C.H.E.E.S.E.
Cold Homes Energy Efficiency Survey Experts

Progress of the CHEESE Project

30 Jan 2017

Establishment
The CHEESE Project began on 1st November 2014 as part of the Bristol Energy Network (BEN). It was formally founded as a separate Unincorporated Association on 17th August 2016, governed by a 5-member volunteer Management Committee working to a formal constitution adopted on the same date.

Registration and Insurance
The CHEESE Project and Heatview have both been registered as Trademarks. Public Liability and asset insurance has been obtained for our activities.

Funding
In the summer of 2016, BEN received £10,000 grant funding for The CHEESE Project from DECC via the Bristol City Council/Quartet - Community Energy Fund (CEF). In September CHEESE also received £9,950 from The Big Lottery: Awards for All. We failed to get a larger grant towards staffing etc. from the Esmée Fairbairn Trust. Unfortunately the grants from CEF, which were bid for in September 2016 by our ward-based partners to buy survey equipment, were unexpectedly rejected. Fortunately the Lottery award made up for this important shortfall.

Banking
The Project commenced in 2015 with payments for purchases made through BEN. As CHEESE obtained further funding, the directors of BEN required us to 'stand on our own feet' as a separate organisation: thus our separation and establishment as a separate body. In November 2016 we opened our bank account, but owing to the fact that BEN's accountant had moved to Australia, it took a further month before funds were received to allow us to purchase equipment. This delayed the start of our surveying activities.

Staffing
The project began with entirely voluntary effort. Brian Harper of Sight Designs in Malvern was contracted as our trainer and advisor. He developed thermal imaging for the British Government in the 1970s and developed the Energy Tracers thermal survey protocol, over five years, which we have licensed and then adapted considerably to fit our low-cost, unique, model. The CEF funding allowed us to employ an organiser for two days a week since December 2016. The Project has benefited from highly-skilled hardware development work and a large amount of skilled software development *gratis* from Jeremy Birch, his son Peter, and James Hanlon. David Tudgey has contributed his extensive knowledge of local community groups and energy activities. Sue Nicholls has provided valuable scientific analysis of our results (see below) as well as coordinating and promoting surveys in Redland. Mike Andrews has employed his skills of managing complex overseas filming and logistics learned at the BBC.

Partners
To be community-based, the project began with informal partnerships with Easton Energy Group and the Bishopston Cotham and Redland Energy Group and Ambition Lawrence Weston. These original 'Cheese Segments' have been expanded to six this year, to include Cotham and Bishopston, and joined by Re:work in Filwood. Further partnerships are in development with Southville, Westbury on Trym, etc.

The segments coordinate and carry out surveys in their areas, have their own trained Energy Tracers, and use equipment supplied by the central office based in Mike Andrews' house. To obtain referrals and to follow up our surveys with remedial action we have contacts with numerous other socially active local groups (see separate list). We are in touch with groups in Oxford, Lewisham, London, and Vancouver British Columbia, who are interested in adopting/licensing our protocol.

Research
We have actively monitored both scientific and commercial developments in the field of thermal imaging of homes. For example Plymouth University have demonstrated that householders who have seen a thermal image of the inside of their homes are 4.8 times more likely to carry out remedial work than those who have only received written and verbal encouragement[1].
A project in Kansas City showed that the use of energy was far more intense and inefficient in poor and black neighbourhoods[2].
Our Technical Manager, Jeremy Birch, has developed energy mapping by ward in Bristol which allows us easily to select fuel-poor target areas. An interactive map can be accessed via our Heatview website[3].

Thermal Imaging hardware development
For the CHEESE Project we do not use simple, standard, stand-alone equipment. We have developed our own kit with sophisticated, unique software. This was enabled by the retail release, in late 2014, of the FLIR One thermal camera which clamps to the back of an Apple iPhone 5. This device was one tenth of the price of contemporary industry models. For their cameras to be used with other smart-phone models FLIR discontinued this model One last year, replacing it with a version which has a socket for Android and iPhone devices. This meant considerable rewriting of software and even re-engineering connections that we use between the camera, phone, and laptop, during 2016/17. We currently use both kinds of camera with the old model being used for external surveys. To reduce our exposure to product changes, and to allow more sophisticated use, we are also in the process of developing our own thermal-imaging camera designed specifically for CHEESE surveys.

