



# Solving the UK's energy crisis: Heat pumps and insulation for peace?

Even before the Russian invasion of Ukraine, the UK's home energy bills were shooting up, catapulting millions more into fuel poverty. But there are solutions which tackle this poverty, reduce carbon emissions, and in the longer-term insulate us from some conflicts, argues **Philip Webber, SGR**.

The war in Ukraine is forcing Europe to understand an interlocking crisis of conflict and energy. The EU and – to a lesser extent – the UK import fossil fuels from Russia, thus helping to fund the invasion. The EU and UK are actively removing themselves from financial transactions with Russia but so far there has been limited discussion of how reducing carbon emissions to zero would reduce this financial policy conflict – ultimately also to zero.

Indeed, with global energy prices skyrocketing even before this crisis, the consequent growth in fuel poverty – in the UK and elsewhere – has been adding another argument in favour of rapidly moving away from fossil fuel dependence.

In this article, I focus mainly on home energy use in the UK, and the need for a rapid transition that makes much greater use of energy conservation and domestic renewable energy.

However, it's impossible to cover this without addressing wider and deeper issues with the nation's energy policies and programmes, so I give a brief overview of these and suggest ways forward to improve home warmth standards and reduce carbon emissions at the same time in a rapid, real, levelling-up green transition.

## Energy sector privatisation

The first key problem with the British energy industry – which began back in the 1980s – is the degree to which it is run by privately-owned corporations. Margaret Thatcher's Conservative government privatised the gas supply industry in 1986 and the electricity sector in 1989.

Today, the UK energy generation and supply network is managed by a wide range of private monopoly suppliers, mostly based overseas. We Own It and Citizens Advice estimate that each year, the energy and network supply companies extract value of £3.7bn in share dividends and profit, money which largely incentivises fossil fuel consumption and which could otherwise be re-invested in energy saving and modernising the energy infrastructure.<sup>1</sup> They further estimate that an energy sector buy-back would pay for itself in around eight years even if shareholders were compensated fully, i.e. with no penalties for years of underinvestment in infrastructure.

So, part of the solution is an urgent restructuring of energy generation.

## Early home energy schemes

It took until 1994, after the iconic 'Earth Summit' of 1992, with the realisation that carbon emissions from fossil fuel use needed to be reduced, that government placed the first obligations on energy companies to help insulate homes, improve domestic energy efficiency and reduce bills – and also to encourage early deployment of renewable energy technologies.

A series of home insulation grant schemes were created usually offering 50% of the upfront cost of insulation or heating improvements for those with lower incomes or in fuel poverty. However, UK housing energy efficiency levels were poorer than much of the rest of Europe, and standards for new housing – when it is far cheaper and easier to install better insulation as part of the fabric – remained weak. Tens of thousands of 'excess deaths' were – and still are – registered each winter as a result of cold living conditions.<sup>2</sup>

In addition, early small-scale renewable energy schemes – e.g. roof-top solar panels and farm-based wind turbines – struggled to achieve planning permission, and the companies running the electricity networks resisted local generation and charged high connection fees. The energy supply system remained focused around large fossil fuel and nuclear power stations and was not designed to work well with local energy generation.

From 2002, the Labour government placed a ‘levy’ on energy bills to contribute to home insulation and subsidies for new renewable schemes – both large and small.

In 2006 the Stern Review commissioned by the UK Treasury, concluded that climate change would lead to annual costs to the economy of 5–20% of Gross Domestic Product (GDP) whilst action to avoid this disaster would be far cheaper at up to 2% of GDP per year.<sup>3</sup> This report boosted green policies to some extent.

Throughout this period domestic energy consumption fell – mainly as a result of EU regulations to improve the efficiencies of electrical appliances and gas boilers, together with some contribution from home insulation programmes. But the reality remained that most homes were still poorly insulated.

### Climate denialism hits back

In a very important counterpoint to the progressive climate measures, from the mid-90s onwards, powerful sections of the corporate media – supported by fossil fuel interests – attacked the green agenda, including questioning the whole concept of climate change as a result of human activity.

Wind turbines, solar panels, and low energy light bulbs were roundly criticised. However, they chose as their main target the levy on household consumers’ energy bills to partly fund renewable generation and insulation. There were many things wrong with the system and how it was funded. By creating a levy rather than funding improvements out of general taxation, government created an easy target for criticism – especially given its lack of progress in tackling wider poverty and inequality. The market-driven energy supply did not work well and, as the government bolted-on various attempts to correct for systematic market failures – for example, by paying wind farms to not generate electricity under certain conditions – further easy targets for criticism were created. The real issue was a failure to plan for an energy transition effectively and to have coherent policies and programmes. Thus, whilst some criticisms were valid, the real culprit of political and economic policy failure avoided scrutiny, whilst green technologies received misplaced attack.

