The energy price crisis – issues for energy use

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Summary

The UK faces an energy affordability crisis and possibly an energy security crisis. Improving energy efficiency and reducing energy demand are key parts of the solution to these, as well as to achieving longer term zero-carbon goals.

Energy affordability is now a critical problem for many households. Without more action on fuel poverty, more people will die due to cold homes this winter. Very large numbers of households will face difficult decisions about home heating. The measures recently announced focus on supporting incomes rather than longer term reductions in dependence on fossil fuels. Improving home energy efficiency and supporting low-income households both need urgent attention.

Saving energy can also contribute to reducing the risk of physical shortages of energy, and therefore a strategy for reducing energy demand should form part of any energy security strategy. The key measures that can be achieved quickly are reducing internal temperatures in over-heated buildings and reducing car fuel use. Energy security is a public good, so Government has the central role in addressing it. Most people and organisations can contribute, but the households most affected by the affordability challenge can contribute the least.

The energy saving measures needed for a transition to net-zero emissions cannot be delivered in their entirety on the timescales needed to resolve an immediate crisis. However, the crisis is an additional reason to begin a planned long-term approach to demand reduction, not to avoid it.

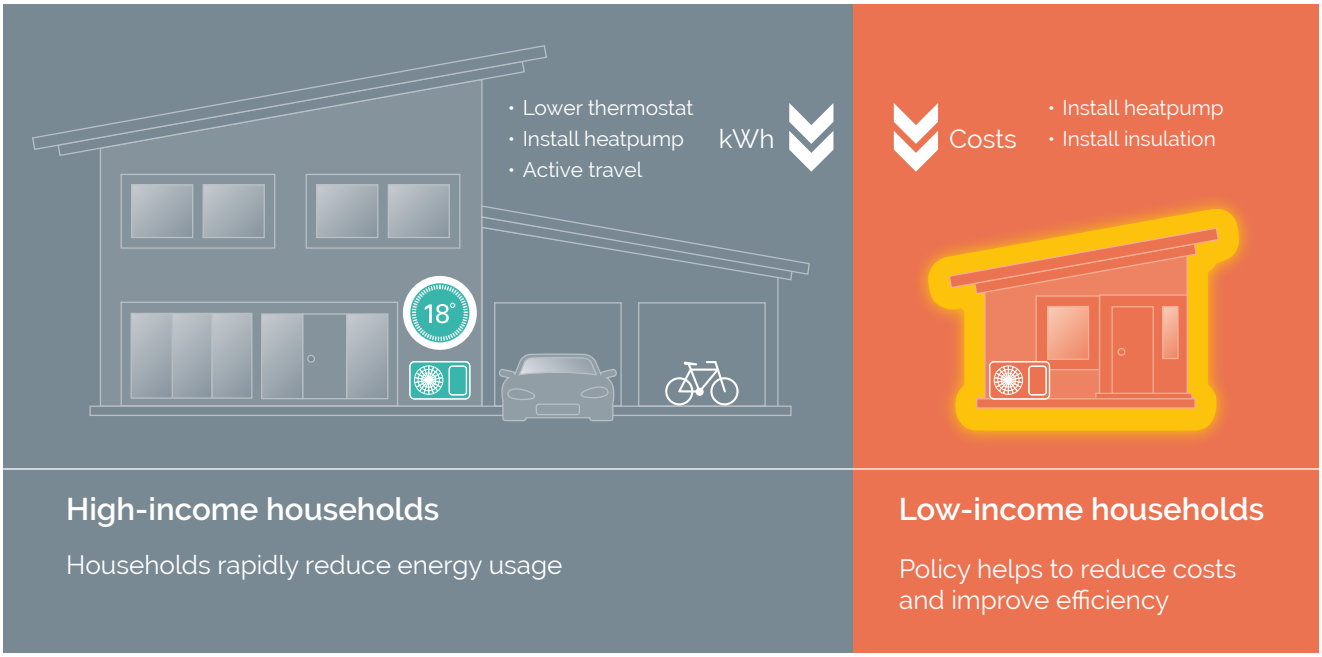
The two problems of affordability and security point to a twin-track strategy in which:

- High-income households take the main responsibility for rapid reductions in energy use to address security risks; and
- Low-income households are the main beneficiaries of policy to reduce prices and increase incomes and as well as the immediate priorities for housing energy efficiency improvement.

The UK needs an immediate short-term plan to address energy affordability and security risks. This should include:

- Addressing affordability concerns through a combination of targeted support to low-income households and Government support to lower the price cap,
- A major programme of evidence-based public information and advice,
- Measures to reduce energy demand in public buildings,
- A boost to projects supporting basic housing fitness and low-cost energy efficiency,
- Funding for local authorities, charities etc. already working to address fuel poverty,
- Increased support for active transport and public transport, and
- Policies to encourage and/or require lower car speeds.

These will assist in enabling some low-income households in poor housing to reduce the costs of keeping warm, and enable those households more able to reduce demand to contribute effectively to addressing energy security risks.



This plan should be the first step of long-term consistent strategy to reduce energy demand, aligning energy security, affordability and climate policy goals, including through:

- A delivery plan for energy demand reduction and decarbonisation across all sectors,
- A more detailed policy framework for heat decarbonisation and demand reduction,
- A major increase in skills investment to increase and improve building energy efficiency,
- Increases in the energy supplier energy saving obligations (ECO),

- Revision of the fuel poverty strategy to address radically changed circumstances, and
- A review of the way retail energy markets are regulated.

