



Domestic Heating: Use of Controls

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¹ This report is a public consultation document and will be used to inform Government decisions. The information and analysis in the report forms part of an integrated, public domain knowledge base that is managed and held by Defra's Market Transformation Programme. The policy scenarios and action plans are illustrative, intended to stimulate discussion and do not imply commitment by Government nor by any other body. Further information and briefing on related issues at www.mtprog.com

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Executive summary

Introduction

There is evidence that a significant proportion of householders do not understand their heating controls, do not set them appropriately, or do not use them at all. This project aims to:

- Reach a crude initial estimate of the shortfall in energy savings due to poor understanding and operation.
- Identify the best way forward to improve the position.

Six focus groups were carried out with members of the public who lived in homes with gas central heating. The groups included men and women, of different ages, working and not working, with and without children, and from different socioeconomic groups. They were carried out in north and south of England.

In the focus groups participants discussed a number of topics in an open ended way, rather than answering a preset series of questions. The discussions were tape recorded and transcribed verbatim. The transcripts were analysed to pick out key issues, to identify where differences or consensus existed among participants, and to find how differences related to the characteristics of participants.

Use of controls

There were people who avoided using their programmer altogether. This tended to be because they found it tricky to use or because they believed that it was more efficient to leave their heating running all the time.

People who did use their programmer were generally flexible and used their heating controls to respond to changes to their routines. However, there were instances of people sticking rigidly to the programmed times.

Use of thermostats varied a great deal. At one extreme, people adjusted them often, when feeling too hot or too cold, going out, coming in, going to bed or getting up in the morning. At the other extreme people did not adjust them at all, but this was very rare.

Similarly, there were people who reported changing the setting on their thermostatic radiator valves (TRVs) on a daily basis while others said they had never changed them in spite of dissatisfaction with the temperature in a room.

People said they opened windows for a short time to cool down their home when they had allowed it to overheat. They also reported leaving them open for longer while the heating was on in order to have fresh air as well as warmth, with little concern about the waste of energy.

Understanding controls

There was a great deal of variation in how well people understood the workings of their heating controls. Some people admitted to a lack of interest in how they worked.

A number of misconceptions about heating controls were mentioned. These included believing that the room thermostat is simply an on/off switch or thinking that it works like a dimmer switch.

Some people understood how use of heating impacts on energy consumption. However, there were people who did not realise that turning down the thermostat would reduce energy consumption. There was also considerable debate about whether intermittent or continuous use of central heating is more efficient.

Importance of comfort, cost and energy

On the whole comfort was the main consideration in determining heating use. As a result there was some evidence of extravagance. However, there were people who were careful with their heating because of the cost implications.

People barely considered the environmental impacts of heating use. This applied even to people who said they were concerned about the environmental impacts of energy consumption in other contexts.

Views about controls

There was a clear message about the need for larger buttons. This was seen as important by both young and older people.

The dominant view was that programmers are too complex. However, some people found them straightforward and some even found them too simple although this was rare.

Position of programmers had a large impact on ease of use. People reported a number of problems including programmers placed too high, too low, out of reach, somewhere dark, or partly hidden.

Views about information

Generally people did not find their manuals easy to understand. To improve the situation, they suggested including plenty of photos, pictures and diagrams, simplifying the instructions and making them procedural, and keeping the manuals short by focusing on the basics.

Some people had asked installers for advice but they reported that they had not been able to spend enough time with them.

Energy consequences of failure to use heating controls properly

If half the owners of heating controls obtain only half the energy saving benefit from them because of incorrect usage, the national energy savings foregone are estimated as 14 TWh/yr.

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This is larger than the national domestic energy consumption of "wet" appliances (washing machines, dishwashers, tumble driers).

Recommendations

EST should:

- Raise awareness with households about the cost and environmental impact of heating use.
- Introduce heating controls and associated concepts in schools, when children have the time and interest to learn about them.
- Inform installers about the ways that they can help households make better use of their heating controls.

Heating controls manufacturers should:

- Redesign products to include large buttons.
- Have a variety of products of different complexity to suit different needs. Indicate the complexity so that an appropriate product can be selected.
- Rewrite instructions to make them more user friendly.

Installers should:

- Select heating controls to suit the household, in particular the desired complexity.
- Place heating controls in convenient positions.
- Be prepared to spend time providing advice on operation.

1 Introduction

1.1 Background

The efficiency of domestic wet central heating systems (the most common type) depends on effective controls. A correctly controlled system is expected to save around 20% of the energy that would be consumed by an uncontrolled system: on a national scale that amounts to 67 TWh/yr. Building regulations, best practice, and other initiatives aim to get a proper set of controls installed with every system and assume that, when they do, the full energy savings are achieved.

There is evidence that a significant proportion of householders do not understand their heating controls, do not set them appropriately, or do not use them at all. There are some projects in progress or recently completed that set out to examine these problems for instance the need for large clear displays and buttons on controls installed for older people.

1.2 Aims

This project aims to build on this work in order to:

- Reach a crude initial estimate of the shortfall in energy savings due to poor understanding and operation.
- Identify the best way forward to improve the position.

1.3 Method

A brief overview of the method is presented below. Further details are covered in Appendix A.

Six focus groups were carried out with members of the public living in homes with gas central heating. Three of the groups were run in the south of England and three in the north. A good mix of participants were recruited to ensure that we heard a wide range of views and experiences. Participants included men and women, of different ages, working and not working, with and without children, and from different socioeconomic groups. The material used for recruitment is included in Appendix B.

In the focus groups participants discussed a number of topics in an open ended way, rather than answering a preset series of questions, to explore their understanding and habits with regard to their heating systems. The topics included: how much people adjust their controls and under what circumstances, how they think controls work and affect efficiency, how they found out how to use their controls and what they think of the sources of information available. The topic guide used to direct discussion is in Appendix C.

The focus groups were tape recorded and transcribed verbatim. The transcripts were analysed to pick out key issues, to identify where differences or consensus existed among participants, and to find explanations for particular views.

