

**Seeing the light:
the impact of micro-
generation on the way
we use energy**

**Qualitative research
findings**

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behalf of the Sustainable
Consumption Roundtable



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Foreword

If everyone on the planet were to consume natural resources and emit carbon dioxide at the same rate as we do in Europe, we would need three planets to support us.

The Sustainable Consumption Roundtable – a joint initiative of the National Consumer Council and the Sustainable Development Commission - has been asked by the Government to advise on practical steps they should take to help people reduce their environmental footprint to sustainable levels. The Roundtable will report in full early in 2006.

In October, the Roundtable held a two-day landmark event to engage 120 consumers from across the social spectrum in exploring their aspirations for the future. Climate change emerged unprompted as a source of anxiety and concern. What also emerged clearly is that consumers feel locked into the systems and norms around them and are looking to Government to lead from the front and instigate change.

On the international stage, this Government has shown strong leadership on climate change. However, it is evident that this leadership is still not being felt where it counts: in people's everyday lives. As a result the Government has revised down its hopes for carbon savings from household energy efficiency over the next five years by nearly one million tonnes of carbon.

The Sustainable Consumption Roundtable is convinced that significant and sustained progress will not be made towards the UK's carbon reduction targets without actively harnessing consumer concern and converting it to action. The challenge is to raise people's use of energy in the home from the subconscious to the conscious, and enable them to feel part of the solution.

In response to this challenge, we commissioned The Hub Research Consultants to explore what impact micro-generation technologies like solar water heating, mini wind turbines and air source heat pumps are having on attitudes to energy use in households and schools around the country. It is clear from their in-depth interviews and observations that DIY energy generation rarely leaves families unchanged in their outlook and behaviour. As the authors say:

'It seems that micro-generation provides a tangible hook to engage householders emotionally with the issue of energy use... Householders described

the sheer pleasure of creation and of self-sufficiency: “It’s like growing your own vegetables”

The most striking finding is the difference in ‘energy intelligence’ between mainstream households with no micro-generation and those who have acquired the technologies passively, through being tenants of pioneering social housing providers. Having come from a similar starting point, these new DIY energy generators exhibit in general a wholly new grasp of energy issues and control over their energy use.

A teenage couple, who moved into social housing fitted with solar water heating in Shropshire, have actively chosen to buy A-rated appliances and investigate the environmental credentials of washable nappies. An elderly widow with a new air source heat pump in Kirklees is experimenting with different settings on her heating control panel to see how she can enjoy warmth at minimum cost: *“I didn’t realise before that it was the immersion heater running away with the money. It’s made me more aware of where power is being used in my house”*

However, it is clear that it is not sufficient to install the technologies and leave householders to make of them what they will. The greatest effects have been felt in households that were introduced to their micro-generators from the start and given clear explanations of how they can be used to advantage. A couple of households were unaware of the purpose of the solar panels on their roofs and as a result are demonstrating little change in awareness or behaviour.

A similar lesson can be learned from the schools that the researchers visited. While pupils and teachers in all three schools are proud of their solar panels or wind turbines, and feel inspired to live up to their new environmental identity, it is clear that the potential of the technology to motivate culture change in the school depends on how actively the teaching staff integrate it into learning activities. Micro-generation in schools is clearly not the answer on its own: it’s catalytic role comes to the fore only if it is used actively as a teaching tool and absorbed into wider school life and learning.

In summary, this research points to some important lessons for the Government, as it grapples with how to get householders and upcoming generations engaged in action to tackle climate change. The language of ‘energy efficiency in the home’ is currently going over the heads of householders who do not make the links between their TVs, dishwashers and thermostats and their active concern about global climate change. Making energy generation part and parcel of people’s homes and schools may hold the key to empowering and engaging energy consumers for the first time. If so, we cannot afford to leave micro-generation at the margins of the UK’s climate change programme.

The Sustainable Consumption Roundtable calls on the Government to:

Announce a new focus on the strategic importance of micro-generation in its Climate Change Programme Review.

In reviewing the contribution of different energy sources to the generation mix, the Government should pay due attention to the potential of different technologies to alienate or engage householders. The potential contribution of micro-generation should be assessed not just in relation to its generation capacity but to its potential as a catalyst for urgently-needed behaviour change.

Until now decisive policy action has been postponed on the assumption that the technologies are too expensive. Such assumptions are self-fulfilling. Costs will only come down when policies are introduced to increase demand, allowing manufacturers to move from 'built-to-order' to mass production.

Set targets for integrating micro-renewables into new homes under the Sustainable Communities Plan, bringing the technologies into the mainstream through economies of scale. The Office of the Deputy Prime Minister (ODPM) should call on all local authorities to adopt positive planning for micro-renewables, as pioneered by Merton Borough Council and at least 14 other authorities to date. These councils have set a requirement that all large new developments should generate at least ten per cent of their energy needs on-site through sustainable micro-generation.

Announce that all new and refurbished public buildings will be fitted with visible micro-renewable technologies.

All public buildings will soon be required to meet criteria set by a new Sustainable Building Code, being developed by the ODPM. Compliance criteria could be set to require a proportion of on-site sustainable micro-generation, to give developers a level playing field in bidding for contracts. Within schools it is crucial that micro-generation is set within the context of a whole school approach to climate change education.

Alan Knight, Co-Chair

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On behalf of the Sustainable Consumption Roundtable

Seeing the light: the impact of micro-generation on our use of energy

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Marches Energy Agency
Proven Energy
South Oxfordshire Housing Association (SOHA)
South Shropshire Housing Association
TvEnergy
WWF
XC02

Glossary of terms

CHP	Combined heat and power
PV	Photo-voltaic
SEG	Socio-economic group
STW	Solar thermal water

Executive summary

Energy is an invisible magic in our homes. It meets our basic need for light and warmth as well as powering an ever more complex array of entertainment and information gadgetry. The phenomenon of micro-generation (where households or communities generate their own energy on site) has received an increasing amount of interest from policy makers and press, yet little research has been done into how it affects attitudes and behaviour around energy and energy efficiency. This research set out to focus on this issue and to understand how people's relationship with energy and their motivations to be energy efficient varied between four very different groups:

- Mainstream households (no micro-generation installed)
- Households which have actively acquired micro-generation technology
- Households which have passively acquired micro-generation technology
- School communities with micro-generation installed, including staff and pupils

The research used a qualitative methodology including in-depth interviews and building tours.

The mainstream householders provided the mass-market benchmark as to the general public's attitudes, behaviour and understanding around energy conservation, carbon dioxide emissions and climate change. What was very clear was that energy and power are not terms within their natural language of mainstream householders. Gas and electricity use operates at the level of the sub-conscious within the home. There is little conscious awareness that lights, heating and appliances within the home are running off fossil fuels extracted from the earth and sea, let alone that a by-product of their usage is carbon emissions which are the key drivers behind climate change.. Whilst there were exceptions to this rule among more affluent households it was clear that such thinking is not front of mind. This was the case even with one householder holding an Oxford chemistry degree! One comment from a research participant probably sums up quite well where a lot of the general public is at on this issue:

"Oh yes, climate change, that's about the weather changing. I've heard about that ...yeah it's an issue, you don't know what to put on in the morning"
Female householder, London

What was also starkly apparent amongst these householders was that few attempts were being made to reduce gas and electricity consumption. Whilst there does seem to be some latent cultural guilt about the notion of waste, with some householders reporting an impulse to turn off lights, TVs and radios (that was not seen in practice!) there appeared to be virtually no sense of being able to actively and significantly reduce energy consumption in the household. Indeed consumers appeared remarkably disempowered in this area with levels of consumption always being attributed to the inherent size and shape of the household. Switching suppliers was considered the

most effective way to reduce bills – and this was not always of interest to those we have termed the more “wealthy softies” within the sample. The only exceptions to this observation were in the least affluent and most cost-conscious households - the “needs must” segment - whereby the usage of key cards and meters seems to have alerted them to differential consumption by appliances, as well as the need and ability to keep their costs down.

The findings from this research strongly indicate that either choosing to install micro-generation (active households) or living in a house where it has been installed (passive households) can significantly shift awareness, attitudes and behaviour above this baseline. It seems that micro-generation provides a tangible hook to engage householders emotionally with the issue of energy use. The emotional resonance appears to come from an element of wonder that in this modern era we can make electricity and heat from such eternal and natural sources as the sun and wind (and waves). Householders described the sheer pleasure of creation and of self-sufficiency. *“It’s like growing your own vegetables”* was one of the oft-cited parallels.

“I tell people all the time that I generate my own electricity.. I love it.. I think its fascinating” Male, N. Lancashire, with off-grid wind

Households with micro-generation installed had often attributed living credentials to their homes, most notably in the case of the elderly widow in Kirklees with her new air source heat pump. She deemed the heat pump to be so independent and intelligent as to warrant being given a name. In eco-housing developments the addition of energy generating technology appears to shift the developments from being mere eco-housing to eco-systems requiring due respect to avoid upsetting the balance.

“We felt it was better to work with the house than work against the house” Teenage parents, Craven Arms, with solar hot water.

Beyond the sheer excitement and pleasure of DIY energy generation, the impact is seen in householders’ shifting attitudes to energy conservation and consumption. Firstly this shift is evident in the language used, with micro-generation households being far more likely to refer to “energy”, “power” and “Kilowatt” than mainstream households. But perhaps far more critically there starts to develop a strong sense of which behaviours are free and self-provided, versus ones that cost money and are supplier dependent.

“When the wind is blowing right up then I turn the electric heaters on – rather than use the gas from the gas bottles” Male, N. Lancashire, with off grid wind.

It is the very nature of this semi-conscious comparison which leads to householders to avoid turning lights and fires on, to turn appliances off at the mains, to limit showering and baths to freer periods, and to focus their use of washing machines and the like on

peak generating times, as well as increasing significantly their interest in saving energy in other ways.

“As we had spent our own money we really began to take an interest and stopped leaving the TV on standby for example, and we are really careful not to leave the loft lights on any more” Male, Cheltenham, with solar PV and combined heat and power.

Clearly these levels of awareness and behaviours differed by individual household and specifically by whether the household had actively or passively acquired the technology.

Active householders for the most part tended to be committed environmentalists whose decision to install micro-generation was based on making a stand or being pioneers for something in which they truly believed. However even in these households there appeared to be something about the process of DIY generation which caused them to shift even further in their attitudes and behaviour. So these households were changing yet more light bulbs to energy efficiency models, trying even harder to ensure everything was turned off at the mains and of course considering yet more ways to generate energy.

Within the active households sample there were less environmentally motivated households, which we have dubbed “technophiles” and “independents”, whose motivations for installation were primarily through a love of the technology and a drive for self-sufficiency. It was clear that these households exhibited even greater shifts in behaviour..

The passive households within the sample were perhaps the most striking examples of the potential impact of micro generation. Evidently the vast majority of these households, prior to living with the technology, had the same low level of understanding around these issues as the mainstream low income households. Living with the technology however seemed to encourage far greater understanding and awareness around energy issues and often had an impact on behaviours too.

One of the most striking examples was that of a teenage couple with a baby living within a special eco-housing development. The pair exhibited a far more sophisticated and ready understanding of energy consumption issues than demonstrated by the affluent mainstream households. They had very clearly taken on the identity and ethos of the property (often a feature of passive sample living in eco-housing), to become energy and environmentally aware. They had actively chosen to buy A-star rated appliances, they now showered or bathed at times of day to take advantage of their free hot water and had even been considering moving to washable nappies. Now their dream is to build their own totally energy sufficient eco -house.

A common feature of passive households was the sheer love of warmth and comfort within their home. A number gave vivid descriptions of having grown up with or

having been living in cold, damp and coal fuelled homes. A striking example of the benefit of micro-generation within the passive households was that of the elderly widow within the Kirklees area who had been retro fitted with an air source heat pump after 17 years of inadequate heating and sky high bills. Her enthusiasm and delight with the technology were contagious. She now declared her home toasty warm, and did not need to wear her winter coat indoors through the harsher winter months. But in addition she had begun to understand the role her immersion heater was playing in the scale of her bills and was now using it far more cost-effectively. Similarly with the heating she was experimenting with different settings on the main control panel to see what times and temperatures she could keep her house warm at minimum cost. She was now being rewarded by her bills dropping which was again spurring her on to take further action.

"I didn't realise before that it was the immersion heater running away with the money. It's made me more aware of where power is being used in my house"
Elderly widow, Kirklees, air source heat pump

Not all the passive households interviewed were success stories. It is clear that the presence of the technology alone does not always cause such a shift in understanding and behaviour. Two such examples were two houses with solar thermal heating. In one the occupier was not even aware that the technology was on the property and consequently was leaving the immersion on 24/7.

"There are solar panels but I don't know what they do" Single mum, SOHA

In the other house the occupier did not fully understand the role played by the solar thermal technology and tended to compare the piping hot water produced by her electric shower to the water in the bath - and thus deemed the solar panels inconsistent, ineffective and a waste of space. Clearly good introductory and, ideally, ongoing communication is necessary to maximise the impact of micro-generation in such passive and even in active households.

The three schools included in the sample appeared to follow a very similar pattern to our domestic sample in terms of varying levels of awareness and behaviour change. One school had actively acquired the technology and was the most advanced in terms of energy efficiency and energy awareness being embedded into the whole school culture. They had a high starting point in terms of environmental awareness and motivation, but the installation of their technology had motivated staff and pupils alike to make even greater shifts towards energy education and efficiency.

"It means we do not waste the power station's electricity" Girl, 7

The other two schools (a primary and secondary school) had passively acquired micro-generation through special arrangements with the local authority. The primary school had initiated some curriculum links and cultural change within the school, though this

was driven largely by the energetic “eco-schools” programme rather than the wind turbine per se. In the secondary school there was fairly low awareness of the PV roof amongst pupils and cultural change towards energy awareness and efficiency was limited. However, this school was producing quite an impressive amount of energy from their PV roof and had received a lot of press attention which the school enjoyed. Interestingly a common finding amongst all of the three contrasting schools was that each school now felt that they had an environmentally friendly reputation that they had to live up to. In each school a contingent of teachers and pupils were aware that the technology on their roofs acted as a literal beacon to the local community that they were making a stand for the environment.

*“A lot of parents seem to notice it and ask what we’re doing. It’s good for them to see new things going on in the school”*Teacher, Scottish primary school

Each school was planning further environmental innovations no doubt fuelled by a desire to live up to this reputation.

In summary it is important to note that the impact of micro-generation may reach far beyond a simple analysis of kilowatts produced and carbon emissions averted. A whole host of attitudinal and behavioural shifts do seem to be fostered (though not automatically created) by the presence of on-site micro-generation. Some of our sample were only producing very modest levels of energy through their micro-generation technology, yet the behavioural impacts in terms of energy awareness and efficiency were often still considerable. Thus the findings from this research indicate that the qualitative impacts of micro-generation technology can be substantial, presenting a living, breathing and emotionally engaging face to energy consumption issues. In short, micro-generation can help bring the invisible to life.