Introduction

As it becomes clear that the war in Ukraine is more than an immediate crisis, energy use is in the headlines. The immediate threat is an 'affordability crisis' with hugely increased energy bills. Less discussed, but at least as worrying, is a potential threat to the physical security of gas supply.

People are increasingly asking: "what does it mean for us?", "what should Government do about it?" and "what can we do about it?". Key questions relate to the ways we use energy, in particular how much energy we use and how this might be reduced. Based on CREDS research and expertise, this paper sets out some insights and recommendations.

The focus is on energy use. Of course, that is not the whole picture. The causes clearly lie in geo-politics and upstream energy markets globally and at a European scale, with the impacts magnified by the Putin regime's invasion of Ukraine. And food prices are also rising. These are not CREDS' domains of expertise, and therefore we focus on energy use in the UK, which is.

This briefing paper sets out the key issues for energy demand in UK households arising from the affordability crisis and security risks, keeping in mind the longer-term climate mitigation imperative. It first describes the nature of the crisis and role of energy demand within it. It then sets out and analyses the UK Government responses and goes on to describe what more is needed and makes recommendations for early action.

Background

The goal of net-zero carbon dioxide emissions by mid-century is the centrepiece of the Paris Agreement on climate change. In the UK, a 2050 net-zero target is written into law, with a series of declining carbon budgets to chart the way.

Globally, decarbonisation at the speed required to deliver these goals will depend heavily on cost effective solutions that can be deployed within the next decade. These are principally renewable electricity and demand reduction (IPCC, 2022). Saving energy therefore will play a major role in climate mitigation.

Globally, the combination of changes to energy services and improving energy efficiency could reduce demand by 40-70% by 2050 (Creutzig et al, 2022). In the UK, CREDS work shows that the potential is very large: energy demand can be reduced by 50% by 2050 (Barrett et al, 2022). These conclusions are broadly consistent with other 2050 net-zero compliant scenarios, both for the UK (CCC, 2020; BEIS, 2021a) and developed countries more generally (Grübler et al, 2018).

Climate mitigation action is urgent, but it requires investments and changes to practices, infrastructure and systems that will take decades, even with strong social and political commitment. So, despite the now familiar framing of the climate challenge as an emergency, the challenges of energy affordability and security that have emerged in the last year are more urgent. Lives can be altered for the worse, and even disastrously, within weeks.

The crisis has its origins in European fossil fuel markets and the impacts of the Putin regime's invasion of Ukraine. A short history of the development of the crisis and its impacts to date is provided in Annex 1. In brief, prices for retail energy have risen dramatically as shown in Figure 1. Electricity prices have more than doubled; gas prices have increased by a factor of nearly four. There are major implications for household budgets, as well as the macroeconomy. No-one is immune, but the largest impacts are on people with low incomes.

The immediate impact is on affordability, but there are potential implications for energy security as well. The short-run price elasticities of energy demand are low, and therefore even very high prices do not radically reduce energy demand. So any further reductions in flows of gas from Russia into Europe may raise risks of physical shortages.

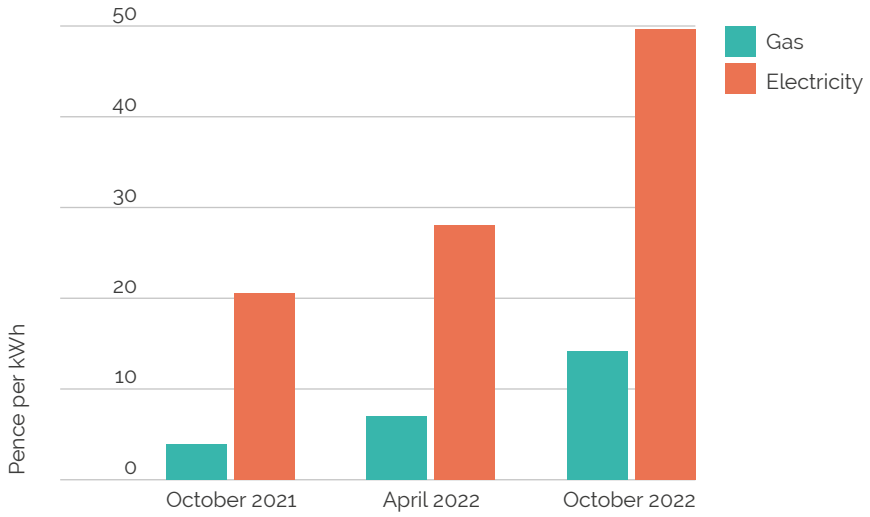


Figure 1: Recent changes to gas and electricity prices for UK households (based on Ofgem data).

Addressing energy demand has the potential to help with these affordability and security crises. Of course, what can be achieved through energy efficiency investment quickly is much less than in the longer term. But there are also options for saving energy without investment, through changes to behaviours or practices, that can deliver reductions quickly.

Whilst the linked crisis of affordability and energy security are related, there are important distinctions in terms of their impacts and potential solutions across the UK population.

Both crises affect all households to some extent, but the main affordability impacts will fall on low-income households, whilst the risks of power cuts are fairly equally spread. In contrast, the main scope for reducing demand quickly lies with higher-income households, which tend to use more energy and particularly for non-essential services that are easier to curtail. Immediate government and public action on energy demand therefore needs to focus on reductions in energy use by high-income users to address security risks, whilst low-income households have less scope for demand reduction and much greater needs in terms of meeting rising costs.