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[1] Matthew Fox, David Coley, Steve Goodhew, Pieter de Wilde, Thermography methodologies for detecting energy related building defects, Renewable and Sustainable Energy Reviews, Volume 40, December 2014, Pages 296-310, ISSN 1364-0321, http://dx.doi.org/10.1016/j.rser.2014.07.188.

[2] Tony Gerard Reames, Targeting energy justice: Exploring spatial, racial/ethnic and socioeconomic disparities in urban residential heating energy efficiency, Energy Policy, Volume 97, October 2016, Pages 549-558, ISSN 0301-4215, http://dx.doi.org/10.1016/j.enpol.2016.07.048.

[3] See http://www.heatview.co.uk/fusion_lsoa.html.

We have also developed our own design of 'blower-door' to reduce pressure inside a house, prior to survey. This costs £170 when a commercial one costs £2,000.

Software development

The most obvious software developed by the project is a website that displays thermal images of the exterior of houses on the same web page as the Google Street View images. www.heatview.co.uk By entering a postcode a householder in an area that we have surveyed, can 'walk' down their street seeing both the Street View image and synchronised thermal images of the same houses. We took 11,000 such images over the winter 2015-16 and are now expanding the coverage in our six target wards. These images are not for analysis, but to attract 'customers' for internal surveys – which produce a far better interpretation of energy loss.

In addition we have developed a bespoke iPhone app to perform thermal surveying. This shows the thermal images within a frame of a visible light image so that the viewer knows what he/she is looking at. There are numerous sophisticated refinements, such as different colour palettes to show up different thermal problems. It is in development by Jeremy Birch with input from Brian Harper. The app was necessary to address various problems in the FLIR-provided software and has enabled us to continue to improve our surveying techniques in a way that would not be possible with off-the-shelf software.

We have developed secure databases for collecting and analysing household data, including remedial action taken, and changes in fuel consumption, with a view to later scientific analysis. A web-based interface to the database is accessible by surveyors to add and amend information. There are also publicly-accessible forms on the website for gathering data from householders.

Survey technique

Brian Harper refined his Energy Tracers protocol over five years, beginning in Devon and ending by surveying 400 homes in Malvern, using cameras built by himself. We have developed and refined his techniques, with his assistance, to make surveys low-cost, more user-friendly, and replicable. This has continued through 2016-17 as we consider this winter season to be the second stage of our highly-successful, award-winning, 2014-15 pilot. The technique is described elsewhere but a key element is that at the end a video and audio recording of the survey is made, including questions and answers between the surveyor and the householder, together with photos of salient points. This is given on a memory-stick or CD to the householder as a record of their survey, together with digital copies of advice on remedial action from the Centre for Sustainable Energy (CSE) advice-sheets. This obviates the need for time-consuming written reports and is thus efficient in use of surveyors' time as well as being more informative.

Contract for trainer

Heads of Terms have been agreed with Brian Harper, our technical expert and Trainer for the licensing of his protocol. We await funds to pay a lawyer to formalise them.

Training Energy Tracers

In autumn 2016 we carried out two 2-day intensive hands-on courses with Brian Harper as protocol trainer and Jeremy Birch as equipment trainer.

Fifteen individuals have completed the course together with a health and safety course for entering homes, run by CSE. We have enrolled the courses to qualify for a Continuing Professional Development certificate. The qualification involves both formal training and surveying experience which is gained first by shadowing Brian or an experienced thermal surveyor, then performing surveys while being shadowed by a trainer assessing their expertise. Three surveyors have successfully completed the course and a dozen more will complete it as we carry out surveys currently.