1.4 Overview of report

The report begins by describing how people use their space and water heating controls and other means of changing the temperature of their home (section 2). It goes on to set out people's understanding of their controls, highlighting misconceptions about what controls do and how they impact on efficiency (section 3). It discusses the factors that are taken into account when deciding how to use heating controls (section 4). Finally it presents people's views about controls and the information provided by manufacturers and installers (section 5 and 6).

2 Use of controls

2.1 Programmer

Some people reported not using their programmer at all. The reasons given were many and varied. Two came up repeatedly. Firstly, it was thought to be more efficient to leave central heating on all the time (discussed in detail in section 3.2).

Secondly, programmers were seen as tricky to use. However, lack of confidence with programmers did not preclude people from relying on them. Some focus group participants who would not touch the programmer themselves did in fact have them set, either by another members of the household or by other people.

“I’d probably make a right mess of it, I’m not very mechanically minded. I’d rather just flick a switch up and down.” (woman, aged 30-60, Leeds)

Confidence with programmers varied a great deal. It was suggested that younger people had more confidence with programmers, particularly digital ones, than the older generation because they had grown up with computers. However, there were examples of young people who shied away from using them. There was also a feeling among some women that the programmer should be left to men, but this was far from universal.

The perceived lack of flexibility associated with programmers was mentioned as a reason for not using them. It was felt, particularly by those with young children, that programmers did not fit with an unpredictable lifestyle. It was also suggested that the weather was too changeable to make programmers worth using, although this was an unusual point of view.

“I just do it as I want it, I turn it on and off... Because I’ve got a young boy I’m up quite early, I put it on then for a couple of hours and then I turn it off... I’m up all different hours so it’s much easier to do it as and when I want it.” (woman, aged 30 to 60, Watford)

Programmers were seen as inconvenient to use. Fiddly programmers were seen as a bother by busy people who could not spare the time to set them or change them. Programmers placed in an awkward position put some people, but by no means all, off using them. Some people objected to being woken by the sound of the heating firing up in the morning.

People who did not use programmers simply left their heating on all the time or only turned it on when required. The latter group pointed out that forgetting to turn the heating on or off could cause problems (*“you wake up in the middle of the night and like, oh my god, switch the heating off, it’s really bad”*). However, on the whole they said they did not mind having to wait while their home warmed up.

“We have to run down an hour early and then go back to bed. It becomes a way of life doesn’t it? The children are hardy and they can get up in the cold.” (women, aged 30 to 60, St Albans)

People who did use their programmers particularly valued getting up to a warm home. They tended to allow half an hour to one hour warm up time. Some spoke with pleasure about hearing the central heating fire up in the morning.

“It is like the heart of the house really, the house is waking up, and you know when you get up say half an hour later at least it is not freezing cold. It is a good sound I think.” (man, aged over 60, St Albans)

In homes where programmers were used, occupancy patterns sometimes but not always determined heating patterns. Where the whole household was out during the day, people universally had their programmer set it to come on first thing in the morning then again in the evening. Where somebody was in during the day, some households kept their heating on all day and only had it go off at night, but others had it set to go off during the day. The latter group put this down to frugality or to habits established when they were working. They kept warm during the day by pressing the boost button as needed, relying on supplementary heating, or keeping active.

On the whole people who used their programmers were flexible and made adjustments to suit their needs. For instance, they reported using the boost button for an extra hour of heat if they stayed up late or advancing to the next programme if they went to bed early. If they felt too hot they turned the heating it off for a while or if they expected a cold night they ran it overnight with the thermostat on low.

There were instances of people sticking rigidly to the programmed times but these were few and far between. For instance, one woman described how her ex-husband would not allow her or her children to have the heating on for any longer than the pre-set timings (*“two hours in the morning and three at night, that was all we got, it was cold!”*) At the other extreme, a young couple said that they never changed their programmer and even left it to come on twice a day while they were on holiday.

Adjusting the programmer when the clocks change was widespread. It was very unusual for people who used their programmer not to do so, although some did not do so immediately (*“when we had one of the old fashioned ones we left it for a few months and then he did it eventually”*) or left the task to the most mechanically minded member of the household. Some found it tricky (*“sit in the airing cupboard for an hour pressing the button”*) but persisted nevertheless.

2.2 Room thermostat

When asked what temperature they generally had their room thermostat set at, some people simply did not know (*“I’m not really sure, about three quarters of the way up”*). Among those who did know, a broad range of temperatures were reported from 6 degrees (*“we use the fire all the time... if it does get cold [the central heating] will turn itself on and stop the house freezing up”*) to 30 degrees (*“we like to live in the Caribbean over the winter”*).

There was also a great deal of variation in how room thermostats were adjusted. Five patterns could be identified. The first pattern involved only adjusting it occasionally. In particular, people turned it up in cold weather and down in warm weather. Some also

reported leaving it on low when on holiday or turning it down low at night rather than turning the heating off during cold spells.

The second pattern involved using the room thermostat as an on/off switch and therefore adjusting it more frequently. In some cases, but not all, people actually believed that the thermostat was a switch (as described in section 3.2). People reported using the thermostat to turn their heating on or off when feeling hot or cold, going out, coming in, going to bed, and getting up in the morning. Closely related to this was the third pattern which involved turning the thermostat up or down in the same situations, but not necessarily until it “*clicked*”.

The fourth pattern also involved frequent changes to the room thermostat setting but for an entirely different reason: different members of the household adjusted it to suit their different needs.

“In our house [the temperature] varies. It depends who’s walking past it because if my wife’s walking past it it’s on full whack. When I walk past it it gets turned down. It doesn’t need to be that high. It’s just ridiculous.” (man, aged 30 to 60, Leeds)

Finally some people did not use their room thermostats at all. This was unusual but occurred for a number of different reasons. These included thinking that the room thermostat was broken, believing that it is better to use their TRVs or boiler thermostat instead because of misconceptions (described in section 3.2), or worrying about forgetting to turn it back.

