How are new technologies brought into energy efficiency programmes?

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Abstract

This paper looks at the process leading up to the incorporation of new technologies into energy efficiency schemes within the UK. It begins with a review of the energy efficiency schemes currently in place, and the "cost-effective" measures that they offer. From this, it identifies the types and number of properties that cannot be helped through existing schemes, i.e: those off the gas network, those with no cavity walls or roof space that can be insulated, high-rise blocks, those in a state of disrepair, etc.

The paper then looks at the technologies that can potentially fill the gaps in measures on offer (both insulation and heating), and the need to look at their relative merits. These include ancillary benefits – e.g: customer preference; ease of use; impact on building maintenance requirements; planning constraints; industry capacity issues; etc. – as well as basic figures for upfront capital costs and the effect on the running cost of a home.

The paper then reviews the process for the piloting and incorporation of technologies into Government schemes such as Warm Front in England, or HEES in Wales. This shows the importance of piloting options, and of ensuring that all aspects of the supply chain are fully addressed before new measures are rolled out.

Introduction

The UK[1] currently has two overall targets relevant to household energy efficiency. These are the UK Government's climate change target and fuel poverty target. The climate change target is to reduce greenhouse gas emissions by 20% on 1990 levels by 2010, with the household sector expected to play its proportionate share. The fuel poverty target is to eradicate fuel poverty among vulnerable households by 2010. (DTI / DEFRA 2001)

Fuel poverty is the situation where a household cannot afford to keep itself warm. Within the UK, fuel poor households are defined as those that need to spend 10% or more of their income on fuel.[2] There are some 4 million fuel poor households in the UK. (DTI 2002). Fuel poverty is a particular problem within the UK because of the poor energy performance of much of the housing stock. Improving energy efficiency is therefore a key policy tool for the eradication of fuel poverty.

With these dual targets – environmental and social – the Government therefore has to ensure that energy efficiency initiatives not only achieve overall carbon savings by 2010,

1. The UK is the United Kingdom of England, Wales, Scotland, (together forming Great Britain), and Northern Ireland. Energy policy is devolved only to Northern Ireland. Energy *efficiency* policy and programmes are devolved to each country. Hence the need within this paper to be clear on the countries referred to. Whilst the bulk of data within this paper is drawn from England, the paper relates to the whole of the UK.
2. Two definitions are currently in use: the situation where a household needs to spend 10% of its a) diposable income OR b) full income on fuel, in order to attain a satisfactory heating regime, defined as 21° C living room temperature and 18° C throughout the rest of the house (DTI/DEFRA 2001).

but also that they are targeted in such a way that the necessary fuel expenditure of vulnerable households is reduced to below 10% of their income, *irrespective* of housing type and income level. If either of these targets seems off-course, then the Government needs to act to ensure that additional resources, and/or new measures, are brought into play. This paper looks at the second of these options, i.e.: the process leading up to the incorporation of new technologies into energy efficiency schemes.

Current Programmes

THE MAIN INITIATIVES IN PLACE

There are three major types of energy efficiency scheme in operation within all countries of the UK: Government-funded energy efficiency schemes for low-income households; schemes run by private energy companies under a regulatory obligation; and local authority (municipality) schemes run according to local priorities. The principles of these are described below:

Government-funded Schemes[3]

The Government-funded schemes are directed at low-income households, with the aim of tackling fuel poverty, in particular amongst those most vulnerable to cold-related ill health. These schemes offer a range of measures as predetermined by the Government, up to some maximum value installed cost. In England, this value is £ 2 500 (c. 4 000 Euro) for eligible pensioners, and £ 1 500 (c. 2 400 Euro) for eligible families with children and other groups.

Where the cost of measures exceeds the grant maximum, either some measures are not installed, or funding from other sources is drawn in. There are varying degrees of flexibility in the grant maximum in the Devolved Administrations.

Energy Company Schemes

Energy company schemes are run as part of a regulatory obligation. In Great Britain, there is full competition in domestic energy markets. The obligation, in the form of a target to save a set amount of energy, is placed on the energy suppliers. This is the Energy Efficiency Commitment. A large proportion of savings must come from low-income ("priority") households. Apart from that, however, the companies can meet their energy saving target with whatever measures they wish, as long as the energy savings have been accredited by the Energy Saving Trust. Naturally, the companies will wish to meet their targets at minimum cost.

