch, that means measuring while the unit is "off" but still plugged in. For appliances without a power switch, such as cordless telephones, answering machines, and battery chargers, measure the power draw while the unit is plugged in, but not being used.

Note that **the power meter cannot be used for heat pumps, stoves/ovens and hot water cylinders** as they are typically not plug-in appliances. Heat pumps and hot water cylinders are used for many hours at a time and need special attention when trying to cut electricity use and electricity bills.

Heat pumps are a very energy efficient technology for both space heating and water heating provided they are sized, installed, and used properly.. Understanding the different settings and how to programme them is crucial in order to use them effectively (refer to the Hot water heat pump factsheet and How to operate heat pumps factsheet - links at the end of this section).

#### What do the measurements mean?

Once you know much energy your appliances are using you can identify the potential for energy and cost savings.

The **WATT** display on the power meter shows the power used by the appliance at that moment measured in Watts (W) . The **KWH** display shows energy consumption for running an appliance over time (according to how long it's been plugged in to that appliance). The Total Price tells you the cost of electricity your appliance has used since you turned it on.

### Alternatives to the power meter

1000 watts (1Kw) of power running for 1 hour = 1 KWh = 1 unit of electricity. Most appliances have a Watt or kilowatt power rating labelled. Multiplying the kilowatt rating by the number of hours run will give you the number of units used.

Another way of converting power consumption of an appliance in Watts to energy costs over a day, month or year, is by using the energy calculator at <http://www.rapidtables.com/calc/electric/energy-cost-calculator.htm>. Enter the appliance's power consumption in Watts (from the power meter or appliance label), your hours of use per day and your electricity cost (eg 25 cents/KWh).

Alternatively if your appliance has an energy rating label you can use the Energywise running cost calculator to estimate how much each appliance will cost per year to run <https://www.energywise.govt.nz/tools/running-costs-calculator/#/>.

### Typical appliance running costs

Electrical space heaters (eg oil column heaters, fan heaters etc) are high power and may be used for many hours at a time and need special attention when trying to cut electricity bills.

Many appliances are high power but only used for short periods. These include microwave ovens, cook-tops/ovens, washing machines and dryers, dishwashers, hair dryers, vacuum cleaners, irons, toasters, electric jug/kettles and some workshop and garden tools. These are low to medium consumers of electricity when averaged over a year and sensible operation can make useful cuts to electricity bills.

There are also many appliances that have very small power consumption, but if they are on all the time (eg on standby) they can add many dollars to electricity bills.

	Typical Use (in KWh 'units')		Cost per use	Estimated Weekly Use (in KWh 'units')		Est. Weekly cost	Est. Monthly cost	Est. Annual Cost
<b>Kitchen</b>								
Dishwasher	2.25	per load	\$0.56	15.75	7 loads	\$3.94	\$15.75	\$204.75
Electric Jug	0.25	per boil	\$0.06	8.75	35 boils	\$2.19	\$8.75	\$113.75
Microwave	0.75	per hour	\$0.19	1.5	2 hours	\$0.38	\$1.50	\$19.50
Oven	1.25	per hour	\$0.31	8.75	7 hours	\$2.19	\$8.75	\$113.75
Element on stove-top	1.25	per hour	\$0.31	9	8 hours	\$2.25	\$9.00	\$117.00
2 Slice Toaster	0.25	per week	\$0.06	0.25		\$0.06	\$0.25	\$3.25
In-sink waste disposer	0.25	per hour	\$0.06	0.25	1 hour	\$0.06	\$0.25	\$3.25

	Typical Use (in KWh 'units')		Cost per use	Estimated Weekly Use (in KWh 'units')		Est. Weekly cost	Est. Monthly cost	Est. Annual Cost
old Fridge or Freezer	3	per day	\$0.75	21	7 days constant	\$5.25	\$21.00	\$273.00
modern chest freezer	1.2	per day	\$0.30	8.4	7 days constant	\$2.10	\$8.40	\$109.20
<b>Laundry</b>								
machine- Hot wash	4.75	per load	\$1.19	28.5	6 washes	\$7.13	\$28.50	\$370.50
machine -Cold wash	0.25	per load	\$0.06	1.5	6 washes	\$0.38	\$1.50	\$19.50
Clothes Dryer	2	per hour	\$0.50	12	6 hours	\$3.00	\$12.00	\$156.00
Ironing	1	per hour	\$0.25	2	2 hours	\$0.50	\$2.00	\$26.00
<b>Bathroom</b>								
Heated towel rail	2.25	per day	\$0.56	15.75	7 days constant	\$3.94	\$15.75	\$204.75
<b>Heating</b>								
two bar radiant heater	2	per hour	\$0.50	56	28 hours	\$14.00	\$56.00	\$728.00
2kW fan heater	2	per hour	\$0.50	56	28 hours	\$14.00	\$56.00	\$728.00
Medium column heater	1.4	per hour	\$0.35	39.2	28 hours	\$9.80	\$39.20	\$509.60
2kW <u>output</u> heat pump	0.75	per hour	\$0.19	21	28 hours	\$5.25	\$21.00	\$273.00
<b>Other Appliances</b>								
Dehumidifier	0.6	per hour	\$0.15	16.8	28 hours	\$4.20	\$16.80	\$218.40
Double electric blanket	0.1	per hour	\$0.03	3.5	35 hours	\$0.88	\$3.50	\$45.50
Stereo	0.2	per hour	\$0.05	1	5 hours	\$0.25	\$1.00	\$13.00
Television	0.25	per hour	\$0.06	5.25	21 hours	\$1.31	\$5.25	\$68.25
DVD player	0.1	per hour	\$0.03	0.6	6 hours	\$0.15	\$0.60	\$7.80
Vacuum cleaner	0.25	per hour	\$0.06	0.25	1 hour	\$0.06	\$0.25	\$3.25
Computer	0.25	per hour	\$0.06	5.25	21 hours	\$1.31	\$5.25	\$68.25
Power Drill	0.25	per hour	\$0.06	0.25	1 hour	\$0.06	\$0.25	\$3.25
Spa Pool	0.5	per hour	\$0.13	10	most of day	\$2.50	\$10.00	\$130.00
<b>Lights</b>								
60 watt bulb	0.25	per 6 hours	\$0.06	1.75	42 hours	\$0.44	\$1.75	\$22.75
100 watt bulb	0.5	per 6 hours	\$0.13	3.5	42 hours	\$0.88	\$3.50	\$45.50
Energy savingCFL bulb	0.12	per 6 hours	\$0.03	0.84	42 hours	\$0.21	\$0.84	\$10.92

Table source: Sustainable Living Trust appliance calculator tool. Estimates calculation based on a household of two adults and three children and unit cost of electricity 25c/KWh.



## What can I do to save electricity used by household appliances?

1. **Choose energy efficient appliances and lighting.** You can cut down on running costs by choosing the right size and type appliance for your needs and taking note of the stars on the energy rating labels. The model with the most stars is the most energy efficient: <https://www.energywise.govt.nz/energy-labels/energy-rating-labels/>. Energy efficient light bulbs (LED) use up to 80% less energy than standard incandescent bulbs.
2. **Turn appliances off at the wall** when not in use rather than leaving them on standby. Some older appliances may have 15-20 Watts standby power, costing \$35-45 per year even when you're not using them.
3. **Make use of timers/ thermostats.** Use timers on electrical heaters to pre-heat rooms outside of peak periods and thermostats to avoid overheating rooms. Use timers for towel rails that come on automatically at certain times of the day.

### For more info see

<https://www.energywise.govt.nz/at-home/appliances/>

<https://www.energywise.govt.nz/at-home/simple-ways-to-lower-energy-bills/#Saveonappliances>

<https://www.energywise.govt.nz/at-home/simple-ways-to-lower-energy-bills/#Saveonlighting>

<https://www.energywise.govt.nz/at-home/heating-and-cooling/types-of-heater/>

<https://www.energywise.govt.nz/at-home/heating-and-cooling/types-of-heater/heat-pumps/>

<https://www.energywise.govt.nz/at-home/water/types-of-water-heating-systems/>

### Factsheets

Help yourself to any of the following factsheets in the resource folder. These are also available at <http://www.ecodesignadvisor.org.nz/factsheets/>



### Tool: Infrared Thermometer



You can use the Infrared Thermometer to check for air leaks around fridge and freezer doors

#### How to use the tool

Check for leaks in the seal by slowly moving the laser pointer down the seal on the side of the fridge/freezer door. Any leaks will show up as cooler spots. A simpler way would be to put a torch into the fridge at night (with the room being dark) to see if light comes through the seals.

Measure the temperature behind the fridge/freezer to check for adequate ventilation - measure the temperature of the wall behind the fridge and compare it with the same wall but away from the fridge.

#### What do the measurements mean?

Any leaks in fridge/freezer door seals will show up as cooler spots. Also look for sections that are cracked or brittle, or pressed out of shape. You can also try putting a piece of paper in the seal and closing the door. If the seal is working properly, it will hold the paper firmly.

If the thermometer shows the wall behind the fridge is one degree or more warmer than the same wall but away from the fridge/ freezer it shows that there is not enough ventilation or space behind the fridge to allow the condensers at the back to cool.

### Fridges and Freezers



- 1. Ensure that fridge and freezer doors are sealing properly.**
- 2. Make sure there is some space between the back of the fridge/freezer and the wall** (3 to 5cm) and both sides (2 to 3cm). This is important because it allows free movement of air to take away the heat given off by the outside of the fridge. Poor air circulation may double the electricity use of a fridge or freezer.
- 3. Check that the temperature is set correctly** - freezers should be between -15°C and -18°C, fridge compartments should be 2°C to 4°C. You can use the thermometer in the kit to check the air temperature inside the fridge.

#### For more info see

<https://www.energywise.govt.nz/at-home/appliances/fridges-and-freezers/>



## When you're done

Please check you have returned the resource folder and all four tools plus extension cord to the Kit.

Help yourself to any of the **factsheets and brochures** in the folder. These will be replaced before the toolkit is borrowed by the next person.

Please tell us how helpful the kit has been and how we can improve it, by completing the short **feedback form** and handing it into the library.

If you notice that any of the tools are faulty or the batteries have run out, please alert the librarian when you return the toolkit to the library.

**If you require any assistance in the use of the HEAT Kit please email [lowcarbonliving@aucklandcouncil.govt.nz](mailto:lowcarbonliving@aucklandcouncil.govt.nz)**

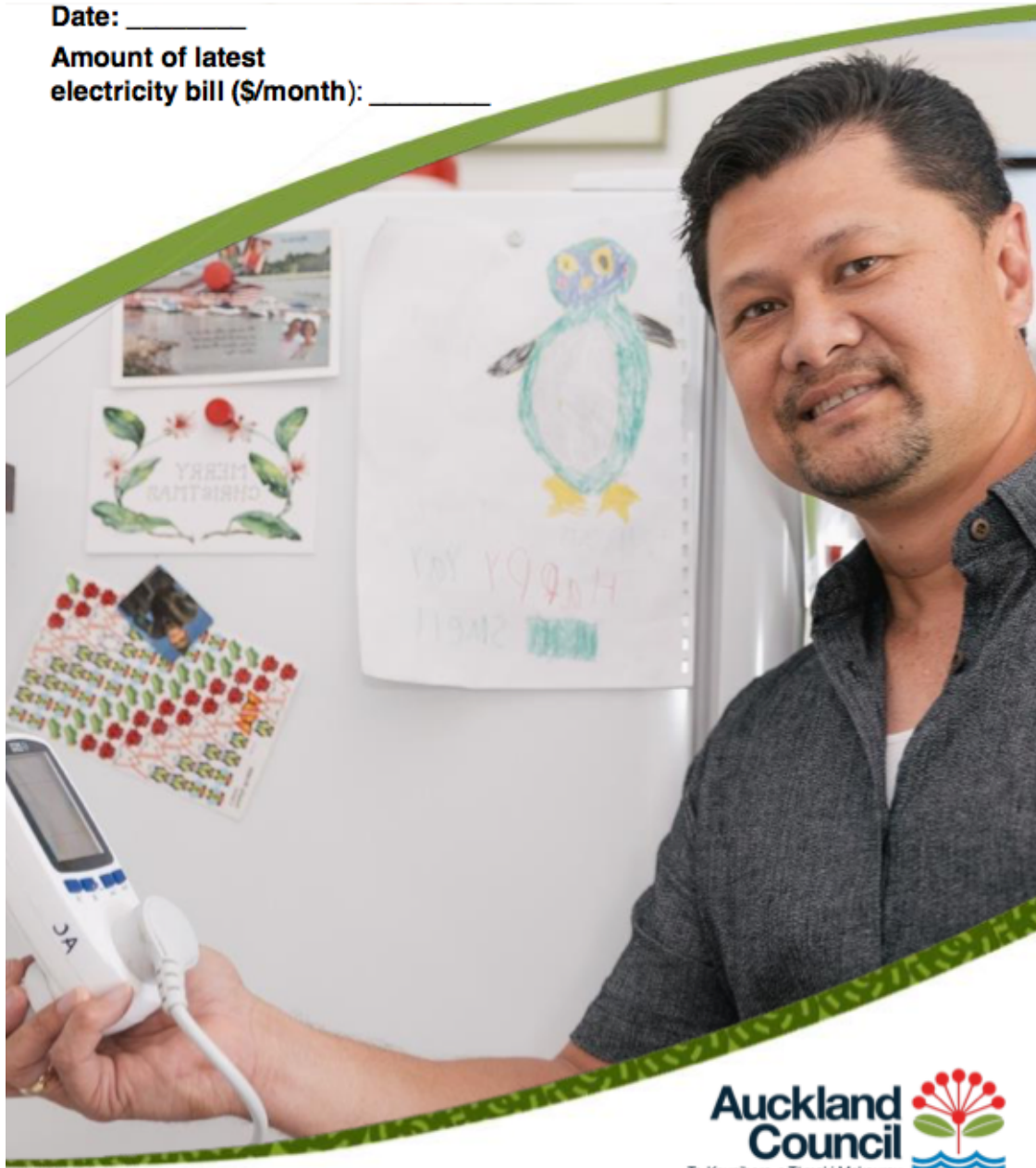
Record booklet

## Home Energy Audit Toolkit Record Booklet

Use this booklet to record the measurements you made using the tools in the Home Energy Audit Toolkit and keep this for future reference.