Government action and plans

It is well-documented that UK public policy on energy saving is not adequate to deliver climate goals. Previous CREDS analysis has shown that energy saving policies have been seriously weakened over the last decade (Eyre and Killip, 2019) and need to be strengthened to deliver climate goals (Barrett et al., 2021; Barrett et al., 2022). Efficiency improvements have stalled in conventionally-fuelled vehicles, new building standards have been delayed, and energy supplier obligations, local authority funding and energy advice services have all been cut.

Critically for those affected by the affordability crisis, levels of energy efficiency retrofit have been severely cut, meaning that future increased activity needs to be expanded hugely (see Figure 2).

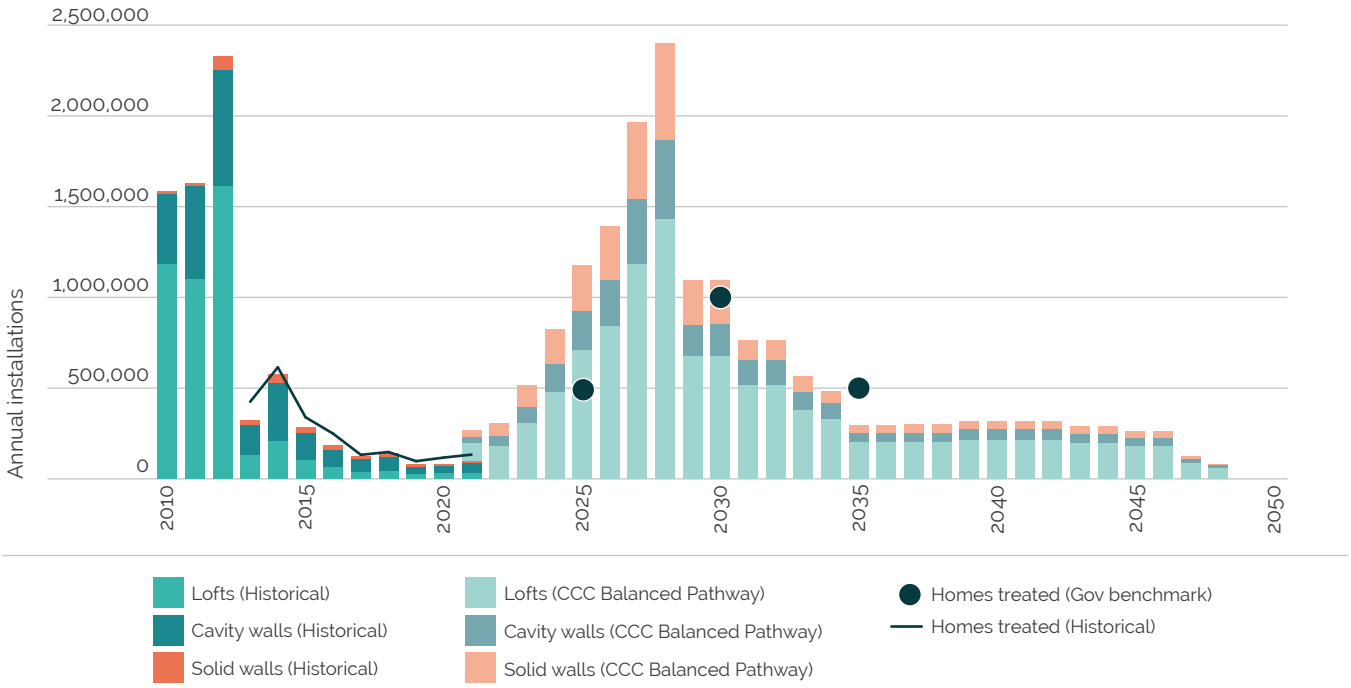


Figure 2: UK residential energy efficiency installations. Source: CCC, 2022.

This decade of weakened policy has put the UK in a worse position to respond to the crisis than we would have been in with a more consistent approach to energy saving. Looking forwards, the Government's Net Zero Strategy (BEIS, 2021a) still assumes that policy should not seek to change energy demand.

Previous work in CREDS has argued this is unhelpful (Eyre, 2022). In the context of the current affordability and security crises, it now also seems highly unrealistic.

More recent policy announcements have shown some tentative steps in the direction of more support for energy efficiency. The 2022 financial Spring Statement included decisions to remove VAT on energy saving materials for 5 years (HMT, 2022). The energy security strategy announced a a £30M Heat Pump Investment Accelerator Competition and energy advice services for consumers and SMEs (HMG, 2022). Subsequently, Government has announced the fourth round of the Energy Company Obligation (ECO4) targeted on energy efficiency investment in low-income households. This will spend an estimated £1 billion annually for 4 years and reduce fuel bills by a notional (i.e. before rebound) £220 million annually by 2026 (BEIS, 2021).

Most of the UK Government's measures to cushion consumers against rising energy bills arising from this crisis have focused on controlling fuel prices and increasing household incomes. Originally, these included a 'one-off' reduction in Council Tax, loans to energy suppliers to enable deferred payment of part of household bills, reduced road fuel duty and a £1 billion Household Support Fund for local authorities (HMT, 2022). As the scale of the cost of living crisis has become more evident this has been supplemented (HMT, 2022b). The loans via suppliers have been doubled to £400 per household and converted to non-refundable payments, with an additional payment of £650 for households on means-tested benefits, £300 extra in the Winter Fuel Payment for pensioner households and £150 for individuals in receipt of disability benefits, worth £0.9 billion. The size of the local authority fund has been increased to £1.5 billion.