In Northern Ireland, where liberalisation of the energy markets is not so far advanced, the obligation on the energy companies still refers to expenditure, under the Energy Efficiency Levy initiative, and there is less pressure from competition to focus on cost-effectiveness.

Local Authority Schemes

Local authorities have been issued with guidance on investing in energy efficiency over many years. Recently, a target has been set for local authorities in England to improve all of their own stock to a "Decent Homes" standard by 2010. (ODPM 2002) This refers to cost-effective measures only. Guidance under HECA (the Home Energy Conservation Act 1995) also encourages them to invest in cost-effective measures. In Scotland, the guidance is not restricted to cost-effective measures.

Apart from the specific Decent Homes target and similar targets being developed in the Devolved Administrations, local authorities are free to invest in any energy efficiency measures they wish, or indeed, none at all. This depends on their own commitment to energy efficiency, their interest in innovation, and the needs of their local community and housing.

MEASURES USED

Criteria for Use of Measures

The basic, "staple" measures used in all of these schemes are broadly similar. The measures are generally those that have been a) accredited by the Energy Saving Trust for their energy savings; and b) have been determined by the Energy Saving Trust to be cost-effective.[4]

Cost-Effectiveness

Cost-effectiveness of measures can mean several things. Two major interpretations are: a) a positive net present value on the investment for the householder; and b) a lower cost of saving than of producing energy for the nation.

As seen above, the significance of cost-effectiveness is slightly different in each situation. Under the Government-funded schemes, only cost-effective measures are offered, in order to make these publicly funded initiatives cost-effective to the country in an economic sense, and to maximise the potential energy savings from public expenditure. The energy suppliers also nearly always offer only cost-effective measures, as they are trying to meet their energy saving targets at minimum cost. They get no extra credit for supporting more expensive measures. They may occasionally run a small, publicity programme with more expensive measures, but the contribution to their overall energy saving target is minimal. Local authorities again try to stick to measures that give them maximum savings per pound spent, but they are free to invest in more innovative and expensive measures if they wish and can afford to do so.

"Staple," Cost-Effective Measures

The following is an indicative list of "staple" measures as originally set out in the proposals for the Energy Efficiency Commitment. (DEFRA 2001)

- cavity wall insulation,
- A and B rated boilers,
- loft insulation (professional),
- loft insulation (DIY),

3. The Government-funded schemes are Warm Front (England), HEES (Home Energy Efficiency Scheme, Wales), Warm Deal and Central Heating for Pensioners (Scotland), and Warm Homes (Northern Ireland).
4. The formal role of the EST in terms of accrediting measures is limited to EEC.

- Fridgesaver type appliance schemes,
- A-rated appliances,
- heating controls,
- CFLs,
- tank insulation,
- draughtproofing.

This list is continually reviewed and updated in guidance from Ofgem, the energy regulator. (Ofgem 2002)

GAPS IN CURRENT INITIATIVES

The question posed at the beginning was: will Government meet its carbon target *and* its fuel poverty target by 2010? If not, what new resources and/or what new measures need to be brought into play?

The End-Result Required

The fuel poverty target is to ensure that, as far as is practicable, no household needs to spend more than 10% of their income on fuel. In England, vulnerable households have a minimum income guarantee (MIG) of around £ 5 000 (c. 8 000 Euro) – sometimes more, depending on family circumstances. This suggests that if the fuel bill of every low-income home was reduced to £ 500 p.a. (c. 800 Euro), then fuel poverty would be eliminated. Table 1 shows what is necessary in an average home, in terms of "staple" measures currently on offer, to achieve this[5]:

From Table 1 it seems that if every low-income home either had an efficient gas central heating system and a major insulation measure, or retained a less efficient gas central heating system but with two major insulation measures, then fuel poverty would be eliminated among all vulnerable households. It is important to note that further work is required to consider annual fuel bills for heating regimes involving under-occupancy and the heating of only living areas, in order to fine-tune the conclusions that can be drawn. The effect of different property types / sizes also needs investigation.

Hard-to-treat Homes

Unfortunately, there are two problems. One is a problem of resources, namely, that it would cost an awful lot to ensure that every low-income household had an efficient gas central heating system, when many such households will be significantly above the MIG income level. Better targeting is therefore necessary.