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1 Introduction

1.1 Background

The generation of energy on-site (micro-generation¹) has attracted interest from commentators who believe that it could contribute to sustainable development by providing renewable energy at the point of use and raising consumer awareness and action on energy efficiency. Other benefits of micro-generation include its ability to provide a diverse supply within a resilient network structure and its potential to address fuel poverty².

On site micro-generation is only a reality for a small minority of buildings and very little research has been conducted amongst those living with the technology.

It is clear that more needs to be known about consumers' relationship with energy expenditure in their homes. Opinion polls record high levels of awareness of and concern about climate change, but the signs are that consumers are not relating this concern to their energy use at home. Energy suppliers are struggling to deliver their Energy Efficiency Commitments because householder uptake of energy efficiency measures like loft insulation remains low, even where the paybacks are fairly short-term.

This research was commissioned by the Sustainable Consumption Roundtable in May 2005 and aimed to test the working hypothesis that households with installed micro-generation come to view and use energy differently from those without.

1.2 Objectives

To compare and contrast attitudes between households with and without micro-generation in terms of attitudes and behaviour to

- Energy consumption
- Energy efficiency
- Energy costs and bills
- Climate change

To understand in practice what behaviour change in energy use means for different households i.e. what habits, routines or rules it entails, what actions they have taken in their houses, how they relate to their homes and their micro generators and how these have varied over time

¹ We interpret the term micro-generation to apply to on-site renewable heat generation through ground source heat pumps, solar hot water systems and wood pellet boilers, and to generation of electricity, from solar photovoltaic (PV) panels, micro-wind turbines, micro-hydro systems and woodchip or gas combined heat and power (CHP).

² A micro-generation manifesto, 2004, Green Alliance

To understand in depth the triggers and barriers to improved energy efficiency and how this might vary over time and changing circumstances.

To understand how usage and attitudes vary between different family members, and any impact the household has on the wider community and their social networks in terms of energy usage.

To understand how the impact of micro-generation might differ where the technology has been installed in a community location such as a school

To gather recommendations from micro-generation users for government, business and other players in terms of improving the uptake and experience of micro-generation

1.3 Sample

29 in depth qualitative interviews in total (including 2 telephone interviews).

10 face to face interviews and 1 telephone interview with households who have actively installed renewable technologies. We have termed these active householders.

- 4 wind turbines, full domestic scale
- 3 solar PV
- 2 combined solar PV and solar hot water (STW)
- 1 combined wind and solar PV, off grid
- 1 combined solar PV and micro CHP

2 additional interviews were conducted with households who have actively installed renewable technologies and were used as useful background information but were not explicitly included in the analysis for the following reasons

- 1 STW. This respondent was working in sustainable development and had come across the Sustainable Development Commission through her work. She was therefore too specialised in her knowledge to be considered part of the main active sample
- 1 micro-hydro telephone interview. This recently installed technology was not currently working due to lack of rainfall though it had worked briefly in the past

8 face to face interviews and 1 telephone interview with households living in social housing where the local authority /housing association have installed some form of renewable technology. We have termed these passive householders. We conducted interviews in four locations

- Craven Arms is a new 20 home development built by South Shropshire Housing Association. The homes save energy by using heat from the sun and incorporate the following features; solar hot water panels and glazing, extra wall and roof

insulation, south facing orientation and two storey solariums. We conducted three interviews in this location

- 3 STW interviews in Craven Arms properties
 - 1 telephone interview with STW property in Clun near Craven Arms
- SOHA (formerly South Oxfordshire Housing Association) have developed 11 energy efficient homes in Didcot. Features in the homes include grey water recycling which treats and recycles water to flush toilets, sky lights and solar hot water panels. Two full length interviews were conducted at this location as well as 2 mini doorstep interviews with solar PV tiles households
 - 1 geothermal heating
 - 1 STW
 - Kirklees council have invested in enabling residents to fit micro-generation into existing properties. 50 domestic properties in Kirklees have been installed with solar hot water systems. In addition, three council properties have been installed with air source heat pumps. Two interviews were conducted in this location
 - 1 air source heat pump
 - 1 STW
 - Maidenhead and District Housing Association have developed a street of 27 solar power homes that are timber framed and clad and insulated by grassed rooves. The homes also feature grey water recycling and sun pipes to provide natural light in interior staircases. One interview was conducted in this location.
 - 1 PV. This home had PV only and did not have other STW like the other homes on the site

8 face to face mainstream household interviews were conducted in Birmingham and London. A range of socio-economic grades (SEGs) were represented and none had renewable technology in place.

Finally, three schools were included in the sample. Interviews with children, teachers and management were conducted during the day long visit.

- Primary school Y: a small community primary school in a conservation area in rural Oxfordshire (within view of Didcot power station) with a mini wind turbine and solar PV. A solar thermal heating system is in place for the swimming pool.
- Primary school Q: a large primary school in the new town of Glenrothes, Scotland, with mini wind turbine recently installed.
- Secondary school X: a comprehensive school in the South of England with 1000 pupils, with a large solar PV roof recently installed.

Sample in detail

No	Category	Technology	Duration	Lifestage/age	Location
1	Active	PV	March 05	Retired Empty nesters	Shrewsbury

				70s	
2	Active	PV and STW	2-3 years	Working couple, Empty nesters, early 50s	Bristol
3	Active	PV and CHP	2-3 years PV, CHP 9 months	Working couple, Empty nesters 50s	Cheltenham
4	Active	PV	Since March 05	Family, parents in 50s with children aged 7 and 5, and 3 elder sons in early 20s (only spoke to parents)	Bradford
5	Active	Wind, PV (off grid)	3 years wind 1 year PV	Working couple, empty nesters 50s	N. Lancashire
6	Active	Wind	Since February 05	Working couple, no kids 60s	S. Lancashire
7	Active	Wind	Since March 05	Working couple, empty nesters 60s	SW. Lancashire
8	Active	Wind	Since March 05	Working male, single 40s	Essex
9	Active	PV	Since March 05	Older couple, no kids, man semi retired, woman working 60s	London
10	Active	PV and STW	STW since 2001, PV since 2003	Young working family 30s with kids 9, 7, 5	Edinburgh
11	Active (telephone interview)	Wind	Since March 05	Young family Early 40s with kids 11 and 5	Glasgow
(12)	Active (telephone interview)	Micro-hydro	Since April 05	Retired couple 70s	Dumfries
(13)	Active	STW	25 years	Older couple, no kids, male 80 retired, woman working 60s	London

No.	Category	Technology	Duration	Lifestage/age	Location
1	Passive	STW	9 months	Older couple, no kids, late 50s	Shropshire, Craven Arms
2	Passive	STW	9 months	Young family Early 20s	Shropshire, Craven Arms
3	Passive	STW	9 months	Young family Late teens	Shropshire, Craven Arms

4	Passive	STW	6 months	Single mum with baby	Didcot, SOHA
5	Passive	Geo thermal heating	1 year	Older couple, Empty nesters, 40s	Didcot, SOHA
6	Passive	Air source heat pump	9 months	Elderly widow, 70s	Kirklees
7	Passive	STW	3 years	Single mum, early 30s, children aged 8 and 6 weeks	Kirklees
8	Passive	PV	3 years	Single, 20s	Maidenhead
(9)	Passive	2 mini doorstep interviews with PV tiles residents	1 year	Families 20s with young kids	Oxfordshire
(10)	Passive	1 x telephone interview with STW	1 year	Family 20s with young kids	Shropshire, Clun, near Craven Arms

No.	Category	Home	Lifestage/age	SEG	Location
1	Mainstream	Social housing	Single mum, 33, child 9 years	C2/D	London
2	Mainstream	Social housing	Grandmother, 50s lives with 9 year old granddaughter	C2/D	London
3	Mainstream	Own home	Family, parents late 30s kids 4 and 2	AB	London
4	Mainstream	Own home	Single mum, 39, 2 teenage kids	C1/2	Birmingham
5	Mainstream	Own home bought off council	Retired widow, 70s	DE	Birmingham
6	Mainstream	Own home	Male, married with no kids, 42	B	Birmingham
7	Mainstream	Rented from private landlord	Mum, 24, cohabiting, 2 young kids	D	Birmingham
8	Mainstream	Own home	Single female 27	C1	Birmingham

2. Context for analysis of findings

2.1 Four steps to energy self-efficacy

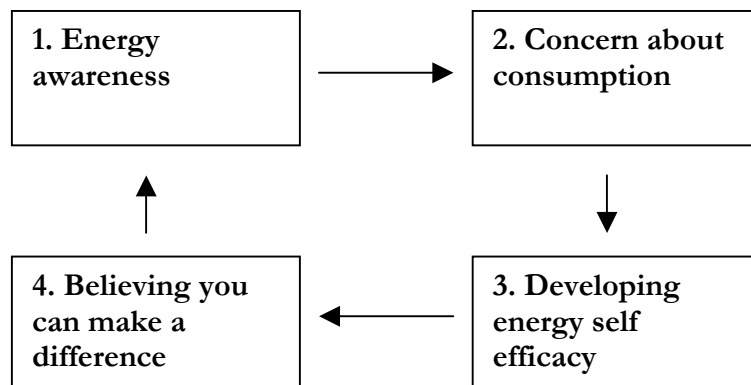
There are many activities individuals can undertake to improve energy efficiency in their homes. These include:

- Infrastructural changes such as loft insulation, double glazing and fitting a boiler jacket
- Behavioural changes such as switching lights and appliances off and turning down the heating
- Lifestyle or purchasing choices such as choosing not to use or purchase some kinds of appliances or deciding to purchase energy efficient versions

This research set out to understand what motivates people in making these kinds of choices and how interest and behaviour change can be sustained over time. We have described individuals who have successfully made their homes energy efficient as having “energy self-efficacy” ie. someone who has

- A sense of responsibility for own/households energy consumption
- An interest in effecting some change in that consumption
- The motivation to take action

But what makes an individual have energy self-efficacy and what stages do they go through to get it? Conversely, where energy self-efficacy is not present, what is lacking? This section outlines four steps which need to be present before energy self-efficacy occurs. In the remainder of the report we go onto analyse passive, active and mainstream householders and where they sit in terms of achieving energy self efficacy.



2.1.1 Energy awareness

Clearly for households to be able to engage and act on energy conservation issues, there needs to be an understanding and awareness of where they are consuming energy within the home.

Interviews with the different mainstream, active and passive households explored the extent to which different households have energy awareness and how this energy awareness is manifested within their homes. The table below shows the wide range of awareness to energy within the sample.

Low awareness	High awareness
<p>Take for granted benefits of gas and electricity</p> <p>Do not stop to think how they are being powered or think about what they are using at home</p> <p>Do not associate their bills with anything they are doing in the home, but feel as if costs are a rateable value attached to that property or somehow seasonal without really taking on board why</p> <p>Know and/or think very little about where gas and electricity come from</p> <p>Only vaguely conscious that the fixed structural aspects of their home will impact energy consumption within home</p> <p>Only vaguely conscious that more fluid structural aspects of their home will impact energy consumption within the home (shutting doors/pulling curtains)</p>	<p>Have fully made the link between the benefits of home appliances/heating and lighting and gas and electricity</p> <p>Are fully alert to their own use of energy as well as the usage patterns of others in the household</p> <p>Have fully made the link between their bills/costs of gas and electricity and what they are consuming in the home.</p> <p>Can differentiate the different powering requirements of different appliances</p> <p>Think more about gas and electricity. Have knowledge of energy issues and energy vocabulary - "power", "grid" and "fossil fuels"</p> <p>Really understand/conscious that the fixed structural aspects of their home will impact on energy consumption</p> <p>Conscious that the fluid structural aspects of their home will impact energy consumption within the home</p>

2.1.2 Concern about consumption

In addition to awareness, in order to develop an interest in effecting some change in energy consumption, it is clear that householders need to be uncomfortable with perceived overuse or unnecessary use of energy.

Concern about consumption appears to be felt in three key ways

- Waste. There appears to be a general concern with waste within British culture. This value of avoiding waste appears to be being passed to some degree from generation to generation, although it also appears to be reducing from generation to generation. Concern about waste is not specifically an energy issue and is also felt in relation to other resources such as water and food
- Personal financial cost. The cost of energy can be felt in absolute terms where householders actually cannot afford to pay for their consumption (and is seen in cases of fuel poverty) or in relative terms where householders are unwilling to pay for that consumption. This unwillingness can be due to householders not valuing the benefits, perhaps because it is seen as functional, rather than pleasurable, or from a feeling that there is an alternative or cheaper way of getting the same benefits
- Environmental impact. This concern can drive energy efficiency. The underpinning motivation is an unwillingness to be contributing irresponsibly to a global problem. This can be at a general vague "energy consumption= bad for the environment" level, or a more sophisticated understanding scarcity of fossil fuels and consequences of CO2 emissions

2.1.3 Developing energy self-efficacy

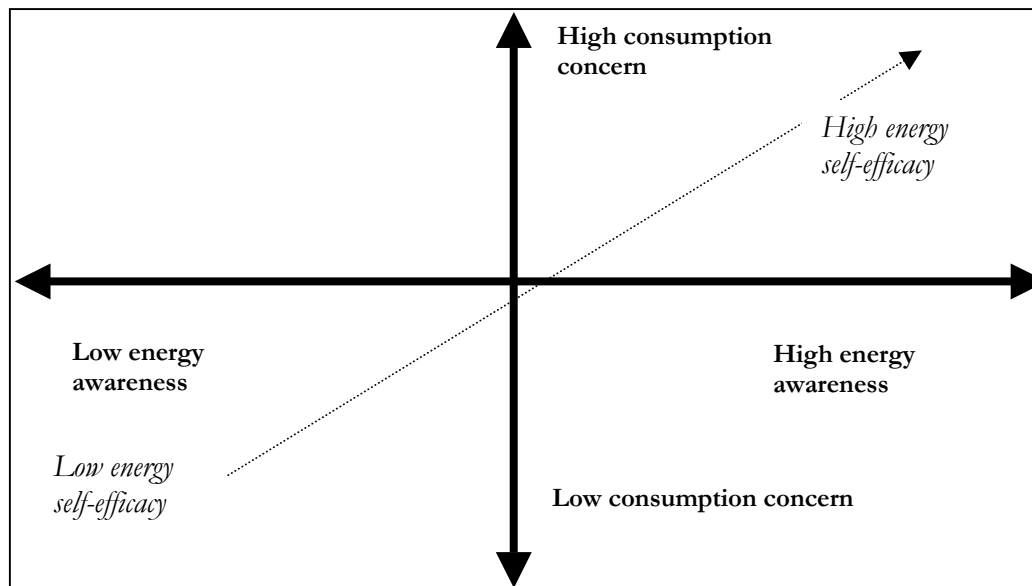
The two elements discussed above - awareness and concern - are essential ingredients for beginning to develop what we have termed "energy self-efficacy".

Energy self-efficacy emerges when the householder makes the connection between their concern over consumption and their awareness about when, how and why that consumption is occurring.