Analysis of policy changes

Energy cost support

The measures to support households against rising home energy costs are useful, but it is widely recognised that they remain inadequate to protect many households against expected price increases, particularly low-income households in energy inefficient homes. Without further measures, and especially support for low-income households, there are likely to be more serious physical and mental health impacts.

Transport fuel costs are also a concern for many households and some low-income households have high car dependency and therefore will be doubly disadvantaged. However, prices of road fuels are changing proportionately less than those of household fuels, due to the higher tax levels. Transport fuel costs are generally less regressive, as higher income households tend to travel more and therefore road fuel duty reductions principally help higher income households (Cass et al, 2022). In the case of aviation, higher fuel costs fall very largely on high income groups.

In the short-term, if major fuel poverty increases are to be avoided, there is no alternative to supporting household incomes, and/or subsidising prices. Effective targeting of the lowest income households would point to some use of means-tested benefits to support incomes.

However, the price rises are so large they now affect a big proportion of households, indicating that some element of price subsidy to reduce the price cap is also needed. In practice, a combination of the two may be the best option.

However, both of these options have very large costs to the taxpayer. The costs of the household payments already agreed alone will exceed £10 billion in a single year, vastly exceeding Government support for energy efficiency. And importantly, they are simply transfer payments, with no long-term benefit to the economy. They are not, therefore, long-term alternatives to improved energy efficiency. The defining characteristic of fuel poverty, compared to other forms of poverty, is the importance of capital investment as a sustainable solution.

Energy efficiency support

The new measures to support increased energy efficiency are therefore helpful, but, alone, will not significantly change energy efficiency investment. The levels of investment in ECO4 are slightly increased from ECO3, but still below the levels required under energy supplier obligation before 2013. The projected savings are much lower than a decade ago, due to the measures being more capital intensive. Energy savings from the 4-year programme of ECO4 will be approximately 3% of the total fuel bills for targeted households and 0.3% of all household energy.

Most details of the proposed advice services have not yet been developed. An improved version of the Simple Energy Advice (2022) website has been migrated to the Government's own website. But no support for local energy advice in England, of the type that existed before 2013, has yet been announced.

The most fundamental problem with recent policy lies not in detailed policy design, but in the underlying philosophy to energy efficiency improvement. The Government's approach to energy efficiency in its energy security strategy is non-interventionist, stating that: "this is not being imposed on people and is a gradual transition following the grain of behaviour. The British people are no-nonsense pragmatists who can make decisions based on the information" (BEIS, 2022). However, this is not a viable policy for public goods, such as climate protection and energy security. Neither net-zero emissions nor better energy security can be realised by relying solely on individual decisions; collective action is also needed and has to be Government led.

Looking forward, the combination of the affordability crisis, security risks and climate mitigation challenges is moving us into uncharted territory, and therefore offers an opportunity for a re-think. Analyses of climate change mitigation, even to address increasingly challenging targets, tend to focus on decadal timescales. The current affordability and security crises are manifest in weeks and months. So the questions are no longer restricted to the long-term question of "How much can we reduce energy demand?" but also include the more immediate dimension of "How fast can we reduce energy demand?" Both long-term investment plans and short-term crisis responses are important.

How much can we reduce energy demand? Action for the long-term

There is a great deal of evidence about how much energy can be saved, and consumer bills reduced, by 2050 or even 2030. Long-term reductions in, and decarbonisation of, home energy use depend critically on insulation and electrification, increasingly the latter (Figure 3).

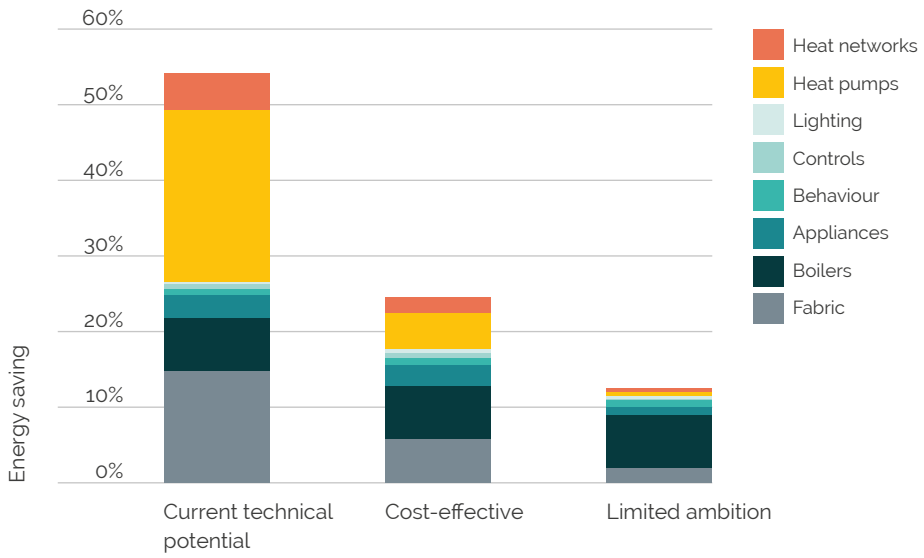


Figure 3: UK Residential Energy Saving potential to 2035 (compared to 2015) from Rosenow et al (2018).

The potential reduction in energy use by 2035 is ~140 TWh/year (30%) (see Figure 3); by 2050 it is ~250 TWh/year (52%) (Barrett et al, 2021). In transport, the main potential lies in shifting travel, particularly long-distance, to more sustainable modes and in electrification of light vehicles. CREDS estimates the potential to be ~260 TWh (40%) by 2030 and ~450 TWh (68%) by 2050 (Barrett et al, 2021), see Figure 4.