The second problem is that not all homes can accommodate the "staple" measures on offer. In particular, many homes may fall into one or more of the following categories:

- are off the gas network,
- have no cavity walls or roof space to insulate,
- are high-rise blocks where gas and insulation are impracticable,
- are in a state of disrepair where measures cannot be installed without wider refurbishment work,

Such homes are considered to be "hard-to-treat" – for technical reasons, or practical reasons (e.g: disruption involved), for cost reasons, etc.

It is important to note the findings of the previous section, which showed that any *one* of the above categories may not

Table 1: Indicative total fuel costs for a typical semi-detached, whole house[5].

	STAPLE MEASURES NOT POSSIBLE TO INSTALL	Heating System	HEATING PATTERN	
			Standard (morning and evening heating)	Extended (all-day heating)
	For comparison: no insulation, peak electric heating		£ 1 779 /yr	£ 1 937 /yr
	No gas / no cavity / no loft insulation	elst	£ 1 135 /yr	£ 1 173 /yr
(a)	No gas / no cavity insulation	elst	£ 932 /yr	£ 956 /yr
	No gas / no loft insulation	elst	£ 838 /yr	£ 859 /yr
(b)	No gas	elst	£ 635 /yr	£ 649 /yr
	No cavity/no loft insulation	*old gas*	*> £ 755 /yr*	*> £ 811 /yr*
	No cavity / no loft insulation	gas	£ 570 /yr	£ 607 /yr
(c)	No cavity insulation	gas	£ 501 /yr	£ 525 /yr
	No loft insulation	gas	£ 466 /yr	£ 485 /yr
	All standard measures with old gas c.htg		> £ 497 /yr	> £ 512 /yr
	All standard measures, gas central heating		*£ 398 /yr*	*£ 408 /yr*

elst – electric storage heating
gas – gas central htg. ('A' 90% effic.)
no cavity – these values are based on a solid wall house
old gas central heating values based on boiler efficiency of 60%

1 morning & evening weekdays, all day weekend
2 all day weekdays and weekends

source: BRE 2002a

5. Heated to 21° C in the living area, using SAP2001 fuel and standing charge prices. Further work is required to consider annual fuel bills for heating regimes involving under-occupancy and the heating of only living areas.

Table 2: Summary of the Numbers of Fuel Poor in Hard-to-Treat Homes, England 1996[6].

Characteristcs	Percentages		Numbers (000s)		
	non-fuel poor	fuel poor	non-fuel poor	fuel poor	totals
Whole Stock	78.2	21.8	15 356	4 287	19 643
Not connected to mains gas supply	64.9	35.1	1 684	912	2 596
Without cavity walls	72.4	27.6	4 882	1 857	6 739
Not connected to mains gas supply and without cavity walls	54.1	45.9	473	402	875

source: BRE 2002b

necessarily be a problem in terms of using staple measures, and therefore combinations need to be looked at.

Quantifying the Problem

In order to identify whether this "hard-to-treat" issue is a significant problem, it first needs to be quantified. A preliminary quantification has been carried out by BRE, the Buildings Research Establishment, using data from a the English House Condition Survey, the Government's sample survey of housing stock (EHCS 1996) – Table 2[6].

By looking at the totals, these figures reveal the magnitude of the problem in England:

- 21% of all fuel poor homes are not connected to gas, compared with 13% of all homes,
- 43% of all fuel poor homes do not have cavity walls, compared with 34% of all homes,
- 9% of all fuel poor homes are neither connected to gas nor have cavity walls, compared with 4% of all homes.

Thus, at a first approximation, at least 21% of the problem of fuel poverty – 912 000 homes – needs the development of measures additional to those generally on offer under current schemes (though note that such measures may entail extension of the gas network, and are not restricted to new technologies per se.) This is important; at this level of analysis, it says that Government needs to do more than it is currently doing, if it is to reach its fuel poverty targets.[7]

A more detailed analysis is yet to be commissioned, using more recent EHCS 2001 data, and this will investigate the proportions of vulnerable households – those who are covered by the fuel poverty target to 2010. It should also reveal more about possible extensions to the gas network. The analysis is likely to show the problem to have grown more acute. This is because some of those fuel poor homes that can be treated will have been helped in the intervening five years, leaving a higher proportion of fuel poor homes as those that are hard-to-treat.

Options for New Technologies

This section looks at the new measures that may be brought into play. But first it looks at the framework within which these need to be assessed.