Date: \_\_\_\_\_

Amount of latest  
electricity bill (\$/month): \_\_\_\_\_





## Keep Your Home Warm



**Thermometer/Hygrometer**  
For measuring air temperature and moisture levels in different parts of your home

Aim: Min daily temp 18 °C or 20 °C for children/elderly  
Min 16 °C in bedrooms overnight

Room	Temperature Reading (over 24 hours)	
	Min	Max
Living Room		
Dining Room		
Kitchen		
Bedroom	1	
	2	
	3	
	4	
Bathroom	1	
	2	
Outside		

### **My Energy Saving Actions**

#### **Keep the heat in**

Tick below the actions you plan to take to keep your home warmer in winter.

- Upgrade/install ceiling Insulation
- Upgrade/install underfloor Insulation
- Seal drafts around doors and windows
- Hang full length lined curtains in bedrooms and living areas
- Open curtains in day to let in the sun and close at dusk
- Double glaze windows or use DIY window-film kit
- Switch to energy efficient clean-heating e.g. heat pump, wood burner
- Only heat or cool rooms in use
- Set temperature controls (12-23 °C) and timers

## Keep Your Home Warm



### Infrared Thermometer

For finding hot spots or cold spots to identify areas of poor insulation or air leaks.

Note the location of any cold spots that indicate areas of poor insulation or air leaks					
		Ceiling	Floors	Walls	Window and Door Seals
Living Room					
Dining Room					
Kitchen					
Bedroom	1				
	2				
	3				
	4				
Bathroom	1				
	2				

## Keep Your Home Dry



### Thermometer/Hygrometer

For measuring air temperature and moisture levels in different parts of your home

Aim: Relative Humidity Range 40 – 65%

Room		Relative Humidity Readings (over 24 hours)	
		Min	Max
Living Room			
Dining Room			
Kitchen			
Bedroom	1		
	2		
	3		
Bathroom	1		
	2		
Under the house			

### **My Energy Saving Actions**

#### **Reduce Dampness**

Tick below the actions you plan to take to keep your home drier.

- Install a groundsheet
- Install extractor fans in kitchen and bathroom
- Use extractor fans or open windows when bathing and cooking
- Put lids on cooking pots
- Dry clothes outside
- Open doors and windows for 30 min daily
- Swap portable gas heaters for an efficient, clean heating option

## Save on Hot Water



**Stopwatch**  
For checking  
your flow rate.



**Infrared Thermometer**  
For finding hot spots or  
cold spots to identify areas  
of poor insulation or air  
leaks.

Aim: Flow rate of less than 9 litres per minute

	<b>Time to fill a 10L bucket (sec)</b>	<b>Flow rate (litres per minute)</b> Refer to instructions for calculations
Shower 1		
Shower 2		

Aim: HWC surface temperature less than 25 °C,  
and hot water temp of 50-60 °C at the tap

<b>Infrared Thermometer Readings</b>	
Hot water cylinder sides	
Hot water cylinder top	
Hot water temperature at tap	

### **My Energy Saving Actions**

#### **Use hot water more efficiently**

Tick below the actions you plan to take to save on hot water.

- Switch to an efficient showerhead or install a flow restrictor
- Take shorter showers
- Cut down on baths
- Adjust HWC temperature setting
- Wash clothes in cold water
- Wrap hot water cylinder
- Lag external hot water pipes
- Switch to an energy efficient water heater e.g. hot water heat pump

## Save on Appliances



### Power meter

For checking the energy use and running costs of your major appliances such as fridge, freezer etc..

Power Meter Readings				
	Energy per use (KWh)	Cost per use	Approx. running cost per week*	Stand-by energy use (KWh)
Fridge (per day)				
Freezer (per day)				
Thermostat Heater (per day)				
Dishwasher (cycle)				
Washing Machine (cycle)				
Clothes Dryer (cycle)				
Heated Towel Rail (hour)				
Electric Heater (hour)				
TV				
Music System				
Computer				
Kettle/Jug				
Toaster				
Hair Dryer				
Mobile phone charger				
Vacuum Cleaner				

## Save on Appliances

\*To calculate the approx. running cost per week  
= Cost per use (from power meter) multiplied by the number of uses per week (e.g. times 7 days for appliances that are always on, or times number of loads, cycles or hours of use per week)

See the HEAT kit page on the Council website for a handy spreadsheet to help calculate your appliance running costs

### **My Energy Saving Actions**

#### **Be smart with appliances**

Tick below the actions you plan to take to reduce your appliance running costs

- When replacing appliances choose the model with the most stars
- Turn appliances off at the wall when not in use. Use multi-plug power boards to easily turn individual devices off.
- Use timers and/or thermostats to manage energy use
  
- Only put as much water to boil in the kettle as you need
- Use the clothes line instead of the dryer
- Only use washing machine and dishwasher when full
  
- Retire old fridges and freezers
- Minimise the time you have the fridge/freezer door open
- Adjust fridge temperature to between 3 °C and 5 °C
- Adjust freezer temperature to between -15 °C and -18 °C
  
- Turn off lights when not needed
- Replace incandescent light bulbs with energy efficient CFL or LED bulbs
- Set up power management features on your computer and TV



## INSULATION

ECO-DESIGN ADVISOR SERIES NO.1



### THE PROBLEM

New Zealand homes are not kind on their occupants or the environment. Most score just two stars out of 10 on the Homestar\* rating system for home performance and environmental impact. Very few score more than four\*\*.

Much of the problem with keeping our homes warm and dry lies in the following:

- Many houses were built before insulation was widely used (and made compulsory).
- Many are poorly positioned to catch the sun, the best and cheapest heating source.
- We like big windows whenever there are views, even if the windows have a cold, south-facing aspect.
- We once had a craze for exposed rafters and other ceilings with tiny insulation cavities, making rooms hard to heat and retrofitting of insulation difficult.
- We prefer to redecorate over less exciting improvements such as insulation, solar heating or water-efficient appliances.
- Our climate makes dampness a constant threat.

Many of these things are changing. We appreciate that there are great costs – to our health and wellbeing as well as to our pocket – in cold, draughty homes. We are realising that the investment in fitting insulation, double-glazing and quality blinds can quickly repay itself. When we alter or make additions to our homes, we are beginning to choose products for their environmental friendliness as well as their price. And when we build from scratch, we think about positioning the house for optimum passive solar heating ("letting the sun heat your home" in the old terminology). All in all, we are becoming greener Kiwis. In this factsheet you will find tips on how to insulate your home and make your insulation dollar go as far as possible.

#### In a nutshell

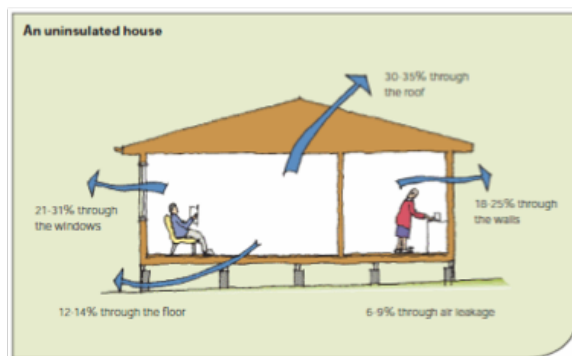
Two-thirds of New Zealand houses were built before 1978 when it became mandatory to install insulation. That means two-thirds have hollow walls clad with weatherboards, bricks or sheeting, single-glazed wooden-framed windows and wooden floors over piles. That's not a recipe for cosiness. Insulation can go a

\* Devised by the New Zealand Green Building Council, Homestar is a national, voluntary system to rate the impact of houses on the environment, in particular how much waste they generate in their construction, how much energy and water they consume in their running, and the level of warmth and health they allow.

\*\* A typical house constructed to the minimum insulation levels of the NZ Building Code achieves a score of four.

long way to keeping your home warm and your power bills down. (It makes for a healthier environment, too, reducing colds and other respiratory illnesses by helping to eliminate condensation, dampness and mould.)

**Where your heat goes:** If your house has no insulation, about 30 per cent of heat is lost through the roof. Another third disappears through windows. And the final third vanishes through the floor, the walls and through air leakage (that is, gaps in floorboards and under doors – and even cat doors!).



Where your heat goes  
[www.smarterhomes.org.nz](http://www.smarterhomes.org.nz)

**Priorities:** The ceiling space should be your first concern for two reasons: first, because it is probably the biggest source of heat loss; and second, because it is the easiest and most accessible area of your house to insulate. There you will get the biggest impact for your dollar. You can also get subsidies to install ceiling (and underfloor) insulation. Note that recessed ceiling downlights are a source of heat loss – air gets through gaps around the bulb, and insulation must be kept well clear of them because of the risk of fire, unless they are specially rated.

# INSULATION: HOW EFFECTIVE IS IT?

ECO DESIGN ADVISOR FACTSHEET No.7 (North Island Zones 1 and 2)

Two of the most common questions asked of Eco Design Advisors are how much insulation should be installed, and how do you know what difference it will make. To answer these questions there are a few basic concepts to understand.

- Heat always tries to flow from a warmer place to a colder place.
- Insulation reduces this heat flow by slowing it down.
- The unit used to measure resistance to heat flow is the R-value ( $m^2C/W$ ). The bigger the number, the better the resistance to heat flow.

All insulation products sold in New Zealand are required to be labelled with the R-value, and when building new you need to demonstrate you can meet the insulation requirements of the New Zealand Building Code (NZBC). To give you a feel for the levels required here are some typical R-values:

Construction (Note 1)	NZBC minimum (Note 2)	Better (Note 3)	Best (Note 3)
Floor	R1.3	R1.9	R3.1
Wall	R1.9	R2.6	R3.3
Ceiling	R2.9	R4.0	R5.0
Windows (Note 4)			
Standard double glazing (aluminium frame)	R0.26		
Minimum WEERS Rated 3 Stars, or Energy Star endorsed		R0.32	
Minimum WEERS Rated 5 Stars			R0.50

Note 1: For non-solid construction.

Note 2: R values stated are total construction R-value, taking into account heat losses through framing members. Note NZBC minimum figures are for Zones 1 and 2, which exclude the North Island high country and all of the South Island, for which higher values again are required – refer to [Factsheet 7a](#) for Zone 3.

Note 3: Refer to BRANZ House Insulation Guide 5th Edition, for options on achieving these desired construction R-values.

Note 4: Consult with your window supplier to ascertain what R<sub>w</sub> value different options will give, or refer to BRANZ Bulletin 579 for guidance ([www.branz.co.nz](http://www.branz.co.nz)).

What can we learn from the above table?

- Insulation is your friend, the more the better, especially in the ceiling, as warm air rises (replacing the cold air that sinks).
- Windows perform really poorly thermally; even double glazed windows lose 10 times as much heat as a well-insulated wall, hence there's still a need for good curtains (see fact sheet no. 2).
- Avoid too much glazing, especially on south sides and via skylights.
- Insulation works in both directions, slowing heat from entering in summer, and will reduce overheating, provided windows are well shaded.



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# HEAT PUMPS – HOW TO RUN THEM EFFECTIVELY

ECO-DESIGN ADVISOR FACTSHEET NO.11

Heat pumps are one of the most efficient types of home heating, but some people find them ineffective or may even incur higher power bills because they don't understand how to use them effectively. Understanding the different settings and how to programme them is crucial. This fact sheet explains how.