### The deliberate dismantling of climate policies – ‘cutting the green crap’

After the Conservatives came into power in 2010, in a coalition government with the Liberal Democrats, a few climate-friendly programmes were initially launched, but then came a serious change in policy direction.

In 2013, the Cameron government announced that they were going to pare back various environmental measures – which became known as ‘cutting the green crap’ – leading to an immediate reduction in average home energy bills by some £112/year.<sup>4</sup> In practice, this meant that continued funding for

### CASE STUDY: Kirklees Council’s home energy schemes

During the 2000s, as head of the environment unit at Kirklees Council in West Yorkshire, I coordinated a series of home energy schemes. By 2006 we had worked on several renewable energy projects funded by a range of UK government departments and the EU, installing the largest amount of domestic solar photovoltaics (PV) in the UK. We won an Ashden award for this work. Apart from the funding base, the work was only possible through the direct support of local government working with housing associations, social and adult services, and a range of other public services including the fire service, schools and police. In other words, the work was at scale and coordinated.

Over the next three years we delivered the largest (and last!) city-scale programme for home insulation, home safety and warmer homes in the UK: Kirklees Warm Zone. This cost £21m and insulated some 55,000 private homes at zero cost to the householder. 50% of the cost came via the government’s CERT (Carbon Emissions Reductions Targets) scheme, which was abolished shortly afterwards. We also improved thousands of domestic heating systems, provided debt advice, improved take-up of benefits and made safe numerous lethal home appliances. This programme also won an Ashden award along with several others. The success of this scheme was through its strong marketing, delivering measures at scale, street-by-street and ward-by-ward, and very close management by the local authority which minimised low quality work and fixed mistakes quickly – all vital to public support and acceptance.

Follow-up research at the University of Leeds<sup>5</sup> confirmed that this work delivered real energy savings that were still visible in official local statistics years later. In fact, the insulation programme delivered more savings than assumed by the government models by at least 20% and were particularly effective at reducing fuel bills for those in the lowest income percentiles. This study found that participating households reduced their energy bills by an average of £125 or 15%. The study also identified the level of background reductions in energy use of 12% – around £100.<sup>6</sup> This was due to people’s own home improvements and a gradual increase in boiler and appliance efficiencies. This study suggests that, with 100% take-up of home insulation and starting from a typically uninsulated base, domestic energy reductions of 27% could be achieved over a four-year period.

In terms of overall benefits, the programme paid for itself within five years, created a shorter-term number of jobs and economic benefit, and continued to deliver energy savings, health and quality of life benefits to this day far exceeding the initial cost.

However, these benefits are widely distributed amongst householders, particularly those on low incomes. From a market perspective, this is a difficulty because these community-wide benefits cannot be easily monetised to make such schemes self-funding for a commercially-funded body.

In 2014, we presented our evidence of the wide community and societal benefit to civil servants. They were very impressed with the results. But at the time, their overriding focus was on impending departmental re-organisation and worries about their future careers. So, this learning was obliterated by the ‘cutting the green crap’ agenda.



In 2015, the government scrapped the proposed zero carbon homes standard and a million new homes were built to poorer energy insulation standards resulting in higher running costs and more carbon emissions.

home energy efficiency programmes was sharply reduced, new onshore wind farms were effectively banned (this measure taking effect in 2018), and some other green programmes scrapped. Two new, smaller domestic energy efficiency programmes – the ‘Green Deal’ and the Energy Company Obligation (ECO) – were introduced. Crucially, these schemes were marketed to individuals typically, rather than areas or communities, and delivered by sets of competing private companies.

The policy changes announced in 2013 led to dramatic change. The number of cavity wall insulation installations per year dropped by 92% and for loft insulation by 74%.<sup>7</sup> The ‘Green Deal’ was later branded a failure by the National Audit Office.<sup>8</sup> The reasons for its failure – many of them repeated in its successor, the Green Homes Grant programme of 2020–21 – were that they abandoned the successful methods of the previous programmes – including those run by local government (see box). There was no strong marketing campaign. The Green Deal was a bad deal financially for consumers. It offered a loan repaid over several years – with no grant incentive – and the interest rate was higher than bank rates. The householder had to get several quotes after finding ‘trusted’ or approved Green Deal contractors. There were thus no economies of scale and prices were high. Quality control was also a problem.