A STRATEGIC APPROACH: POLICY

Now that the problem has been identified and quantified, the obvious policy question is this: Shall we sort out the easy and cheap homes first, and leave the difficult and expensive homes until later? By the time we get round to the latter, we may find that:

- the cost of currently expensive technologies has fallen,
- new, more effective technologies have become available,
- policy priorities have shifted, e.g: a focus on replacing poor quality old housing with new homes,
- other factors have changed, e.g: income levels have risen so much that fuel poverty is no longer an issue.

There is also an economic argument that focusing funding into cost-effective measures (and indeed, other investment) now will generate wealth for the nation that allows investment in higher cost measures later.

Against these optimistic scenarios must be considered:

- the opportunity costs of not dealing with properties at the time they are encountered; a lot of effort is spent by all energy efficiency schemes in generating consumer interest, and this effort is wasted if applicants are turned away and "asked to come back" in five years' time,
- how to foster innovation in technologies and wider market transformation, if the problem is not grappled with,
- the social equity issue of helping only those that already live in relatively better homes,
- the possibility that little will have changed in five years' time in the solutions available, but the timescale for eliminating fuel poverty in these homes will have reduced from eight to three years.

6. Using the "full income" definition of fuel poverty. Using the "basic income" definition yields a higher proportion in fuel poverty, by 3-5 percent.
7. A debate must still take place as to likely rises in income and heating standards by 2010 and beyond, and also to what extent the energy efficiency "deficit" could be compensated for by cash subsidies. That debate is outside the scope of this paper, which focuses on energy efficient solutions.

A STRATEGIC APPROACH: JOINING UP POLICIES

If a decision is made that hard-to-treat homes do need to be addressed, the technological options need to be considered not only in terms of their upfront costs and benefits, but also in terms of their ancillary, non-energy benefits, and how these link in with wider policies.

Ancillary benefits may include:

- protection of fabric of building,
- reduced condensation and mould growth,
- improved aesthetics, internal and external,
- improved sound proofing,
- reduced incidence of burst pipes and ice dams,
- improved air quality,
- improved fire retardance.

Not only should these benefits be considered when selecting the technology; conversely, when initiatives are run to pursue policies associated with these other benefits, this may be an opportunity to incorporate the new energy efficiency measures.

A STRATEGIC APPROACH: DELIVERY

However beneficial technologies are for policy, and however compatible they are with wider policy issues, they must be deliverable. This means there must be a credible infrastructure in place, and the technologies must be acceptable to the consumer. On both of these issues, the difficulty is to predict changes in infrastructure and attitudes before the technologies have been brought on stream.

LIST OF TECHNOLOGIES

Table 3 lists the currently available non-staple technological options with the potential to save fuel bills, together with their ancillary benefits[8].

It is important to note when considering options for new technologies the complexity of prioritising these. This is the result of a number of factors, including: the difficulty of obtaining "indicative" information, for instance, the unit cost of a measure under a large-scale scheme before the scheme has been set up; the variety of difficult-to-compare factors that need to be considered; and the option of combining measures into packages involving countless permutations.

Developing the Schemes

PAST EXPERIENCE

There is already some experience of incorporating new measures into existing schemes, although these have been limited to cost-effective measures.

Government-funded Schemes: HEES / Warm Front

In its initial guise, the Home Energy Efficiency Scheme offered just insulation measures. The Energy Saving Trust then piloted the inclusion of compact fluorescent lamps (CFLs). This showed that CFLs could be delivered within the HEES delivery mechanism, and that HEES clients would use them wisely. In 1999, a more radical review of HEES was undertaken in England (DETR 1999), which led to the incorporation of heating measures into the grant package, in particular: gas central heating, gas wall heaters, and electric storage heaters.

The measures and the grant ceiling were selected on the basis of:

- cost-effectiveness,
- ability to reduce household energy bill by a significant amount,
- widespread and proven use within the UK,
- technical appropriateness for many fuel poor homes within England.

Measures were ranked, or prioritised, within packages for any particular household, by installing the highest impact measure first, and adding to this as many of the lower impact measures as could be afforded within the grant maximum.

