End the wait. Insulate.

Social housing energy efficiency and the energy crisis

Researched and produced by the Centre for Sustainable Energy for UK100

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About UK100

UK100's primary purpose is to support the early shift in the UK to Net Zero and cleaner air.

UK100 believes that this can only be done by a collective approach from the most influential leaders across the country learning together, agreeing priorities for legislative and regulatory change and giving them the power to engage with national decision-makers to bring about rapid action on climate and clean air. UK100 main aim is to provide the networks, tools and connections to make this happen.

About the Centre for Sustainable Energy

The Centre for Sustainable Energy (CSE) is a charity supporting people and organisations across the UK to tackle the climate emergency and end the suffering caused by cold homes.

We do this by sharing our knowledge, practical experience and policy insights. For over 40 years, we've supported people to take effective action on energy in their homes. We help communities and local councils to understand energy issues, set priorities, and put plans into action. Our research and analysis focus on making the energy system greener, smarter and fairer. Find out more at www.cse.org.uk

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Foreword.

This report could not be more timely. The UK is in the middle of a gas price crisis. At the same time, the war in Ukraine is accelerating the need to end our reliance on imported fossil fuels.

This report highlights the key role local leaders can play in boosting UK energy security, reducing household bills, driving skills and market transformation, and accelerating Net Zero through energy efficiency.

To deliver Net Zero, we must act with urgency and we must ensure that we utilise all the powers in our control to do so. Yet housing represents a significant challenge to our ambitions to decarbonise our local communities. Whilst much effort and attention has been put into building lower carbon new homes, making those that we already have more efficient, less leaky and warmer is difficult because as local authorities we have less power to affect the energy performance of existing buildings. We are under no obligation to take action in this respect.

However, in Wiltshire, we have already taken significant strides in addressing the energy efficiency of our council-owned building stock. Through our Housing Energy Efficiency Programme (HEEP), we intend to get all our existing council housing properties up to EPC level B within ten years because we see the value in taking this action, not just for the climate, but for our community. This isn't an easy task, like many rural areas our housing is not concentrated in a single large urban area but is spread over a much wider area.

This initiative is important, not just in tackling housing emissions, but in order to give education providers and businesses in the area the confidence to invest in greener skills development and to help build the local supply chain. Our investment in our own building stock is levelling up our area, building a more resilient workforce, all while reducing bills for some of the most vulnerable households - objectives which are equally important to a prosperous future.

In the current crisis, the case for energy efficiency upgrades has never been stronger, as evidenced by this report. The **greater level of investment in making the housing stock energy efficient, the larger the energy bill savings and jobs dividend.** This report indicates that the total public and private investment needed to upgrade our social housing stock to meet Net Zero by 2050 while reducing bills is in the region of **£57 billion,** a figure that supports **over 80,000 skilled workers across the country to transform the wider energy efficiency market**.

Transformational change is possible - we are demonstrating that in Wiltshire. Social housing energy efficiency at scale is possible, and we could go further and faster on delivering cheaper bills and reaching Net Zero, if we were afforded greater powers. There are important lessons to learn from the Green Homes Grant - local authorities can be an effective delivery partner, and the Government should capitalise on our ability and reach to do so. Wiltshire and the wider UK100 membership stands ready to work with the Government to deliver.

Cllr. Richard Clewer, Leader, Wiltshire Council
Chair, Countryside Climate Network
Co-President, UK100

Executive summary.

“The cheapest energy is the energy we do not use. To avoid another winter like this, we need a locally-led energy efficiency revolution to slash household bills long term. The more urgently it is implemented, the better it can protect Brits from the misery of £4,000-a-year energy bills. It is time to end the wait and insulate.

Polly Billington, Chief Executive Officer, UK100

Key findings.

In the context of the energy crisis and economic uncertainty facing millions of Brits, this report sets out the need for an urgent near-term response and a long-term Government strategy to upgrade the energy efficiency of the UK's[1] housing stock. It also outlines why tackling social housing is a logical first step.

The 2019 Government Manifesto committed to a £3.8 billion Social Housing Decarbonisation Fund (SHDF) over ten years. The total allocated to be spent by 2025, by the time Wave 2.1 the SHDF competition closes in November 2022, will be £1 billion. Yet there is no clarity about what the next phase(s) will look like or whether/how the remaining funding will be deployed. This report argues the competitive and restrictive nature of the fund, the short time frame for projects to be brought online, the current skills shortage in the energy efficiency sector, and the urgent need to tackle the gas crisis and fuel bills necessitates a new approach.