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## Winter Heating



1. Press **MODE** or **MASTER CONTROL** button until you have selected the **Heat (Sun)** setting.



2. Press the **FAN** button until you have selected the **Auto Fan** setting.



3. Set the temperature between 20°C and 22°C. Setting the temperature higher makes it work harder and it will be less efficient. Running a heat pump at 26°C will use 50% more power than at 21°C. If you are not at home during the day, turn the heat pump off when you go out.



4. Use the **SWING** button to adjust the direction of the air flow down into the room (refer also to next page).

# WINDOWS AND CURTAINS

ECO-DESIGN ADVISOR SERIES NO.2



## THE WEAK LINK

Windows are the weak link in keeping houses warm. In a typical uninsulated house, a third of heat is lost through windows. (The roof accounts for another third and the final third vanishes through the floor, the walls and gaps under doors and in floorboards.) Single-glazed windows let out heat 10 times more readily than insulated walls, and even standard double-glazed windows are inferior to uninsulated walls.

We can't do without windows, of course: our rooms would become prison cells. Windows admit light and connect us to the outside world. If correctly proportioned and placed, however, they can let in welcome winter sun. And if also double glazed and properly curtained, they will hold in much of that free heat, reducing your power bills in the process.

If you have single-glazed windows, there are three choices available to you:

- Cheapest of all is a window insulator kit manufactured by 3M. Thermally, it is unexpectedly efficient, though aesthetically it may not be to everyone's taste (the film does not reflect exactly like glass).
- Secondary glazing can be half the price of removing single-glazed windows and installing double-glazed windows. However, the seals must be absolutely right or condensation can occur. Opening such windows can be awkward because you have in a sense two windows.

Installing double-glazed windows is not cheap, but the benefits are undeniable. (They are also an acceptable solution to meeting Building Code in new houses.) They hold in warm air and deflect cold air very well, ensuring energy used in the house is not wasted. Performance can vary according to the type of glass, whether the vacuum between the panes is filled with air or another gas and the type of window framing, as the chart below shows. Single glazing is included for a comparison of performance. The R-value in the chart is a measure of thermal effectiveness: the bigger the number, the greater the effectiveness. Note how the performance improves with better window frames and glazing (though the use of argon gas adds only a very slight enhancement). To put into perspective the performance of even the best glazing, a wall without insulation has a rating of between R 0.35 and R 0.60, should have a minimum R value of 2.0.

Comparison of Types of glazing

	Single glazing	Standard double glazing	Double glazing with Low E glass	Double glazing with Low E glass plus Argon
Aluminium frames	R 0.15	R 0.26	R 0.31	R 0.32
Thermally broken aluminium frames*	R 0.17	R 0.31	R 0.39	R 0.41
Timber/uPVC	R 0.19	R 0.36	R 0.47	R 0.50

\* Stops transfer of heat and cold via window frames

Note: Figures from NZS 4218:2009. Figures for double glazing based on 10mm space between panes

For the technically minded, Low E coatings let the sun's heat through the glass but act like a mirror to prevent it from leaving. All double-glazed windows have a gap between the panes of between 8 millimetres and 12 millimetres. In standard double-glazed windows, the gap contains air. For extra money, the air can be replaced with argon gas, which is a better insulator than air. There are questions, however, about how long argon gas stays in the unit.



# HEAT PUMP WATER HEATERS

ECO DESIGN ADVISOR SERIES NO. 8



Heat pumps can heat water as well as the more common application of heating homes and are becoming a popular alternative to standard electric, gas and solar hot water systems.

Heat pump water heaters (HPWHs) are a more efficient way to heat water than standard electric or gas cylinders.

They typically absorb energy from the outdoor air, the ground or water bodies (lakes, ponds) to heat water, which is stored in an insulated cylinder.



*An integral heat pump hot water cylinder is usually sited outside. Photos: BRANZ Bulletin 529 Dec 2010*

## What's good about HPWH

- A well-designed and installed system uses significantly less energy than standard electric or gas cylinders.
- Heat pump water heaters can work in places that aren't good for solar water heaters - places that get less sun, like the south side of hills.
- Energy savings are less dependent on daily hot water usage patterns (eg when you shower) compared with solar hot water.
- If cheaper night-rate electricity is available in your area, some models can take advantage of it. Check with your electricity supplier and, if it's

available, get your cylinder sized so you can use it.

## How HPWHs work

- A heat pump water heater transfers heat from an outside heat source (usually the ambient heat in air) into a hot water tank and uses a compressor/condenser/evaporator to raise the water temperature, the reverse of the way a fridge works.
- Heat pump systems use electrical energy only to 'move' the heat - they don't actually 'make' heat. This makes heat pump systems much more efficient than traditional electric or gas water heaters.
- Some systems incorporate an electric element booster, for when the air is too cold for the heat pump to extract heat efficiently, while other systems can operate at very low temperatures and still produce enough hot water at good efficiencies. There are also systems that are designed to be used only in warmer areas.

The actual efficiency that you would get from a heat pump water heater depends on the make of the system, the quality of the installation, the average temperatures where you live, the amount of hot water you use and the location of the compressor unit.

## What to be aware of

- Some systems work better in cold climates than others (see below for further detail on use in cold climates).
- Systems that use an electric booster (backup element) in cold conditions can be more expensive to run.
- Many HPWHs operate essentially as electric systems below 7°C. If using these systems, ensure that they are on a timer to operate during the daytime only. Otherwise they are



# REDUCING MOISTURE AND CONDENSATION

ECO DESIGN ADVISOR FACTSHEET NO.3

It's a sad fact that many New Zealand homes are cold and damp. These conditions contribute significantly to health problems such as asthma and respiratory illness, which have a disproportionate impact on children and older adults.



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Mould thrives in a cold and damp environment. These conditions can exist in a home for a number of reasons:

- poor design and construction;
- inadequate ventilation;
- lack of or not using extractor fans;
- drying washing indoors;
- the use of un-flued gas heaters;
- rising damp from beneath the floor;
- leaks in walls or roofs.

Because many New Zealanders do not adequately heat their homes, we are unwittingly providing the conditions for mould to thrive. Research indicates that many of our homes are not heated to the World Health Organisation recommended minimums of 18°C for living spaces and 16°C for bedrooms. The higher the temperature the less likely condensation and mould will develop.

Healthy levels of relative humidity within homes can vary between 30% and 65%. At the high end of this range and above, mould and dust mites can thrive.

Addressing the problems of a cold, damp home include the following strategies: 1) minimise or eliminate the sources of moisture; 2) insulate and heat your home adequately; 3) manage the conditions for health and comfort.

## Minimise or eliminate sources of moisture

- Do not air washing indoors. Ensure that clothes driers are vented outside.
- Do not use un-flued gas heaters.
- Use an extractor fan and pot lids while cooking. The best range hoods are larger than the cooking area, are vented outside, and have quiet motors.
- Use an extractor fan while showering and keep showers short. Better yet, install an automatic timer so that the fan runs for 10 minutes after you leave, and make sure the bathroom door is closed when you do. Choose an extractor fan with good air flow volume, and if it struggles to ventilate the space, ensure there is enough inward air flow (either through an open window or a gap under the bathroom door).
- Ensure adequate drainage around the perimeter of your home. Contact a specialist if you suspect water is flowing underneath the structure.
- If your home is on piles and the basement is fully enclosed, install a ground vapour barrier such as heavy-grade polythene to prevent rising damp.
- Limit indoor pot plants and cover fish tanks.
- Check gutters and downpipes for signs of leaks.

# GROUND MOISTURE BARRIERS - GUIDE TO INSTALLATION

ECO DESIGN ADVISOR FACTSHEET NO.12

Dollar for dollar, installing a polythene groundsheet (also called a moisture barrier or vapour barrier) is one of the best things you can do to improve the health and comfort of your home. By putting a cap on rising damp you can lower the moisture level in your home, which will reduce condensation and mould, as well as make the air feel more comfortable and the home easier to heat. If you do it yourself, the cost will come in just over one dollar per square metre.



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## Step One: Measure and Buy

Once you know the size of your home in square metres, purchase that much heavy duty builder's polythene (no less than 0.25 mm thick) plus 10%-20% to account for overlaps and wastage.

Tip: polythene is folded at the factory and then rolled. In most cases, if you buy rolls that unfold to two metres rather than four metres the installation process will be easier. If you buy four metre wide rolls it may be easier to cut the polythene strips in half to make it more manageable under the house.

Buy enough rolls of 50mm wide polythene tape to tape the joins and around all piles. You'll also need a Stanley knife or scissors for cutting the polythene and tape.



## Step Two: Planning

Most piles are spaced @ 1.3 metres centres in rows approximately 1.8 to 2.0 metres apart. It is generally easier to lay the polythene along the bays between the pile rows (parallel with the bearers), so work out which way the rows run, this will determine if you are laying the polythene across or along the building length. Measure the distance between the foundation walls and add 150mm. This is the length you need to cut the polythene strips to; you need to allow the ends of the sheets to run up onto the perimeter foundation wall by at least 50mm. It is generally easier to cut the lengths outside before taking them under the house, so remember the old builders saying "measure twice and cut once"!

## Step Three: Roll it out

Tip: a small builder's apron will help you keep track of your blade and rolls of tape while under the house. Start at the end of the house furthest away from the access point and work your way back to that point.


The first row will generally be against an outside foundation wall so position the polythene sheet so that when you unfold it the edge and ends will turn up the outside of the foundation wall a minimum of 50mm. It is a good idea to weight down the edge with bricks, stones or metal pegs to hold it in place and stop it sliding or blowing out of position.


## Appendix 2. Feedback survey questions and answers (n=70)

Please take a moment to let us know about your experience using the HEAT Kit.

Complete and pass this card to the librarian when you return the kit and we'll send you a free LED energy saving light bulb (retail value approx \$17).

1. How useful were the tools in helping you to identify how to make your home healthier and warmer and save energy? (Please tick one box on the scale where 1 is least useful and 5 is most useful)

Infrared thermometer 	← No use			Most useful →	
	1	2	3	4	5
infrared thermometer					
thermometer/hygrometer					
stopwatch					
power meter					
resource folder					

Thermometer/hygrometer  


2. Did you have any problems using any of the tools? Please explain:
- 

3. Do you have comments or suggestions on how the HEAT kit could be improved?
- 

4. Please write down up to three actions that your household will take to stay warm and save money as a result of using the HEAT kit

My Energy Saving Actions

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_



Please tell us your name and address and we will send you a free energy saving LED lightbulb (approximate retail value \$17)

Name \_\_\_\_\_

Address \_\_\_\_\_

Tick what type of bulb fitting you would like:    € Bayonet    € Screw

Would you be willing to answer further questions about your experience using the HEAT kit?

If yes, please tell us your email address and/or phone number:

Email: \_\_\_\_\_ Phone: \_\_\_\_\_

Librarians: Please send this feedback form via internal mail to I&ES Ops Support, Level 2 Bledisloe Building.



## Results

- 1) *Did you use a kit with a small or large display power meter?* 49 had a small display power meter, and 19 had a large-display power meter, one didn't know. Four people, who work at a public library and did use the kit did not respond to the survey (two were interviewed though).
- 2) *How useful were the tools in the HEAT kit in helping you identify how to make your home healthier and warmer and save energy? (Please tick one box where 1 is least useful and 5 is most useful)* Note: Eight people said all tools were 5=most useful, two people said all tools were

4 (useful), one said all tools were 1=least useful, two didn't answer this section and 6 answered it incompletely.

- a. *The infrared thermometer*: thirty-three answered 5 (most useful); twenty-four said 4 (useful); eight said 3 (neutral); two said 2 (not very useful) and one said 1 (not at all useful).
- b. *The digital thermometer/hygrometer*: thirty-five said 5; twenty-one said 4; seven said 3, three said 2, one said 1.
- c. *The plug-in power meter*: seventeen said 5; seventeen said 4; fourteen said 3; four said 2 and twelve said 1.
- d. *The stopwatch*: nine people said 5; twelve said 4; sixteen said 3; fifteen said 2; and fourteen said 1.
- e. *The resource folder*: thirty-four said 5; twenty said 4; nine said 3; one said 2; and two said 1.

3) *Did you have any problems using any of the tools? Please explain*: Thirty-one said no and that it was easy to understand; twenty mentioned the plug-in power meter (7 said it was hard to understand; 8 said the writing was too small – all had the small display; 2 said it didn't work at all; 2 said it was hard to calculate the \$ amount from it and 1 said it was too hard to get to the appliances with it; 1 said it was intimidating to have to reprogramme it for every device; 1 said you needed to be an electrician to use it); 4 said the infrared thermometer showed false readings; 11 did not answer this question.