The inclusion of new measures was piloted by the Energy Saving Trust in three areas of England, and identified a number of problems relating to the delivery of heating systems. However, the Government decided to launch the scheme, and iron out problems as they arose. This had pros and cons: on the one hand, because of a quick start, many fuel poor homes were helped immediately; on the other, because of the problems with infrastructure, many other fuel poor homes were subjected to very long waiting times for installation (up to 9 months) and / or poor quality installations. It has taken around two years for these issues to be more or less resolved.

Energy Company Schemes: SoP/EEC

SoP and now EEC schemes have developed slightly more organically. From 1994 to 2000, there was a regulatory requirement for measures to be cost-effective. Hence the energy suppliers were restricted in the measures they were able to use. Since 2000, the cost of measures is not prescribed, and energy companies can employ any measure that has been accredited by the Energy Saving Trust to save energy.[9] This has led to some companies using technologies such as:

- solar thermal,
- ground source heat pumps,
- external wall insulation,
- radiator panels,
- dimmable CLFs.

These schemes are being developed by individual energy suppliers rather than as one, national initiative. Suppliers will in general pilot the use of a technology on a small scale first, to ensure reliable delivery and good customer satisfaction.

8. Note the absence of micro-CHP, the emerging technology of CHP units in individual homes. These are not yet proven in use, and have therefore not been considered in this investigation, although their potential as an effective energy efficiency measure over the course of this decade is great.
9. In 2000, the energy saving target was extended to include gas suppliers, thereby allowing the inclusion of gas heating systems as well as insulation measures.

Table 3: Non-Staple Technologies with the Potential for Use, and non-Financial Benefits / Disbenefits.

Technological Options	Annual running cost, three-bedroom semi-detached house (£ p.a.)	Ancillary Benefits	Disbenefits
Scenarios using Staple Measures Only			
Baseline property – poor insulation and heating	1 356	-	-
Benchmark property – current Warm Front measures applied, no gas	975	-	-
Target property – current Warm Front measures applied, with gas	627	-	-
New Options			
35 sec oil condensing combination boiler + radiators	679	widely used technology	high end-use carbon emissions; requires delivery infrastructure for refuelling
50mm external wall insulation	1 040	protects external wall; aesthetic appeal	may not be seen as aesthetically advantageous; possible planning issues
10mm latex foam internal wall insulation	1 216	easy to apply; effective against cold bridging; soundproofing	not widely used at this thickness
Auto feed wood burning boiler + radiators	792	environmentally sustainable; could initiate general market take-up	not widely used; infrastructure and refuelling issues
50mm Wallreform	1 047	protects external wall; aesthetic appeal	may not be seen as aesthetically advantageous; possible planning issues
LPG condensing combination boiler + radiators	1 132	widely used technology	requires delivery infrastructure for refuelling
Communal LPG + combination boiler + radiators	920	widely used technology	requires delivery infrastructure for refuelling
$6m^2$ solar heating	1 272	environmentally sustainable	still requires base heating; may encounter planning issues
Dry lining	1 099	can increase responsiveness of central heating system by isolating thermal mass of walls	entails significant disruption to householder; slightly reduces size of rooms
Oil fired CHP + radiators	508	widely used fuel; environmentally sustainable way of using it	requires delivery infrastructure for refuelling; requires dense housing
LPG fired CHP + radiators	996	environmentally sustainable way of using fuel	requires delivery infrastructure for refuelling; requires dense housing
Ground source heat pump + radiators	689	environmentally sustainable	not widely used; may require space by property for laying underground loops
Coal boiler + radiators	789	widely used technology	requires delivery infrastructure for refuelling
Underfloor insulation	-	soundproofing	disruptive to install
Biomass CHP + radiators	-	environmentally sustainable way of using fuel	requires dense housing
Heat recovery ventilation	-	reduced condensation and mould; improved air quality	noise; effectiveness depends on customer use
Secondary glazing	-	soundproofing	
Emerging insulation measures	-	a variety of emerging benefits	not widely used, untested

Source: The list of technologies and the table of running costs is from the report by National Energy Services Ltd (NES) to the Welsh Assembly Government. (NES 2002)

Note the absence of micro-CHP, the emerging technology of CHP units in individual homes. These are not yet proven in use, and have therefore not been considered in this investigation, although their potential as an effective energy efficiency measure over the course of this decade is great.

It is difficult to say at this stage what success and what problems each technology has encountered under SoP / EEC schemes. But clearly, the more technologies are used by energy suppliers, the more confidence there will be among other players to use them.