Therefore, energy self-efficacy across the totality of this sample varied according to two key dimensions

- High energy awareness → low energy awareness
- High concern about consumption → to low concern about consumption

This diagram demonstrates that the higher the level of energy awareness and the greater the concern with energy consumption then the higher the level of energy self-efficacy.



Where householders had made the connection, they began to take specific action to improve the energy efficiency of their homes such as embarking on insulation projects and making a conscious effort to remember to turn appliances off or down. However, the behavioural change entailed in having energy self-efficacy is only sustainable if the final and fourth step in the process is taken.

2.1.4 Believing you can make a difference

Once there is an intention to reduce energy consumption and steps are taken to do, so the extent to which this escalates or falters depends on whether the householder gets positive results from the steps they have taken– and then feels inspired to take further action. This positive reinforcement can occur through reduced bills, or through energy saving literature or promotions which remind householders why their actions are worthwhile. This positive feedback can also result in people engaging more and more with other sustainable issues, and sustainable behaviours become part of their identity and lifestyle.

Conversely, if a householder feels a lack of positive feedback then the reverse is also true, that the householder can feel less empowered around their energy consumption and therefore interest and behaviours to reduce energy consumption dwindle.

3. Mainstream households

Summary

- Mainstream householders tended to take their energy for granted and very rarely thought about it
- They did claim to try to avoid very obvious cases of waste such as heating in hot weather or leaving TVs on in unused rooms
- But many were not undertaking any energy efficiency measures at all and some were overusing energy
- Concern about costs was fairly widespread, but participants did not perceive a strong link between their usage and costs. Other factors such as the supplier were considered much more important
- There was some basic knowledge of climate change. People did not identify energy efficiency in the home as an environmentally friendly behaviour – even in households where other sustainable behaviours were taking place
- On prompting people had heard of renewable energy, especially solar, and considered it to be a good thing for the environment though they did not know exactly why

3.1 Overview of mainstream households

The mainstream householders were selected to represent a broad range of age, life-stage, property type and income. The properties had the following characteristics

- All but one had both gas and electricity and central heating. The one exception had economy 7 style storage heaters
- Six had double glazing. One had sash windows and had not considered double glazing. A number had installed double glazing whilst living at the property and had noticed the dramatic difference in warmth in the home. Double glazing was increasingly seen as an essential element of modern and comfortable living and was not seen as a special energy efficiency measure
- Three householders knew that they had loft insulation. Two of these had decided to install it because they had received information about how they could qualify for getting it free or at a substantial discount. The rest did not know if they had loft insulation or not and several thought their home would not be suitable for it.
- One householder living alone had recently been installed with a water metre which she was extremely pleased with. Another householder had considered installing a water metre to save on costs but had found he did not qualify because he owned a pressure washer

The mainstream householders included a diverse range of types of fuel supplier and payment

- 2 paid joint gas and electricity by direct debit
- 2 used key metre cards (separate gas and electricity) and topped them up in cash at the local shop

- 1 paid gas and electricity bills at the Post Office by regularly topping up payment cards
- 1 paid joint gas and electricity by cheque, quarterly
- 1 paid gas and electricity separately at the Post Office
- 1 paid electricity only by direct debit monthly

Mainstream householders tended to fall into three groups in terms of how conscious they were of energy issues and to what extent they made a connection between this and their own behaviour. These groups were most strongly correlated with SEG and terminal education age.

“Wealthy softies”. This group were the more affluent/AB within our sample. These respondents had some intellectual awareness that energy was a valuable and potentially finite commodity which was being supplied to them via power stations and a grid network. However, in practice they seemed to have only a very loose mental association between using appliances and heating and consuming energy and were not concerned about saving energy. This was the case even in two households where lots of other sustainable behaviours were in evidence, such as recycling and using washable nappies. Interestingly amongst some householders there was some low level resistance to energy conservation behaviours. They did not seem to want to associate themselves with being too poor to live in comfort. A couple also felt that energy efficiency behaviours, such as switching the lights off, were too trivial for them to engage with.

“24/7 oblivious”. This group includes a wide range of affluence and SEG. They tended to include the younger individuals in the sample. They took the supply of energy to their home entirely for granted. Whilst they could identify themselves as people who switched on and off appliances and heating, they did not see themselves as energy consumers. Some of this group were less affluent and might be struggling to pay bills. However, they made no attempts to reduce costs because they were often poor money managers who resisted checking bills or reading metres and did not know how to reduce costs anyway. Some of this group were inclined to overuse energy for a variety of reasons

- Do not want to compromise comfortable living
- Like to have things on 24/7 for maximum convenience
- Misunderstand some appliances, some believed that broadband requires the computer to be on all the time
- Have problems managing others in the household e.g. children who constantly leave things on

“Needs must”. This group was disparate in terms of age and education but were all on a fairly low income. They were more likely to look at their bills and metres to check they were correct. There were also more likely to know which appliances used up a lot of energy such as the fire and the washing machine. Some of these individuals had

undertaken some improvements in energy efficiency within their homes such as insulation and turning thermostats down. It should be noted that they were small in comparison with the changes enacted in the households with micro-generation installed. The group included

- A retired widow who had experienced fuel poverty in the past and had eagerly installed energy saving infrastructure such as double glazing and loft insulation and had a well honed routine to ensure the house was kept warm by making sure curtains were drawn and doors were closed
- A young mum who had moved into a rented property which was installed with a key card metre. She had quickly become much more aware of which appliances cost more and had started to use the tumble dryer less as a result

3.2 Energy awareness

This research reinforces the view that energy production, consumption and efficiency are not engaging issues for the general public. At the most basic level using gas and electricity within the home were behaviours that seemed to operate below the level of conscious thought. During the house tours some respondents did not appear to notice that TVs or radios had been left on in unoccupied rooms.

The interviews themselves did seem to have some impact in terms of making research participants more aware of their use of energy. The follow up telephone calls conducted a week after the in home interviews showed some respondents had become slightly more conscious of energy use.

"I notice it more now, I come downstairs and I notice I've left stuff on in the lounge!"
Female, 39, Birmingham

Respondents had very little understanding about where gas and electricity come from and how they are produced.

"I suppose I did this at school. Maybe my son would know" Female, 39, Birmingham

"Electricity, well it comes from that little meter...comes straight in here...I have idea where it comes in from before that...I've never thought about it" Female, 30s, C2D, London

Only the AB household in the sample could articulate the link between fossil fuel, domestic consumption and climate change but it was a laboured process for them to articulate it and certainly not a front of mind issue (which was perhaps surprising given they held a chemistry degree!). The rest of the sample did not understand where gas and electricity came from let alone that fossil fuels are finite and that burning them has consequences. The tendency to pay gas and electricity together to

one supplier appears to be further eroding awareness of what gas and electricity are and where they come from.

Respondents were unaware (apart from the AB/B households) about CO2 emissions in general and their impact on climate change, and therefore respondents did not know that domestic energy consumption contributes to CO2 emissions which in turn causes climate change with potentially disastrous effects. On prompting there was some latent awareness of human activity causing changes to weather patterns but this not readily associated with domestic energy use.

3.3 Concern about energy consumption

There was very low concern about energy consumption across the mainstream sample. In fact the research suggested that using lots of energy (and in the case of the 24/7 oblivious group over using it) made householders feel good about their homes

- A warm, comfortable, welcoming home
- An entertaining home with lots of things to do in every room
- Modern and convenient, everything ready to be used with minimum effort
- Having lots of things on hand give the impression that lots of people are in the house and therefore improved security and helped occupiers feel safe/not alone

There was little perception that over using energy was a “bad thing” best avoided. This was surprising given that some of the sample were worried about paying high bills, especially those in social housing. Even though they were worried about costs, they simply had not made the connection between costs and their own behaviour.

“It’s lazy really... we like to leave radios on in all the rooms so you don’t have to turn them on and off and you go in and out of rooms” Female, 30s, AB, London

There was however, some evidence within the mainstream sample of small scale concern for energy consumption in the following areas.

a) Waste

The research showed a general cultural tradition of anti-wastage, particularly amongst respondents who had directly experienced rationing or the winter of discontent. A couple of respondents also had connections with less developed countries (Jamaica) where resources can be unpredictable or scarce.

A general concern about waste meant that there was awareness of some basic behaviours (though not necessarily acted upon) including

- Turning lights off when leaving a room
- Not heating rooms which are not used

- Not leaving the house with the radio and TV left on (although some doing this for security reasons)

Concern about waste was more prevalent in relation to water than electricity or gas. There was moderate awareness of water metres (one respondent had recently had one fitted) and some anxiety about droughts and hose pipe bans. Water is a more visible resource than energy within the house and therefore concern about wastage was slightly higher, even though there was no connection between usage and bills for the majority of the sample.

"I always brush my teeth without leaving the taps running. It's something we learned at scouts" Male, 42, Birmingham

b) Cost

Concern about cost was fairly widespread. A proportion of the sample were on a relatively low income and energy bills represented a significant outgoing. Even those on a higher income did not want to pay over the odds for their gas and electricity and some resented paying as much as they did.

When asked about reducing their energy bills, all respondents spontaneously assumed that this was a question about switching suppliers, and not a question about their own use. There is some evidence that aggressive marketing from energy suppliers conducted through telephone calls and door to door sales have increased the assumption that the best way to save money on bills is to switch suppliers. However, such switches are not always successful. Two had felt duped into switching energy suppliers which they later regretted.

Therefore, there was a general assumption that costs of energy was a function of the following:

- Supplier (hence can save money by changing supplier)
- General costs of electricity and gas (in hands of utility companies)
- What utilities you have in the house/how home is heated etc, i.e. gas central heating or storage heaters
- How big the accommodation is
- The inherent nature of the house itself and any home improvements that have been done e.g. double glazing
- How many people live in the accommodation
- Whether people are in the home during the day
- Seasonal fluctuations
- Personal consumption

Personal consumption was considered less important than all these factors and therefore not prioritised when thinking about costs of energy bills for most householders.

Two of the individuals in social housing had developed strategies to cope with bills but neither prioritised energy efficiency measures as a way of saving money

- The London single mum was struggling to pay her bills and her approach to reducing them was to regularly challenge the gas and electricity boards about incorrect bills. She refused to believe that her high bills were correct, even though her consumption was clearly very high
- The London grandmother was very worried about paying bills and went to the Post Office regularly to pay her bills. She also had decided not to use her tumble drier as a way of cutting down on usage, but her main strategy for keeping on top of bills was good money management, checking bills were correct and overpaying to prevent going into debt. She did not undertake any other energy saving measures

"We can't be using that much.. Its just the 2 of us.. in this 2 bed flat .. I am out all day.. and we are on income support.. I just don't know how the bills are so high.. I think there is something wrong with them" Female, 30s, London commenting whilst in broad daylight lights were on in most rooms and a TV and radio were playing in an unoccupied bedroom, and all appliances in the sitting room (TV, DVD, stereo, computer) were on standby

The householders who displayed the most energy efficacy in terms of the link between cost and usage in the mainstream sample were those individuals with key cards. Both told stories about having to sit in the dark when the metre ran out unexpectedly. They had noticed that the money on the metre ran out faster if they had been using certain appliances a lot e.g. the heating or the washing machine. This awareness, combined with a concern for costs, had led to some minor behaviour changes

- Delay in using the washing machine if the metre is running low
- Using the tumble dryer less often and drying washing outside

However, smaller changes such as switching off appliances at the wall or switching off lights were less visible in terms of how fast the metre ran out and consequently these respondents did not think about them.

c) Environmental impact

There was no spontaneous awareness that domestic energy use could harm the environment by increasing CO₂ emissions. On prompting this came as a surprise to householders who were aware of environmental issues but were more likely to associate them with recycling or transport issues rather than domestic energy use. The AB household in London and the single female household in Birmingham were both keen recyclers, and diligently sorted their waste because they wanted to do their bit

for the environment. However, neither were concerned about their energy use in environmental terms and simply had not realised that domestic energy use could harm the environment.

"Recycling is all around me, it's in my environment. I see stuff left for charity shops and I hear the lorry emptying the recycling bins. But I just don't think about saving electricity" Female, 27, Birmingham

"I can't really believe that it will do much for the world by turning lights off or the TV off" Female, AB, 30s, London

On prompting the more affluent male respondent in Birmingham was aware of the need to cut down on energy use in order to reduce the risks of climate change. He was not personally engaged in environmental issues and was not recycling or undertaking any other sustainable behaviours. However, he did appear to have a fairly strict routine of switching off computers, stereos and other appliances off at the wall and not leaving things on standby, partly as a safety measure but also because he said the habit had been drilled into him at work. He felt his employer, Jaguar, had had an influence on him because they were enforcing a strict environmental policy which meant that all staff had to be rigorous in terms of switching off electrical appliances, especially overnight. This behaviour had now become habitual at work as well as at home, though he did not claim to be personally motivated for environment reasons.

3.4 Developing energy self-efficacy

None of the mainstream households could be described as having energy self-efficacy as outlined in the first chapter. Most of the mainstream households exhibited a very low sense that they were in any way able to impact the consumption (and therefore bills) of their gas and electricity. Energy was taken for granted and the cost of energy was perceived to be largely outside their control.

Where energy efficiency measures were being taken they were piecemeal and often contradicted by inefficiency in another area, for example

- The 24 year old mum with the key card was limiting her use of tumble dryer for cost reasons but had not installed any of the low energy light bulbs she had received free from an energy company because she did not fully understand what benefit they would bring
- The affluent male who was switching off appliances at the wall for safety reasons and to avoid waste said that his wife liked the heating on full blast during the winter. They had also taken out the low energy light bulbs when they moved in because they thought they looked ugly in the chandeliers
- The elderly widow had undertaken a number of improvements to the infrastructure of the house to ensure it was warm, but she thought very little about her electricity use and tended to leave things on standby

Research participants did not use the word “energy” in relation to gas or electricity. This could be one reason why consumers are failing to connect with messages around “energy efficiency” from gas and electricity companies or from other parties.

“Of course I know that it’s ‘energy’... they promote themselves as energy suppliers but in my heart that is not the term I use – it’s gas and electricity – if that...more often its turn the cooker on, turn the telly off.” Female, AB, 30s, London

The nature of energy bills was also a hindrance to developing energy self-efficacy. Householders experience a lack of connection with the bills that arrive for gas and electricity (and water)

- Bills arrive a long time after the behaviours, and are for a 3 month period
- Bills are often estimation
- There is no breakdown of consumption (unlike telephone bills)
- In a language that is not understood (what is a kw or a unit?)
- Lack of understanding of what power different appliances take

Information and advice about energy efficiency could be empowering for people, especially if it was face to face. Householders were unlikely to seek out information spontaneously but several had experienced good advice about energy efficiency

- One respondent had heard a speaker on energy efficiency at her local Widows Support Group and had been inspired to ensure that radiators in seldom used rooms were turned off or down
- A Warmfront home visit team had visited one research participant as part of a scheme in Birmingham and she had received a grant for tailored improvements to her rented home as well as free advice

The information left with participants from the Energy Saving Trust also had a positive impact on awareness, if not actual behaviour. Motivating advice within the Energy Saving Trust literature included

- Looking for energy efficient logos on new appliances
- Regularly defrosting the fridge
- Insulating boilers

Information which was linked to specific cost savings were particularly memorable and interesting e.g. “Fit a boiler jacket that’s at least 75mm (3”) thick and you could save £10-£15 a year”. After a week of having the literature, none of the respondents had acted on any of the specific advice, but felt they might do in the future.