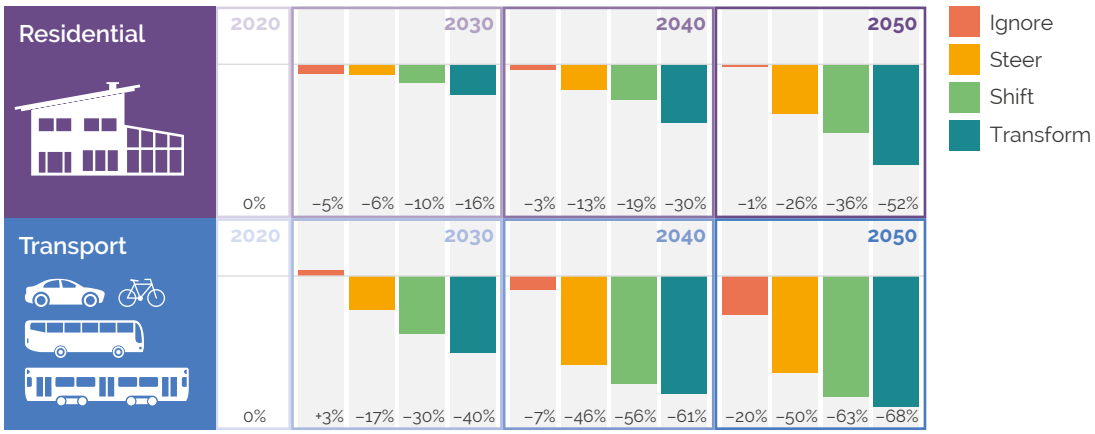


Figure 4: Potential for reducing energy demand in the residential and transport sectors in different scenarios by 2050 from Barrett et al (2021).

Whilst the affordability crisis has focused attention on the energy bills of low-income households, they are not the main energy users. Long-term policy needs a much stronger focus on how to reduce emissions in 'able to pay' households. CREDS has set out elsewhere the types of policies that might be adopted to deliver these potentials (e.g. Eyre and Killip, 2019; Barrett et al, 2021). We do not repeat these here, as the focus is on more short-term issues. However, the timescales for achieving these changes need to take account of the need to plan, invest, develop supply chains, build, educate, advise and change social norms. For this reason, the energy saving measures involved in a complete energy transition cannot practically be delivered at scale and timescales needed to resolve an immediate crisis. However, the crisis should be an additional reason to start delivering a planned long-term approach to demand reduction, not to avoid it.

There is a risk that switching the focus onto 'energy saving now' detracts from these goals that are central to delivering climate mitigation. It is therefore important that immediate measures, adopted to address affordability and short-term energy security objectives, are designed to support longer term policy change. For this reason, the following principles should be adopted as part of the short-term policy package:

- No reductions in ambition, targets or financial support for long-term climate goals,
- No long-term public support to infrastructure for fossil fuel production or use, and
- Revenue support to household and/or businesses to ameliorate fossil fuel costs should, over time, prioritise investment in energy saving above subsidising fossil fuel use.

The crisis has also highlighted and exacerbated failings in gas and electricity retail markets. Retail market policy since full liberalisation in 1998 has focused on competition in commodity sales, overlooking opportunities to reduce bills by reducing demand. Price regulation was reintroduced in response to limited switching and the resulting price cap then killed off many badly capitalised suppliers on whom the government and Ofgem were relying on to increase competition (Citizens Advice, 2022). So now 22 million households have prices set by the regulator, not competitive markets, and it is hard to believe Government will abandon price controls whilst prices are high. Indeed, many of the proposals now being made assume far greater policy control over prices than is consistent with fully liberalised markets. The design of UK energy retail markets therefore needs a major rethink, to address social issues more effectively, and to encourage investment in energy efficiency.

How fast can we reduce energy demand? Action for the short-term

There is an international literature on "saving energy in a hurry" that has been summarised by the International Energy Agency (IEA, 2011; IEA; 2018) and shows the potential for savings of at least 20% (more in transport), within weeks, if and when a situation is acknowledged as a crisis.

Whilst this has not happened in recent years in the UK, there is experience of energy crises in the UK from the oil shocks of the 1970s, when energy demand fell significantly across all sectors (~10% over 2 years) after each price shock (Lees and Eyre, 2021).

The case for focusing on short-term energy savings is based on the current affordability crisis and the increased risks of a physical energy security crisis. Rapid (short run) energy savings are those which can be made without investment in new physical equipment, i.e. by reducing demand for energy services or using existing equipment more efficiently. In essence, this can be done by avoiding waste (e.g. switching off equipment that is not in use) and by reducing the energy services consumed.

The potentials for doing these are significant, but not equally distributed across the population. Energy waste and 'excess' energy use are predominantly in higher-income households, whereas the impacts of the affordability crisis fall mainly on lower-income households. This has important implications for policy. In essence, it points to a twin-track strategy in which:

- High-income households take the main responsibility for rapid reductions in energy use to address security risks; and
- Low-income households are the main beneficiaries of policy to reduce prices and increase incomes and as well as the immediate priorities for housing energy efficiency improvement.

Of course, the population does not fall neatly into two groups, and as prices rise, more households will be under financial pressure. Moreover, some policy interventions can benefit both types of household, in particular education about energy use and its costs, and advice about how to reduce energy waste and improve efficiency.