Thus market-based ideology trumped evidence-based research and experience – and failed.

Then, in 2015, the government scrapped the proposed zero carbon homes standard. Thus, up to the time of writing, a million new homes were built to poorer energy insulation standards resulting in higher running costs. Most of these costs would have been met by developers, not householders.

*Carbon Brief* recently estimated<sup>9</sup> the overall impact of ‘cutting the green crap’. By the winter of 2022, if the government cuts had not been made, energy efficiency programmes would have saved £902m, onshore wind £1,956m and zero carbon homes £198m per year – a grand total of £3,100m/year. These measures if kept in place would have saved the average household around £40/year and the average business a further £60/year.

So, progress has stalled and home energy costs could be somewhat cheaper. But is there a solution to high energy prices that is consistent with reducing carbon emissions and improving security? Before summarising a viable way forward, it

is important to address the widespread misinformation about the latest energy price rises.

### Why have home energy costs increased so sharply?

In short, home energy costs have increased in the last few months because the wholesale price of fossil gas has doubled – and then the war in Ukraine has exacerbated this. Nevertheless, much of the debate up until the breakout of war still focused perversely on the level of the ‘green levies’ on fuel bills – presumably in a hangover from the prolonged media attacks on these levies for the last two decades. Whilst the ‘green levies’ stand at around £180, ‘other’ costs in energy bills – network costs, operating costs, profit and supplier failure – amount to around £530 (in fact, the majority of this sum is a result of dealing with 27 smaller energy companies who have recently gone out of business), whilst the wholesale price of gas – previously £400–500 – had, just before the outbreak of war, doubled to over £1,000.<sup>10</sup> This global gas market is also the reason why an expansion in the extraction of North Sea gas or another attempt to establish a UK fracking industry would not significantly reduce gas prices – any new gas would be sold, as usual, to the highest international bidder not in ways which would lower costs for British domestic users.

But it isn’t at all obvious why the cost of *electricity* is also set to go up dramatically. The cost of renewable electrical generation is currently 30–40% of the typical domestic electricity tariff.<sup>11</sup> But the UK electricity market pools all generation together according to its short-term<sup>12</sup> wholesale price. Renewable and nuclear generation are run as much as the technologies and weather conditions allow. But the remaining power, primarily gas-fired generation, is used when overall demand outstrips this core supply. These generators only deliver if the market price covers their operating costs, so this price is almost entirely set by the cost of wholesale gas for electrical generation. Despite this, renewable generation is still reducing electricity bills – but by far less than it could in a restructured market.

### A longer-term solution?

This electricity market needs to be changed. One suggestion is to set up a green energy supply pool funded by long-term fixed-price contracts.<sup>13</sup> This pool would only buy from the wholesale gas market for limited times. To minimise these costs, the green

pool would offer discounts for customers willing to shift their consumption to off-peak times, or use electric vehicles (EVs) or in-house battery systems to smooth energy demand. This would reduce emissions at the same time as reducing electricity bills.

Turning to gas, its main use in the UK, apart from powering large power stations and some industrial processes (which could convert to electricity), is for domestic central heating. Typically, this supplies 80% of home heating. As a first step, this consumption (and hence cost) should be reduced by a comprehensive home and business retrofit insulation programme combined with a fast-paced roll-out of heat pumps. As heat pumps run on electrical power, it is vital that the electricity energy market is restructured to take advantage of the very low price of renewable generation as outlined above. Renewable generation also needs to increase in scale and to include other reliable sources such as tidal power. Demand smoothing as discussed above can help to limit the necessary expansion in the overall size of the network generating capacity.

The critical advantage of heat pumps is that they typically generate three times as much heat energy, by extracting it from the air or ground, as the electricity required to run them. This means they are one of the most energy efficient technologies available. Furthermore, by increasing levels of home insulation combined with local generation such as roof-top solar PV and continued improvement in the efficiencies of electrical appliances, electricity demand could be reduced even further.