4) *Do you have any comments or suggestions on how the HEAT kit could be improved?*

"The copies of record booklet and fact sheets/brochures provided are great. I wish to have a copy of the instructions and information in the pages prior to "when you're done".

"More information over lightning and light bulbs would be helpful."

"No method of checking HWC. Call me."

"Excellent took kit to help us reduce our carbon footprint."

"It would be good to have section on timers for when you heat water; how they work."

"Used on my house, my brothers and my sons think would be better used in winter as outside wall temperature inside where I know there is insulation or not. Showed 5 degree difference though from roof (inside ceiling) to that of an uninsulated man hole roof cover - improvements a moisture meter."

"The record sheet in pack had been used. It would have been helpful."

"Give some example data so I can compare with, like the appliance running costs help a lot."

"Infrared thermometer has no visible light to focus."

"Provide an extra power meter, and maybe get a different type, one that's easier to use."

"Good, thanks but (for me) I would like to have used it in Winter as that is when I notice the cold..! Very well put together kit, though, otherwise."

"Since waiting time is substantial, either procure more tool kits or increase lending period."

"If the librarians could check each tool worked before taking it out."

"It will be better if I do not need to do setting power meter whenever I move it from one power point to another."

"IR camera and longer to use it. Get a proper foam insert cut rather use the 'cubed' foam."

"It was overall very good and useful."

"No. I maybe more advertising in library. I found out about it thru "Our Auckland".

"it would be helpful to have some way of measuring the energy and cost involved in heating the hot water."

"Make it easier for the average person to understand. A small booklet with the USEFUL TIPS in larger book would be good to have."

"Better/simple power meter."

"Make clear which improvements can be made by tenants vs owners."

"Step by Step processes."

"There is no information about underfloor insulation except for the polythene ground sheet.

Does the Council have answers about insulation efficiency, retailers are prejudiced, they only want to sell their products."

"If meter worked it would be a great kit."

"May need to show step by step instructions on how to calculate running cost and which screen to take data from. As I found these were 2 screens showing "w".

"The instructions could be grouped around things each tool can do instead of clicking through different sections to find different applications of same tool."

"Although it would be expensive having multiple hygrometers and taking readings from all of them over. The exact same time period would have been more useful. A thermal imaging device would also be more useful than the infrared thermometer. I was hoping to be able to see water and heat leaks."

"Perhaps the power meter could have a 'table' of costs...e.g. "if your power bill is usually between \$100 and \$200, put in 13c", and 15c for \$200-\$300... and so forth?"

"Simplify instructions - folder was too long."

"Simplify the power meter."

"No suggestions. I thought the stopwatch and power meter were good tools to include. I didn't use these because I've used a stopwatch to calculate water flow and with the power meter I chose not to use it (at this time)."

"If someone could go through the tools and explain how it works, especially the power meter, it would be very helpful."

"More time to lend from library - an extra week."

"Give examples of average usage in heated/unheated houses."

"Need better instructions re infrared thermometer. Need page numbers (e.g. you refer to things on page 3). Better instructions re: stopwatch (for reset & mode buttons). However, the whole kit is a brilliant idea and altogether well-resourced & well-thought out. Thank you."

"Heat Kit would be better to use in the colder months (esp. the infrared tool) as the differences weren't huge in December however, I know in winter there is a big difference and would better be able to test insulation etc."

- 5) *Please write up to three actions that your household will take to stay warm and save money as a result of using the HEAT kit:* Note: one said they weren't starting any EE measures until it was winter, one simply said they wouldn't change what they were doing; four didn't fill it in at all; three only filled in one action, and eleven only filled in two actions.

*1. My Energy-Saving Action 1:* avoid drying clothes indoors (2x); repack the insulation above bedroom ceiling/attic (7x); underfloor insulation (3x); wall insulation; look at having one fridge; better hot water cylinder insulation (2x); Turn down or get wrap for hot H2O cylinder (5x); install heat transfer system (2x); quote for double glazing of windows (3x); install ground moisture barrier (3x); get better/install curtains (7x); stopping the gaps in door (3x); close doors and curtains to keep heat in (4x); update shower head (2x); take shorter showers; install extractor fan – kitchen; reduce temperature on heat pump (2x); use heat pump instead of electric plug-in heaters (2x); turn off appliances at wall (4x); turn off lights; improve window seals; change light bulbs to LEDs (2x); wash clothes in cold water; use dryer less.

*2. My Energy-Saving Action 2:* use lids on pots when cooking; use extractor fan when cooking; boil only enough water needed for tea; check and turn off stand-by appliances (4x); install more efficient shower head (6x); wrap HWC; open windows daily (5x); get better heater/heat pump (4x); seal window and door gaps (5x); underfloor insulation (3x); keep thermostat between 20-22C (when in use, 3x); install/upgrade curtains (3x); dry clothes outside (2x); moisture barrier under house (4x); check insulation (3x); check hot water temperature and turn to 55C (2x); close curtains earlier; take shorter showers (5x); add 2<sup>nd</sup> dehumidifier; quote for double glazing (2x); use washing machine with full load only; turn lights off; get Eco Design Advisor in.

*3. My Energy-Saving Action 3:* use less hot water and tell others in household; check HWC and cover it (4x); insulate hot water pipes; turn off appliance at wall (4x); turn off lights; get quote for heat pump water heater; check fridge and oven aren't too close and fridge not too close to wall; fully-lined curtains (4x); seal door and window gaps (3x); ventilation system; open windows after shower (2x); underfloor insulation; bathroom extractor; better Energy Star appliances; use dehumidifier (3x); use most EE programme on dishwasher and washing machine (3x); update old freezer; reduce setting on heat pump; find out about better insulation; ground moisture barriers; replace downlights; take 5 minute showers only (2x); get EE shower head; insulating film on windows (2x); use heat pump instead of other heaters; dry clothes outside; use microwave more for cooking; close curtains.

- 6) *Please tell us your name and address and we will send you a free LED energy saving light bulb valued at around \$17.*
- 7) *Would you be willing to answer further questions about your experience using the HEAT kit? If yes, please tell us your email address and phone number.*



## Appendix 3. Focus Group methodology, questions & minutes

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### What is a focus group?

- A focus group is a small group of six to ten people led through an open discussion by a skilled moderator.
- The focus group moderator nurtures disclosure in an open and spontaneous format. The moderator's goal is to generate a maximum number of different ideas and opinions from as many different people in the time allotted.
- The ideal amount of time to set aside for a focus group is anywhere from 45 to 90 minutes.
- Focus groups are structured around a set of carefully predetermined questions – usually no more than 10 – but the discussion is free-flowing.
- A homogeneous group of strangers comprise the focus group.
- It takes more than one focus group on any one topic to produce valid results – usually three or four.

### Issues to consider

- How many participants to invite per group – maximum of 12, aim for 10 and expect 1-2 per group not to show up. 8 per focus group is a decent number.
- How many focus groups – it depends on how many people said they would participate when filling in the surveys. Preferably 3, but 2 minimum.
- How long they should go – maximum of 2h including some tea and biscuits.
- How many questions to ask - maximum of 12 including some initial engagement and final exit question.
- How to get people to participate? Incentives are sometimes used but many people also respond well to intrinsic, or altruistic motivations. Ensure that the invite makes it clear that this is part of an international research project aimed at helping people understand how well their homes are performing in terms of energy and health outcomes. Also make sure that people understand what is required of them and how much it is appreciated. Make sure they're comfortable, that times are not onerous (e.g. evening is better for many), that they get refreshments, that it's not too noisy or disruptive, that there's parking.
- How to ensure homogeneity? Seeing we don't have such a large pool to choose from, ease of access to the focus group location (e.g. centrally-located library where they borrowed the tools). Also good to split focus groups into renters vs owners.
- Do we need to exclude anyone? Sometimes, if the tools in the toolkit changed during the trial (as it did in Auckland), this will determine the group's make-up.

## Methodology to conduct a focus group

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### Preparation

Preparation work for focus groups will take about 6-8 weeks. The Auckland Council focus group took place on April 4, 2018 and the Irish one on April 23, 2018. Interviews (see below) were also conducted via phone/skype.

We need to:

1. Set date and time for focus groups, book venues.
2. Look at survey data to see if any exclusion criteria are needed with participants who said they wouldn't mind being contacted
3. Create participants list for up to 3 focus groups of 8 individuals in each (aim for 10)
4. Develop phone recruitment script which asks and records some simple demographics (gender, age range, renting or owning). Call, review interest and group make-up.
5. Develop timeline with reminders when people will be contacted again (phone and/or email). Make sure they know about, and will sign a consent form, maybe prepare an FAQ.
6. Clearly define overall purpose and specific outcomes with programme sponsor. E.g. "Auckland Council wants to know what worked and what didn't work so well with the HEAT kits so they can fine-tune their programme. It is also important to be able to assess what, if any, impact this programme had on Auckland residents and how this impact can be improved."

7. Identify a research assistant to aid facilitator (SEA) on the day. This includes organising recording device, note keeping, making points of body language and nonverbal cues, preparing and offering tea and biscuits, greeting etc.
8. Develop focus group questions with sponsor.
9. Develop feedback form.
10. Develop analysis plan and what will go into final report.

## Auckland Council phone recruitment script

Introduce yourself and that you work for Auckland Council

"I'm calling about the Home Energy Audit Toolkit that you borrowed from the library last year. We received your phone number from the feedback card you filled out and returned from the kit." *(If they do not know what you're talking about remind them that the kit came in a case which contained four tools for measuring and improving the energy efficiency of their home)*

"First of all, thank you so much for taking the time to complete the feedback card that was included with the kit. Did you receive the free LED lightbulb that we couriered out to you?"

In your response, you said that you would be willing to answer further questions about your experience using the HEAT kit. We are organising a series of focus groups in early April to get additional feedback on the HEAT kits and would like you to join us. These focus groups are part of an international research project that seeks to learn how these kits may help people make their homes more healthy and more energy efficient. It would be very helpful if you join us so we can improve the HEAT kits and support people like yourself to have warmer, healthier homes and cheaper energy bills. Your responses will be anonymous and will contribute to our understanding about energy kits like this one and their role in energy conservation.

Would you help us by volunteering two hours of your time to take part in a focus group on either Wednesday 4<sup>th</sup> or Thursday 5<sup>th</sup> April?"

*If yes/maybe/ depends ( i.e. not a straight out no)*

"Thank you, that's great. It will be a relatively informal, open discussion over tea and snacks and will be a good way of meeting likeminded people and contributing to your community. We will try to find a venue and time of day that works for the most number of people without having to travel too far.

Which of the following dates and times would suit you best?

We'd like to get feedback from a variety of people, so if you don't mind, we have a few further questions:

- Do you own your home or rent?
- Age range (<30, 30-55, >55)?

Once we have contacted everyone, we will get back to you by email to confirm the location of the focus group and give you further details. Could I please check that I have your correct email address and phone number? Thank you very much for your time. We'll be in touch with you in about a week."

*If Not willing to spend 2h in focus group:* "Would you be willing to participate in a 20minute interview via phone or skype with our researcher instead?"

*If yes:* "What is usually the best day of the week and time of the day to reach you?"

## Follow up email

Thank you so much for your interest in participating in a focus group to share more about your experience using the HEAT kit. Please read the further information below and reply by DATE confirming whether you are able to attend.

When and Where

## FAQ's

Who will be part of the focus group?

What / who is it for?

What is required of me?

*(Include consent for audio recording)*

How can I get there?

What parking is available?

What refreshments will be offered?

Can I bring someone else along or to take my place if I can't make it?

## Consent form

### *Consent to Participate in Focus Group*

You have been asked to participate in a focus group sponsored by the Auckland Council. The purpose of the group is to understand what worked and what didn't work with the HEAT kits you borrowed so they can fine-tune their programme. It is also important to be able to assess what, if any, impact this programme had on Auckland residents and how this impact can be improved. The information learned in the focus groups will be used to re-design the HEAT kit programme so that it is ready to be scaled up across New Zealand.

You can choose whether or not to participate in the focus group and stop at any time. Although the focus group will be tape recorded, your responses will remain anonymous and no names will be mentioned in the report.

There are no right or wrong answers to the focus group questions. We want to hear many different viewpoints and would like to hear from everyone. We hope you can be honest even when your responses may not be in agreement with the rest of the group. In respect for each other, we ask that only one individual speak at a time in the group and that responses made by all participants be kept confidential.

I understand this information and agree to participate fully under the conditions stated above:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

## During the Focus Group

### Introduction

#### WELCOME

Thanks for agreeing to be part of the focus group. We appreciate your willingness to participate.

#### INTRODUCTIONS

Moderator; assistant moderator

#### PURPOSE OF FOCUS GROUPS

We have been invited by the Auckland Council to conduct this focus group. We are holding these sessions to learn about your experience with the HEAT kits you recently borrowed.