2.3 Thermostatic radiator valves

In some homes with TRVs, people made no use of them at all. For instance, a young woman who had just had a new radiator with a TRV put into her dining room had not adjusted it even though she and her family found the room “*freezing*” (“*I just say, oh well, put your slippers on.*”)

Two reasons were given for not using TRVs. Some people were put off by not understanding how they worked (as described in section 3.2). For others the problem was the effort needed to use them:

“They are really annoying to have to bend down and twist the blooming things to nought aren’t they? Just to turn one bedroom down. Just don’t bother... I pump the thermostat up and just let it do it’s thing.” (woman, aged 30 to 60, St Albans)

However, TRVs did have their adherents. Some people reported adjusting their TRVs once to suit different heating needs in different rooms and then leaving them on this setting. In particular they used them to keep certain rooms, mainly bedrooms, cooler than the rest of the home.

“We never have them on upstairs at all because nobody likes a hot bedroom. All the rooms downstairs, like the lounge is say on 5 but then the dining room is only on 4 or something like that... Most of the time they are on that number.” (woman, aged 30 to 60, St Albans)

TRVs seemed to be popular with teenagers and young adults who used them to exercise control in their own rooms. For example a young man living with his parents said that he left the room thermostat to them but usually kept the TRV in his bedroom turned right down.

Some people made short term adjustments TRV settings to cool down or heat up a room. For instance, a mother with young children explained that she changed the TRV in her children's room so that it was warm during the day when they were playing there and cooler at night.

A more unusual pattern was for people to use TRVs to adjust the temperature of the whole home, rather than individual rooms.

"I haven't got a [room] thermostat so I've had to go round the whole house, because once the house gets hot every room gets hot, so I've had to turn every thermostat off and although I have turned the heating off it doesn't work fast enough so I've turned every one to nought and then I throw all the windows open and then I have to put it back on!" (woman, aged 30 to 60, Leeds)

2.4 Supplementary heating

People reported having a variety of types of supplementary heating. Coal effect and living flame gas fires dominated. However, electric fan heaters, electric imitation coal fires, electric convector heaters, electric bar heaters, coal fires, log burners, and back boilers were also mentioned. While some people hardly ever used their fires because they felt they provided little heat, other people made more use of them.

The dominant pattern was for people to use them occasionally. Their use depended on the weather, with people turning them on if it was "very very cold" or, more unusually, in autumn when it was not cold enough to warrant turning on the central heating. It also depended on mood or whim ("*it is not necessary... just because I like the flames*"). Fires with flames were described as "*mesmerising*" or "*cosy*".

In contrast, in some situations supplementary heating was used on a regular basis. In particular it was used where only one person was at home during the day so that just one room could be heated rather than using central heating in the whole home. It also came in handy to deal with deficiencies or problems with the central heating. For instance, a young man used it for "*instant heat*" in a room where he felt the central heating was insufficient ("*a big massive room with just two [radiators] in, that always takes a good 10 minutes at least*"). A woman whose young child slept in a room next to the boiler turned the central heating off in the evening so that her child's bedroom did not overheat and used a gas fire downstairs to keep warm.

There were people who actually reported using their central heating to supplement some other form of heating. They opted for this arrangement because they preferred their home to be on the cool side or because they preferred the effect of other types of heating.

"We feel warmer I think with my little coal gas fire. It looks warm and snugly but a radiator doesn't look warm and snugly." (woman, aged over 60, Leeds)

This pattern of use did not seem to be determined by concerns about cost of heating. On the whole there seemed to be little thought given to the efficiency of supplementary heating. There was disagreement among those who had thought about it.

“We’ve been told that the living flame fire is really inefficient and loads of heat goes up the chimney... But we think it’s worth the extra money to get the effects because it’s the focal point of the room and we sort of sit round it.” (man, aged over 60, Leeds)

“When they first came out, it seems like years, it could even be 15 years ago or more and the gas board wouldn’t sell them, they didn’t approve of them. That’s how sort of inefficient they were supposed to be. But we’ve had a couple since then and they’ve come on leaps and bounds and I think the gas board do approve of them now. And they are much warmer than they ever were.” (woman, aged over 60, Leeds)

Concerns about the safety of supplementary heating were mentioned, although rarely. For instance, an older woman reported that she relied on her gas fire all the time, except when her grandchildren came to visit because she did not like having an open flame around children.

2.5 Opening windows

There were people who said they would never consider opening their windows while the heating was on (*“iniquitous, a terrible waste of heat”*) but this was not the dominant view. Some people reported opening their windows for a short time in order to cool down just part of their home or to cool things down more quickly than would be possible by adjusting the heating controls.

“Downstairs in our house doesn’t get so warm, the upstairs, we have a terraced house and it seems to be much hotter up there, and we don’t actually seem to regulate our heat very well in this house at all... So I tend to open a window.” (woman, aged 30 to 60, St Albans)

“You get to a stage where you think you’re comfortable and it gets hotter and hotter and you don’t realise it’s getting hot until it’s too late, so then you open a window because it’s too late to turn it down because it takes ages for it to cool down, you just open a window and let some air in.” (man, aged 30 to 60, St Albans)

There were also people who left their windows open for longer. This pattern tended to be reported by women. They explained *“you can still feel the heat but there is a nice draught of fresh air”* and on the whole were not aware that it was wasteful of energy.

I: *“Does it ever seem as though you’re wasting?”*

R: *“No, I know it sounds silly, but no, because the warm air is still there, it’s just by window you can feel it’s cooler.”* (woman, aged over 60, Leeds)

2.6 Water heating

People seemed to be much less aware of their water heating than their space heating and to give it less thought in their daily lives. In some cases they simply did not know what type

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of water heating they had, for instance whether they had a combi boiler, and what controls were available to them. As a result, they had less to say in the focus groups about water heating controls than about space heating controls.

