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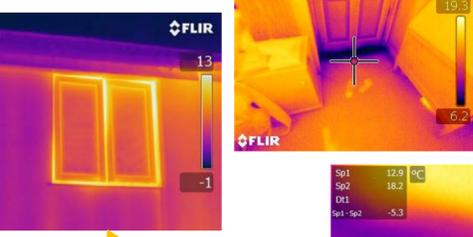
Home Heating: Mental Models around thermal images

Effectively communicating complex issues so that individuals can make smart decisions in home energy efficiency relies on understanding people's knowledge and perceptions, which may be 'out of line' with 'expert' knowledge (Attari et al., 2010; Morgan et al., 2002). We used thermal image visualisation of homes to explore this.

Methodology
 - 223 homeowners received a free thermal imaging visit.
 - For a subgroup of 20 people, audio / video recordings were taken at the thermographer visit and at a followup visit by the researchers around two weeks later. Sometimes householders were asked to make a drawing.

(This is part of a larger study funded through the EDEN Project / Dept for Energy and Climate Change, where we compare tailored and generic thermal imaging with a control group)

1) Understanding heat in the home
 Householders interpret the image and makes links

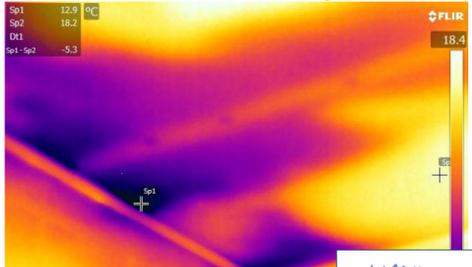


"In the attic, you can actually see daylight from the outside [...]. Is it normal to have a gap there to let the building breathe?"

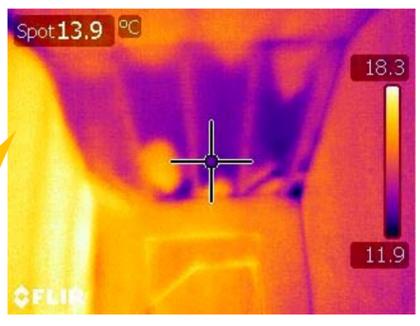
"It was surprising, the stuff that it showed, just from what the camera could do. It was quite surprising. We had our grandson here. He was fascinated.."

"We are leaking cold air or warm air. Which takes over...cold over warm? Cold will always overtake temperature, because the cold always penetrates to take over that area of heat."

"It's amazing how much heat is actually coming out through these windows. [...] They're fairly new windows."



2) Moving towards action
 Householders begin to consider ways of addressing the issues identified



"I was surprised, the insulation (above the stairs) must have slipped. We had not noticed that, it's an important area, as it's halfway up the stairs and we heat the front room, so it's disappearing or being absorbed up there. That's interesting, we can do something about that."

3) After two weeks
 There are some examples of further consideration and elaboration.

"That's virtually impossible to get to!"

"Have you found other windows that are comparable to that?"



4) Social multiplication
 The images attract interest and attention in adults and children and are talked about

HH1 to child: "Have a look at this – it's a thermal camera. Blue means cold."
 Child: "That's a cool camera!"
 looking at image
 Child: "Cor, that's a bad one, that one"
 child pointing to image
 Child to HH2: "Look, it's a thermal camera"
 HH2: "Oh my God!"



In the context of "the most boring conversation you could have in the pub" (from focus group)

Energy Diary: Capturing Energy Behaviours and Beliefs

To develop effective interventions that motivate energy conservation we need to examine energy-relevant behaviours and people's perceptions of these.

Daily diary methods can capture people's experiences and perceptions in everyday environments and provide rich data (Gunther & Wenzel, 2012). The data can be reasonably accurate but is less intrusive than methods requiring occupants to record actions immediately (Kahneman et al., 2004).

In our iPad Energy Diary (Fig. 1), participants select energy-relevant behaviours they have done during a specific time period. Questions then examine importance in daily life, behavioural flexibility and perceived energy use. This is a **feasibility study** in the first instance.



Fig. 1: iPad diary

Diary as a Discussion Tool

Data from pilot interviews shows that the diary triggers conversations about energy-relevant behaviours and helps people reflect on their energy usage (see quotes below).

"If the window has already been open for a minute, has the energy already been lost? ...or how long does it take to lose the energy out the window?...is leaving it open 5-10 minutes no worse than 1 because it has already been lost?"