BUILDING ON EXISTING ACTIVITY

Another area to look at is the activities of individual local authorities and housing associations. The Energy Efficiency Partnership for Homes has commissioned an investigation of local authority activity, the aims of which include:

- ascertaining what new technologies are currently used by local authorities,
- ascertaining what experience local authorities have had with these technologies,
- identifying the barriers to the adoption of new technologies by local authorities.

The report (Impetus 2003) concluded that local authorities were doing relatively little with non-staple technologies, partly because there is plenty of work still to do on staple technologies, but partly because local authorities lack the confidence to try out new things that have not been fully proven in mass markets. Nevertheless, limited use of most of the non-staple technologies was identified that would allow practical lessons to be learnt in order to inform the decision making process for larger schemes.

The next step for the Energy Efficiency Partnership for Homes is to undertake a similar investigation into the activities of housing associations, which may be less risk-averse in trying out new techniques.

CHOOSING TECHNOLOGIES

Table 4 (overleaf) shows an attempt to solve the hard-to-treat problem for a semi-detached house in England, by splitting into three basic scenarios (as suggested in BRE 2002a but ignoring loft insulation), and considering a variety of packages. The figures were developed using energy modelling software.

Table 4 has provided the key figures on initial (investment) costs and running (fuel) costs for various packages, yielding the following conclusions:

Solid Walled Houses in Gas Areas:

1. Installation of efficient gas central heating and loft insulation as the main measures will reduce the fuel bill to around £ 600.
2. Adding external wall insulation will then reduce the fuel bill to below £ 500, although at an increase in the upfront capital cost of over £ 3 000.

Cavity Walled Houses Outside Gas Areas:

1. Extension of the gas network and installation of efficient gas central heating, cavity wall insulation and loft insulation as the main measures will reduce the fuel bill to below £ 500.
2. Where gas network extension is very costly or impracticable, however, oil central heating, wood pellet boilers, and ground source heat pumps all reduce the fuel bill to below £ 500 when combined with cavity wall insulation and loft insulation. The upfront capital cost of oil heating is around £ 1 500 to £ 2 000 lower than that of the other two options.

Solid Walled Houses Outside Gas Areas:

1. Extension of the gas network and installation of efficient gas central heating and loft insulation as the main measures will reduce the fuel bill to around £ 600.
2. Adding external wall insulation will then reduce the fuel bill to below £ 500, although at an increase in the upfront capital cost of over £ 3 000.
3. Where gas network extension is very costly or impracticable, however, oil central heating, wood pellet boilers, and ground source heat pumps all reduce the fuel bill to below £ 500 when combined with external or internal wall insulation and loft insulation. The upfront capital cost of oil heating is around £ 1 500 to £ 2 000 lower than that of the other two options. The upfront capital cost of internal wall insulation is around £ 2 000 lower than that of external wall insulation.

The decision must ultimately be made by Government, with a view to political considerations such as how much it is willing to spend per household, and the link to other policies. Clearly the implications for long-term environmental policy of installing gas, oil, wood pellet boilers, or ground source heat pumps are quite different. The decision making process is still underway.

PILOTING

Once the technologies have been selected, DEFRA and DTI between them intend to commission pilots. A specification for these has been commissioned from National Energy Services (NES). This will look at:

- the process for selection of geographical areas for piloting technologies,
- recruiting households for installation of the pilot technologies,
- the management of the pilots,
- the evaluation criteria for the pilot technologies.

Some technologies are more developed than others, but piloting is important for all of the options under consideration, in order to test out the full range of issues – from delivery route to in-use effectiveness to reliability to customer satisfaction. The technologies may not be limited to the Transco findings above; they may include communal systems as well, which will have to resolve issues of ownership, controls, and maintenance.

In Wales, where the smaller size of the country allows more flexibility, the process of piloting ground source heat pumps, wood pellet boilers, and oil heating is already under active consideration. In England, it is expected that the pilots will be initiated some time in 2003.

Table 4: Possible Packages of Measures for the Three Basic "Hard-to-Treat" Scenarios, Using a Semi-Detached Property.