On the whole people left the hot water on all the time, irrespective of whether the central heating was on so that they did not run out and because “you never know when you need hot water”. However, there were instances of people who had the hot water go off with the central heating and only decided to leave it on in particular circumstances, such as when they were intending to do lots of washing. In exceptional cases people reported turning off their water heating as well as their space heating in summer. This was either based on the mistaken belief that there was no facility to turn off one without the other or because hot water was barely needed in summer:

“My boiler just goes off. Any reason I need hot water, I’ve got an electric shower and the washing machine and dishwasher have all got their own heaters inside... So if anybody wants to wash their hands in the summer, the ambient temperature is around about, well, it’s the same as room temperatures... My little lad likes a bath so we then turn the immersion heater on but that takes like half an hour.” (man, aged 30 to 60, Leeds)

There were mixed views about immersion heaters, with some people seeing them as a useful extra and others seeing them as old fashioned (“*you get immersion heaters in older houses*”). The latter view was expressed particularly by younger people who thought of them as something that their parents or grandparents would have.

People fell into three groups with respect to patterns of use of immersion heaters. The first group reported not using them at all because they had been told they were expensive, they simply never ran out of hot water, or in rare cases they said they found them noisy. The second group reported using them as a last resort, when the boiler packed up, when the gas stopped working, or when they ran out of hot water and wanted it in a hurry. The last group relied on their immersion heater, using it frequently because they ran out of hot water often (“*there are six of us in the house so the hot water doesn’t last long*”) or because they thought this allowed them to switch their central heating off in the summer.

3 Understanding controls

3.1 What controls do

Generally focus group participants found it difficult or were reluctant to explain how they thought their controls worked. It was therefore difficult to get a feel for the prevalence of different views. However, it was clear that was a great deal of variation in how well they understood the workings of their heating controls. At one extreme were people who had a detailed understanding, generally gained through their jobs or by carrying out DIY. At the other extreme were people who said it had never crossed their mind:

“I’ve really got not interest. I’ve got a baby, I do a bit of work, [it’s] the last thing on my mind.” (woman, aged under 30, Watford)

On the whole, people understood what programmers do (*“an on and off switch which comes on at certain set times”*), even those who had trouble using them. In contrast, people had no difficulty using room thermostats but their understanding was patchy. Some clearly understood their purpose (*“when the house gets to the temperature it should cut everything out”*) but two misconceptions were mentioned.

Firstly, it was believed that room thermostats were simply on/off switches. One person even referred to hers as *“a round switch”*.

“All I know is you turn the thermostat round and it’ll come on when you want to. You just click it round and then it fires up.” (woman, aged under 30, Watford)

Secondly, it was thought that thermostats worked like dimmer switches. One woman explained that she thought hers was broken.

“With mine, when you try to control the temperature it won’t. It’s either on hot or off cold... You know you have got your numbers for your degrees of how hot. It goes up to 30 but once you turn it past 20 it makes this little click noise and it just goes off. So you can never have it 10 degrees or 20 degrees, it is like above 25 degrees or nothing at all... It needs replacing.” (woman, aged under 30, Leeds)

The difference between room and boiler thermostats was generally not well understood. People with a thorough knowledge of central heating tended to understand what each did but others believed they both had the same function:

“A thermostat on the boiler just detects how hot the water gets, not how hot the room gets. I mean if you have the water coming through at 20 degrees, your room will get up to 20 degrees but it’ll take longer than if your water comes through at 50 degrees.” (man, aged over 60, Leeds)

“I turn the temperature down on the boiler. I just think it’s more direct to come from the boiler, more accurate rather than the [room] thermostat.” (man, aged 30 to 60, Leeds)

Understanding of TRVs was also mixed. Some people knew how they worked (*“It shuts the water flow down to the radiator, keeps it cooler”, “Those radiator valves are designed to switch off when they hit that temperature”*) but others did not. A number of misconceptions existed although not single one was widespread. For instance, it was suggested that they do exactly the same as ordinary radiator valves therefore some people could not see any point in having them. It was thought that there was no need to adjust the room thermostat in homes with TRVs, because they override it. There was concern that using TRVs would *“unbalance”* the central heating system.

“It seems to me that if you balance the system and then cut one of the radiators off, immediately it’s got unbalanced, so I’ve never set much store by these numbered controls on the foot of the radiator. As I understand it, if you just turn every radiator valve open, then dependent on how the system is designed and which route it takes through the house, some of the radiators remain cold and some of them will get very hot. So you’ve got to adjust each individual radiator once they’re set up to even the heating out throughout the house.” (man, aged over 60, Leeds)

3.2 How controls affect efficiency

There were mixed views about whether adjusting the thermostat affects energy consumption. Generally people were aware that it would use less energy if the thermostat was turned down. This view was based on common sense (*“more heat, more power”*), information they had been given (*“When you used to get your gas bill it used to tell you that if you just lowered your thermostat 2 or 3 degrees you’d save so much a year on your bills”*), or comparisons with related situations (*“It’s the same as washing your clothes – instead of washing them at 60 wash them at 40, you save so much energy”*).

However, some were not convinced that the savings would be substantial (*“They say if you turn it down by about 5 degrees, you’re saving about £40 or something, it’s not a great deal of money is it?”*). Other people thought that turning down the thermostat would make no difference at all to energy consumption.

There was also considerable disagreement about whether it is more efficient to leave the central heating on continuously or to have it on intermittently, only when it is actually needed. People in favour of the intermittent pattern could not see the point of heating their home when nobody was there (*“It’s obviously using a certain amount of gas to keep it going, to keep it at a certain level”*). On the other hand, people in favour of leaving it on continuously generally believed that it took more energy to heat the home from cold than to keep it warm (*“You’re not wasting heat having to re-warm the house every morning and every evening”, “Not using as much gas to keep it warm, just simmering so to speak”*). The energy used to turn the boiler on was also mentioned although this was less of a concern (*“Each time the boiler has to fire up it costs money so it’s better to turn it right down low and keep it on”*).

Views on the subject were influenced by what people had heard from family, friends, official information. For instance, one person who frequently turned his heating on and off had been influenced by an advertising campaign (*“I always think of the adverts with the tortoise going ‘oh its on/offable”*). A young man who had recently moved into a newly built house was given different advice by two people working for the builder. General hearsay from unspecified sources (*“they say if it comes on and goes off you’re wasting energy”*)

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also held sway with some people. While some people held strong opinions, others admitted to feeling unsure about what to do.