3.5 Awareness and attitudes towards renewable energy

“Renewable energy” was not a familiar term for most people. On prompting awareness of solar panels was fairly high and most people had seen them on houses or on TV.

“Bob the Builder has them!” Mum, 24, Birmingham

Awareness of wind turbines was lower though on prompting people remember having seen wind farms on holiday or on TV. There was very low awareness of domestic or roof top turbines and people were very doubtful about these working or being allowed in their area.

Wind and solar energy were perceived to be “a good thing” and there was widespread knowledge that they were good for the environment, though people could not say exactly why. They were perceived to be clean and modern technologies.

When given more information about micro-generation there was some appeal of selling electricity back to the grid, especially amongst men. Some felt it might be quite exciting producing your own energy.

“I suppose it would be like Tom Good.... just like producing your own vegetables.. That self-sufficiency bit... going back to nature... creating something from nature, from nothing... I imagine it would be very rewarding and I could get hooked on it... but I am not sure I really believe it would work feels like it's a bit of a gimmick although... would be much more exciting that insulating your loft... it would be so much more tangible than saving energy” Female, 30s, AB, London

However, most research participants were extremely doubtful that they would ever be willing to put up a solar panel or a wind turbine on their properties. Barriers in order of importance were as follows:

- Cost. There is an assumption that the cost must be very high
- Weather not suitable. People tended to believe that there would not be enough wind or sun in their area to make the technology work properly
- Property not suitable. Perception that a turbine will need a very big garden and a panel will need a very big roof facing in the correct direction
- Too long term. Many of those in the mainstream sample could not say where they would be living in 5 years time and therefore were unlikely to substantially invest in their current homes
- Aesthetic concerns. This was more relevant for wind turbines than solar panels which were thought to be far less obtrusive
- Too eccentric. Micro-generation was perceived to be most relevant for people who had made a lifestyle decision to “go green”. None of the mainstream householders felt this was a central part of their identity

"Oh that kind of stuff that is for people who live in the countryside... who want an alternative lifestyle... not for city people. It's for those who want to get in touch with nature... you know they are probably hippies, the sort of people who would educate their children at home" Female, 30s, C2D, London

4. Passive households

Summary

- Passive householders were very positive about their homes and found them warm and comfortable. The installation of the technology had a beneficial effect on quality of life and had helped to address fuel poverty
- Householders who had micro-generation installed through the council or housing association typically exhibited a greater understanding and interest in environmental issues, such as climate change, than the mainstream householders (though not nearly as great as within active households)
- Across the passive sample there seemed to be a greater propensity to be taking some measures to improve energy efficiency than observed in mainstream households
- That said, there was a great deal of variation. Some passive householders were barely aware of the technology, whilst others had fully taken on the identity of environmentally friendly households. Having the technology installed does seem to encourage, but does not automatically create, awareness, interest and behaviour change
- A positive impact on energy efficiency was more likely where the presence and purpose of the technology had been well presented by the housing association or council, and residents had received simple and clear instructions about what they could do to maximise its efficiency

4.1 Overview of passive households

Prior to living in the properties with micro-generation installed, passive householders were very similar in terms of the attitudes and behaviours to the mainstream householders

- Barely conscious of using of gas and electricity
- The least affluent had concern about their bills, but felt a lack of empowerment about how to bring them down (in particular the older couple and young parents in 20s in Craven Arms and the elderly lady in retro fitted property)
- The more affluent exhibited little interest in their bills (older single mum in Kirklees and the single man in Maidenhead)
- Three of the households had not paid their own bills prior to living in these properties, (single man in Maidenhead, younger single mum in Didcot and teenage parents in Craven Arms)
- Prior to moving in/being installed with technology had known nothing about how gas or electricity are produced or the impact of domestic consumption on the environment

All but one of the households were really pleased and very proud of the special features of their homes. The one exception had the retrospectively fitted solar thermal

water (STW) panels. The rest tended to be advocates of their housing and specifically their renewable technology on basis of:

- Low bills “

“The gas bill in 4 months has been £20 – I think that’s pretty good” Teenage couple, Craven Arms

“In 7 or 8 months we have hardly had a gas bill” Male, 20s, Craven Arms

- Providing warm, cosy and comfortable housing

“The way it’s been built stops it being cold and damp” Male, 20s, Craven Arms

- Aware that their housing was somehow “good for the environment” and felt that they were doing their part by living in such housing
- Can begin to be aware that in other homes and buildings consumption of energy is not mitigated by renewable technologies and is therefore more costly or wasteful
- Some appeared to take on the eco-identity of the housing often describing themselves as people with a special concern for the environment or claimed they are teased by friends as eco-warriors (said proudly)

“When you move in you’re-thinking what you can do – you can’t throw cardboard in the bin any more...” Older couple, SOHA, geo-thermal heating

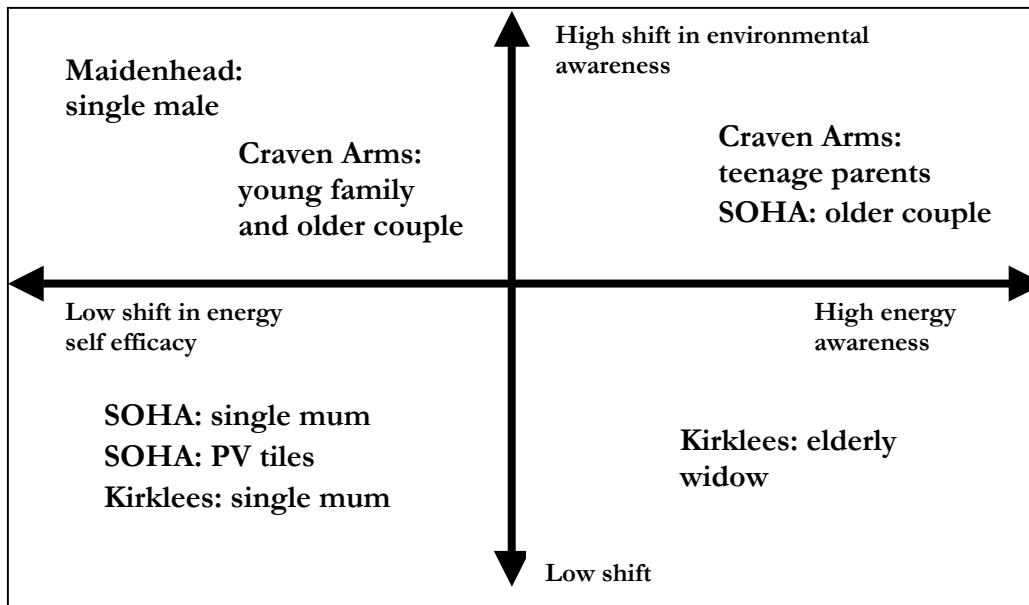
4.2 Developing energy self-efficacy

The passive householders sample varied far more than the mainstream and active sample in terms of how aware, concerned and active they were in energy efficiency. Some research participants had made lots of changes in their behaviour as a result of moving into the home/having the technology installed whereas others were barely aware of their technology or what it did. There was a lot of variation within each of the four steps towards energy self-efficacy, so different householders were at widely divergent stages in

- Awareness
- Concern
- Developing energy self efficacy
- Believing you can make a difference

The variation in the sample can be categorised according to two key dimensions

- High to low shift in engagement with environmental issues
- High to low shift in energy self-efficacy



From the presence of different households on these dimensions, one can make a number of assumptions about what caused these shifts within the different households.

Eco-housing with multiple features appears to successfully raise overall awareness of environmental issues and to a lesser extent energy saving issues within that. This can be seen by the Craven Arms residents who had typically experienced an increase in environmental awareness which was not always matched by an increase in energy efficiency behaviours. Moving in to the new eco-homes typically coincided with significant turning point in people's lives. Sometimes individuals had been on a housing list for a long period of time and moving into a new home represented a new start and a chance to form a new identity and lifestyle. Others had experience a major life change such as having a baby or stopping work which preceded their move into the home. Some of the new occupants of the homes were willing to identify with the overall ethos of the buildings without necessarily understanding the detail of specific technologies or how they were meant to interact with them.

The second assumption which can be made is that the presence of renewable technology does encourage a shift in energy self-efficacy but only when there is a proper context for understanding it and when residents can see good results and rewards for developing it.

Each of the four broad groups in the sample are now discussed in detail.

a) “Sustainable Lifestyle Converts”

Two households living in eco-housing with renewable technology appear to have undergone total transformation in their awareness and attitudes to the environment and energy conservation since moving into these properties (teenage parents in the Craven Arms and the older couple in SOHA). In both instances the transformation appear to have been brought about by the strong identity of the development as eco-housing and clear explanation from the housing association about the specific eco-features within the building.

The reputation of the accommodation has had an impact on the identity of the residents (and actually was evident in all eco-housing to a lesser or greater degree) whereby somehow living in an eco-house calls upon the occupiers to be more eco-friendly in order to live up to their house.

“We became eco-nutheads when we moved in here” Older couple, SOHA, geothermal

“We really wanted it to work, wanted to do it when we first came to the house, because it was a low energy house we were really careful with the lights, bought A rated appliances and became frantic recyclers, we were really excited about it we thought it was going to be a whole new way of living” Teenage couple, Craven Arms

The presence of the renewable technology has in these instances enhanced the appeal and credibility of the eco-homes by providing a visual, tangible and modern point of difference. This was particularly the case in the Craven Arms and Maidenhead properties which were highly distinctive versus the SOHA properties which were more standard looking.

The technology also seemed to transform the houses into feeling like eco-systems which were self supporting in themselves. People sometimes described their technology, particularly geo thermal and air source heat pumps, as intelligent, living and even giving them names.

In addition the presence of the renewable technologies did seem to reinforce and remind residents of the issue of energy saving.

“We felt it was better to work with the house than work against the house” Teenage parents, Craven Arms, STW

The visual presence of the technologies appears to provide a tangible reminder of free energy production (as opposed to energy conservation – which tend to be the remit of the other features in these houses) which in turn leads residents to begin to differentiate between free and costly behaviours. In many ways the rain-butts and water meters fitted in most of the eco-house households characterise this issue. All the households with these rain butts were choosing to water their gardens with the butts,

describing that you have a clear choice between free water and metered water so it is obvious to choose the former.

"We hate to see water going to waste. Since now it's costing you money, we don't like to use metered water on the garden. Rain is free!" Older couple, SOHA

"Sun and rain don't cost anything" Teenage couple, Craven Arms

Whilst with energy the choice is not so visual and not so stark as with water, there starts to be a latent comparison in STW homes between the costs of having a bath (free) and the costs of leaving a TV on standby (£60 a year in some literature which passive householders had been given). This differential between the cost of different behaviours and experiences within the house seems to be a mental starting point in understanding that there are things that the occupier can do to reduce energy consumption still further.

The teenage parents living in the Craven Arms development had found that their behaviours and attitudes towards the environment had changed significantly since moving into the home.

- Highly aware of articles and news pieces on environmental issues. They cited environment agency reports on nappies and electric cars for example
- Started to recycle
- Dream now to build own eco-home with *"grey water recycling"*
- Giving away very large paddling pool because it takes too much water

Specifically in terms of energy efficient behaviours, the promise and reward of low bills has encouraged a whole set of new and adapted behaviours

- Taken to line drying *"We use the tumble dryer a lot less now. We've got the airing cupboard and drying area"*
- Switching off lights/TV more than before
- Bathing at optimal points of day to take advantage of solar water *"We have our baths and showers as soon as we get in – we know the water is going to be nice and hot.. get the washing done when it's nice and hot to get it out on the line"*
- Turning down thermostat
- Purchase energy efficient appliances and lightbulbs *"We bought a few additional energy saving lightbulbs. As we are living in an energy saving house and then we should buy energy saving bulbs"*
- Nagging friends and neighbours to follow their example

"The booklets that we were given made a difference. Now I try and turn things off at the main switch and turn the thermostat down" Teenage couple, Craven Arms

All of this was a huge change from their initial impression of the Craven Arms which was not overly positive.

"We weren't keen on Craven Arms, but we needed a house" Teenage couple, Craven Arms

Again, the couple in their 40s living in the SOHA housing in Didcot described how much more interested in the environment they had become since knowing they had a place at the development

- Looking on internet for information how to reduce energy consumption
- Become very active recyclers

Specifically in terms of energy efficiency this couple had begun to

- Turn off lights/nothing left on standby
- Purchase energy efficient appliances

That said this couple felt that their geo thermal heating combined with grey water recycling was contributing to (perceived) very high electricity bills and this had somewhat undermined their enthusiasm.

b) "Newly Connected Comfies"

This quadrant is characterised by an elderly lady who had been living in her bungalow struggling to pay her electricity bills for 17 years. The house was only installed with an electricity supply. Prior to the installation of the air source heat pump she had had to keep her jumpers and coats on all day during the winter and her children and grandchildren did not stay long on visits because of the cold. The installation of air source heat had not only in her opinion, transformed her house, and to some extent her bills, but her social life too, with her family now taking their coats off on visits – and staying far longer too!

"Toasty warm – it hits you, can sit like this in winter time, I used to sit with all my clothes on, woollies and my coat and still I could not get warm and everything was on.... now I've not had an electric blanket on since it was put in unless its really a very bad night" Older widow, Kirklees, Air source heat pump "

Now I know its that immersion heater running away with electricity, I don't leave it on for more than 10 minutes. I didn't realise before that it was the immersion heater running away with the money. Its made me more aware of where power is being used in my house" Older widow, Kirklees, Air source heat pump

In addition she has engaged totally with the council's energy officers' plans to get her bills yet lower

- Actively taking on the steps he suggests. In particular she has begun to switch off the immersion heater and sees it now as the "culprit" for the bills. She feels she has something to target and that she can now make a difference

- She is also very engaged with maximising the efficiency of the system by experimenting with different timings and temperatures to see how low she can put it before it feels uncomfortable, reassured that at any time she can increase temperature in her accommodation

She appeared to have little or no increased awareness of the environment. This is interesting in contrast to those living in eco-housing who often seemed to exhibit some shift in their own identity as a consequence of moving into such housing.

She was very clear that she was living in a standard bungalow which had had some very latest technology fitted, and was only vaguely aware or interested in that it was good for the environment. Perhaps unsurprisingly her main focus and delight was a sense that she felt truly physically comfortable in her home and her bills were at last coming down – and she was partly instrumental in that.

c) “Proud Greens”

Households in this category comprised of the single male in Maidenhead with PV, the older couple in the Craven Arms and the young family in the Craven Arms.

The single male with PV living in Maidenhead said he loved living in his flat because of the distinctive and environmental nature of the property.