Information and advice

There are a number of 'easy guides' to quick energy savings. Some are not consistent with current evidence, notably a recent claim that switching off electrical items on standby can save '£147 a year' (Centrica, 2022), which is a large over-estimate. Fortunately, some reliable sources are widely used, notably the list from the Energy Saving Trust (EST, 2022) which covers switching off standby and lights, draught-proofing, washing temperatures, natural drying, showering length, kettle overfilling, dishwasher use and hot water cylinder insulation. Whilst each is relatively minor, the combination is potentially significant. The Government endorsed web advice service for England provides similar information (Simple Energy Advice, 2022) and has now been re-located to GOV.UK.

The recent price rises have seen a number of high-level simple guides which go further to address dealing with the crisis, notably from the European Commission and the International Energy Agency with a "9-point plan to save energy, Ukraine and the planet" (Euractiv, 2022). Based on what is known about drivers of behaviour change, exhortation from Brussels and Paris and hyperbolic headlines will not be sufficient.

But the basic list of measures that might make a substantial short-term contribution is broadly sensible, covering heating and cooling set points, boiler settings, home working, driving less, reducing highway car speeds, car free Sundays, walking and cycling, use of public transport and flying less.

The UK expects to invest £11 billion to roll out smart meters and in-home-displays (IHD). IHDs have the potential to help homeowners manage their energy use during the fuel crisis, but occupants may need support to get them working and advice about how to best use them to reduce their energy costs. And some older IHDs are of limited diagnostic value as they do not provide instantaneous consumption.

The variation in savings potentials across different households is very large. Many households are unaware of whether they are above or below average users, which is why individual advice has value, in addition to generic information. Government plans in the energy security strategy (HMG, 2022) to reinstate more substantial energy saving advice programmes in England are therefore potentially helpful. To address the immediate affordability crisis and security risks, programmes will need to be in place both nationally and locally for the winter of 2022/23.

Locally, local authorities, housing associations, fuel poverty charities and their contractors are best placed to play a role in both energy advice and local delivery, and to scale up activity quickly. For example, the Housing Support Fund allows resources to be used to support these as "essentials linked to energy and water", but the main intended use is income support to those in need.

What works in energy advice is well-understood from many years of experience (Maby, 2020) and can be highly cost-effective (Eyre et al, 2011). There is also relevant experience in other sectors, for example in community development (Chiu & West, 2007). Currently, local energy efficiency advice funding is very small compared to the scale of the problem, and therefore will need to be increased to have a major impact.

Various models of energy advice funding exist, including the network of local energy advice centres in Scotland and more project-based approaches such as the redress fund, financed by energy supplier contributions as an alternative to paying penalties.

In the short term, there will be a need to promote clear messages about ill-advised and potentially dangerous 'energy saving' actions that people under stress may consider, ranging from not cooking to burning wastes and bypassing gas meters.

When considering short-term opportunities to improve energy security, the main options obviously lie in the end uses that are the highest energy users. In UK homes this is space heating, and in transport it is car use.

Heating

In the few months before winter 2022, it will only be possible to undertake a small proportion of the retrofit measures that are ultimately needed. Scaling up the supply chain for deep retrofit is impossible on these timescales (Killip et al, 2020). Social considerations therefore point to prioritising simpler, lower cost measures and targeting low income households and the worst-maintained properties. Appropriate measures would include basic insulation, draught-proofing, boiler maintenance and repairs, installing and repairing heating controls, as well as more basic housing repairs, e.g. to address damp and broken windows.

Realistically only organisations with existing capacity and programmes can make a significant contribution quickly. Nationally, this points to using and expanding the supply chains that deliver the Energy Company Obligation, for example by increasing these obligations from the levels now proposed in ECO4. There is a precedent for this during the (much smaller) energy price crisis of 2010 (Rosenow, 2012).

Lower internal temperatures provide the main energy saving opportunity without changing the physical housing stock. Reducing room temperatures by 1C will typically reduce annual space heating demand by approximately 13% (see Annex 2). As space heating constitutes approximately 75% of residential gas demand, it would reduce sectoral gas demand by about 10%. Changing thermostat settings is the usual shorthand for how this can be achieved, and the single most important measure. However, not all homes have central thermostats, and there are other options for reducing average temperatures, notably 'zoning' by leaving rooms unheated or on low radiator/heater settings, or reducing the hours for which homes are heated.

A key constraint on the energy saving potential of moving to cooler homes is impacts on health. Cold homes are clearly implicated in the excess winter deaths observed every year in the UK (Marmot et al, 2011). National and international health advice suggests temperature below 18C are potentially damaging, especially to vulnerable residents. (see Annex 2). Many UK homes are already not heated to this temperature, and therefore their residents should not be advised to reduce temperatures as prices rise, although many probably will without further financial support. Energy saving advice therefore needs to be undertaken in conjunction with public health advice, including that already published in the Government's own Cold Weather Plan for England (Appendix 2).

Space heating in households is the UK's largest energy use, more 300 TWh/year. If the warmest 50% of homes reduced internal temperatures by 2C, this would reduce energy demand by approximately 30 TWh/year.

Achieving such a change would not be a trivial exercise. A regulatory approach to controlling maximum temperatures in households would be unenforceable. The extent to which 'able to heat' households would comply with a voluntary programme is context dependent. Experience from emergency situations in other countries (IEA, 2011) shows substantial savings quickly are possible.