We are grateful for your input and want you to share your honest and open thoughts with us.

#### *Ground Rules*

##### 1. WE WANT YOU TO DO THE TALKING.

We would like everyone to participate.

I may call on you if I haven't heard from you in a while.

##### 2. THERE ARE NO RIGHT OR WRONG ANSWERS

Every person's experiences and opinions are important. Speak up whether you agree or disagree.

We want to hear a wide range of opinions.

##### 3. WHAT IS SAID IN THIS ROOM STAYS IN THIS ROOM.

We want folks to feel comfortable sharing when sensitive issues come up.

##### 4. WE WILL BE TAPE RECORDING THE GROUP.

We want to capture everything you have to say.

We don't identify anyone by name in our report. You will remain anonymous.

I will facilitate the discussion by asking questions, probing further where there is an interesting point being made, and keeping the conversation flowing across participants. The assistant moderator will record our conversation and take notes, including of nonverbal cues, body language etc. Liz from the Auckland Council is here in case you have any questions about the HEAT kit.

## Question guide

From [NSF Focus Group Guide](#) (1999): “When formulating questions, aim for the questions to be conversational, brief, jargon-free, direct, and focused on participant experience. Pose one-dimensional questions that ask about one topic at a time. Also, use open-ended questions that avoid a “yes” or “no” response. Open-ended questions allow participants to determine the direction of the conversation. Asking participants to “think back” is a way of focusing their responses on their own experiences instead of vague generalities. Avoid asking “why” questions, because they encourage an intellectualized/rational response rather than an experiential answer.

The sequencing of the questions is very important. The sequence must focus the discussion, make sense to the participants, allow the conversation to flow, and give participants an anchor to build their views/opinions. Questions should funnel from the general to the specific, from positive to negative, and from un-cued (open-ended) to cued (follow-up probes). The first question should be general in nature and could be used as an “ice breaker” to put the participants at ease. The purpose of the focus group is to solicit responses from the hearts and minds of the participants, and take advantage of group dynamics. Ideally, what one participant states about a given topic will generate more ideas and opinions from other participants resulting in new ideas and perspectives.”

The Auckland Focus Group questions are shown below, with the minutes taken during the conversation and from the recorded transcript.

## Analysis Plan

The goal of the analysis is to produce a statement of what was found from the discussion(s), and it is driven by the research purpose. When planning the analysis, determine the level required to address your purposes and outcomes. Levels of analysis range in sophistication from descriptions to interpretations to recommendations. Stakeholder input is important to determine the level of analysis necessary, as it is important that the analysis fulfills all stakeholder information needs. Each focus group counts only as ONE observation. We recorded transcripts of the conversation, in addition to the assistant’s notes on non-verbal cues. We can also triangulate the focus group outcomes with the interviews (see Appendix 4, below), and the Phase 1 and Phase 2 (only in Ireland) surveys.

## Auckland Focus Group questions and minutes

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The Focus Group participants were anonymised and are called M, J, S, L and Ja. The FG took just under two hours. Initial chat: M said that Auckland was lucky to have heat kits (when Sea mentioned that they do not have them in Wellington). She also noted that when she went to go hire the kit, there was a long waiting list. It was months before she got to hire one (161<sup>st</sup> in line) at the central library. The Mt. Albert library shorter wait time—one month wait time.

1) **Introduction:** *Please state your name, where you live and why you decided to participate in this focus group.*

- **L** from Onehunga decided to partake because she used the HEAT kit and thought it was cool, free and accessible.
- **J** was originally from England and lives in Devonport. He came because it was a good initiative, particularly for a family to understand energy use. He wanted to provide feedback.
- **S** was from Te Atatu peninsula. She was keen to save on energy (and on money) and wanted to provide feedback.
- **M** lived close to where the Focus Group was held. She chose to participate because she was interested in knowing more about the kit and how it could help her to save energy. She just moved to a new house so it was good to know which part of the house was warm and dry.

- **Ja** saw the kits at the library, and thought they were “way cool!” He also thought it was good to know how much the devices were costing them in regards of energy. He is considering using solar and has great interest in knowing how to save energy.

## 2) **Current Energy Usage:**

### a. *When it comes to energy usage in your home, what do you think about?*

- Thinks of power bill
- Water heating
- Electricity only, no gas, had no comparison between UK and NZ so when he thinks of energy use—it’s always electricity. Wonders why electricity is so expensive when 80-90% comes from renewable sources.
- During winter especially, has two kids, uses a lot of heat in water so that is when she really noticed the energy bill going up.

### b. *How often do you think about it?*

- When the bill comes. Always aware, wants to be environmentally friendly.
- Every week he gets an email stating what he has spent (green and red and yellow arrows) – joined a specific power company to get this frequent feedback.
- Gets a 30-day graph from his power company as well and can get obsessive studying any changes in patterns.
- Gets a comparison compared to others in neighbourhood from power company.
- **S** thinks she has made some progress with her family – now gets the kids to shut down the lights after leaving the room. She thinks of energy several times a day. Before leaving to come here, her family were cooking. She had to tell them to close the lid to save energy.
- **M** is always thinking about it because she always wants to be warm and hates to be cold (originally from the Philippines). Has a heat pump, but doesn’t yet want to turn on. Always has an internal battle—between being warm or saving energy. Her water bill is really low, and she thinks that something was wrong with house but HEAT kit didn’t help her to know what was going on. She put in a ground sheet but she cannot know the benefits because it is not winter yet. She even called her electricity company and they said that it was not normal.

### c. *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?*

- Lights - always turns them off
- Closing doors, especially in winter
- Not leaving the water running for a long time
- Interesting—that the water heater is always on...in the UK it is different. He has experimented with that by turning the heater on or off and it actually saved him money.
- Agent in previous house said not to turn off the water tank. It can be annoying if you forget to turn on again (Sea – probably told that because of health reason – don’t want water to get below 55C).
- Assumed that the cylinder knows when it needs to be heated up, but that is not the case. It starts heating up the water at the slightest change in water volume.
- Uses cold water on washing machine.
- Uses free power every day to save money – Time of Use tariffs.

### d. *What is your energy bill? (asked by one of the participants)*

80m<sup>2</sup>=\$60 per month (roof insulated)

34\$ one week, \$140-150 in summer and double in winter

\$130-140 in summer \$250 in winter (old, uninsulated bach)

## 3) **Values, Motivations and Considerations:**

### a. *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?*

- Google, energy for your home (Eco Design Advice), was actively looking to have a kit. She got a good fridge and wanted to see how to make the new house warmer. Had Eco design visit. Also knows about *Energywise* smart homes. Knows that there are lots of resources at library that are not obvious.
- Wife uses the library. Maybe through *Energywise* or maybe facebook. Wife got aware of it. Son is home schooled so it was a good tool for him to know how to calculate—gave him some field work in the home. Provides a different dimension for education.

- Works for the Red Cross and has a colleague from *Ecomatters*. Attended a mini workshop for foreigners on how to be energy wise in NZ because it is so different to their home countries. There, the HEAT kit was mentioned and how it was free. But she noted that they were no signs at the library. And then she had to book it and wait for a very long time as she booked it in winter.
- Wishes the library loan was longer as it takes time to use the tools. Had the kit for a few days and forgot and had a bit of a panic to measure everything. The plug-in appliance meter needs to be plugged in a whole day so more time is needed to do it everywhere.
- L—never used the plug in tool.
- J hired the kit twice! The plug-in meter was used the most. Checked all of his appliances such as kettle. Used it as a fun activity with his son. Wrote all the data down. Needed to reset everything but after doing it three times, it was not difficult. Made him realise how different costs go against common sense i.e. that the heat pump was cheaper than other forms of heater. Stopped using his column heater because of it.
- Pulling out the fridge was a nuisance and time consuming - had to bring it back so couldn't do it all.
- Lived in an apartment that was serviced so did not know the costs...once they moved she became concerned about how to pay. Was also concerned about mould.
  - b. Did you already know what some or all of the tools inside the toolkit were used for?*
- Read the instructions. Wanted to get the most out of it so read the instructions really properly. Thought nothing was too difficult. Kids got involved at first but after a while they stopped. Talked about getting more insulation.
- Knew the magnifying glass and extension cable.
- Infrared thermometer was generally regarded as the most fun tool.
  - c. Which of the tool/s were very useful/not so useful?*
- Stopwatch. She had too much of a low flow showerhead – thought it means taking longer showers to rinse conditioner. Got plumber in, changed main, and now 6l at the tap and 9l for the shower. Before, it was only 3l at the tap and she had to wait for the shower really long. The plumber said that she is not saving water but she is saving time. Now, it is hotter as well.
- Plug-in appliance meter was used the most by J but he did not use the thermal leak detector, was interested in humidity, temperature and energy.
- Water flow was good to measure, also read the water heat level with the infrared thermometer—found it very useful.
- S used it all—the least used was the plug-in meter because she could not figure it out.
- L hated to do the calculation for the plug-in meter.
- J and Ja were ok doing the calculation because both are engineers.
- S used the humidity meter lots and measured power usage. She used the kit at nights after the kids were in bed.
  - d. What did you think of the suitcase?*
- Practical
- Looks like the nuclear bomb codes are hidden in it! Joked about James Bond.
- Worried that someone might think it was more valuable than it was (million dollars in there). Joked about “all that was missing was the handcuffs to cuff it to myself”
- Liked that all the parts were laid out
- Good not to have anything broken

#### 4) **Experiences with the HEAT kits:**

- a. Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?*
- M wanted a copy of the info to keep at home. She ended up copying it by hand for herself
- L photographed it.
- Others kept the extra copies included.
- Useful to have information on how to use the various tools.
- Should also include where you can get tools or energy efficient technologies in the market.
- L had no expectations
- J thought it was good!
- Ja thought more practical info would be great—building on the practical would be useful
- Fun
- Impressed with the instructions



- Not overwhelming
- Would love to have more info on what to do next, and access for resources and where to go for tech ‘bible of energy saving’ all the while minimizing the information as it can be overwhelming.
  - b. Usage: Were the instructions easy to follow?*
- No one had any issues
  - c. How useful was the small booklet where you could record the measurements you made using the tools? Did you actually fill it out? Where is it now?*
- Useful to keep it all together
- Good memory, so did not use it
- No extra copies for more measurements
- Still has it
  - d. Benefits: What benefits did you gain from borrowing the kit?*
- Knowledge (all)
- ‘Bonding with the house’
- See how things work
- Showed how damp things got even if you are airing it out. Showed that they had to buy a good dehumidifier because they now understood severity of problem.
- Used it to prioritise what needs to be done. Thought it was really bad, but it was not as bad as expected. Could determine when humidity was getting worse.
- Felt that she could do everything she could do, even though Eco Design Advisor said he didn’t know how to help her. Frustrated by the dampness that persists even when she always has the windows open.
- Became more conscious. Mom taught her how to save energy and she passed it on to her kids. Pass on how not only to save money, but the additional importance of being conscious on the environment.
  - e. Concerns/Disappointments: Was there anything in the kit that you felt was missing? Was there something you hoped to gain that you didn’t from this experience?*
- Washing outside (north facing) and LED lights. Really bright LEDs are good—would think it is useful to have Lumens meter (to gauge brightness), like the Canadian toolkit does (see Rotmann, 2018 for cross-country comparison)
- Compass like in Australian kits? Could be useful as a prompt to think about where the sun shines.
- A water flow bag like in the US kits could also be useful.
- Dodgy wiring detector.
  - f. Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?*
- Heck yeah!
- Have recommended it and said that it was free
- Mentioned the money it helped me save and what you could learn about your house.
- Read every word in booklet, even additional information that was not related to tools.
- Felt empowered to have the knowledge and it to be so accessible.
- More of a kit for middle class people perhaps not lower socio-economic class?
- Helped make more informed decisions especially in a context where market dictates our choices.

##### 5) **Adoption of energy-saving measures:**

- a. Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.*
- Really conscious of moisture because knows she needs better fans in bathroom.
- Hard when others living with you who cannot be bothered to hang clothes outside
- Taught family to put lid on the pots when cooking after showing the difference with the humidity meter.
- Opens kitchen window now when cooking.
- Uses the dryer less than three times a year.
- Not sure if it has changed as he used it as an academic interest.
- Allowed me to make informed decisions to decide which appliance to use
- Dehumidifier is best when moved around so that it can remove moisture from everywhere...then the moisture meter showed it was good for a few hours.