“I feel good about living here, I feel I am doing my bit for the environment... I think it’s great that they have gone out of their way to build houses that create less waste... I love this building it’s a good feeling living here” Male, 20s, Maidenhead

Unfortunately the flat he was living in had the fewest features compared to the other houses on the site and in fact the occupier was very confused over what he did or did not have, even though he had been living there 3 years. Nonetheless, he was very keen to describe himself as environmentally conscious and he was undertaking a number of environmental behaviours

- Being careful with water when washing up
- Making sure he always hangs out his washing, not planning to get a tumble drier
- Nags his girlfriend about leaving the TV and DVD on standby

“I’m 100% proud to be living here even though I’ve had some teasing comments” Male, 20s, Maidenhead

However it seemed that he was doing these knowing that they are good environmental practices, rather than because his understanding and awareness of energy consumption had increased. This lack of shift in his behaviour could be attributable to the lack of detailed information about the renewable energy technology and how best to enhance energy efficiency in the home. Like a number of others in SOHA PV housing he was not taking advantage of the facility to give figures to his

electricity company for a rebate. That said, he exhibited higher awareness of where gas and electricity come from and the impact of domestic consumption on the planet than many in the mainstream sample.

The two Craven Arms households, as with the Maidenhead household, appeared to have undergone some behaviour changes due to the shift in their identities as a consequence of living in eco-housing

- Recycling (provided on doorstep)
- Pulling blinds
- Using rainbutts
- Using drying areas and washing lines

“When we first saw the houses we thought they looked a bit odd ... but when we went inside we really liked them... we really like living here, it’s warm in winter, spacious and also it did change the bills quite a bit. I didn’t think it would really but it has...before we couldn’t really afford to heat the house...” Older couple, Craven Arms

“We do some things slightly differently, like closing the blinds and following some of the tips in the booklet” Older couple, Craven Arms

“We were born in the war and remember rationing. We were brought up not to waste things anyway, not like younger people today” Older couple, Craven Arms

Once again though this group did not seem to have particularly embraced energy conservation in their homes or made a big shift in energy self-efficacy, although were paying some attention to their bills and meters and were generally very pleased with them. They were also much more aware of environmental issues than the mainstream sample.

“Global warming is a worry... we are looking at catastrophic floods and storms we are already seen it all now” Older couple, Craven Arms

“Whoever is in charge of doing these [eco homes] or building these, will save the planet and will save a lot of pollution in the air” Male, 20s, Maidenhead

d) “24/7 Oblivious”

Those households who seemed least affected by the presence of the technology and/or living in eco homes were as follows

- The single mum with STW in SOHA housing had moved to the home as part of a temporary housing solution. She was looking after a baby with some health problems and was not at all focused on the environmental or energy saving aspects of the home. No one had explained the role of the solar thermal water to her and she had consequently kept the immersion heater on all the time

“There are solar panels but I don’t know what they do” Single mum, SOHA

- The single mum in Kirklees had received retro fitted PV panels three years ago. She was relatively affluent and not worried at all about her bills. She had unrealistically high expectations of the panels to heat the water 100% of the time and when it failed to so do she seemed to dismiss their contribution. The confusion was in part due to the fact that it had not been explained to her that the shower was electric and not fed by the STW, so she tended to compare the heat in the shower to that of the bath/washing up bowl. She had no sense of any change in her bills (but she was very low bill aware) and perhaps would have benefited from a clearer visual way of capturing the contribution of the panels to her water, and of how to make full use of her STW
- The mini doorstep interviews with SOHA residents with PV tiles appeared to show little shift in energy self-efficacy or environmental awareness (however fuller interviews might have prompted more details). Only one of the three houses interviewed were sending details of their PV reading to the electricity company, therefore only one was reaping any benefit. One consistent finding from all three houses was a sense that they did not understand what they had, were confused about what they had and tended to ignore it as a consequence

4.3 Triggers to improved energy efficiency amongst passive householders

- Living in an eco home did appear to be more conducive to large scale behaviour change than living in homes which had retrospectively been installed with renewable technologies. Occupants were more engaged with environmental issues, and energy saving, in homes which are built to encourage a holistic environmental lifestyle. The following features acted as constant reminders about the environmental purpose of the housing
 - sky lights/tubes
 - passive ventilation
 - good insulation
 - double/triple glazing
 - solariums
 - washing lines, covered outdoor drying spaces
 - rain butts
 - cycle racks
 - door step green box collection
 - accessible, easy to read meters
 - energy saving light bulbs and fittings
- Tangible evidence that renewable energy works, such as a warm house or very low bills. (the success of the air source heat pump in Kirklees was so great it did not require the additional features of an eco house to be considered a clear winner by the occupant)

- Creating a clear environmental identity for the homes through a launch, seminars, press coverage and special awards also helped engage occupants with the overall ethos of the building
- Unusual architecture could increase the sense amongst residents that they were in a special property which they needed to live up to by taking on environmental behaviours. However, there was also some feeling from occupants of Craven Arms and Maidenhead that the odd look of the buildings had made the housing unpopular with other people on the council housing list, which is how they had been able to get into a property quicker than they might have done otherwise

“People take the mickey out of how they look, but they should build more of them, they save on bills and they are warm, cosy and comfortable places to live” Male, 20s, Craven Arms

- Provision of a clear set of advice and tips with the house welcome pack of how occupiers can save money and reduce waste by taking on simple behaviours
- Long term housing arrangements. Where occupiers regarded the accommodation as a permanent arrangement they were more likely to become engaged and take on energy efficiency
- Prominently sited water butts combined with clearly metered water bills led residents to differentiate between free and costly resources which in turn helped an attitude shift in energy as well as water
- Technology which is perceived to be intelligent and can adapt to different conditions, for example by switching itself on and off according to the weather, impressed residents and also combated doubts about the ability of the technology to work in British conditions (which are widely assumed to be not good for renewable energy, especially solar)

“You don’t have to touch it, you can leave the settings, if it’s a beautiful week it doesn’t come on, you don’t have to worry when you go on holiday, it knows what it’s doing” Elderly widow, air source heat pump

4.4 Barriers against improved energy efficiency amongst passive householders

- Installation of the technology with no explanation or introduction to its purpose or way of working
- Not providing tips for how to save money or reduce consumption, or providing too technical or dense text explanations
- There is a risk that the technology is perceived to be expensive and no context or advice provided to mitigate this perception, for instance electricity bills might be higher as a result of geo-thermal pump even though water bills are lower

- Too much work on behalf of the householder, such as giving meter readings to benefit from rebates for PV, can risk householders deciding to ignore the technology altogether
- Excessively high expectations over what the technology resulting in a diminished interest in the technology. These expectations need to be managed, for instance some householders might assume STW will heat water all year round where it is only designed to work from May to September
- Technology which is less visually prominent can become invisible to householders. The PV tiles seem to have been a bit too successful in blending into their surroundings as some of the residents in these homes had never noticed them or had forgotten all about them
- A lack of time to experiment could also adversely affect engagement with the technology. The elderly lady in Kirklees had devoted time to identifying the best balance between setting the times and temperature on her air source heat pump. But in homes where residents were in less often, a lack of time could mean that they were unable to identify a good balance of using technology which could make them resort to maximum convenience such as leaving the immersion heater on all the time
- Some householders in the Craven Arms (pictured below) had been firmly instructed not to touch any of the controls linked to the technology. This was obviously intended to prevent any accidents or mistakes happening, but it also had the less desirable effect of disempowering residents and making them feel they were not fully in charge of the technology

5. Active households

Summary

- Active householders typically had a strong interest in the environment and this was often but not always a key driver in their decision to install micro-generation
- Active households had often taken some steps to make sure their homes were energy efficiency well before they installed the technology as part of their overall environmental concern and energy awareness
- The installation of micro-generation encouraged householders to make even more improvements to the energy efficiency in their homes. This was being driven by a desire to become as self sufficient as possible, as well as by a heightened alertness to bills, costs and metering
- The improvements to energy efficiency were seen across the sample but were most dramatic in households where environmental concern was lower and fewer pre-existing measures were in place
- Active householders were advocates of renewable energy and micro-generation in particular and believed they were having a positive influence on awareness of energy issues amongst family, friends and neighbours

5.1 Overview of active households

There were some strong similarities between the different households who had actively installed micro-generation. Typically they had the following characteristics

- Relatively affluent, ABC1 (with a strong AB) skew
- Very educated, informed and articulate
- All white
- Male. We interviewed several couples and families, but the male was usually the key decision maker and ongoing “owner” of the technology. Several couples in the sample talked about their differing motivations which reinforced their commitment to the project. Whilst the male may have been primarily motivated by gadget appeal of micro-generation, this was endorsed by a more committed environmentalist partner
- Exhibited low consumption lifestyles (even to the extreme in one instance)
- Had a higher level of environmental awareness than the mainstream sample (though not always concerned by environmental issues)
- Often (but not always) exhibiting other sustainable behaviours such as
 - Recycling/re-using
 - Growing own vegetables
 - Husbandry (chickens/goats etc)
 - Composting
- Had a higher than average degree of technological comfort. In fact the decision making process and final installation of the technology did seem to require quite a high level of technical confidence and competence

- Computer and internet users. Computers were very important to active household and were a key source of research
- Had some interest in self-sufficiency, with all households exhibiting some self-sufficiency traits such as a keen interest in vegetable gardening
- Many, but not all, of the sample were in or approaching retirement and seemed to feel that they had at least some spare time on their hands

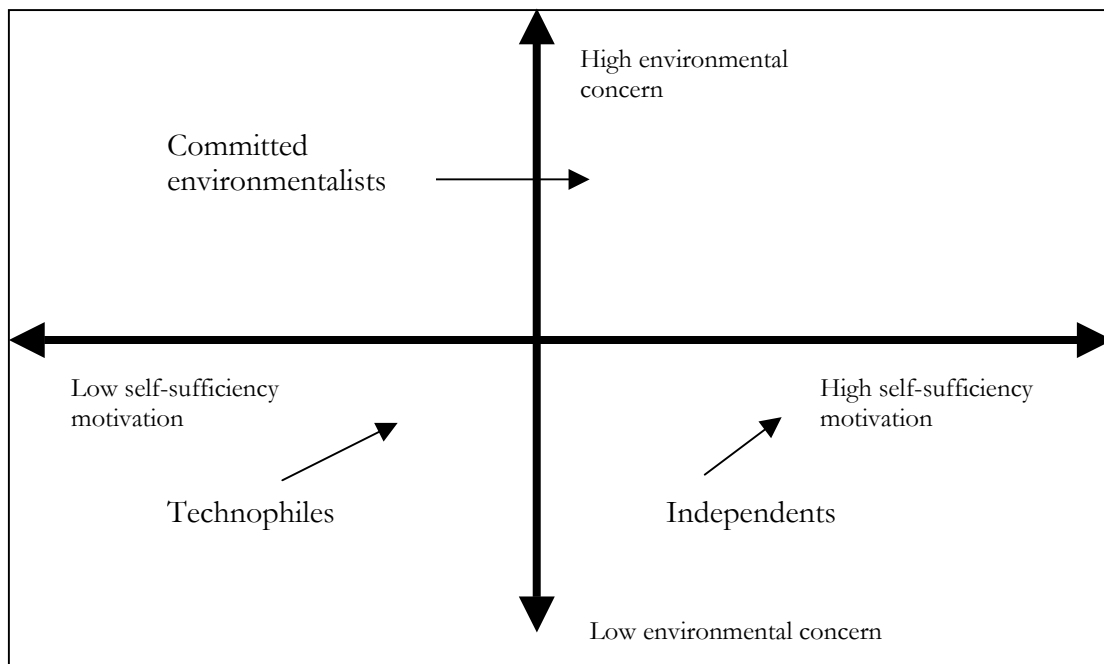
Beyond these broad similarities however it is possible to differentiate the households according to their motivation and interest in obtaining renewable energy technology

- High to low environmental concern
- High to low self-sufficiency motivation

These two dimensions establish the differences between three groups seen within the sample

- Committed environmentalists
- Technophiles
- Independents

The arrows on the diagram show that the primary shift was a greater interest and motivation in self-sufficiency. The longer householders lived with the technology, they also became more concerned about the environment.



5.2 “Committed environmentalists”

These comprised approximately two thirds of the sample and were mainly PV and/or STW installers, although the micro-hydro and Glasgow wind turbine households would also sit within this category.

These households were the most affluent and most educated in the sample (AB in terms of SEG). They were extremely well informed about environmental issues and had considered them deeply. They appeared relatively affluent, but were not at all consumption orientated, often living in comfortable homes with nothing pristine.



That said they were often living in attractive period properties, with attractive gardens.

These households all exhibited a high level of environmental interest and behaviours *prior* to installing the renewable technology. The following characteristics were common

- All were recycling/re-using
 - All had vegetable patches
 - Used organic methods
 - Purchased ethically, for instance organic, free range, local
- Limited car use
 - Limited aeroplane use
 - Members of environmental organisations and charities such as Friends of the Earth and CPRE
 - Were sympathetic to or involved with political parties due to their environmental stance, in particular the Green Party and the Liberal Democrats
 - Some membership of Christian organisations such as the Quakers and Methodists

Specifically within energy efficiency they had

- Insulated their houses
- Double or triple glazed their houses and fitted draught excluders to windows and doors
- Already adopted certain energy conserving behaviours such as turning off lights and fitting energy saving light bulbs
- Made energy efficient purchasing choices, for instance gas condensing boilers and AA energy efficient appliances

Why did they install renewable technology?

Renewable technology was something that they tended to have been aware of for a long time through the organisations they were linked to or through newspapers or magazines. A number could cite specific articles from years ago that had first captured their imagination. Interestingly all appeared to have a close and familiar relationship with the Centre for Alternative Technology in Wales (CAT), which for many was really instrumental in converting what may have been a dream or vague concept into something that felt tangible and possible.

The primary motivation to finally install micro-generation appeared to be almost completely altruistic

- A desire to make a stand for something they firmly believed in
- A feeling that they wanted to be the pioneers and help the industry grow
- A desire to create something tangible that could set an example for others to take up their own renewable technology

"Until there is a big market out there the price won't come down. I wanted to support it" Male, Bristol, PV and STW

More immediate triggers appeared to be a combination of financial windfalls/apparent surplus (assisted by low consumption lifestyle) and an awareness of the availability of grants.

Other factors which had an influence on committed environmentalists when choosing the technology were as follows

- Suitability of location. PV was clearly considered the only viable option for the suburban locations, whereas the wind turbine in Glasgow was sited on farm land and had plenty of space. For this householder with micro-hydro installed, part of the motivation was restoring the former glory of the old mill by using the infrastructure to enable it to generate energy once more
- Cost. In one instance STW was installed at the same time as PV (which had been the original intended purchase) because they were able to save money by having it all done at the same time and because they were undertaking a major refit anyway. In another case STW had preceded the installation of PV because it had been the cheaper option to start out with and when it worked well and the owners became more confident and installed PV
- What would work with existing boilers (very little known about CHP amongst sample without micro-CHP)
- What seemed highest profile at the time. The Major Solar Demonstration grants had clearly had an influence on some PV installers

5.3 “Independents”

This group was far less environmentally driven than the committed environmentalists within the sample, though they were more intellectually engaged and informed on environmental issues than the mainstream sample. This group was a minority in our actives sample, and all three cases had installed wind turbines. One of the households was off grid.