4 Importance of comfort, cost and energy

4.1 Comfort

On the whole, comfort was the main consideration in determining the use of central heating². For some people this meant keeping their home warm enough to wear a T-shirt in winter while for others a cool home was preferable (*“I like just to have the chilliness taken off”*). In some cases people gave almost little thought to anything other than comfort. For instance, a young woman who ran her heating continuously described how she turned the room thermostat down if she felt too warm but admitted that it did not occur to her to do so when going out.

People reported that a comfortable temperature was not always easy to achieve and identified three reasons for this. Firstly, it was partly down to the homes themselves. For instance, someone living in an old home described how the upstairs was too warm while the downstairs was too cold because the radiators were small and the chimney allowed heat to escape. Secondly, it had a lot to do with members of the household liking different temperatures (*“my husband, he’s purple in the face because it’s so hot... I’m absolutely freezing and I have to put a fleece on”*). Thirdly, lack of skill with heating controls played a part. A young man who had moved into his home 3 months before explained:

“I thought I’d worked out a timing system that I thought would be good but it’s been getting either too hot or too cold in one room. Generally I didn’t want to knock the whole timing system out so I’d just turn it off if it was getting too hot... It’s not perfect yet.” (man, aged under 30, St Albans)

4.2 Cost

Some people were very aware of the cost of their central heating, either because money was tight or because they just saw no point in being wasteful. This impacted on use of heating controls in various ways. In particular they mentioned putting on extra clothes if they were chilly rather than turning on the heating or turning up the thermostat (*“I say well it’s free to put a jumper on”*), limiting how long the heating was on for.

However, for other people cost did not enter into their use of central heating. Several reasons were given. Firstly, central heating was seen a high priority for expenditure (*“It would be a false economy to economise with heating, it is so important”, “I’d rather spend the money on keeping warm than maybe on something else”*). Secondly, some simply did not know how to cut their bills. Finally, heating bills were seen as very affordable so there was little need to economise.

² The relative importance of comfort and cost reported in this project may have had something to do with the sample and the methodology. Participants were recruited in socioeconomic groups C2DE but they were mostly in group C2, with only 3 in group D and none in group E. Participants may also have felt uncomfortable about discussing money concerns in the group setting.

The payment method used for gas bills did make a difference to use of central heating in some cases, although not all. For instance, one woman talked about having to economise on heating her whole life until she started paying by Stay Warm (*“if it’s cold, it’s on”*). A father of four who paid by direct debit said that if he had to pay his heating bill in the winter instead of spread out over the year he would certainly find ways to cut down (*“If they sent me a bill for £250 I’d be saying to the kids, heaters off now, windows shut, curtains, cardies on.”*)

4.3 Energy

Energy consumption barely featured in people’s explanations about their use of central heating. There were some people, particularly mothers of young children, who said that they were concerned about energy consumption (*“the supply will run out”*). However, this affected their use of electric lights more than their use of heating. They thought this was perhaps because the waste was more visible as it is easy to spot a light on in an empty room.

Some older people suggested that their age group are wary of waste in general, including wasting energy, and this affects their use of their central heating controls. For instance, a retired man said that he and his wife would not consider opening windows when the heating was on or leaving the heating on when they went out because of childhood experiences. However, this concern about wasting energy was far from universal among the older people in the focus groups.

“Heating and things in the War were very very scarce and you got into the habit of switching off lights and all sorts of things and it just stays with you.” (man, aged over 60, St Albans)

4.4 Other issues

Speed and convenience were important in determining how controls were used. For instance, a working mother with two young children explained that she opted for the thermostat because it was much quicker to use than the timer (*“if it’s not quick I can’t be doing with that”*). Health also played a part, but there was a difference of opinion about whether a warm or cool home is healthier.

Several other factors were less important, though still considered by some people. These included the sounds associated with central heating (*“the rumbling noise of the boiler”*) particularly at night. The need to dry laundry over radiators governed use of central heating in some homes. The impact of heating on the home itself was an issue. For instance, a woman whose children had recently moved out said that she still kept their rooms heated, rather than turning down the TRVs, because otherwise they would get damp.

5 Views about controls

People reported that a number of features of their heating controls, both their design and position, affected how easy they were to use. They talked particularly about their programmers. Where design or position was problematic, some people struggled on regardless but other people were put off using them altogether.

5.1 Design

Size of controls emerged as an important issue for all ages, not just older people. Small buttons and tappets on programmers were found to be fiddly, fragile and difficult to see. Large buttons were a boon (*“big enough to put your digit in quite happily without any of those little bits and pieces”*). Other messages about design of programmers were less clear.

There were also mixed views about the complexity of programmers. The dominant view was that they were too complicated. However, there were people who found them straightforward (*“self explanatory”* or *“idiot proof”*) or even some unusual people who found them too simple. For instance, one person with a very basic dial programmer liked the sound of someone else’s which could be programmed to go on and off as many times a day as he wanted. A technophile said that she would like a programmer which would turn the heating on at different temperatures at different times of the day, rather than having to use the thermostat.

There was no clear consensus about whether digital or dial and tappet programmers were easier to use. Some people with digital programmers found them complicated while others found them straightforward, and the same was true of dial and tappet programmers:

“It is like a dial with the red and the blue, but it’s got those little teeth that you push down and you have to look to what time you want it to come on... It’s just too complicated.” (woman, aged 30 to 60, Watford)

“It’s pretty easy. It’s a 24 hour clock and just put out the bits that you want it to be on... I don’t think it’s rocket science.” (man, aged under 30, Leeds)

A large number of buttons made them confusing but on the other hand there were complaints about having the same button do more than one thing.

“There’s so many little buttons, it’s not very clear to see at all... Rather than having to press two buttons at once to do something, I’d rather have extra buttons that have got the labels on there clearly so you can see what you’re doing. Because they’re trying to minimise the buttons, you have to press two simultaneously or whatever.” (woman, aged 30 to 60, Watford)

Changing the time when the clocks went backwards or forwards was found to be tricky in some cases. People gave examples of dials programmers where the dial could only be moved in one direction and digital programmers where the hours could only be changed in one direction. They believed that programmers should be designed to make this task easy

and welcomed it when this was the case (*“very simple, push a button, it just takes a few seconds”*) or where the clock updated itself.