Description of Semi-Detached Home				Energy Rating							
		Installed cost	Amortised capital	Cost per £ saved (ex CO_2)	NHER out of 10	SAP Out of 100	Running cost (£ p.a.)	CO_2 emissions (tonnes p.a.)	Cost of Carbon Dioxide Abatement	Running cost (inc CO_2)	Cost per £ saved (inc CO_2)
A	Base property (solid wall, no gas)	0	0.00	NA	0.9	1	1,273	14.9	284.45	1557.45	NA
	Solid wall houses in gas areas										
1	Condensing boiler plus up to the hilt loft (300 mm) and jacket (125 mm) insulation.	2 610	191	0.25	6.2	63	520	4.6	87.82	607.82	0.20
2	External wall insulation plus loft (300 mm) and jacket (125 mm) insulation	3 630	121	0.25	3.2	26	790	8.1	154.64	944.64	0.20
3	Condensing boiler plus loft insulation, tank insulation, and external wall insulation	5 580	301	0.36	8.1	82	426	3.3	63.00	489.00	0.28
4	Internal wall insulation plus tank and loft insulation	1 320	44	0.11	2.6	19	887	9.6	183.27	1070.27	0.09
	Cavity wall houses outside gas areas										
B	Base property (empty cavity, no gas)	0	0	NA	1.3	4	1,146	13	248.18	1394.18	NA
5	Gas condensing plus cavity wall plus loft insulation	2 580	201	0.28	8.2	83	426	3.3	63.00	489.00	0.22
6	Gas condensing plus cavity wall plus loft insulation and gas connection	3 330	239	0.33	8.2	83	426	3.3	63.00	489.00	0.26
7	Electric storage plus up to the hilt insulation	1 970	110	0.21	4.6	41	623	6	114.55	737.55	0.17
8	Oil boiler plus loft, cavity and tank insulation	3 130	238	0.35	9.2	80	461	4.1	78.27	539.27	0.28
9	Ground source heat pump plus loft, cavity and tank insulation	5 395	339	0.46	9.6	69	413	1.3	24.82	437.82	0.35
10	Wood pellet boiler plus loft, cavity and tank insulation	4 630	338	0.50	7.4	69	466	1.7	32.45	498.45	0.38
	Solid wall houses outside gas areas										
11	Gas condensing plus loft etc. insulation finc 750 gas connection	3 030	229	0.30	6.2	63	520	4.6	87.82	607.82	0.24
12	Gas plus solid wall plus loft	5 580	301	0.35	8.2	83	425	3.3	63.00	488.00	0.28
13	Electric storage plus solid wall plus loft etc.	4 970	210	0.32	4.6	41	623	6	114.55	737.55	0.26
14	Oil boiler plus external wall, loft and tank insulation	6 130	338	0.42	9.2	80	460	4.1	78.27	538.27	0.33
15	Ground source heat pump plus external wall, loft and tank insulation	8 395	439	0.51	9.6	69	413	1.3	24.82	437.82	0.39
16	Wood pellet boiler plus external wall, loft and tank insulation	7 630	438	0.54	7.4	68	466	1.7	32.45	498.45	0.41
17	Oil boiler plus internal wall, loft and tank insulation	3 820	261	0.34	8.7	73	498	4.6	87.82	585.82	0.27
18	Ground source heat pump plus internal wall, loft and tank insulation	6 085	362	0.43	8.9	64	441	1.3	24.82	465.82	0.33
19	Wood pellet boiler plus internal wall, loft and tank insulation	5 320	361	0.47	6.5	61	506	1.7	32.45	538.45	0.35

source: Transco 2002

INCORPORATION OF NEW TECHNOLOGIES INTO SCHEMES

As previously mentioned, new technologies are already coming on stream under EEC and through individual local authority programmes. The pilots should provide an open and rigorous evaluation of the practical issues relating to the use of these technologies on a larger scale. They should therefore lead to:

- more confidence among energy suppliers to offer the technologies to their clients,
- more confidence among local authorities to use the technologies with their residents,
- an understanding by Government of the technologies most effective in relieving fuel poverty,
- an understanding by Government of the infrastructure and other issues to address when incorporating the technologies in Warm Front.

Subsequent to piloting, the relevant industries and others can be informed of the outcome as early as possible, to allow time for preparation. In particular this entails gearing up the necessary infrastructure. The specifications for the technologies, and eligibility criteria, can then be worked up. Ideally, this will be done in consultation with all relevant stakeholder groups, through fora such as that afforded by the Energy Efficiency Partnership for Homes. This would ensure that all aspects of delivery are addressed systematically.