One example of a community already running a sustainable local energy system, powered by its own off-grid energy supply, is the Scottish island of Eigg. The resident-owned network is powered by hydro-power, wind and solar PV. It supplies electrical power 95-97% of the time whereas formerly residents used diesel generators for at least 50% of their supply.<sup>14</sup>

### Reducing domestic heating bills in the short-term

In February this year, the government announced it will fund some price reductions for householders and to smooth the energy price spike by a loan repayable over four years. Despite this, energy bills will still rise dramatically. Smoothing the price rise over several years does not address the fundamental problem and is vulnerable to future price rises. The government has chosen not to apply a windfall tax on the profits of large energy suppliers despite these increasing dramatically. There are also large existing subsidies paid to the fossil fuel industry. These need to be diverted to renewables and households and some industrial consumers to keep increases in bills to within price controls set by government. Before the outbreak of war, fuel poverty was already predicted to rise to six million households, an increase of 50%. The latest government data reveal over 29,000 excess winter deaths in 2021 arising from the impacts of cold homes.<sup>15</sup> This, along with high levels of food insecurity, is a shocking indictment for such a rich economy as the UK.

### Conclusions

The government continues to ignore the societal and economic benefits of programmes of home insulation. Whilst the upfront cost may seem high, the benefits in health, jobs, and energy savings mean that such schemes pay for themselves in about five years and continue to deliver benefits for the next 40 years. They would create a real programme for 'levelling up'. A re-invigorated programme of heat pump installation and the phasing out of gas boilers would dramatically reduce UK carbon emissions when combined with the expansion of the renewables network. And a rapid implementation of this policy now would also help break the link between energy use and the invasion of Ukraine.

Strong government support for modernisation of the electricity supply network and market should be combined with the ending of fossil fuel subsidies and real long-term zero carbon policies – for example, a halt to all airport expansion, a sharply reduced road-building programme, and a stop to new coal mines and oil fields. This would send a clear message to the financial markets that new types of development, based on principles of sustainable development and zero carbon, will now be the new normal and that government is prepared to underwrite the investment to keep costs manageable. An overheating climate is a real and present danger far greater than the COVID-19 pandemic.<sup>16</sup> It requires similar support. The UK government has spent at least £370bn during the pandemic in a new form of quantitative easing (QE) that has gone largely unannounced.<sup>17</sup> The government could, if it chose, use QE to fund the necessary low carbon transition. But the key crucial difference in this case would be that the spending, rather than shoring up an economy in enforced suspension, would deliver a new front against climate change and improve energy security with additional benefits including improved health and a real levelling-up agenda across all of society and the UK economy.

*Dr Philip Webber is Chair of SGR, and a former head of environment at Kirklees Council, West Yorkshire.*

### STOP PRESS

**As this edition was going to press, new UK energy policies were due to be announced – driven by the desire to reduce fossil fuel imports from Russia. The signs are not good that the lessons outlined in this article are being learned.**

### References

- Hall (2019). <https://gala.gre.ac.uk/id/eprint/25938/> Also see video summary at: <https://twitter.com/i/status/1489193586658787328>
- OFTEC (2021). <https://www.oftec.org/news/2021/12/23/government-urged-to-tackle-uk-s-winter-death-and-cold-home-crisis>
- Stern (2006). <https://www.lse.ac.uk/GranthamInstitute/publication/the-economics-of-climate-change-the-stern-review/> In a follow-up report ten years later, the author said that he had understated the impacts and costs of climate overheating.
- Carbon Brief (2022). <https://www.carbonbrief.org/analysis-cutting-the-green-crap-has-added-2-5bn-to-uk-energy-bills>
- Webber *et al* (2015). The impacts of household retrofit and domestic energy efficiency schemes: A large scale, ex-post evaluation. *Energy Policy*, vol.84, pp.35-43. <https://doi.org/10.1016/j.enpol.2015.04.020>
- 2011 constant energy prices
- Carbon Brief (2022) – as note 4.
- NAO (2016). <https://www.nao.org.uk/report/green-deal-and-energy-company-obligation/>
- Carbon Brief (2022) – as note 4.
- Hannon *et al* (2021). <https://theconversation.com/energy-discounts-are-a-sticking-plaster-heres-a-long-term-solution-to-soaring-household-bills-176402>
- BEIS (2020). <https://www.gov.uk/government/publications/beis-electricity-generation-costs-2020>
- Up to two years.
- Grubb (2022). <https://www.ucl.ac.uk/news/2022/jan/opinion-renewables-are-cheaper-ever-so-why-are-household-energy-bills-only-going>
- BBC News (2021). <https://www.bbc.co.uk/news/av/science-environment-59238305>
- OFTEC (2021) – as note 2.
- IPCC (2022). <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>
- Financial Times* (2020). Bank of England to directly finance UK government's extra spending. 9 April. <https://www.ft.com/content/664c575b-0f54-44e5-ab78-2fd30ef213cb>