- Ja convinced his wife to get LEDs all over the house post of kit hire, but she was hesitant because it felt that it was too bright but he found some that were equivalent in brightness (\$40). Over 50 bulbs in house, has changed 80% and has dropped \$250 monthly bill down to \$180. \$350 to change the bulbs, did not need to change the fixtures. Kids use community showers at the pool. Misconception that you need to change fixture when you can change the bulb only. But you need the right type of model for it to work.
  - b. Has it changed the way you view the performance and energy efficiency of your home?*
- There is nothing efficient about my house—typical NZ house. Used to double glazing overseas.
- Felt disappointed at one point, insulation did not make a lot of difference between insulated room and not insulated room—used laser to check this.
- Got quote from double glazing but too expensive.
- Wants to double glaze but family says it is a waste of money.
- Helps that he has floor to ceiling curtains.
- Had black out curtains already.
  - c. Have you been able to implement any changes since borrowing the kit?*
- Added ground sheet to reduce dampness.
- Ripping out windows and changing to new fridge (in process).
- Put curtains up.
- Ground sheets cause they are cheap and effective.
- Considered insulating hot water cylinder but in the middle of house so uses the heating for heating the house, and uses the heat to dry towels from kids swimming heaps
- Changed which heater to use more often—heat pump vs oil filled radiator vs fan
  - d. What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?*
- Info on solar PV, smart technology and timers and remotes.
- That you can go beyond the kit. Read about the ceiling fan.
- Double glazing info, HVAC, fans...
- Do more than just the kit, add resources. Which electricity company to choose...how to choose which one, etc. how to negotiate with the companies or how by lumping services can save you money. Kit made him aware of how far his dollar goes when using energy, or how far a kW goes.
- How indoor plants can relate to humidity....more info if that is the case.

#### 6) **Role of Auckland Council:**

*a. Did you know that Auckland Council funded the kits?*

YES!

*b. Do you think they should continue in helping householders like yourself be able to borrow the kit? Do you think they should have more kits/more tools in them?*

- More kits.
- Should continue supplying them to libraries and publicise them more.
  - c. Do you have any concerns about the Council helping Aucklanders in this way?*
- No I Really like it, trust that they are being neutral and not influenced by market or companies.
- Unbiased info, its great!

## Appendix 4. Interviews

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The interviews were conducted via phone late April/early May 2018 by Dr Sea Rotmann. Each took around 20 minutes. The same questions as asked in the Focus Group were asked here. Everyone agreed to have their anonymised answers published in this report.

### The Questions – Interviewee 1

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* DP, works at library.
- 2) **Current Energy Usage:**
  - a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* Hot water, thinks lion's share of energy bill is hot water? Doesn't think about it that often at the moment cause has a flat mate who does the power buying on the spot market. Household is managed fairly well, power bills are pretty good.
  - b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Since having HEAT kit, he was really interested in thermal leak detector to use on hot water cylinder. Understood their cylinder was a bit low, used info in the kit – mentioned it to flat mate who's also owner of the house. She bought lagging for HWC, neither of them are good at DIY so it hasn't been done yet, just sits in cupboard.
- 3) **Values, Motivations and Considerations:**
  - a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Works at library, probably also got a Council email. *[Special question for library staff only]: Were you trained at all to loan out HEAT kits?* Have loaned one out to someone, so must have been inducted but thinks it was largely email procedures he followed. Not much talk when HEAT kits turned up at library.
  - b) *Did you already know what some or all of the tools inside the toolkit were used for?* Not sure. Had a vague feeling he did read about it before he borrowed it.
  - c) *Which of the tool/s were very useful/not so useful?* Thermal leak detector – very useful. Couldn't remember other tools. Temperature and humidity logger were useful, he used everything. Logged humidity in all the rooms in the house, talked about results with his flat mate. Usefulness was taking the data and actually figuring out what to do with it.
  - d) *What did you think of the suitcase?* No particular thoughts. Fairly low-key design, functional best way to describe it. It all fits in. Very big though.
- 4) **Experiences with the HEAT kits:**
  - a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Looking for ways to save energy, and they were met. Discovered HWC was too low.
  - b) *Usage: Were the instructions easy to follow? Yes, doesn't recall issues. How useful was the small booklet where you could record the measurements you made using the tools? Fulfilled its function, usefulness is in doing something with the measurements. Did you actually fill it out? Where is it now?* Did fill it out and thinks he knows where it is (flat-related documents).
  - c) *Benefits: What benefits did you gain from borrowing the kit?* Bit more awareness around the kinds of things that can impact on home energy use – e.g. humidity, which he didn't think about much before.
  - d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing? Not really. Was there something you hoped to gain that you didn't from this experience?* Practical pointers as to where he could go to get help with e.g. lagging of HWC. Realises Council can't be seen to push specific providers but still requires too much research.
  - e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Yes for sure. "I'd say that it's definitely good to be engaging in an active way with what is happening in your house in terms of energy usage and how energy can be conserved. The kit is one kind of tool that can help with that."
- 5) **Adoption of energy-saving measures:**

- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* Before the kit, he was already quite energy conscious. Main thing would be the lagging, he looks at it, it's just sitting there, he knows it needs to get on to do something. Kit helped him be more conscious.
  - b) *Has it changed the way you view the performance and energy efficiency of your home?* In the sense of knowing about the cylinder. It's a wooden home, not great build, so he already knew it wasn't that EE.
  - c) *Have you been able to implement any changes since borrowing the kit?* None, other than the lagging. Also put up some thermal light drapes and thought about warmth in his bedroom.
  - d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Thermal drapes, but is beyond him. Flat mate needs to make decision. Organisations that makes drapes available for people – e.g. Curtain Bank might be good. Not sure if there are some similar ones in Auckland. He's not aware between links of Council and such organisations. For him, part of question is around house ownership.
- 6) *Role of Auckland Council:*
- a) *Did you know that Auckland Council funded the kits?* Not sure he knew, just assumed it.
  - b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Absolutely. Do you think they should have more kits/more tools in them? Not really, but should have more advertising and maybe an infographic on what can be done. Flowchart of practical steps.
  - c) *Do you have any concerns about the Council helping Aucklanders in this way?* Not at all, it's terrific.

## The Questions – Interviewee 2

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* KL, border of Waikato. Decided to participate because I asked him.
- 2) **Current Energy Usage:**
  - a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* Most physical things like lighting, washing machine, cookers – thinks about it less than he used to now that he changed his lights to LEDs but still switches lights off whenever someone's not in the room.
  - b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* LEDs, switch lights off – has always done it. Insulation in loft. Occasionally gets it checked is at current recommended fitness. Looks at Energy Star rating on appliances when buying them. In winter, puts double-wrap on bedroom window, for reducing condensation. What he hasn't done is underfloor insulation checked, is planning to do that.
- 3) **Values, Motivations and Considerations:**
  - a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Saw leaflet in library, thought it was good idea, was on waiting list for a couple of months.
  - b) *Did you already know what some or all of the tools inside the toolkit were used for?* Yes, he was process engineer in carbon plant in UK, aluminium smelter. Dealt with hot pitch so temperature was very important.
  - c) *Which of the tool/s were very useful/not so useful?* Temperature logger, can't remember what they were called – used it in all their rooms. Thermal leak detector – reported one of the devices not working, did not get a new one. Appliance plug didn't work. Wants something like that, though they are awkward to use for things like the cooker which are wired into wall or dishwasher which is hard to get to are difficult. Local library – wants to get it again.
  - d) *What did you think of the suitcase?* Pretty substantial, like a Pelican case. Wise to make sturdy suitcases.
- 4) **Experiences with the HEAT kits:**

- a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Read guff about what was in it, knew what to expect, shame one device didn't work.
- b) *Usage: Were the instructions easy to follow?* Yes, doesn't recall issues. *How useful was the small booklet where you could record the measurements you made using the tools?* Very useful. Wouldn't have done measurements so regularly (especially moisture comparison in different rooms) if he didn't have it. *Did you actually fill it out? Where is it now?* Yes. Not a clue – somewhere in filing cabinet, house in chaos right now cause daughter is living with them.
- c) *Benefits: What benefits did you gain from borrowing the kit?* Found out one of their rooms had a lot more moisture than others, investigated and found leaking drain pipe. Soaked the wall. Very positive outcome as they could fix it now. Helped to see difference with rooms that had HVAC compared with others (they were better).
- d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing?* Tricky question, there's lots of cool gear out there e.g. mapping heat distribution ("it's probably the engineer coming out in me" "I want to take pictures from the roof to see where heat is coming out") downward-pointing heat guns. *Was there something you hoped to gain that you didn't from this experience?* Power plug not working, didn't get good picture of appliance use. What he considered afterwards was difference in solar power vs ordinary grid power. Signed up to *SolarCity* but didn't come to anything because house was built early 1990s and they were worried about asbestos. Got up to day before they would have installed it and it all turned to custard. Could have just done \$80 asbestos test instead they gave up on \$30K contract. Would have changed usage habits e.g. washing during day to use much less power at night. Daughter is nocturnal creature so uses a lot of electricity talking to people all through the night in other parts of the world etc.
- e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Yes, he has done, told them about it. "Order it, have a go, see what your place is like. Especially my daughter who moved into a rental in the country which looks like it could really benefit from insulation and moisture reduction." Hasn't used it yet because she's single parent of two young kids and doesn't have that much time.

5) **Adoption of energy-saving measures:**

- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* Has done so, no detailed description.
- b) *Has it changed the way you view the performance and energy efficiency of your home?* Moisture issue definitely and now turns monitors off when away from computer, turns TV off with button not just on remote. That came from the booklet and just getting the HEAT kit made him think about power usage.
- c) *Have you been able to implement any changes since borrowing the kit?* Put LEDs in after the kit – in all the lights and lamps (were already done in downlights). Fixed wall with moisture issues. Didn't just grab it and had kit sitting on the desk.
- d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Plug meter, double glazing but too expensive, also hard to find good people who can do it. Being able to turn home into a data-gathering house – e.g. with HEMS device.

6) **Role of Auckland Council:**

- a) *Did you know that Auckland Council funded the kits?* Yes.
- b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Yes, very wise and good way of helping people make the most of resources – seeing energy is scarce.
- c) *Do you think they should have more kits/tools in them?* For some people, would be good to get them out so they don't have to wait so long. Might have forgotten that they wanted it. Wall moisture detector – something you can put against the wall and ideally don't need to stick into the wall. Building Inspectors have them.
- d) *Do you have any concerns about the Council helping Aucklanders in this way?* Not at all, it's terrific.



## The Questions – Interviewee 3

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* MC, Manurewa.
- 2) **Current Energy Usage:**
  - a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* How much money it is going to cost. Power bill isn't too bad but she is conscious on it.
  - b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Turns off lights, turn things off at the wall, tries to. Don't use heaters until it gets really, really cold. Use jumpers and blankets instead. House is pretty warm as it is well-insulated.
- 3) **Values, Motivations and Considerations:**
  - a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Saw leaflet in the library, had to wait a few weeks. Curiosity motivated here, wanted to see how healthy their home was and if there are major things to improve.
  - b) *Did you already know what some or all of the tools inside the toolkit were used for?* Sure, knew stop watch, that was straight forward and handy. But infrared thermometer was a big eye opener which showed them areas which weren't insulated, was surprising.
  - c) *Which of the tool/s were very useful/not so useful?* Stop watch and infrared thermometer useful. Did use plug-in meter to see how much power washing machine used. Not much moisture in the house which is good.
  - d) *What did you think of the suitcase?* Pretty cool, pretty "top secret".
- 4) **Experiences with the HEAT kits:**
  - a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Probably met her expectations, really good to find out more about the house.
  - b) *Usage: Were the instructions easy to follow?* Yes, everything was well explained. *How useful was the small booklet where you could record the measurements you made using the tools?* Didn't use it. *Did you actually fill it out?* No. *Where is it now?* Used scrap piece of paper instead, gave booklet back. Threw out the scrap paper.
  - c) *Benefits: What benefits did you gain from borrowing the kit?* Improved ceiling insulation after using HEAT kit, cause they could see some areas were colder. Also did something in the bedrooms, but can't remember.
  - d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing?* Not really. Pretty comprehensive.
  - e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Told people about the kits, few people. Recommended to them they borrow it as they might find it helpful seeing they lived in older homes. Knows that at least one of them did borrow it as well.
- 5) **Adoption of energy-saving measures:**
  - a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* Kit may not have changed it but she is more aware of how they can use energy. Were already energy savers, reaffirmed that idea.
  - b) *Has it changed the way you view the performance and energy efficiency of your home?* Yes it did, in terms of the insulation.
  - c) *Have you been able to implement any changes since borrowing the kit?* Insulation, but not much else needed to be done. Then remembered flow restrictor on shower head, stop watch really helped. Plumbing shop didn't even know what she was talking about! Only attachments to make more water happen, didn't know about restrictors.
  - d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Just around the windows, maybe not even double-glazing just pelmets. Curtains are pretty good but heat rises and the picture in the manual showed how warm air is pulled outside. Comes down to cost, as a lot of this is expensive.