And experience in the pandemic indicates that the vast majority of the public will make changes to normal practices, provided these are justified, clearly explained, supported by expert opinion and seen to be generally observed, including by political leaders. The implication is that a campaign would need government leadership, but also support from independent experts in energy saving, money saving and public health.

The same physical principles apply in non-domestic buildings, although space heating is generally responsible for a smaller share of energy use: 47% in UK non-domestic buildings (ECUK, 2020). Compared to housing, there are better control systems, fewer decision-makers, and therefore greater opportunity for rapid action, notably in Government owned and occupied buildings. Over 36% of non-domestic building heating (40 TWh/year) is in public sector buildings – education, health, emergency service, military and government offices (ECUK, 2020). These are amenable to more direct Government control, both through energy management and funding mechanisms such as the Public Sector Decarbonisation Fund and the Salix revolving loan fund. A Government decision to reduce internal temperatures in public buildings to 18C next winter would have a very significant impact, both directly and as a sign of leadership to corporate decision-makers and households. A precedent is similar action in 1974 to limit internal temperature in public buildings, although no enforcement action was ever taken and the regulation was repealed in 2013 (DECC, 2013). Open access public buildings, such as libraries and community centres, might need to be exempted, where it is proposed to use these as 'refuges from the cold'.

Transport

Reducing energy use in car travel rests on two pillars, using cars less (including by sharing) and driving them more efficiently. Ongoing work on the impacts of the pandemic on energy use is providing an example of how car travel can be reduced in a crisis. Weekday traffic levels fell by more than 60% at the height of lockdown and have stabilised at levels about 10% below pre-lockdown levels (Anable et al, 2022) as working and shopping patterns have changed. The fuel price crisis provides an opportunity to lock these in. UK car annual energy use is approximately 22 Mtoe (250 TWh) (ECUK, 2020), so a 10% reduction on weekdays saves about 20 TWh/year.

The policy packages needed to support less car travel are relatively well-known. Those which can be undertaken quickly include support for public transport (especially to reverse cuts to bus services), reallocation of road space to non-motorised vehicles and reprioritisation of capital spending away from road building. Working from home is now an option for a large proportion of the workforce in the way it was not during previous energy crises. A requirement, or even encouragement, to work at home when practicable and affordable is therefore a short-term energy saving option.

Car fuel efficiencies generally decline as speeds exceed 60 mph. Over 40% of car mileage is on non-urban highways (DfT, 2022) and vehicle efficiency falls by 10-15% between 60mph and 70 mph (Layberry et al, 2006). The implication is that reducing 70mph highway speeds to 60 mph would reduce energy use by 10-15 TWh/year.

In principle, this can be delivered via either voluntary or regulatory means. The former should form part of broader energy information and advice programmes. The latter would be more effective, but would have important enforcement implications, as many current speed limits are not enforced. It could be done quickly by Highways England and devolved equivalents. There is a precedent for this both in the 1970s fuel crises (Bonila and Foxon, 2009) and more recently on specific motorways to address air quality breaches (Highways England, 2020).

Recommendations

The UK needs an immediate short-term plan to address energy affordability and security risks. This should include:

- Addressing affordability concerns through a combination of targeted support to low-income households and Government support to lower the price cap,
- A major programme of evidence-based public information and advice,
- Measures to reduce energy demand in public buildings,
- A boost to projects supporting basic housing fitness and low-cost energy efficiency,
- Funding for local authorities, charities etc. already working to address fuel poverty,
- Increased support for active transport and public transport, and
- Policies to encourage and/or require lower car speeds.

These will assist in enabling some low-income households in poor housing to reduce the costs of keeping warm, and enable those households more able to reduce demand to contribute effectively to addressing energy security risks.

This plan should be the first step of long-term consistent strategy to reduce energy demand, aligning energy security, affordability and climate policy goals, including through:

- A delivery plan for energy demand reduction and decarbonisation across all sectors,
- A more detailed policy framework for heat decarbonisation and demand reduction,
- A major increase in skills investment to increase and improve building energy efficiency,
- Increases in the energy supplier energy saving obligations (ECO),
- Revision of the fuel poverty strategy to address radically changed circumstances, and
- A review of the way retail energy markets are regulated.

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Annex 1: The energy affordability and security crises

The origins of gas and oil price rises are complex. Contributory factors to the initial price rises in 2021 included changes to currency exchange rates, reduced international investment during the pandemic, demand increases in Asia due to a cold winter, decisions to close a major North Sea gas storage facility and reduced UK wind output. These led to energy supplier failures, the cost of which were added to bills (Bradshaw 2021).

Subsequently, the situation has been exacerbated by the Russian invasion of the Ukraine and European countries' response. This has significantly reduced Russian gas exports to Europe, increasing prices, although oil and gas still flow in substantial volumes. Whether these flows, and the payments in the other direction, will continue remains an open question. The trade survived the height of the cold war, with both sides judging that it remained in their economic interest. But it is clearly contingent on both how European (in particular EU) public policy develops and whether the Putin regime sees it as remaining in its interest as the war proceeds. In any event, physical attacks on pipelines could have an impact whatever those responsible for trade policy want. Given European dependence on Russian gas (and to a lesser extent oil), the impacts on European, and therefore UK, gas supply would be huge.

Most of the attention has been on the prices for oil and gas in European markets, which have been the primary indicators of the crisis. However, in the background, is the related question of physical security of supply, i.e. having sufficient energy. The current 'energy affordability crisis' could therefore become an 'energy security crisis'. Of course, in market economies, the two cannot easily be separated, as physical shortage tends to translate into rationing by price. And therefore, insecurity at the level of the of the individual user can be driven by affordability.