5.2 Position

The position of programmers had a large impact on ease of use. When they had been placed too high (*“I have to go in the cupboard with ladders etc”*), too low (*“it is at a level where you’ve got to get down on your knees”*), out of reach (*“my ones are over the sink and you have to sort of lean across”*), somewhere dark (*“we go in with a torch”*), partly hidden (*“it is in a cupboard with the tank and I can’t see half the dials”*), or just out of the way, this made them troublesome to use. A woman whose husband was in a wheelchair also pointed out that the programmer was too high for him to use.

People liked the idea of having heating controls on a remote control although they generally did not know that moveable controls actually existed. The appeal was in having them close to hand. For instance, someone who very rarely touched any of his heating controls said he might use them on a remote control.

“You could have it on the Sky remote next to the football channel. Switch it off and put the heating on... It sounds stupid but if I had a remote control in the front room on the table I’d probably use it instead of scrambling round looking for the TRVs... It just on zz zz.” (man, aged under 30, Leeds)

However, one person who had a moveable thermostat kept it permanently in the coldest part of the house as instructed, rather than moving it around.

6 Views about information

6.1 Sources of information

People had learnt how to use their central heating controls in a number of different ways. Some had used their manuals or asked installers, plumbers or gas men for help (discussed below). Others had not used official sources of information but instance had been taught by family or friends or had learnt by having a go (*"I just fiddled around with it and worked it out for myself"*). In spite of the various sources of information available, some people admitted that they simply had not learnt how to use their controls, particularly their programmers, and were concerned that they did not make good use of their heating as a result.

Different ways of learning suited different people. They talked about their preferred learning method (*"I'm a visual learner", "I'm not a book person"*). Women seemed more willing than men to ask for help from family and friends. Younger people were more inclined than older people to work out their controls by having a go. There was a feeling that men were generally more inclined than women to read manuals (*"I have always thought instruction books were for men. Women don't bother to read them, we just get on and fiddle with the knobs, don't we?"*) and that older people tend to prefer being shown how to work things rather than having to read up on them.

6.2 Manuals

While some people found their manuals easy to understand, this view was far from widespread. They tended to be seen as a last resort (*"I would have a go at the buttons first and if I really had a big problem then I'd got to the book"*) or something to be used only by plumbers. They were described as intimidating and time-consuming to get to grips with:

"I have got a book of instructions, but I've got books of instructions for hundreds of things... Video cameras, millions of things that I still don't know how to use properly. I'm just so busy and also I need a good clear hour. Now I'm a mum I'm just too busy, I don't have a chance to do things." (woman, 30 to 60, Watford)

This difficulty stemmed partly from their sheer size (*"you've got two or three or four big massive books"*). People felt they were given too much detail (*"too much techy stuff"*) and information not intended for them. This included instructions for plumbers, in other languages, and for other boilers (*"with the 018/14 do this, but with the 02a/12 you have to do this"*). They found the language too technical (*"written by people who know all about it putting down what they and their colleagues understand"*) and felt that manuals were just too wordy (*"great big long paragraphs"*). When drawings or photos were included they were said to be technical or complicated.

To make manuals more user friendly, people requested plenty of photos, pictures, and diagrams with arrows. They asked for instructions to be simplified, made procedural (*"Start at the beginning and finish at the end and do it step by step by step"*), and printed in a large font.

“If they designed it like you are going to bleach your hair. They have got a head and then 1 open the bottle, 2... If you have got a picture of what you are supposed to do and then it is 1, 2, 3, 4, I think that would be fabulous.” (woman, aged over 60, St Albans)

The need to keep manuals short was emphasised. This could be done omitting everything except the basics, perhaps even reducing instructions to one page along the lines of the quick set up guide provided with TVs. Alternatively, detailed information for plumbers could be included in a separate manual, or the basics could be placed at the front and more detailed information further back. By the basics people meant how to turn the heating on and off, how to control the temperature, how to set the timer, what buttons do what, and who to contact for help, including telephone numbers for help desks.

Although there were examples of people taking good care of their manuals (*“29 years I’ve had my book”*), they did seem to get lost, particularly when people moved home. In response it was suggested that instructions should be placed by the controls or fixed to them.

6.3 Information on controls themselves

People who had instructions on their programmers were pleased with them. They liked the fact that they were short and simple (*“just in five sentences so it’s really easy”*) and easy to find (*“it stays with the control box, it doesn’t disappear in a set of books”*). They sometimes did away altogether with the need to use the manual.

However, there were mixed views about the symbols used on heating controls. Some people believed that their meaning was clear but others were less sure.

“You’ve got little pictures and that’s enough... Little pictures above each dial. I think one of them is like a flame, one of them is like the sign you get on roads in winter, like it’s an icicle or something.” (man, under 30, Leeds)

“The manufacturers are the only ones that understand... Dripping taps, what does it mean? To the clever young man who thought it up it was perfectly obvious but [not] for middle-aged housewives.” (woman, 30 to 60, St Albans)

6.4 Installers, plumbers and engineers

People reported asking installers, plumbers and engineers to show them how to use their controls and sometimes to set their programmers. Experiences varied, with the least enthusiastic feeling that her installer had not helped at all (*“Well this is how you do it love, you see it’s on now, and so you’ll be fine”*) while the most enthusiastic felt that she had been given all the information she needed (*“He just told me how to make it work in a simple way”*).

There was widespread agreement that installers did not have the time to explain properly. People recognised that training up households was not really part of an installer’s job but wondered whether someone else could visit or phone later to explain the controls to them. They felt that this might suit the households better too because at the time of installation *“you just want to get them out of the house”*.

There was also some concern that installers might not know a great deal about the system that they were installing because there are so many different systems on the market.