6) **Role of Auckland Council:**

- a) *Did you know that Auckland Council funded the kits?* No she didn't.
- b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Absolutely.
- c) *Do you have any concerns about the Council helping Aucklanders in this way?* Not at all.

## The Questions – Interviewee 4

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* RH, Waitakeres.

2) **Current Energy Usage:**

- a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* Wood burner, especially in winter. Moisture and dampness.
- b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Thinking about installing a moisture barrier (plastic sheet?) under the house. Draught stripping.

3) **Values, Motivations and Considerations:**

- a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Power consumption was a bit high (compared to himself – lives by himself), saw the advert in library. Had to wait very long, 7 months! Asked for in May but didn't get it until December when it wasn't of much use as all doors and windows were open. Would like one for the winter, so might try again but it said it wasn't available.
- b) *Did you already know what some or all of the tools inside the toolkit were used for?* Roughly knew what they were used for but not how to use them.
- c) *Which of the tool/s were very useful/not so useful?* Humidity logger, very useful. Plug-in meter was a bit complex, "I'm not so handy with those things but once I figured it out it was very useful". Infrared thermometer – bit useless, he already knew where his cold spots were.
- d) *What did you think of the suitcase?* It was alright, handy, very good that it was complete.

4) **Experiences with the HEAT kits:**

- a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Didn't really have any expectations, but after using it he thought it was very helpful in certain aspects. Wanted more information on others.
- b) *Usage: Were the instructions easy to follow? Yes, in general. How useful was the small booklet where you could record the measurements you made using the tools? Quite handy. Did you actually fill it out? Yes. Where is it now? Still has it, will compare his winter data.*
- c) *Benefits: What benefits did you gain from borrowing the kit?* Didn't come up with a real solution, as he has moisture problem where he needs a plastic covering under the house. Probably his fridge caused the spike in usage.
- d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing? Not really. Though a noise meter would be good. Was there something you hoped to gain that you didn't from this experience? Yes, that his power bill would go down but it didn't. Fridge thermometer might be good.*
- e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them? Yes sure. Hygrometer especially is very useful to show how much dampness you have in your house.*

5) **Adoption of energy-saving measures:**

- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* Draught stripper in a few places, decreasing humidity is a big one.
- b) *Has it changed the way you view the performance and energy efficiency of your home?* Dampness is real problem, people who borrow it are probably already aware of what is happening. He's always been aware of energy consumption so kit didn't really help.
- c) *Have you been able to implement any changes since borrowing the kit?* No.

d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Heat pump on top of wood fire (he needs that for the power cuts). Another fridge – he'll replace the old one. Uses moisture absorbers, no dehumidifier. Will try moisture barrier under house.

6) **Role of Auckland Council:**

- a) *Did you know that Auckland Council funded the kits?* No, but makes sense seeing it's from the library.
- b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Yes, library is very good and accessible place to loan them out.
- c) *Do you have any concerns about the Council helping Aucklanders in this way?* No. Though they could have advertised it more, e.g. in newsletter.

## The Questions – Interviewee 5

1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* EB, Papakura.

2) **Current Energy Usage:**

- a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* Mainly lights, cook with gas, LED lights everywhere, wood burner so not really thinking about that much.
- b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Switched to LEDs, if a new appliance look for Energy Star labels.

3) **Values, Motivations and Considerations:**

- a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Had to wait a long time, didn't bother him. Great to pick up from library, easy to get to. Good to see many people are using it. Not sure, then remembered that his son told him about it – though then he remembered it was something. Water bed, wanted to see what power consumption that used. Surprisingly low! Wouldn't give it up either way, had it for 30 years and likes sleeping on it. Fridge and freezer quite old, wanted to see what they were doing. Came out about average.
- b) *Did you already know what some or all of the tools inside the toolkit were used for?* Knew about most, one that measured power consumption wasn't very user friendly, hard to read the gauge even though it came with magnifying glass. Can't remember what was in it. Used infrared thermometer, thought it was quite good, checked insulation around outside of house and was pleased with its performance.
- c) *Which of the tool/s were very useful/not so useful?* Plug-in meter too fiddly, infrared thermometer good, moisture and thermometer good, saw that the area he was worried about dampness wasn't too bad. Kept all results, wants to check again in a year or two.
- d) *What did you think of the suitcase?* Nice suitcase, robust, can go through a lot of hands without damaging it.

4) **Experiences with the HEAT kits:**

- a) **Expectations:** *What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Already thought they were doing pretty well on saving energy, wanted to verify that. Also wanted to check energy efficiency performance. Met his expectations, very pleased that he did it.
- b) **Usage:** *Were the instructions easy to follow?* Didn't think they were. Working out the calculations wasn't too easy, stuffed it up a couple of times. Did it again, most rooms about 3 times as he messed it up the first couple of times. Didn't follow instructions, "typical male, doesn't follow instructions well". Remembered there was a difference between measuring and because it was hard to read he got it wrong. Didn't use magnifying glass – "it's a bit pointless". *How useful was the small booklet where you could record the measurements you made using the tools?* Had some problems with recording it as two pages looked very similar and he mixed up the readings. To do with what you were recording and on what day. Not laid out that clearly. *Did you actually fill it out?* Yes. *Where is it now?* Kept it but filed somewhere.

- c) *Benefits: What benefits did you gain from borrowing the kit?* Confirmation that house was moderately energy efficient and dry. Installed DVS system not long after, as south end of house was a bit damp. Wants to borrow it again to see if that changed dampness.
  - d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing?* Not really.
  - e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Definitely, yes, even lent it to his son when he had it. They tried it but didn't get as involved.
- 5) **Adoption of energy-saving measures:**
- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* Now has baseline for potential dampness in the house, glad it's quite dry. Bit more average than he expected. Wanted to measure and know where he sat. Spent money on DVS after.
  - b) *Has it changed the way you view the performance and energy efficiency of your home?* Baseline and comparison.
  - c) *Have you been able to implement any changes since borrowing the kit?* DVS, nothing else.
  - d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Couple of bedrooms need redecorating, will pull gib off and insulate outside wall then. Can do it all himself.
- 6) **Role of Auckland Council:**
- a) *Did you know that Auckland Council funded the kits?* Yes, read it somewhere.
  - b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Yes absolutely. Maybe don't need more, doesn't know how to measure it depends how many people use it and how well it's advertised. Great idea, so important to teach people about cold, damp houses that make them sick. Not that hard to use.
  - c) *Do you have any concerns about the Council helping Aucklanders in this way?* No, that's what Council is meant to do, they exist to help their community.

## The Questions – Interviewee 6

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* TR, West Auckland.
- 2) **Current Energy Usage:**
  - a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* Try to save power. Cooking and oven and electronic devices. Doesn't think about it too often.
  - b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Switched to LEDs, try to turn off lights where they can. Try to limit showers.
- 3) **Values, Motivations and Considerations:**
  - a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Thinks he saw it on some notice but not where... maybe a Council newsletter? Didn't take long. Often wondered what all their appliances which are always on stand-by do – if they should turn them off. Him and his wife often talked about this and thought about getting a smart plug. Also wondered if the thermometer could help show how much heat was lost through windows if double-glazing was useful.
  - b) *Did you already know what some or all of the tools inside the toolkit were used for?* Were he read about it, there was a pretty clear list of what to expect. Also what sealed the deal was getting a free LED light bulb. Slow to get into gear to borrow it but once he saw that he got pushed over the line pretty quickly.
  - c) *Which of the tool/s were very useful/not so useful?* Digital plug meter was broken, which was the one he wanted the most. Took it back to library but they couldn't help. IR thermometer was very useful, also change on what time they closed the curtains. Definitely found a difference between closing curtains earlier. Hygrometer was also very good, showed them if they needed to open windows. Leave window open in laundry, saw if it made area more moist in winter but saw ventilation was much more useful. Made moisture leave more easily.

d) *What did you think of the suitcase?* \*Laughs\* Quite liked it. Looked very industrial, very cool. Like an experimental kit. Family loved it, especially the kids as soon as they spotted it they wanted to know what is inside it. Intrigued.

4) **Experiences with the HEAT kits:**

- a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Not too sure how useful it would be, more a curiosity but got some really good insights e.g. where they lose temperature and where moisture was. Definitely wants to borrow it again to see the update especially now that they swapped downlights with LEDs that block the holes. Also really wants to use that plug-in meter.
- b) *Usage: Were the instructions easy to follow? Yes very easy instructions. How useful was the small booklet where you could record the measurements you made using the tools?* Surprised how much easier it was to fill in with the recording booklet. He wouldn't have thought of how to log temperature over time for example, quite a bit of fun with the family and kids. *Did you actually fill it out?* Yes. *Where is it now?* Still has the booklet.
- c) *Benefits: What benefits did you gain from borrowing the kit?* Places where they were losing heat, pushed him to change the downlights and seal them up. Best way to get airflow to places to keep them dry.
- d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing?* Plug meter should have worked.
- e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Yes, absolutely, already has. Described all different tools and how useful it was to be able to check things. Infrared thermometer etc. quite expensive to get so it's nice to borrow it and get information you otherwise wouldn't have.

5) **Adoption of energy-saving measures:**

- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* More about how they can keep house warm and save energy, thinking about where heat escapes. Kids got a lot more of an idea when to close curtains etc. And even just talking about it helps, e.g. why they turn lights off and that it's better for the environment not to waste resources.
- b) *Has it changed the way you view the performance and energy efficiency of your home?* Definitely with downlights and very much want the double glazing on their big ranch slider which just showed how much heat that lost and how much they could save if it was properly double glazed..
- c) *Have you been able to implement any changes since borrowing the kit?* Yes, mentioned above. Also in the garage, didn't realise until the moisture meter was used that it would really help to e.g. leave garage door open on a warm afternoon. Getting a dry breeze through really makes a bit change, also makes indoor temperature warmer.
- d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Double glazing. Testing the appliances.

6) **Role of Auckland Council:**

- a) *Did you know that Auckland Council funded the kits?* Yes.
- b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Yes, absolutely it's a great expansion of the library service, like their internet service linda.com – training videos where you can learn different things (no subscription) e.g. photoshop. Good to see libraries expanding their services beyond books.
- c) *Do you have any concerns about the Council helping Aucklanders in this way?* No absolutely not. Great idea to make people more aware how much power they use and to make an impact on the environment.

## The Questions – Interviewee 7

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* PM, Sunnybrook.
- 2) **Current Energy Usage:**



- a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* Hot water, dryer, heaters, TVs, microwaves, fridges, washing machines. Thinks about it a lot, tries to conserve it.
- b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Turns off things at the wall, not stand-by. Not use dryer, hang things on clothesline. Washing when there is a full load. Keeping doors shut, use heaters smartly, block off draughts, draw curtains. Got HEAT kit to see where she was losing heat.

3) **Values, Motivations and Considerations:**

- a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Good question. Can't remember... the magazine that comes in the mailbox, "Our Aucklander"? Tells you about things happening in the community, she likes the library. Got it on the board outside the library. Saw article, googled it, and then asked lady at the counter. Didn't have to wait more than a couple of weeks. Surprised how many there were – their library had 3-5 of them.
- b) *Did you already know what some or all of the tools inside the toolkit were used for?* Think she read ahead when it was advertised. Knew about room temperature, found out about others when she got the kit. Pretty straightforward. Didn't use plug-in meter. Used IR thermometer the most.
- c) *Which of the tool/s were very useful/not so useful?* Plug-in meter not necessary cause she wasn't interested in knowing though she thought it was a good idea for others. Is already turning off things at wall. IR thermometer great, told her what she wanted to know. Hygrometer and digital thermometer good, used them in all her rooms, some for many days. Checked if different things she did made a difference to the temperature. E.g. they have a lounge with a fire place, has an arch, didn't know how to block it cause it's a rental. Tried curtains, looked before and after and saw they really made a difference.
- d) *What did you think of the suitcase?* Really cool! Laughs. Cool taking it away and all the different tools, everyone in house was interested what was in it. Kids were really into it. Really good as it makes it easier to get them on board to e.g. close the doors when they are cold.

4) **Experiences with the HEAT kits:**

- a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* Yes, they were met. Needed to read things a couple of times to grasp what they were for. Maybe little CD or DVD to show how things are to be used. Needed to ask her son for one of the items (thinks it was the plug). Learns by watching something rather than reading.
- b) *Usage: Were the instructions easy to follow? How useful was the small booklet where you could record the measurements you made using the tools?* Didn't record it, has really good memory. Wrote a bit down on paper. *Did you actually fill it out?* No. *Where is it now?* Paper was more simple, this was a bit too much.
- c) *Benefits: What benefits did you gain from borrowing the kit?* Benefit of understanding extra consumption – where it was coming from. Gave her chance of ways of fixing it – e.g. the curtains and draught stoppers. Silly blinds which didn't do much. Got free insulation but didn't think they did it very well, tested the floor and got them to check insulation. Really helpful. Could tell certain parts of house were colder than others but TLD could prove it.
- d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing?* Not really. Maybe tips and links to website – like a one-stop-shop to make it easy and clear.
- e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Yes definitely, told her mom about it, wants to get it. Also told friends, always talk about things like energy when it gets colder.