The detailed modelling and analysis from UK100 and the Centre for Sustainable Energy (CSE) demonstrates the potential for redesigning the SHDF to more effectively deliver the remaining £2.8 billion of pledged funding while slashing energy bills for some of the most vulnerable social housing tenants.

A new SHDF focused on an urgent, targeted, non-competitive £900 million fund, deployed by local authorities and delivered over the next three years could reduce energy bills for over 180,000 predominantly low-income households by over a third - up to £1,500 a year.[2]

1 The CSE model did not include Northern Ireland's social housing stock due to a lack of available data

2 £1,500 is an estimated near-term energy bill saving for 2022/2023. More detail is in the “An urgent energy efficiency programme for social housing from 2022 - 2025” section of the report. In the long-term, the modelling and analysis estimate energy bills in 2050 will have reduced by almost 7% on average. The long-term saving is based on modelling assumptions that gas prices will eventually stabilise before 2050 and that the Government will make good on its stated intention to decouple electricity prices from gas prices in the long term. More detail is in the “Net Zero social housing by 2050.” section

The remaining £1.9 billion of pledged SHDF, if deployed according to the model proposed in this report, could improve the energy efficiency of another 370,000 social housing households between 2026 and 2028. The improved SHDF in this scenario would see over 550,000 homes upgraded between 2022 and 2028, permanently reducing household bills and energy demand.

Furthermore, the report outlines the need for sustained investment beyond the currently committed 10-year lifespan of the SHDF to ensure all of the UK's social housing properties are upgraded in line with the Government's 2050 Net Zero pledge. The modelling in this report suggests the Government would need to invest £16 billion between 2029 and 2050 to unlock the private investment necessary to cover the total £50 billion cost of upgrading almost five million social housing properties to Net Zero standard by 2050.

The total public investment to 2050 represents less than 20% of the roughly £100 billion savings made from the current Chancellor's decision to cut the length of the Energy Price Guarantee (EPG) from two years to six months[3] and it would be spread over almost 30 years.

The report argues that permanently reducing energy bills for low-income social housing tenants is in line with the Chancellor's promise to target help for the most vulnerable after the EPG ends in April 2023 and leaves households facing average energy bills of over £4,000.[4]

An urgent social housing energy efficiency programme can also be the foundation for a medium- and long-term plan to upgrade and refurbish homes beyond the social housing sector, creating a market that can bring the benefits of energy efficiency to private renters, owner occupiers and landlords.

Establishing a supply chain and a skilled workforce to deliver investment in a long-term “affordable to rent, affordable to run” energy efficiency strategy to 2050 can attract private investment in an underdeveloped energy efficiency market. A long-term programme will also accelerate progress towards the UK's Net Zero goal, support 83,560 jobs, and boost local economies.

3 https://news.sky.com/story/energy-price-guarantee-could-cost-taxpayer-140 billion-in-extreme-scenario-market-expert-warns-12712574 and https://ifs.org.uk/articles/response-energy-price-guarantee Original estimates for the cost of the two-year EPG ranged from more than £100 billion to £140 billion in place of Government costings. We are taking a conservative median estimated price tag of £120 billion over two years, which suggests a monthly cost of £5 billion. Therefore, over six months, the project would cost £30 billion instead of £120 billion, saving the Treasury roughly £90 billion compared to the original proposal

4 https://www.cornwall-insight.com/press/response-to-the-domestic-energy-price-guarantee-announcement/

End the wait. Insulate.

The average family will see their energy bill rise above £4,000 next year.[5] And that is after they have navigated a bleak winter of fuel poverty[6] and the prospect of rolling blackouts.[7]

Brits are amongst the hardest hit by the energy crisis fuelled by Russia's illegal war on Ukraine.[8] Yet we are poorly placed to deal with these challenges because successive governments have failed to tackle the UK's energy efficiency deficit.

The cheapest energy is the energy we do not use. But we are living in some of the draughtiest homes in Europe, meaning that keeping them warm and comfortable is more expensive and results in more energy wasted.

Administrations have kicked the can down the road on making our homes fit for the future. And the dithering is adding an average of £1,000 a year to already staggeringly high household energy bills.[9]

But despite a 2019 Government commitment to "help lower energy bills by investing [in] energy efficiency"[10] national energy policy has been frustrated by Government instability, a series of u-turns,[11] a successful high court challenge to the UK's Net Zero Strategy,[12] a failed national roll-out of the Green Homes Grant (GHG),[13] a delayed Energy Bill,[14] and short-term competitive funding projects.

It is time to end the wait and insulate.

And with more social housing tenants in poverty,[15] and more levers available to local and regional leaders over social housing than the wider housing stock, this report is focused on exploring an energy efficiency strategy that prioritises upgrading the social housing stock first.