These households had a keen interest in being as self-sufficient as possible. They tended to exhibit a sense of not wanting to be dependent on anyone else and liked to live a general “independent” way of life. The South Lancashire couple were conducting low level farming, keeping goats and making their own bees wax. Two were keenly collecting wood for use in wood burning stoves. Independents arguably lived in the least pristine households. The off grid couple were living in a caravan whilst building a new home.

Why did they install renewable technology?

Compared to the committed environmentalists, renewable technology appeared to be a relatively new area and topic for the independents group. Two had accidentally come across the idea of domestic renewable technology in the local pub! The off grid respondent had mentioned his problems with grid providers whilst drinking with friends when it was suggested that he look into alternative energies, whilst the other had happened on a local community meeting to discuss the possibility of installing renewable technologies. In both northern instances the presence of local wind farms appear to have had a positive influence in convincing respondents of the viability of wind (even when one actively opposed the wind farm’s arrival).

A strong part of the appeal of renewable energy was being free of their energy suppliers. Two of the sample were motivated to install micro-generation partly in response to what they saw as “greedy” and unreasonable energy suppliers.

- The off grid respondent had moved to an off grid location and quickly had a series of disagreements with the energy company about connecting his property to the grid. After installation he was very satisfied that he had managed to find another way to power his home which did not involved the energy company!
- Similarly the respondent in Essex was not on the direct gas mains (although he was on the electricity mains) so the gas was delivered once a year to a tank. He was alarmed and annoyed when a gas bill came and the price had gone up by 20%. He was also mindful of a potential energy crisis in the future and a desire to be free of the gas supplier finally triggered him to research wind power properly



The South Lancashire couple were concerned over the costs and availability of wood for wood fuelled boiler and had directly witnessed the negative impact of emissions from burning MDF on the vegetation in the surrounding area. This made them keen to research wind as an alternative.

Why wind?

Wind was the only real contender for these three householders because of their interest in self-sufficiency (all three expected to get financial payback in the relatively short term) and because of their windy locations. All were aware of the grant and this had certainly been an incentive to go through with the project.

Suburban locations were a problem for wind turbine enthusiasts, but not an insurmountable one. The Essex householder owned a fairly large garden in which to site the turbine but his land was extremely close to a new development of homes and he was unsure whether planning permission would be granted. He decided to put forward his plans anyway as he felt he had nothing to lose and he did not consider solar a viable alternative. In the event the plans were passed by a clear majority despite a high number of objections from local residents.

All had done some basic research on solar (PV and STW) and dismissed it on grounds of not being as good value as wind and because their locations were not perceived to be sunny enough. There was far less awareness of geothermal/ground source heat pumps or micro CHP and those in the independents group had not researched them.

5.4 “Techno-philes”

There were two techno-philes in the actives sample, who had no other strong motivation for installing technology beyond a strong interest in the technology itself. One had initially installed PV and more recently had become involved in micro-CHP trials. The other had recently purchased a wind turbine after attempting to make his own several years earlier!

It is important to note that although these respondents loved technology, these were not homes full of modern gadgetry. It was the idea of new innovations which could create energy from sun and wind which really captured the imagination of these households.

One of these households had taken such an interest in the technological aspect of renewable energy since installing PV that he registered for a MSc on Sustainable

Energy. He also liked to spend his leisure time considering specific issues facing the renewable industry, such as how the grid would cope with mass-scale domestic generation feeding it.

Why they chose to install renewable technologies

Like the committed environmentalist group their interest in renewable technologies appears to have been latent for years. The rationale to actually install the technology appears mainly to be a combination of

- I wanted one, I always have
- A life stage issue, possibly heading towards retirement and looking for projects
- Sufficiently affluent and triggered by availability of grants

One household had chosen PV because wind was not considered suitable in his suburban location and because PV was considered to be much more interesting than STW which he described as boring. On becoming increasingly informed this PV owner had actively pursued being included in the CHP trials.

The other household had always had a wind turbine in mind since arriving in a particularly windy location.

5.5 Overall satisfaction with their technology

All of the active households, committed environmentalists, independents and techno-philosophers, were proud of the technology that they had and gained great pleasure from the generation of their own energy. These households talked very openly about their technology to others, and could give examples of where they had influenced others to consider uptake. Several had been the topic of local newspapers or radio programmes and of considerable interest to passers-by.

They all appear to experience tremendous pleasure from having made their dream a reality, standing for something they see as pioneering technology, and for the sheer pleasure in producing their own energy. *'It's like growing vegetables'* was a frequently cited parallel. All believed that their project would go from strength to strength and predicted worse case fuel pricing scenarios.

"It gives a certain satisfaction knowing that you're using something you've produced yourself, like growing your own vegetables" Male, Dumfries, micro-hydro

"I tell people all the time that I generate my own electricity.. I love it.. I think it's fascinating" Male, N. Lancashire, off grid wind

The level of excitement and interest appeared relatively proportional to amount of electricity or hot water produced. Established wind turbine households were perhaps

the most enthusiastic about their technology and felt able to boast about their technology as being environmentally friendly and cost effective.

PV owners appeared a little more subdued in communicating the benefits to others, although they were highly engaged themselves. This was due to the long payback time and the relatively small scale of electricity produced.

STW owners were also a little more muted, although braver in communicating the benefits due to the lower start up cost and short term of payback. They were not as enthusiastic as PV or wind owners about the impact of the STW on their overall household.

One consistent disappointment across the sample was the fact that most households still experienced power cuts in their areas because the energy company could not risk power surging into the grid from domestic sources when technicians might be working on power lines. This was a particular frustration for independents because it ran counter to their whole self sufficiency mindset.

5.6 Specific changes in the four steps since installing the technology

The installation of the technology had impacted on attitudes and behaviour in all of the households interviewed. The change was more dramatic in households who had the least energy self-efficacy prior to installation but was apparent even in households where lots of energy conservation behaviours had been in place before. All households identified an increase in their motivation to be as self-sufficient as possible following installation of micro-generation.

"It's become a bit of a game, seeing if I can be as close to self sufficient as possible"
Male, Essex, wind turbine

5.6.1 Energy awareness

All respondents exhibited a relatively high energy awareness prior to installation of the technology. Committed environmentalists were the most aware.

"I have always been starkly aware that every time I put a light or boil the kettle it's another unit of fossil fuel we don't have that I am burning" Male, Bristol, PV and STW

"I've always been aware of fossil fuels running out. So I was more interested in the fuel side than global warming, though that was part of it." Male, Edinburgh, PV and STW

All groups felt more aware of energy within the home following installation. In contrast to the mainstream sample they all fluently use the specialised language of energy, for instance, "power", "surge", "kilowatt", "efficiency". Householders

demonstrated a keen interest in the level of KW produced from their appliances and took frequent readings. This had the effect of creating a latent comparison with the KW used in the house produced from non renewable sources.

Despite their keen interest in energy, they did occasionally take for granted the benefits of the power but said they felt more alert to when and why they were using power than before.

"It has made me far more aware, when I look at the lightbulbs I think that it's me, I am the one generating my own electricity.. it's made me really aware of the weather.. more connected as to what is happening at ground level" Male, N. Lancashire, off grid

There was some room for increased energy awareness in these households. There was not a particularly sharp understanding of the precise level of power that different appliances take (except for one household who had bought a gadget to tell him exactly that). Some things were still left on standby and a number of householders admitted to sometimes forgetting to turn things off. This was particularly the case with computers, and a number were observed to be still on during the interviews and house tours.

5.6.2 Concern about consumption

Prior to installation, feeling "good" or "bad" about the energy they used was common amongst households. This feeling was further accentuated once the technology was up and running. All householders experiences a greater level of concern than before in the areas of

- Waste. All were more alert now to power that is wasted and were more likely to admonish family members and even visitors who are wasteful of energy. One respondent proudly related a story about a lodger he had living with him who had begun to use the kettle less partly in response to the metre demonstrating electrical consumption situated nearby
- Costs. Householders showed a marked increase in engagement with bills and working out how costs are going. Many respondents found their bills not detailed enough and were keeping their own performance records

"Somehow it has converted us into looking after our own interests more... we have paid good money for it... it would be silly not to take advantage of it" Retired couple, Shrewsbury, PV

- Environment. Respondents felt good about producing clean energy and could begin to feel uncomfortable about having to use "bad" energy, for instance in poor weather conditions, or where they had to use a non renewable fuel source for another benefit, such as heating

"Once you do something like this it gives you a real buzz, you feel good when you switch on the TV, and you don't feel bad about it" Male, N. Lancashire, off grid

"We are not perfect but we ask ourselves what can we do to save on electricity"
Female, Shrewsbury, PV

"It's good for the planet and we get money because we export some to the electricity board" Girl, 9, daughter of Edinburgh PV and STW owners

"I did feel bad about the water feature we used to have in the old house, it did feel wasteful. Now I feel that we're doing nobody any harm" Male, Lancashire, wind and PV

"We are really impressed by how much electricity the CHP is producing. It's clever producing it as a by product at a time when you need it most like when it's cold and dark. I feel a bit better about the central heating when it's on... and feel worse about putting the [fake] coal fire on" Male, 50s, Cheltenham

Some respondents also experienced some confusion about what the most energy efficient behaviours were and experienced some mild anxiety as a result.

"We can't quite decide what is worse - getting rid of a freezer that works or using one that is energy inefficient" Male, 50s, Cheltenham

Another respondent had heard that energy efficient light bulbs were only more efficient than regular light bulbs if they were kept on for six hours at a time. Consequently he was not entirely clear what strategy to take with his lighting.

5.6.3 Developing energy self-efficacy

All households showed an increase in energy self-efficacy to a greater or lesser extent. This was apparent across the sample and was not linked to prior environmental concern. It was engagement with the technology itself which was driving energy efficiency and the more engaged households were with the technology, the more energy efficient measures they took on.

"If you hear it drumming away outside, you're going to switch lights off" Male, Dumfries, micro-hydro

"The advantage with is that it makes you think about your energy use more. You value it more...You realise it's easier to save it than make it. That is especially true of the hot water panel, but also with the electricity too" Male, Edinburgh, PV and STW

The following are examples of changes which were apparent in active households

- Being more vigilant about not leaving things on standby

- Changing or updating appliances to be more energy efficient
- Increasing number of energy saving light bulbs in house
- Reducing usage of kettle/lights/other electrical appliances
- Moving from electric to gas cookers
- Installation of electric radiators
- Choosing appliances, such as washing machines and showers, which will take hot water from the STW
- Tolerating slightly less comfort or performance than before, though not all family members would comply with this *"Occasionally I'll put the gas on when he's not looking in order to have a hot shower rather than a warm shower!"* Female, Edinburgh, PV and STW

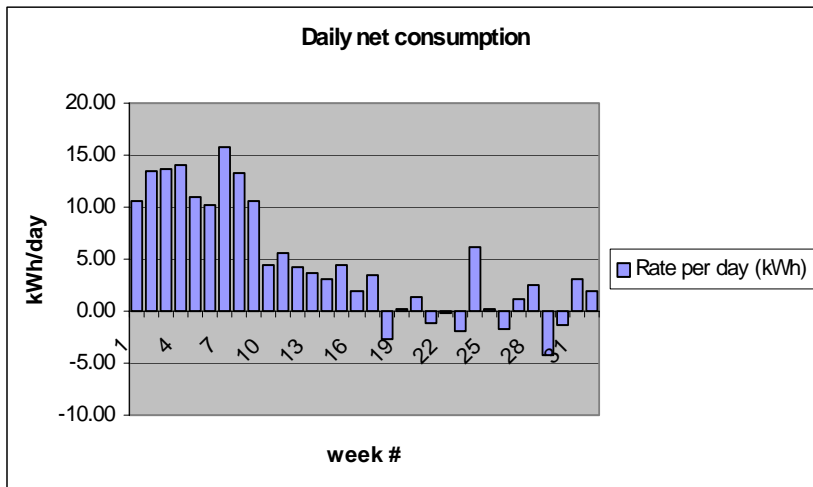
"The pay back and what you actually achieve is much higher for doing all these things [energy efficiency measures]" Male, Bristol, PV and STW

"When that red light is on we know we are exporting to the grid – so it's time to put the washing machine on or it's OK to boil the kettle. When that light is not on we make sure that everything is off – nothing is on standby cos we know that its probably really costing us" Older couple, SW Lancashire, wind

Some of the committed environmentalists said that they had already been quite rigorous in making sure their homes were energy efficient and the technology had reinforced, rather than radically changed, their behaviour.

"I suppose it's been a series of step changes, initially we were interested or concerned, so we had cavity insulation and we would pull curtains early that sort of thing. Then, when we had the PV installed, as we had spent our own money, we really began to take an interest" Male, 50s, Cheltenham

"Some of these things were already habits, it's just reinforced them" Male, Glasgow, wind turbine



Detailed records of consumption could really help householders identify the hidden culprits of energy consumption in their homes. One household had identified that their heated towel rail was using up a large amount of energy. They managed to cut their consumption by

nearly a third when they moved the towel onto a timer system (see drop in consumption after week 10 in diagram on left). Another household were using the carbon trust monthly 30 minute by 30 minute graphs of production and consumption. They retrospectively analysed their behaviour and actively considered steps that they could take to reduce consumption in future. Some households felt that they had taken so many steps that they had reached maximum efficiency.

"I think we've reached the limit, I've found new ways of switching things off that we thought couldn't be switched off before, but I'm not sure how much further we could go" Male, Edinburgh, PV and STW

Most householders had developed a preference for using power during weather periods that mean the power they used is from their technology rather than from the grid. The drive to use energy when it is being produced, rather than when it is not, demonstrates the clear connection that has been made between what they are doing and what is powering that activity. The tariff of Good Energy, which pays for production, not export, appeared to encourage this behaviour, with customers eager to use what they feel they are being paid for, although this was apparent to some extent in households with only export tariffs too. Examples of this preference included

- Use of washing machine during windy periods
- Using solar hot water during the hottest times. In one home children were discouraged from taking baths in rainy/cloudy weather and were encouraged instead to take a shower at the swimming baths!
- Advising visitors and workers to use their surplus energy during windy periods by bringing in their washing (this household was off grid so they could not sell surplus back to supplier)

"I want to feel that as much electricity as I can use is my own electricity" Male, Shrewsbury, PV

In homes with multiple fuel supplies respondents said that the non renewable energy supply seemed less appealing than before

- The couple in the micro CHP household talked about their reluctance to use electrical fires or gas fires for heating now that micro-CHP is in place
- The STW household with electrical showers had started to avoid using the shower and preferred baths
- One wind turbine household was in the process of installing additional PV panels to avoid using the diesel generator when the wind turbine was not working through lack of wind
- Another wind turbine household had installed electric radiators to avoid using the wood burner

Interestingly in the households which were still reliant on gas for heating, the new behaviours tended to orientate around the energy type they were producing (hot water and/or electricity) with far less shift in reducing or dealing with their gas consumption.