Affordability

Energy affordability is the immediate threat. At the time of writing (August 2022), the global oil price has fallen a little from the early March peak of $120 per barrel to just below $100 per barrel. Oil price rises have driven the petrol/diesel price at the pump above £1.70/1.80 per litre. Gas prices remain more of a concern. The European gas price is approximately €230/MWh (~19p/kWh), even higher than its March peak level. UK retail market gas prices under the household price cap from 1st October are 14 p/kWh for gas. The effect on electricity prices has also been substantial, with the price cap at 49 p/kWh (based on Ofgem, 2022).

Energy price rises also affect non-domestic energy users, who are likely to pass on costs in their products to their customers, contributing to general inflation. At the same time food prices are rising, driven by a combination of rising input prices and the war in Ukraine. The combination is a major contributor to inflation, which is now at its highest level since the aftermath of the last oil crises. In short, rising energy costs sit at the heart of an 'affordability crisis' for UK households.

Security

Concerns about energy security risks mean that the wisdom of reliance on Russian gas and oil is now questioned as never before. Although climate mitigation points to eventual elimination of oil and gas use for energy, we will need some for the next 30 years. UK oil and gas production has been in decline for 20 years and cannot increase quickly, even with new investment. Oil and gas imports will therefore remain a reality.

Oil markets are global, so reliance on Russian supply can be limited more easily. Although UK reliance on Russian natural gas is limited to 4% of total use (House of Commons, 2022), natural gas poses more problems at European scale, and this will affect the UK. Increased use of LNG from outside Europe is clearly possibly, but would need infrastructure investment, which would have to be done in the context of declining gas usage. EU policy is clearly moving in this direction. This will improve the prospects for European gas security in general, but may not entirely address UK issues, given that the UK is outside the single market (Bradshaw, 2021), especially if Norwegian supplies are diverted to elsewhere in Europe. This implies that the UK needs a proactive policy for the role of gas, covering both gas supply and gas demand, throughout the zero-carbon transition.

Crisis response

In a physical security crisis, it seems unlikely that government could stand on the sidelines, and rely entirely on rationing by price. That has not happened in previous crises. At a minimum, operators of the gas and electricity systems have continency plans to protect system safety and would action them. Physical disconnection of households from gas is very unlikely, largely because depressurisation of the low-pressure gas mains can lead to explosion risks from combustible mixtures of methane and air.

Large industrial users, who have opted for interruptible contracts, are likely to be the first to be required to reduce demand. And the UK has experience of using emergency powers to reduce industrial energy demand, notably in the '3 day week' of the winter of 1973-74.

Some substitution of gas in the electricity system is likely, indeed this has already happened with remaining coal stations having some increased usage. However, gas is usually the marginal power generation fuel in the GB system, and therefore using less electricity is the main option for reducing reliance on gas-fired power generation. In extreme circumstances, there are processes for incentivising rarely-used generators and industrial demand response, before household users are impacted. In a crisis, power cuts rather than gas cuts would be the first direct household impact.

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Annex 2: Health and energy impacts of internal temperature change in UK housing

Reducing the thermostat by 1C from 21C can reduce the space heating energy use by up to 13%, and hence reduce total fuel cost by about 4%. The exact savings depend on the type of heating, controls, how cold the winter is, etc.

The World Health Organisation and The UK Health Security Agency recommends heating to 18C. Lower temperatures can be dangerous particularly for the vulnerable.

Currently many homes are already kept at and controlled to below 18C (25% of homes have room thermostats set at below 19C).

England and Wales had 24,000 excess winter deaths in 2019 (the last year where Covid does not dominate the stats) a proportion of which are thought to be attributed to cold homes. Significant reduction in room temperatures, particularly below 18C is likely to increase this number if we have a cold winter.

Homes that are heated to a low temperature or are partially heated can experience high relative humidity which can result in mould growth and house dust mites which can also cause health problems particularly for asthma and eczema sufferers.

Homes have several thermostats (room, thermostatic radiator valves (TRVs), boiler thermostat and hot water thermostat), leading to a risk of confusion with generic messages of "turn down your thermostat".

The Cold weather plan for England: Protecting health and reducing harm from cold weather

Key public health messages

Contact your GP or pharmacist if you think you, or someone you are for, might qualify for a free flu jab. There are 4 flu leaflets: one general, one for pregnancy, one for people with a learning disability and one about children.

Free flu vaccinations are available for those who are at risk. For a full list see the annual flu plan.

Keep your home warm, efficiently and safely, by:

- Heating your home to at least 18C in winter poses minimal risk to your health when you are wearing suitable clothing
- Getting your heating system and cooking appliances checked and keeping your home well ventilated
- Using your electric blanket as instructed and getting it tested every 3 years – never use a hot water bottle with an electric blanket
- Not using a gas cooker or oven to heat your home; it is inefficient and there is a risk of carbon monoxide poisoning and this can kill
- Making sure you have a supply of heating oil or LPG or solid fuel if you are not on mains gas or electricity – to make sure you do not run out in winter

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About CREDS

The Centre for Research in Energy Demand Solutions (CREDS) was established as part of the UK Research and Innovation's Energy Programme in April 2018, with funding of £19.5M over five years. Its mission is to make the UK a leader in understanding the changes in energy demand needed for the transition to a secure and affordable, net-zero society. CREDS has a team of over 140 people based at 24 UK universities

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