6.5 Other information

Although people suggested cutting down on technical information, they felt the need for more information on how to get value for money. They asked for pointers on what to do to save money, advice on the contentious issue of whether it costs more to run the heating continuously or intermittently, and a guide to what the wall thermostat and radiator valves should be set at for comfort and efficiency.

People would also welcome information provided in other ways. They suggested having instructions on video or perhaps audio tape. They liked the idea of a helpline (*“manned by people who really know what they’re talking about, somebody who is experienced in the system”*). A website was also flagged up as an option although it was recognised that its use would be limited to people who use computers.

People had little awareness of other sources of information. It was extremely rare for them to be aware of energy advice help lines (*“British Gas have got energy efficiency advisors and if you ask to speak to them they’ll tell you”*) and audits that are available. Where people had heard of this service, there was some concern that they would not be eligible or that they would be charged for using it.

7 Energy consequences of failure to make good use of heating controls

7.1 Effect of non-use or non-adjustment

The energy consequences are difficult to assess with accuracy, as the extent of non-use varies and focus groups cannot produce firm numeric estimates that can confidently be extrapolated to the whole population. Nevertheless, the focus groups have shown that a substantial number of householders do not use one or more of the main heating controls for various reasons, and a tentative estimate of what this would mean if replicated nationally is given in 7.2.

The effects on energy consumption differ according to the three main user controls, described below:

Programmer: Non-adjustment of the programmer is likely to result in heating and hot water systems being left on longer than necessary. When close control of timing is not applied, householders are more likely to use their heating extravagantly than to suffer periods of uncomfortably low temperatures. In particular, they may not switch off when departing from usual routine e.g. going away for the weekend. Evidence from the focus groups showed that householders generally had little idea of running costs and were not greatly concerned about their fuel bills.

Room thermostat: Non-use of the room thermostat means that close control of air temperature is not maintained. The result is more likely to be over-heating than under-heating, as manual intervention is more readily triggered by low temperature discomfort, and in some cases the remedy for high temperature discomfort is opening the windows instead of switching off the heat source. Another consequence is that excessive boiler cycling may occur when TRVs shut down after the house has fully warmed up.

TRVs: The purpose of these is to restrain heating in individual rooms – especially bedrooms – to allow for non-uniform preferences. Once set to meet the occupant's requirement, there may be no need for further adjustment for long periods, so non-adjustment identified in the focus groups does not necessarily imply incorrect use. On the other hand, frequent re-setting (there are some examples of twice per day) suggest a misunderstanding of the purpose, and the resulting poor control of temperature will lead to wastage.

7.2 National energy savings from heating controls

Indicative figures for savings from domestic heating controls have been derived from the following steps:

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1. The energy consumed by domestic central heating systems with gas and oil boilers is estimated at 436TWh/yr (in year 2000 – see Ref. [1]).
2. EHCS (see Ref. [2]) data suggests that about 75% of households possess an adequate set of controls (programmer, room thermostat and some TRVs).
3. Households that possess an adequate set of controls and use them appropriately will save about 16% of the energy that would be needed for an uncontrolled heating system (see Ref. [3]).
4. Those that possess adequate heating controls but do not use them sensibly will get some, though not all, of the potential benefits. Assume this is half as much i.e. 8% of the energy that would be needed for an uncontrolled heating system.
5. The focus group results did not produce firm estimates of non-users, but it is clear the numbers are substantial. For the purposes of illustration assume that it is 50%.
6. Using the estimates and assumptions set out above, the following national energy savings figures can be calculated :
 - 43 TWh/yr is already being saved as a result of heating controls installed and used properly;
 - 14 TWh/yr could be saved in addition if all controls already installed were used properly;
 - 77 TWh/yr could be saved if all heating systems had heating controls that were used properly.

It is emphasised that these savings figures are indicative only, and are not based on robust estimates of the extent and value of non-use of heating controls.

The large potential saving from better use of existing controls should be seen in the context of domestic energy consumption generally, as shown in the table below. Figures have been taken from Ref. [1].

Product sector	Annual energy consumption in TWh/yr
Lighting	18
Fridges, freezers	18
Potential for better use of heating controls	14
Washing machines, dishwashers, driers	13
Cooking (electric)	13
Cooking (gas)	8
Consumer electronics	9

8 Recommendations

To enable people to make good use of their heating controls, the current problems need to be tackled on three fronts.

8.1 Energy Saving Trust

- Raise awareness with households about the cost and environmental impact of heating use.
- Introduce heating controls and associated concepts in schools, when children have the time and interest to learn about them.
- Inform installers about the ways that they can help households make better use of their heating controls (see below).

8.2 Heating controls manufacturers

- Redesign products to include large buttons. This will benefit people generally, not just older and disabled people.
- Have a variety of products of different complexity to suit different needs. Indicate the complexity so that an appropriate product can be selected.
- Rewrite instructions to make them more user friendly.

8.3 Installers

- Select heating controls to suit the household, in particular the desired complexity.
- Place heating controls in convenient positions.
- Be prepared to spend time providing advice on operation. Installers may also need training in how to provide advice.

References

- [1] Market Transformation Programme Briefing Note BNXS16: Domestic energy consumption strategic overview, January 2004
- [2] English House Condition Survey, 1996
- [3] Good Practice Guide 302: Controls for domestic central heating and hot water, September 2001

Appendix A: Method

Qualitative research

The approach taken in this project is qualitative, rather than quantitative. In qualitative research participants are encouraged to give a full description of their activities, experiences, views and so on, and to explain the reasons underpinning them, rather than answering preset closed questions.

Qualitative research is valuable for several reasons. It retains the participant’s point of view. It obtains detailed responses. It allows unexpected issues to emerge because issues are discussed in an open ended way. It allows complex interrelationships and context to be explored.

In qualitative research it is not meaningful to report the number of participants expressing particular views or describing particular experiences. This is because of the small size of the sample and the purposive way in which it is selected (described below). Only a very broad indication of prevalence is possible.