It is possible that energy awareness will diminish over time for some householders. One respondent with a recently installed wind turbine in Scotland said that he expected some of the changes, such as putting the washing machine on during windy periods, to deplete over time as the novelty of producing their own energy wore off. He had two young children and was perhaps less inclined to treat the technology as a full scale project or experiment than some of the older/retired individuals. Nonetheless, the individuals who had been living with STW for 26 years had become completely ingrained in their routine of only washing up and bathing at the end of the day when the water was at its hottest.

5.6.4 Believing you can make a difference

All active householders believed that they were making a positive difference by both reducing their own ecological footprint and by being living proof of what was possible. Those who felt they had seen positive and dramatic results from their technology appeared to be the ones most likely to wholeheartedly start to adopt yet more behaviours to maximise self-sufficiency. This appeared to be the case most with wind/micro CHP relative to PV and STW, due mainly to the greater scale of energy production.

Positive feedback about their production helped empower householders

- Easily readable meters for capturing KW produced
- Charts matching output to input
- Red lights showing high energy production
- Rebate and contact with energy supplier (often Good Energy in these households)

Active households that seemed less empowered were those with

- Poorer or harder to access meters
- Problems with energy company regarding rebate or connection to grid
- Lower level of power production overall, for instance STW only

Many householders were so delighted with the success of their technology, they were often considering installing a second or even third or had done so already

- PV followed STW in one house
- PV had followed wind turbine in another household
- Micro-CHP had followed PV in another
- There was much discussion about the merits of adding STW within PV houses
- There was a fair amount of excitement about “swifts” or mini wind turbines for those in more suburban settings
- Some interest about micro CHPs on prompting

As well as enhancing interest in energy, the presence of micro-generation did seem to increase commitment to sustainable development in its broadest sense. A number of respondents said that their lifestyle was becoming increasingly green, partly because the installation of their technology acted as a constant reminder and inspiration for new things they could be doing. This was most pronounced amongst the committed environmentalist group, but was seen in other groups as well

- Some talked about reconsidering car use and purchase. One had moved to a bio diesel car and another had sold their car a few months after installation
- Respondents were becoming more aware of flying as an unsustainable behaviour. Some introduced self imposed limits of the number or type of flights they could take. Another had introduced carbon offsetting within their workplace.
- Some moves to manual work from fuel powered work, a domestic lawnmower to scythe in one case

“I had been thinking about getting one of those sit-on lawnmowers, because it would be fun, and then once I got the turbine I started thinking more about the fuel it would take, and they’re not very efficient, and I ended up getting a scythe instead” Male, Essex, wind turbine

- The off grid household said he had become a nature convert over the three years since the installation of his turbine. He had planted over 3,000 shrubs and trees and was actively trying to support wild bird population

6. Schools

Summary

- The three schools contrasted starkly in terms of the cultural impact of their technology
- The primary school in England was not creating much energy from their mini solar and wind turbine, but it was having a very positive influence on the children in terms of their awareness of energy issues and their desire to be energy efficient within the school, and in some cases at home as well
- The Scottish primary school displayed less universal awareness of the environmental benefits of their renewable energy than the English school, but children had a strong association between their wind turbine and the physical benefits of warmth, light and entertainment
- The technology was built into the curriculum in both primary schools and teachers appreciated having a tangible and visible example of energy production to use in their lessons
- The secondary school was creating much more energy from their PV roof, but awareness of the technology and what it was for was low. There appeared to be no measures in place to save energy and in fact there was clearly a lot of wastage in energy and other resources. The technology had been included in the geography curriculum but so far only a very small number of children had completed this unit
- The three schools in the sample show that the level of culture change is not proportional to the scale of the technology
- A key difference between the schools was that the English primary school had installed their technology in response to a request from the children's council, whereas the local council had led the initiative in installing the PV roof at the secondary school and at the Scottish school. The "bottom up" approach seemed to be more instrumental in creating culture change
- Despite the huge differences in the schools, all felt that the technology branded their school an "eco-school", which was a reputation they had to live up to. All schools were planning further green initiatives

6.1 Overview of schools within this sample

High School X is a comprehensive school in the South of England with about 1000 pupils. The social and economic backgrounds of the pupils are very varied. The percentage of pupils receiving free school meals is above average. According to the latest Ofsted report attainment at the school fluctuates from year to year but is generally below the national average.



The school has a very large PV roof which had been incorporated as part of a roofing project. The cost of the PV roof was around £60,000 and the roof project overall about £200,000 and was paid for by the county council or grants. It was installed during summer 2004 in time for the new school year. The PV roof is expected to save around a quarter of the schools bills. The decision to install such technology was taken by the county

council, and the school governors agreed on basis that technology was going to save them money, it was free and it would be good to support a renewable energy source. In many respects the learning from this school parallels much of the learning from the passive households.

- A very low energy awareness/concern starting point
- Impact of technology dependent on the context in which it is presented
- Can start to achieve some shift in attitudes and awareness through the identity change that comes about by pioneering such a differentiating technology.

Primary school Y is a small community primary school in a conservation area in rural Oxfordshire (although within view of Didcot power station). The school has around 200 pupils, mainly from affluent families. Attainment on entry to the school is above the national average. The population of the school is fairly stable with little mobility amongst pupils or staff. It is the proud owner of a eco school -green flag .

This school has DIY solar system providing warm water to the swimming pool, (within a insulated Perspex dome), and a very small wind turbine and PV panel. The solar panel and wind turbine are not significant enough to feed the grid. The total cost for the latter was £2,500, which was raised by approaching Didcot power station and a renewable energy consultancy. In reality the wind turbine and panel merely power lights in the bike shed and a water feature. The decision to install such technology was driven by a request from the school council (comprised of elected children from each year, and with a sub group who were formerly on the eco-committee). In many respects the learning from this school parallels some of the learning from the committed environmentalist active households

- Already at a high level of awareness and concern. The school's identity is already "eco-friendly" (a term much used by the children!)
- The technology seems to create even further interest in self-sufficiency and energy self-efficacy

In this school it was the sheer presence of the technology that was driving some shift, not necessarily the results/feedback from it, due to its low level of real energy delivery.

Primary School Q is a large primary school in the new town of Glenrothes, Scotland. There are about 600 pupils on the school roll, which includes a nursery class. The school building dates from the 1980s and is situated in a large residential area. The proportion of children receiving free school meals is above the national average and pupils' attendance is in line with the national average. In 2005 the school was the subject of a favourable HMI report which praised the school's extra curricula activities and emphasis on personal social development including the thriving house system and school council. The school has an additional pupil Eco-council whose activities include enforcing litter policies (loss of house points) and creating posters to promote energy efficiency.

The school was approached a couple of years ago to take part in a pilot scheme which aimed to place five Swift wind turbines on five Fife schools. The Swift turbines are smaller and generate less electricity than the domestic Proven wind turbines featured in the active householder sample. The school was already working towards Eco-school status and saw this as an additional opportunity to display a commitment to environmental issues. The turbine was developed by Renewable Devices and all five pilots were supported by a £45,000 grant from a partnership including the Scottish Executive, Fife Council and Scottish Power. The schools did not have to provide any funding for the pilot. The turbine was installed on Primary School Q in May 2004.

This school is characterised by

- A fairly high level of awareness/concern about environmental issues pre installation of the wind turbine
- A shift towards greater energy efficiency. Staff and pupils attribute this shift to the stepped up activities of the Eco-council as they aim to get their gold flag. The wind turbine is enhancing rather than driving these activities.

Primary school Q has experienced quite a lot of teething problems with the technology and the turbine has had to be replaced and/or fixed several times. Additionally, the site is not as windy as originally expected

Given the acute differences between the schools, we discuss them separately within this report, but would recommend that further research is carried out in this area.

6.2 High school X

Prior to the installation of the PV roof there had been very little attempt at bringing in any sustainable behaviours to the school. This lack of engagement had arguably not changed that much after the installation of the PV roof. Staff themselves admitted there was no green ethos at the school. At the time of visiting the school there was

- No recycling of paper or cardboard (blamed in part on poor facilities in the area)
- Plastic cutlery and cups and polystyrene plates were all provided and used on a disposable basis with no attempt at recycling

- No noticeable attempt at composting or dealing with kitchen waste (apart from in a health and safety way)
- No noticeable gardening/sensory activities
- No attempts to switch off lights. Lights and fans were frequently on in unoccupied rooms with nobody in them (see picture of staff room opposite with two fans on). Lights were used in rooms that were basking in daylight
- No overt attempts to reduce water wastage
- Whole banks of computers were left on and did not seem to be switched off or on according to need or numbers of pupils in the class
- Heating was left on when it was not needed, for example over weekends or in rooms which were already warm

6.2.1 Overall feelings and attitudes towards the renewable technology

Awareness that the technology existed was not universal within the school. This can perhaps in part be attributed to the relatively subtle visual nature of the PV roofing, as well as problems with communication within the school.

a) Staff

All staff interviewed were aware of the technology, and were aware of its purpose. They knew

- It was solar power
- It produced electrical energy and that produced a reasonable amount of power, though they also knew it was not powering the whole school
- That it would save the school a reasonable amount of money

Attitudes varied amongst the staff according to how positive they were about the technology. The majority were upbeat and positive about it, and generally proud of such an addition to the school. Some of the more green minded staff felt that the roof fitted with their own ethos and reminded them such things were happening and made them feel encouraged for the future. Those who had some responsibility for the promotion of the school felt that the roof had enhanced the image of the school and presented it as “green” and pioneering. They were pleased that the school had attracted media attention and had more frequent visitors. They felt that the school would now “pull its socks up” to live up to the attention.

Several staff interviewed were more negative about the PV roof because they felt irritated that little had been done to integrate it into the curriculum and opportunities had been lost to effect change in attitudes and behaviour within the school. They also communicated some cynicism about the ongoing promotion of the roof despite the clear continued energy wastage and lack of environmental ethos in the school.

b) Students

Only about one third of the students interviewed knew about the solar panels. The interviews were conducted in geography classes and around the school. The geography classes were the source of knowledge and understanding with awareness of the roof much higher amongst pupils in these lessons than elsewhere.

Those who did not know about it appeared to have little to say about it, beyond the fact that they did not know about it and did not know what to think about it.

Pupils who did know about the technology displayed a reasonably good understanding of their purpose

- Captures the sun's energy and turns it into electrical energy
- *"Powers two computer rooms"* (which is what they are being told in geography)
- Saves the school money. Many thought this was the primary motivation for having it

A minority understood the panels on a more sophisticated level and said they were

- Good for the environment, good for the planet
- Helped reduce "pollution"

However, they did not display any knowledge about CO2 emissions or climate change

6.2.2 Changes in attitudes and behaviour

a) Staff

Staff felt that the school was slowly beginning to take on a greener identity. Since the installation of the PV roof, a new geography block had been conceived and built and was shortly to launch. There was some considerable interest about this from the press officer and the geography teachers. The block had been designed with a number of specific eco- features such as reflective roof and windows, sensor lights which automatically turn off in unoccupied rooms, overhanging roof and rainfall collection. All staff spontaneously mentioned that they did not think the geography block would have been conceived if it had not been for the fact that High School X was becoming known as a green school. They felt that the higher authorities at the school felt the school needed to start living up to the reputation which has started with the PV roof.

The school had also made some ambitious plans to start gardening lessons and projects to make use of the extensive grounds.

b) Students

Out of those who were aware of the PV roof, a significant minority of the mid to lower school boys seemed to have really engaged with the concept and to be interested in what was going on. There had been a considerable shift in awareness amongst this

group and to some extent a greater ability to make the connection between how the lights/heating are powered and concern for the environment.

"We were looking at the lights the other day in Science trying to figure out how the energy from the roof gets into the lights" Boy, Year 8

"I think it's really cool, really interesting, I often look at the panel and see what they have produced that day" Boy, Year 8

"It's made me think about the environment now, before I came here I never gave it a second thought" Boy Year 9 (endorsed by parent who mentioned son prompting her to turn lights off and save water)

"Now I turn my play station off at home when I go out" Boy Year 9 (he had conducted a mini school project on the panels)

6.2.3 Summary of what has worked and not worked

What has worked about engaging the school

Visibility/tangibility	Emotion/reward
Large roof for those who know what the squares are Large information panel with numbers showing energy created that day and in total in main traffic area Mini projects in geography Geography lessons giving examples of the scale of the energy produced e.g. two computer rooms being powered each day	Stream of visitors Press attention Feel school is innovative/special

What has not worked about engaging the school

Invisibility/intangibility	Lack of reward/emotion
Subtle nature of roof Not built into curriculum	No financial feedback No discussion/mention outside of geography lessons

6.3 Primary School Y

Over the last 12 years the school has gone a long way in learning about environmental and sustainability issues. This journey was initiated by a body called the Northmoor Trust, which was specifically set up and funded to carry out outreach work with schools. Apparently 12 years ago they knew very little about environmental issues, however it is clear that this philosophy is now very embedded in the school ethos and identity.

Green keepers poster

Be kind to people, respect each other
Take care in the play area
Walk or cycle to school more often
Keep doors shut
Don't leave taps running
Reduce waste packaging in your lunch box
Keep the classroom tidy
Use both sides of your paper
Switch off lights
Don't waste food
Put rubbish in a bin

The observation and interviews in the schools unearthed plenty of signs that this ethos is lived and breathed within the school

- Pupil designed energy saving posters by lights and taps
 - Shredding paper site for animal bedding and local stable
 - Re-using paper piles and a strict rule that all paper has to be used on two sides
 - Computers off, and only turned on according to need and numbers in the class
 - Lights off in unoccupied classrooms
 - Lights not being turned on in rooms evidently deemed adequately lit
 - Composting
 - Sensory garden
- Jam packed bike shed
 - Pupil led eco-committee recently merged into school council to reflect environment as a central school issue. Currently working on strategies to reduce waste/energy consumption
 - Involvement in some very successful specific energy/water conservation projects in an international school partnership
 - Delegation of pupils in charge of reading meters. Windows were specially installed into meters to enable reading. Currently in process of having water meter moved to enable pupils to read that too
 - Pupils given financial calculations to estimate bill size from meter readings as part of school project

Staff all consistently relay the green ethos of the school and proudly point out the green eco-school flag which was awarded permanently last year after 8 years. Pupils all proudly talk about their school as an eco-school and cite numerous examples of its activity.

Why did they install renewable technology?

The solar system for the swimming pool was designed and installed some 12 years ago at the start of the school's eco-journey by an enthusiastic parent-governor. This individual has now gone on to be involved in renewable energy on a professional basis.