5) **Adoption of energy-saving measures:**

- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* By being aware and reminding herself where heat can leak out. How to be more efficient. Helped her remember tips that she already knew.
- b) *Has it changed the way you view the performance and energy efficiency of your home?* Yes, definitely. Watching consumption of power (uses Powershop).

- c) *Have you been able to implement any changes since borrowing the kit?* Curtain, moved insulation, felt it was warmer. Have curtains from ceiling to floor so they have no gaps.
  - d) *What are some changes you would have liked to have implemented that you haven't or were unable to? Why? What additional support would be helpful?* Can't do certain things like moving door as it's a rental. Heat from fireplace doesn't travel well. Has ventilation system (DVS), also one that transfers heat like a ducting system. Blows cold out of the roof. Though it did stop the damp and mold. Landlady wanted to put rent up after she made her do it, wants heat pump now too.
- 6) **Role of Auckland Council:**
- a) *Did you know that Auckland Council funded the kits?* No, she didn't.
  - b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Yes absolutely. Good to make people more conscious.
  - c) *Do you have any concerns about the Council helping Aucklanders in this way?* No.

## The Questions – Interviewee 8

- 1) **Introduction:** *Please state your name, where you live and why you decided to participate in this interview.* NG, works at Library. Lives at North Shore, Paremoremo. Rents home.
- 2) **Current Energy Usage:**
- a) *When it comes to energy usage in your home, what do you think about? How often do you think about it?* How much heating is necessary to be comfortable. Not very often in summer but a lot in winter when the bills go up.
  - b) *What actions are you taking and/or have you taken (if any) to manage and/or save energy in your home?* Two of the rooms she added curtains. A few tips from HEAT kit were good like getting curtains right to the bottom and changing to LEDs. Things that surprised her the most was that she had to ventilate home for only 20mins a day. She thought it had to be open all day long as she went to work. A lot warmer if she doesn't keep it open all day.
- 3) **Values, Motivations and Considerations:**
- a) *How did you get to know about the HEAT kit and what motivated you to borrow one from the library?* Working in library where it was first trialed, was in a lot of demand to begin with, a lot of people didn't get it in time for winter. She put a request in and froze her hold to wait until winter came and then she was the first on the list. Learned by observing other people, was very interested in the HEAT kit because she saw people took some extreme measures when listening to other people and reading their feedback forms they sent in – so much money was spent on heating. What spurred her on was having a colleague who used it who made huge savings. One customer even moved house! On the whole, even though he ended up spending more on rent he saved more money on heating and cooling. The new house had insulation in it. They learned from each other, even though it was advertised in Council newsletters. She learned more from word of mouth than the newsletters. This was made easier by her sitting at the source in the library. Lots of people still don't seem to know it is available in the library – problem is that no one looks at it in summer and in winter there are huge waiting lists. May need to change promotion to make it clear that holds need to be placed if they want to have them in winter. Each of 55 libraries have kit and like a normal book, if one runs out, another will come in and provide it via inter-library courier system (*“Just like NZ Post, just for books and other library items like HEAT kits”*)
  - b) *Did you already know what some or all of the tools inside the toolkit were used for?* Yes, she knew some of them as she had done scientific experiments before, but not all of them. Was surprised with the stop watch. Didn't think it was relevant [Didn't realise it was for measuring hot water use in shower, thought it was for draughts]
  - c) *Which of the tool/s were very useful/not so useful?* All worked well, magnifying glass not so useful – most people would have something like that. Stopwatch. One she really enjoyed not just in her home when she had some health and safety issues at work – thermometer. Knew she had to change bedroom for her child as the room she slept in wasn't correct temperature. So they moved and now health issues decreased. Also found hygrometer

very useful. Never read her humidifier levels before, only after getting kit. Had dehumidifier at home, but now understood what the readings were about.

- d) *What did you think of the suitcase?* “I loved it! Because I didn’t want anything in there to break because of the high cost and because it was so big and bulky, we couldn’t lose it. When we handed it over to customers they got the shock of their lives as they thought it was something tiny. Nobody can steal it from the library either, being so visible. Amongst library staff we call it the Obama Bag because it looks like the nuclear codes should be in it.”

4) **Experiences with the HEAT kits:**

- a) *Expectations: What expectations did you have for the kit when you borrowed it? Did it meet your expectations?* She thought it was going to be a quick and easy exercise as in “I do something today, find out the temperature and then it tells me what I should do.” But she never expected to have to do the measurements over the two week period but maybe there should be some suggestion that the experiment should be done once every 3-6months. She decided to that on her own, because she just didn’t know that certain things didn’t work.
- b) *Usage: Were the instructions easy to follow?* Yes, really liked the layout and fact sheets and tips. Didn’t have anyone ask for help or translation either. *How useful was the small booklet where you could record the measurements you made using the tools?* Very. *Did you actually fill it out?* Yes, that’s when she realised about her humidifier level. *Where is it now?* Didn’t throw it away, somewhere at home. Kept it somewhere to compare spring data. They also had people who used the booklet but only for the first week and then they returned it with the HEAT kit. They would have thrown it away due to it being personal data. If people report that e.g. booklet was filled in already the library staff can reprint it for them.
- c) *Benefits: What benefits did you gain from borrowing the kit?* More tips on how money can be saved overall. Worried about spending in winter. Most important thing for her was her child’s health. Did room change.
- d) *Concerns/Disappointments: Was there anything in the kit that you felt was missing?* Not really. Feels that sometimes you don’t know what you don’t know. People that are new to the country or moving house should be advised that these kits are available before investing. She never imagined a kit like this could exist, especially in a country like NZ where houses are so cold and damp – now tenants have the tools to go to landlord to tell them that their dwelling is not up to scratch. Bills are up to tenants to pay, important to be able to empower them. When people go to Citizens Advice Bureau and ask about renting they should be told about HEAT kits.
- e) *Social proof: Would you recommend the HEAT kits to your family or friends? If so, what would you say to them?* Yes, definitely. She not only relates her own experiences but also stories about how useful it is from her customers. Don’t know how much you are wasting until you can measure it.

5) **Adoption of energy-saving measures:**

- a) *Please describe to me how this experience (borrowing the kit) has shaped how you interact and view your home environment.* Initially very worried re health issues but now feels more empowered about what to do about it. She didn’t know about a lot of the tips even know she’s well read. She now views her home more positively, was always thinking of moving but now realises that with only a few simple things she can be in control of what her home is doing.
- b) *Has it changed the way you view the performance and energy efficiency of your home?* Yes, very much so.
- c) *Have you been able to implement any changes since borrowing the kit?* Child, curtains, dehumidifier, ventilation and also making use of sun’s energy. Not so much appliances – she used appliance meter but not many were plugged in all the time. Cut down number of washes, only full load of washing.
- d) *What are some changes you would have liked to have implemented that you haven’t or were unable to? Why? What additional support would be helpful?* Drying of clothing indoors, can’t do it because of her husband’s job, can’t leave his clothes outside whilst he’s not at home (policeman). Landlord (Dept of Corrections) usually came and had a look

and attended to anything they asked for. She stopped using the unflued gas heater completely, now uses wood heater only.

6) **Role of Auckland Council:**

- a) *Did you know that Auckland Council funded the kits?* Yes, she remembered initial promotional email.
- b) *Do you think they should continue in helping householders like yourself be able to borrow the kit?* Yes absolutely – especially with this crazy housing shortage.
- c) *Do you have any concerns about the Council helping Aucklanders in this way?* No. We pay so many rates they can help us with great initiatives like this one.

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## IEA Demand Side Management Energy Technology Initiative

The Demand-Side Management (DSM) Energy Technology Initiative is one of more than 40 Co-operative Energy Technology Initiatives within the framework of the International Energy Agency (IEA). The Demand-Side Management (DSM) Energy Technology Initiative, which was initiated in 1993, deals with a variety of strategies to reduce energy demand. The following member countries and sponsors have been working to identify and promote opportunities for DSM:

Austria, Belgium, Canada, Finland, India, Ireland, Italy, Republic of Korea, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, United States, ECI (sponsor), RAP (sponsor)

**Programme Vision:** Demand-side activities should be active elements and the first choice in all energy policy decisions designed to create more reliable and more sustainable energy systems

**Programme Mission:** Deliver to its stakeholders, materials that are readily applicable for them in crafting and implementing policies and measures. The Programme should also deliver technology and applications that either facilitate operations of energy systems or facilitate necessary market transformations

The DSM Energy Technology Initiative's work is organized into two clusters:

The **load shape cluster**, and

The **load level cluster**.

The 'load shape' cluster will include Tasks that seek to impact the shape of the load curve over very short (minutes-hours-day) to longer (days-week-season) time periods. Work within this cluster primarily increases the reliability of systems. The 'load level' will include Tasks that seek to shift the load curve to lower demand levels or shift between loads from one energy system to another. Work within this cluster primarily targets the reduction of emissions.

A total of 24 projects or "Tasks" have been initiated since the beginning of the DSM Programme. The overall program is monitored by an Executive Committee consisting of representatives from each contracting party to the DSM Energy Technology Initiative. The leadership and management of the individual Tasks are the responsibility of Operating Agents.

### **These Tasks and their respective Operating Agents are:**

**Task 1** International Database on Demand-Side Management & Evaluation Guidebook on the Impact of DSM and EE for Kyoto's GHG Targets – Completed  
Harry Vreuls, RVO, the Netherlands

**Task 2** Communications Technologies for Demand-Side Management – Completed  
Richard Formby, EA Technology, United Kingdom

**Task 3** Cooperative Procurement of Innovative Technologies for Demand-Side Management – Completed  
Hans Westling, Promandat AB, Sweden

**Task 4** Development of Improved Methods for Integrating Demand-Side Management into Resource Planning – Completed  
Grayson Heffner, EPRI, United States

**Task 5** Techniques for Implementation of Demand-Side Management Technology in the Marketplace – Completed  
Juan Comas, FECSA, Spain

**Task 6** DSM and Energy Efficiency in Changing Electricity Business Environments – Completed  
David Crossley, Energy Futures, Australia Pty. Ltd., Australia

**Task 7** International Collaboration on Market Transformation – Completed  
Verney Ryan, BRE, United Kingdom

**Task 8** Demand-Side Bidding in a Competitive Electricity Market – Completed  
Linda Hull, EA Technology Ltd, United Kingdom

**Task 9** The Role of Municipalities in a Liberalised System – Completed  
Martin Cahn, Energie Cites, France

**Task 10** Performance Contracting – Completed  
Hans Westling, Promandat AB, Sweden

**Task 11** Time of Use Pricing and Energy Use for Demand Management Delivery- Completed  
Richard Formby, EA Technology Ltd, United Kingdom

**Task 12** Energy Standards - to be determined

**Task 13** Demand Response Resources - Completed  
Ross Malme, RETX, United States

**Task 14** White Certificates – Completed  
Antonio Capozza, CESI, Italy

**Task 15** Network-Driven DSM - Completed  
David Crossley, Energy Futures Australia Pty. Ltd, Australia

**Task 16** Competitive Energy Services  
Jan W. Bleyl, Graz Energy Agency, Austria / Seppo Silvonen/Pertti Koski, Motiva, Finland

**Task 17** Integration of Demand Side Management, Distributed Generation, Renewable Energy Sources and Energy Storages  
Seppo Kärkkäinen, Elektraflex Oy, Finland

**Task 18** Demand Side Management and Climate Change - Completed  
David Crossley, Energy Futures Australia Pty. Ltd, Australia

**Task 19** Micro Demand Response and Energy Saving - Completed  
Linda Hull, EA Technology Ltd, United Kingdom

**Task 20** Branding of Energy Efficiency - Completed  
Balawant Joshi, ABPS Infrastructure Private Limited, India

**Task 21** Standardisation of Energy Savings Calculations - Completed  
Harry Vreuls, SenterNovem, Netherlands

**Task 22** Energy Efficiency Portfolio Standards - Completed  
Balawant Joshi, ABPS Infrastructure Private Limited, India

**Task 23** The Role of Customers in Delivering Effective Smart Grids - Completed  
Linda Hull. EA Technology Ltd, United Kingdom

**Task 24** Behaviour Change in DSM: Phase 1 - From theory to practice  
Phase 2 – Helping the Behaviour Changers  
Dr Sea Rotmann, SEA, New Zealand

**Task 25** Business Models for a more Effective Market Uptake of DSM Energy Services  
Ruth Mourik, DuneWorks, The Netherlands

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