Table A.1 Background information about focus group participants

	Number of participants	
	Achieved	Target
Sex		
Male	15	At least 10
Female	29	At least 10
Age		
Under 30	14	At least 14
30 to 60	28	At least 10
60 or over	12	At least 14
Working status		
Working	29	At least 14
Not working	25	At least 14
Socioeconomic group		
ABC1	32	At least 14
C2DE	19	At least 14
Not provided	3	0
Location		
Watford/St Albans	28	30
Leeds	26	30
Total	54	60

Selection and recruitment of focus group participants

Six focus groups were carried out with members of the public who had gas central heating in their homes. The location and composition of the focus groups were considered carefully to ensure that a range of views and experiences would be heard. Three groups were carried out in Leeds in the north of England, and three in Watford/St Albans in the south. Across all the groups, we aimed to include men and women, of different ages, working and not working (unemployed, retired or studying), with and without children, and from different socioeconomic groups. Some had had their central heating for some time

while others had had new controls or systems installed in the previous two years. To ensure that participants felt comfortable with each other, some groups were fairly homogeneous, for instance one group was composed only of people aged under 30. Table A.1 shows the target and achieved characteristics of focus group participants.

Recruitment was carried out by professional recruiters working mostly in shopping areas. People who agreed to attend were given the letter in Appendix B to confirm arrangements.

Procedure for focus groups

Focus groups take the form of a discussion guided by a moderator covering issues listed in a topic guide (see Appendix C). Participants were encouraged to speak freely around these issues, rather than being asked a series of preset closed questions. The moderator prompted participants to ensure that all key areas were discussed and probed to ensure that participants' views on important issues were fully explored.

Focus groups were held in recruiters' homes or in local venues such as primary schools that were easy to travel to and not intimidating. A token of appreciation (£25 or £30) was provided for participants' attendance. The moderator aimed to make focus groups enjoyable and to ensure that participants knew that their opinions were valued and would be taken seriously.

Data analysis and reporting

The focus groups were tape recorded and transcribed verbatim. This allows detailed analysis to be carried out and so participants' views to be reported in their own words.

Information from the transcripts was systematically sorted and recorded in thematic matrices. Material relating to each theme was recorded in a column of the matrix and material from each participant was recorded in a row of the matrix. The matrices were then examined to pick out key issues, to identify where differences or consensus existed among participants, and to find explanations for particular views.

Key issues are reported in the text, illustrated and amplified by quotes from the focus groups (shown in italics). Quotes are followed by a brief description of the respondent, sufficient to provide useful background information but to preserve anonymity.

Appendix B: Letter confirming arrangements

Thank you very much for agreeing to take part in the group discussion on [date]. The discussion will be held at [venue] starting at [start time] and finishing by about [end time].

The purpose of the group discussion is to find out how people use their central heating and controls. This work is for the Department for Environment, Food and Rural Affairs and the discussion will be led by BRE, an independent consultancy.

We are interested to hear everyone's views, no matter how much or how little they use their heating. There are no right or wrong answers - we would simply like to hear what you think.

What you say during the discussion will help in the development of central heating controls in the future. However, when using the findings you will not be identified by name. To thank you for coming along to the discussion and helping with this work, we will give everyone who takes part £25.

I look forward to meeting you on [date]. If you have any questions before then, please do contact me on 01923 664485. If you have any problems on the day, you can reach me on my mobile phone (079800 42381).

Yours sincerely

Kathryn Rathouse

Appendix C: Topic guide for focus groups

Background

1. Where live and how long lived there
2. Household composition – including age of children
3. Work and leisure activities – and time spent at home

Description of heating system and controls

4. What type of heating they have in their homes, including supplementary heating
5. What type of controls they have PROMPT AND SHOW PROPS
 - Wall thermostat
 - Thermostatic radiator valves
 - Timer – dial and tappets/buttons and displays
6. Where controls and boiler are
7. What type of water heating they have
 - Whether they have immersion heater
 - Whether they have combi boiler – CHECK BY ASKING
 - Whether have hot water cylinder
 - Whether they can hear boiler coming on when they turn on hot water
8. Whether central heating or controls have been installed since they moved in IF SO
 - Why
 - What they had before
9. Views about their heating – what they like and what they dislike (and why)

Space heating - use of controls

10. What temperature thermostat is set at
11. Whether they adjust the controls – PROMPT timer, thermostat, TRVs
 - Why/why not
 - When/how often
 - Who in household makes adjustments

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12. What they do in certain situations (and why)

- If their home feels too cold or too warm
- If one room in their home feels too cold or too warm
- When they go out
- When they go to bed
- When they go on holiday – in particular in winter
- Whether they allow for warm up time mornings/evenings/return from holidays etc
- When the clocks change
- To economise – if they are concerned about heating costs PROMPT after large bills, at end of month

13. Why they adjust heating controls - PROMPT comfort, saving money, saving energy/environment

14. When they use the supplementary heating – whether they have heating & supplementary on at same time (and why)

15. Whether they ever have heating on and windows open at same time (and why)

16. Whether they are aware of boiler coming on and off

- How often
- What they do about it

Understanding of space heating controls

17. How they think the system reacts to the changes they make

- What they think happens when they adjust thermostat
- What they think happens when they adjust TRVs
- How they think the timer works

18. How they think use of controls affects

- Cost e.g. effect of adjusting thermostat on cost
- Temperature in home

Water heating – use of controls

19. Whether they adjust the controls i.e. whether they use immersion heater, or adjust thermostat on boiler

- Why/why not
- When/how often
- Who in household makes adjustments

20. What they do in certain situations (and why)

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- If they run out of hot water e.g. after hot bath
- In summer i.e. whether they use immersion heater
- To economise – if they are concerned about heating costs PROMPT after large bills, at end of month

Heating costs

21. How much they think heating costs

22. How they make payments PROMPT quarterly bills, direct debit regular amounts

23. Whether pay for fuel themselves or as part of rent/service charge

Sources of information

24. How they found out how to use their heating system and controls – PROMPT

- Booklet/written information
- Installer
- Neighbours, family, friends

25. What they think about information provided – PROBE

- Booklet/written information
- Installer

26. What information would they ideally like and in what form

Way forward

27. Messages for heating controls manufacturers

28. Anything else would like to add

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