Staff and pupils are very keen to stress that it was the students themselves that made a request for renewable technology as they wanted to see it working in their school (though one cannot help feeling that they were given a little help in that direction). The story in the school is that the staff tried to appease the request by the purchase of an Early Learning Centre windmill for £3.99 to demonstrate wind power. This was rejected by the children in the school council and the head was sent out to do better. He did briefly explore CHP but was put off by the high cost (£60,000) and finally came up with the affordable mini wind and PV solution through consultation with renewable energy companies. This was fitted at the start of 2005.

The primary motivation appears to have been educational, with the students demanding working examples of renewable technology in their school. It is also clear that the very strong sense of eco-identity will have driven this request too – with the school seeking more and more opportunities to express its identity and make a stand for its values in society.

6.3.1 Overall feelings and attitudes towards the renewable technology

a) Staff

Staff were all aware and interested in the renewable technology but they tended to relate more to the PV and wind turbine as something for the children, rather than anything for them, probably due to its very low energy production. Their relationship with the technology appeared to be more about what it says about the school.

"It's as clear a statement as who we are as that green flag flapping out there on that pole" staff member

Some appeared to have more respect for the solar system on the pool in terms of its real energy production value. However this has a far lower profile in the school due to being fitted sometime ago, its rather tatty/DIY appearance and because not many were clear about exactly how it was operating.

b) Pupils (aged 6-11)

There was unanimous awareness of the mini wind turbine and solar panels, although far lower awareness of the solar system working by the pool. Pupils were seen

standing around the dials in the playground looking at how much power was being generated by the wind and sun.

Almost all the children were very engaged and interested in the technology

- Talk about it with great pride and say it makes them and their school feel special
- Relay parrot fashion things they have been taught about it
- Talk with great excitement about how it works
- Can talk language of energy, batteries, cables, power, and even ampage in some instances

Detailed understanding varied. From age 7 to 11 there was an extraordinary level of awareness of the role of renewable energy

- It takes energy from the sun and wind
- It gives us light and warmth
- It gives us power in our school
- It helps us a lot and *“keeps Mr Jones’s bills down”*
- It means we can spend money on other things than the bills
- It’s good for the environment (limited)

“It means we do not waste the power station’s electricity” Girl, 7

However it was clear that only a tiny minority really had a true understanding of its limited capacity and many were under an illusion of far greater power:

“I tell my granny that our school is special. We make our own electricity” Girl, 9

A small minority of the children were aware that the technology was only able to power the bike shed and water feature. These children expressed some disappointment of its limited remit, although also felt good about the impact



“We often turn on the bike sheds for fun, I feel good about the bike shed lights” Boy 10

6.3.2 Changes in attitudes and behaviour

a) Staff

There did not appear to be any particular shift in individual awareness or energy self-efficacy amongst staff since the arrival of the latest renewable technology, but there did seem to be an increased desire to build in more renewable and sustainable technologies into the school.

Recently they had had introduced into the school a software package (eco-warrior) which reads the meters remotely around the school and shows on a 30 minute basis the change in consumption in the school. This is displayed on a computer permanently in the centre of the school. This is part of their continued drive in energy and water conservation.

In addition they were currently looking into installing grey water recycling to reduce water usage in the school.

b) Pupils

There were not dramatic shifts evident amongst pupils in terms of their energy efficacy, which seemed to be good prior to installation anyway. However it was clear that the presence of the technology (especially given the powerful context for its introduction), meant that pupils were better able to make the connection between their concern for waste, “Mr Jones’ bills”, the environment and the usage of electricity and heating in the school.

A couple of pupils said that the technology had made them more likely to make an effort to reduce energy usage at home.

“When I see it, it reminds me that I must remember to turn off lights and the computers, and not leave things on standby at home” Boy, 10 who had complained about its low energy production

“I think it’s really good, it’s something physical so it makes you realise that steps can be taken to make a difference” Girl, 9

6.3.3 Summary of what has worked and not worked

What has worked in engaging the school?

Visibility/tangibility	Emotional/reward
Sheer physical presence of wind/PV in playground Meter works like mile-ometer, shows high to low, no need to understand units	Told that saving money means more things for playground Getting green flag Water feature (really liked) Bike lights (not previously there, told can have them now) Sense of pride/being special

What has not worked in engaging the school?

Visibility/tangibility	Emotional/reward
Low energy production	Where low energy production is realised by pupils

6.4 Primary School Q

This school had an extremely strong commitment to developing children’s sense of citizenship and personal responsibility. The school’s enthusiasm for promoting environmental awareness was strongly linked to this wider theme of citizenship as it was seen as an excellent context to teach children about personal responsibility and real life issues that children could directly relate to (such as litter and traffic). Therefore whilst the school’s activities as an Eco-school were well liked, other activities such as allocation of house points and the school council were higher profile in terms of seeming to represent the school’s core values and identity.

The school’s activities in the area of sustainable development were numerous

- Eco council meet weekly to discuss and agree activities and ideas
- Lots of efforts to reduce litter dropping around the school. Problem areas have been targeted and penalties introduced (150 house points deducted for dropping litter, and 500 for lying about dropping litter!)
- The timer on the heating has been rescheduled to reduce use
- Paper recycling bins everywhere
- Class projects often focus on environmental issues, particularly in the upper school. Some classes has been tasked to measure water/energy use at home and generate ideas for how usage can be reduced
- Child designed posters above light switches to remind pupils/staff to switch off the lights
- Door shutting encouraged to conserve heat
- Children allowed to tell teachers off for leaving on taps/computers/lights
- Daily weather bulletins and regular weather projects
- School travel plan being implemented and children encouraged to think about how they get into school

However, there was also some evidence of less environmentally friendly practices too

- No evidence of recycling other than paper
- Quite a lot of computers on but not being used
- “Always on” hot water urn in staff room (in fact the children were told at the launch that the wind turbine would provide the same amount of energy as required for the hot water urn)
- Poor insulation in mobile classrooms

Why did they install the technology?

Installation of the technology was remarkably straightforward for this school. Most of the administration was managed at the council and by the technology supplier. A letter and questionnaire arrived from the council about the wind turbine pilot and the school responded by filling in the questionnaire. The primary motivation to respond to the letter appears to have been educational, in both an academic and pastoral sense. The head teacher felt that the visible presence of renewable energy on site could help stimulate science/maths projects as well as support the schools overall focus on caring for people and the environment. Getting “something for nothing” and potentially saving costs was seen as an additional benefit. The headteacher also noted that the school liked to get involved with new and exciting projects because they helped with the school’s reputation amongst parents and in the local community.

6.4.1 Overall feelings and attitudes towards the renewable technology

a) Staff

All staff interviewed knew about the wind turbine and the fact it generated electricity for the school. They also knew that there had been some problems with the technology and that it did not turn all the time.

Staff did not see the wind turbine as an isolated phenomenon and linked it very much with the Eco-school initiative. Some saw the wind turbine as a useful tool in the effort to obtain the higher prize of a gold Eco-school flag. A number of teachers said that lots of parents had noticed it and it was good for the wider community to have visible sign of what is going on at the school. In fact, teachers seemed to value the reputational benefits of the wind turbine much more highly than its energy generation benefits. This is due to the fact that teachers were only very vague about what the wind turbine was actually achieving in terms of energy production. Specifically teachers did not know

- What level of energy the turbine was generating
- Where in the school this energy was going
- How much money this might save the school
- What had gone wrong with the turbine and why it had needed so much initial maintenance

The council and the technology suppliers had done an enormous amount to help the school use the technology

- Weekly metre readings with older pupils
- Giving talks/lessons to pupils
- Monitoring and mending the technology

In fact, beyond initiating the curriculum projects the school staff had not had a great deal to do with the installation of the technology and did not feel full ownership over it.

"It was given to us" Teacher

Consequently many of the staff had failed to engage with the actual technology and were a little bit unsure about it and pleased that they did not have to deal with it/fix it. In addition the metre was broken at one stage and when working only displayed a series of numbers which were hard to interpret by themselves. Teachers had not yet received any feedback on costs or levels of generation, though the council and head teacher hoped that would change once the technology had been working continually for a year. Interestingly the 17 teachers in the school were all women and this might explain a lack of involvement with the gadgetry side of micro-generation which had engaged so many of the men in our sample.

More generally, teachers had quite a limited understanding of environmental issues and not many felt entirely confident describing exactly why the wind turbine was environmentally friendly. No one in the school used the term "sustainable development" and whilst sympathetic about environmental issues, no one appeared to be truly passionate about it.

Teachers were very positive about the educational benefits of the wind turbine. Teachers found the turbine useful because it was something tangible to point to when talking about certain subjects such as weather, energy or the environment. At the initial stages the turbine had been a useful prompt for poetry, art and model making projects (see box). It had also helped with maths lessons because children could draw charts and graphs based on metre readings. Enthusiasm for the turbine was waning slightly as the school got more used to it.

b) Pupils

The turbine itself was very visually prominent and all the children noticed that when it was windy it turned. According to teachers the children were more likely to talk about and go to look at the turbine on windy days when the spinning of the turbine became more impressive. Almost all the children interviewed could describe reasonably accurately what it was for.

"It makes us energy" girl, 9

They had a strong association between the wind turbine and the physical benefits that they could feel and see themselves.

"It keeps us warm" girl, 7

"It gives us lights" girl, 9

"It makes the TVs work" boy, 9

Most of the children believed that the turbine powered the whole school and some thought that it might be producing energy even when it was not turning. A couple of children remembered that they had been told it powered the same amount of electricity as required for the teachers' hot water urn and had become confused.

"Does it make the coffee in the staff room hotter?" girl, 8

There was some limited awareness amongst the older pupils that the turbine was good for the environment, but it was hard for them to articulate why, though some made a tenuous link with cutting down trees. When asked how other schools without wind turbines got their energy the children struggled to answer

- The electricity men?
- Scottish Power?
- Through pylons and wires?
- *"Maybe they are cold"?*

Although many children were vague about the exact benefits, they had been left with a strong impression that their school was special, they were lucky to have the wind turbine and overall it was a positive thing for the school. The launch, press coverage and ministerial visit in 2004 had reinforced this positive feeling, though the general profile of the wind turbine did seem to be diminishing over time.

6.4.2 Changes in attitudes and behaviour

a) Staff

There was clearly a slow move towards enhanced energy efficiency within the school and teachers were trying to implement some of the behaviour changes emerging from the Eco council such as shutting doors and turning off lights and computers. Some effective practices in the school included

- Rewarding individual pupils by allowing them to turn off lights when leaving a classroom
- Janitors briefed to leave sticky notes on appliances left on overnight
- Pupils allowed to reprimand teachers for wasting energy/water

However, there was no feedback loop in terms of calculating energy usage/costs and feeding this back to teachers and consequently the whole area could lack a sense of urgency or reality for some of the teachers. In addition there was no explicit link in the school between the wind turbine and energy usage/costs which could make

teachers view the turbine as a bolt on extra rather than an inherent part of the “eco-system” of the school.

Most of the staff appeared to view Eco-schools and the wind turbine as a teaching tool rather than as an opportunity to change behaviour or reflect on their own lifestyles. Some admitted that although they were happy to incorporate environmental surveys or quizzes into their lesson plans, they did not think much about environment issues and often forgot to recycle or save energy.

“It is difficult to remember to do some of these things and we’re all in control of our own little areas” Teacher

b) Pupils

According to teachers, children had developed an enhanced energy and weather awareness as a result of the turbine. It is hard to verify this without baseline data though it was certainly true that all the children, and not just the oldest/brightest, had an excellent grasp of energy related vocabulary such as gas, electricity, pylons and energy. They also seemed very conscious and appreciative of the benefits of energy such as warm, light and comfort.

As described above in the staff section, there was a slow move towards energy efficiency in the school, but pupils perceived this as driven by Eco-school initiative and not connected to the turbine. The children did not seem to have realised that in order to enhance the impact of their wind turbine, the school needed to become more energy efficient overall. A small number of children knew that the wind turbine is “environmentally friendly”, and most knew that saving electricity is “environmentally friendly”, but there was no evidence that children had made any connection between these two ideas.

The lack of effective feedback regarding the turbine and usage/costs was partly due to the fact that the school had experienced a lot of technical problems with the turbine in the early days. Now that the turbine had been working for a year the head teacher felt it was time to calculate the money they had saved and reward pupils with a choice of treat such as new playground equipment.

There is a danger that when proper feedback about total energy generated and the link to costs is communicated to staff and pupils there may be some disappointment about its low production. The site is not as windy as expected and the turbine was not turning on the day of the case study visit. One solution would be to make sure that energy efficiency savings and the energy generated from the turbine are communicated together so that the school’s energy efforts are seen holistically.

6.4.3 Summary of what has worked and not worked

What has worked in engaging the school?

Visibility/tangibility	Emotional/reward
Wind turbine turning Launch and press coverage Multiple curriculum links in art, geography, science etc	Conscious link with warmth, light and entertainment Getting green flag and working towards next grade up Sense of pride/being special Link with learning outcomes and rewards

What has not worked in engaging the school?

Visibility/tangibility	Lack of emotional/reward
Wind turbine not turning (poor site) Metre not working/hard to interpret	No feedback about total production/cost saving

7. Conclusions

- Energy conservation and efficiency issues were not considered important amongst the mainstream sample. Measures to improve energy efficiency were seen as intangible and not emotionally rewarding. People also found it hard to believe that domestic energy use could really harm the environment
- Issues such as purchasing organic or local, composting and recycling were much more tangible for people and were felt to have an emotional benefit (see diagram below) The conservation of paper and water were also highly engaging, and people mentioned wanting to save trees. Awareness that these behaviours are good for the environment was high, even if only a minority were taking consistent action
- The installation of micro-generation had a profound effect on many individuals across the sample, in homes and schools. Instead of being invisible and un-engaging, they could now see the creative process of energy being made and powering their buildings. The emotional benefits from the energy, such as warmth, comfort, light, entertainment, cooking and cleanliness, were now strongly associated with the energy source and made people feel good about their technology.
- There was evidence of behaviour change in the area of energy efficiency. Users experienced an added incentive to conserve energy because this intensified the value of the energy they were creating. This effect was widespread but not universal

Visibility/tangibility	Emotional/creating
Wind turbine turning Solar panels present on roof CHP/air source heat pump boxes visible Water heat varying with time of year and weather Meters capturing how much power produced that day/in total Red light showing when power being exported to grid (key trigger for using own power) Production charts produced by Carbon Trust in micro CHP household	Meter showing how much power produced that day/in total Rebate/cheques for power generated Reward of reduced bills

- A minority of individuals who had micro-generation in their homes or schools appeared largely unaffected by it. This was more likely in the schools or in the passive sample. A lack of engagement was more likely where individuals had passively acquired the technology, where communication about what it did was poor and where the benefits, such as lower costs, were not noticed
- Many individuals, in particular those in the active households, passionately believed that micro-generation should be more strongly supported by government. They advocated more and better grants for home installation and wanted the government to stand firm on the stipulation for micro-generation to be included in new build developments. They saw the value of micro-generation as being not only in energy generation, but also about education and improved energy efficiency.

“Great ideas are like seeds, they get planted and start gestating - there will come a time when people will be able to afford these things and when they will make economic sense” Retired empty nesters, Shrewsbury, PV