Videos for training
We have completed a second 20-minute training video of one of Brian's lectures – suitable for showing elsewhere[4]. We have also made numerous short videos to demonstrate for training in the use of our survey equipment[5]. When our Energy Tracers are more practised, we plan to remake our first 24-minute survey film which at present shows Brian using his own equipment, trailed by Jeremy Birch[6].

Staff equipment
Staff have been supplied with personal high-visibility vests, identity tags, and screech alarms.

CHEESE energy-saving boxes
A box containing a whole-home energy monitor to clip to the mains feed, an individual meter for sockets (to show appliance consumption and electricity cost), two thermometers for inside and outside, a Haynes Eco-House Manual, and logging sheets and instructions, are lent to the householder for two weeks. This provides the householder (and us) with more information on their behaviour to encourage them to reduce their energy use. We are currently making up these boxes (in the meantime we have been using similar but more complex ones developed by Brian Harper).

Data collection
Data on the home – for example past fuel bills - can be entered on-line into our confidential data-base by the Energy Tracer at the end of a survey. In the event of a lack of WiFi, we have printed forms for householders, who are also warned in advance what data we shall collect (with an option to opt-out).

The surveys are followed up after one month with a phone-call to find out what the householder has done or plans to do, and then after a year by a visit to check what has been done in the way of remedial measures and to get new energy-consumption data.

Completed surveys
This winter, a warm October and November, and the late arrival of our funds to buy new equipment meant that we could do little surveying before the New Year. Last winter we did 60 internal surveys, this year our target was 200. We have so far done 13 and are just gearing up, but we think 120 surveys may be a more realistic target before it gets too warm after Easter.
However the time has been well spent on perfecting equipment and all the ancillary management tools needed to record and interpret the results. This is still the second *development* phase.

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[4] The video is available at https://vimeo.com/182068748.
[5] These are available at http://www.heatview.co.uk/training.
[6] The original video is available at https://vimeo.com/147568669.

Survey outcomes
Our project has the aim of reducing Bristol's energy consumption for heating homes. Therefore the surveys need to result in measures being taken by the householder to improve thermal efficiency - through added insulation or the stopping of draughts, behaviour changes etc. Many of these are low-cost. Brian Harper previously thermal-surveyed 400 houses in Malvern and found that 90 per-cent of householders surveyed carried out some remedial measures. During winter 2015-16 we thermal-surveyed 20 houses internally in Redland. All householders pledged to take remedial action varying from replacing windows to sealing chimneys and floorboards. All participants said they would recommend a CHEESE survey to others. In Easton, eight out of 12 householders thought their knowledge of energy in their home had improved a lot, and the remainder that it had improved. Eleven out of twelve would share their experience with friends.

The typical reaction to an internal survey is that it is 'revelatory' of energy loss. A proportion of those surveyed are already carrying out improvements and our surveys encourage them to do more. Many of the survey outcomes can also be addressed by tenants, with low-cost solutions.

Householders' comments:

- "A real eye-opener. Excellent! I found I could do everything for about £150 and got to work straight away."
- "There were still places where draughts were coming in and heat leaking out that I would never have thought of."

We are approaching the anniversary of our first surveys and will now be collecting data on actual reductions in energy consumption from bills. These have to be adjusted for degree-days to make an accurate comparison possible from year to year.

Publicity and Advertising
We have paid for advertising/advertorial in local magazines such as BS6 and a Filwood magazine, and we have had coverage in local newsletters and newsgroups. We are putting up flyers in libraries, community centres, shops, local notice-boards, etc., and are doing house-to-house flyer drops. We are planning for CHEESE Segments to host events and CHEESE parties to gain clients. We are using the contacts of other community organisations to seek out the fuel-poor. We are seeking other local publicity.

Press comment
BBC Futures are going to run a feature on the scheme. We have been in the Bristol Cable https://thebristolcable.org/2017/01/energy-gaps/ and filmed for a documentary for Hong Kong TV. We plan to appear on local radio and TV if possible.

General Manager, The CHEESE Project
30 Jan 2017