"I could get estates to fix the draught from the window, or put on a jacket or scarf rather than use a heater, but the heater is more convenient that getting dressed/undressed going to and from meetings etc" (about an electric heater in the office)

"I have no idea really how much electricity a shower uses relative to say.... A heater or kettle"

Diary Case Study: Feasibility in three homes

Householders (HH) filled in the diary for one week in relation to morning and afternoon peak times.

HH thought heating used most energy relative to other HH actions, followed by dishwasher/washing machine/tumble dryer, finally PC/TV/lights. Most actions were seen as important and not moveable to other times. This seems to indicate little ability or willingness to shift behaviours from peak (Fig. 2, and see example load for HH1 in Fig. 3).

Fig. 2: Importance ratings for three householders Wednesday and Saturday (scores between 1 and 7; the higher the more important)

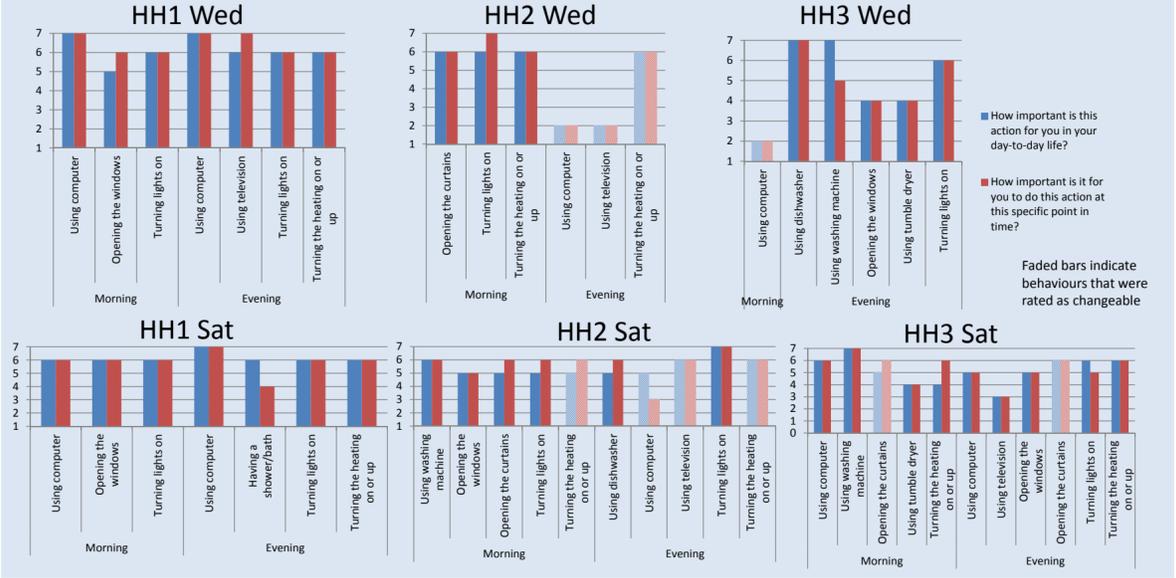
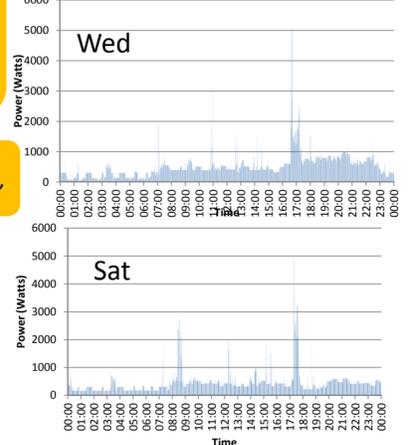


Fig. 3: electricity loads HH1



- So... what have we learned?**
- Peak times tend to be dominated by routine behaviours: householders said they conducted these actions regularly at that time of day.
 - Discourse also reflects habitual behaviours and challenges for behaviour change: for each action householders were asked whether they could have done anything to reduce energy use. Overall, little alternatives were mentioned, and in those cases where alternatives were given householders often indicated that they were too busy to implement these changes, or that it was difficult to change their routine.
 - Challenges: Actions are missing from the diary (e.g. cooking-related); participants might not remember or want to report everything

Next step

- We'll adapt the diary and then get a larger data set to examine peak time energy-relevant behaviours by placing a kiosk in the Plymouth City Council reception.