Conclusions

The objectives of a policy initiative have a profound influence on the target group to assist, and the means of assistance. Thus climate change policy may wish to focus its attention on more affluent households that use the most energy, and are able to invest in the cleanest technologies. However, fuel poverty policy requires a focus on vulnerable households, offering measures that are most effective at reducing running costs.

It is easy to put off the "hard-to-treat" areas until the easier options have been dealt with. This may result in new options coming on stream by the time the problem is addressed. However, it runs the risk that the problem becomes more acute, and opportunities to tackle it organically are missed.

The vicious circle that is the problem of market transformation applies. Technologies that are not widely used do not instil confidence in those who develop schemes; and are therefore more difficult to incorporate into schemes even where they have potential. Yet a large-scale subsidy scheme, offering new measures to some 100 000 households each year, actually has the potential to help wider market transformation.

There is therefore a need for the sharing of practical experience, and looking at what individual, perhaps more innovative local authorities, housing associations, and others have achieved. Fora for ongoing liaison on such issues are much needed, with continuous input of practical experience as well as lab testing of technologies.

Once technologies have been selected for serious consideration in an initiative, they need to be piloted in order to test out their effectiveness from the beginning to the end of the delivery chain. This will help to avoid unpleasant surprises when the technologies are rolled out in large-scale schemes.

Glossary

BRE (Buildings Research Establishment)
cavity wall – a common build form in Great Britain, entailing two walls with an air gap in between, that can be filled with an insulating material
DEFRA (Department for the Environment, Food, and Rural Affairs) – formerly DETR, responsible in England for policy on energy efficiency, fuel poverty and climate change
DTI (Department of Trade and Industry) – responsible for energy policy across Great Britain
Energy Efficiency Commitment (EEC) – an obligation on all energy suppliers in Great Britain to reach energy saving targets in the household sector
Energy Efficiency Partnership for Homes (EEP) – a UK-wide partnership of stakeholders in domestic energy efficiency, facilitated by the Energy Saving Trust
EST (Energy Saving Trust) – a not-for-profit organisation that receives Government funding to run a variety of sustainable energy programmes
fuel poverty – the inability to heat a home, as a result of low income and poor energy efficiency
hard-to-treat homes – homes that cannot easily or cheaply be treated with "staple" energy efficiency measures
HEES (Home Energy Efficiency Scheme) – the Government's energy efficiency scheme to tackle fuel poverty (see "Warm Front")
Home Energy Conservation Act (HECA) – a requirement on all local authorities to report on progress towards achieving 30% energy saving targets in the household sector
MIG (Minimum Income Guarantee) – a level of income for specific groups of householders, guaranteed by the state
Ofgem – Office of Gas and Energy Markets, the energy regulator
staple measures – measures generally offered under large-scale schemes within the UK (most of the cost-effective measures)
Standards of Performance (SoP) – the former regulatory obligation on energy suppliers to meet energy saving targets from 1994-2002
Warm Front – the Government's energy efficiency scheme to tackle fuel poverty in England; equivalents in the Devolved Administrations are **HEES** (Wales), **Warm Deal** (Scotland), and **Warm Homes** (Northern Ireland)

References

BRE 2002a: Buildings Research Establishment "Hard-to-treat Homes" – a paper for the sub-group of the Energy Efficiency Partnership for Homes Fuel Poverty Strategy Group

BRE 2002b: Buildings Research Establishment "Analysis of Fuel Poverty in Hard-to-treat Homes using EHCS 1996 Data" – a paper for the sub-group of the Energy Efficiency Partnership for Homes Fuel Poverty Strategy Group

DETR 1999: Department of the Environment, Transport, and the Regions "The New HEES, A Scheme for Warmer, Healthier Homes"
DEFRA 2001: Department of the Environment, Food, and Rural Affairs "Energy Efficiency Commitment 2002-2005 Consultation Proposals"
DTI / DEFRA 2001: Departments of Trade and Industry / Environment, Food, and Rural Affiairs "The UK Fuel Poverty Strategy"
DTI 2002: Department of Trade and Industry "Fuel Poverty in England 1998"
EHCS 1996: Department of Trade and Industry "The English House Condition Survey 1996 – Energy Report"
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NES 2002: National Energy Services "Alternative Measures for HEES – Welsh Assembly Government – Final Report"
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