Levelling Up.

With a social housing stock of almost five million homes, local and regional governments should be the focus of plans to kickstart a domestic energy efficiency revolution. They predominantly own the assets and recognise the value of tackling the energy crisis with and for their tenants. Social housing tenants are more likely to struggle with bills and spend any money saved locally, boosting the local economy.[16] A local and regional approach aligns both the Government's Levelling Up and Net Zero strategies.

5 *Ibid.*
6 https://www.standard.co.uk/business/money/fuel-poverty-set-to-hit-almost-11-million-households-from-april-campaigners-b1033728.html
7 https://www.theguardian.com/business/2022/oct/06/how-would-three-hour-power-cuts-work-great-britain
8 https://www.energylivenews.com/2022/09/05/uk-households-are-the-hardest-hit-by-energy-crisis-in-western-europe/
9 https://www.theguardian.com/money/2022/aug/10/poorly-insulated-homes-will-spend-almost-1000-more-on-gas-study-says
10 https://www.conservatives.com/our-plan/conservative-party-manifesto-2019
11 https://www.bbc.co.uk/news/business-63283436
12 https://www.localGovernmentlawyer.co.uk/litigation-and-enforcement/400-litigation-news/51869-Government-will-not-appeal-high-court-ruling-that-its-net-zero-strategy-is-unlawful
13 https://www.theguardian.com/environment/2021/dec/01/uk-green-homes-scheme-was-slam-dunk-fail-says-public-accounts-committee
14 https://theenergyst.com/energy-security-bill-delayed-minister-confirms
15 https://www.cih.org/news/uk-housing-review-2022-shows-millions-of-households-could-be-plunged-into-fuel-poverty-unless-Government-acts-to-address-spiralling-costs-and-energy-inefficiency
16 https://commonbond.org/economic-benefits-of-affordable-housing/

Beyond an urgent plan for the most vulnerable social housing tenants, this report demonstrates how a long-term Government strategy committing initial public funding to draw in a total investment of £55 billion between 2025 and 2050 could create an 80,000-strong workforce, creating more jobs in regions with more homes. The East of England, London and the South East would see the most jobs created, followed by the Midlands, the North West and Scotland. But it is in the North East where the greatest number of jobs per dwelling would be created.

Each region needs a different skills mix. Everywhere needs more air source heat pump installers, for example. But there is less need for cavity and external wall insulators in regions like the South East and East of England, where these industries are more established. Collaboration with local and regional authorities in the design and delivery of the programme would enhance its effectiveness, as demonstrated by the outcomes of the Local Authority Delivery element of the GHG.[17]

As demonstrated in the pandemic, local authorities can mobilise quickly, and know their communities in the granular detail required to deliver programmes such as energy efficiency at scale. A well-designed approach to policy, building on local authority knowledge and insight, and the disciplined allocation of investment could help to tackle regional inequality by identifying those areas where current energy performance is lower and energy efficiency needs are greatest.

Kickstart the market.

As with the success of offshore wind in the UK, private and public partnerships are a key driver of market development. Investing in social housing will support tens of thousands of jobs while also building confidence in the energy efficiency market by upskilling a large proportion of the labour force.

As Wiltshire Council Leader Richard Clewer points out in his Foreword, investment in making homes more comfortable and affordable also gives education providers and businesses the confidence to invest in the green skills necessary to build resilient local and national supply chains.

UK100's work with our membership across the UK has identified supply chain shortages that have prevented early adopters from upgrading the energy efficiency of their homes. Urgent investment will have a multiplying effect on the job and economic dividends.[18]

As the UK Heat and Building Strategy states, "if established early, these energy efficiency and low-carbon heat markets can take advantage of more export opportunities for goods and services and demonstrate our ability to be a green 'Global Britain'."[19]

The Strategy predicts decarbonising buildings could support 175,000 skilled green jobs by 2030. Yet there is little detail on how and where these jobs will be realised. The 80,000-strong workforce identified in this report needed to upgrade the country's social housing can be the catalyst for realising that ambition across all regions.

This study calls for an urgent programme of social housing energy efficiency upgrades. However, it also underlines the need for a long-term strategic plan with clear and consistent policy objectives that provide industry with the confidence to invest and develop workforce skills and supply chain capacity.

17 https://www.gov.uk/Government/statistics/green-homes-grant-local-authority-delivery-lad-release-march-2022
18 https://www.uk100.org/sites/default/files/2022-07/Heat%20and%20Buildings.pdf
19 https://www.gov.uk/Government/publications/heat-and-buildings-strategy/heat-and-building-strategy-accessible-webpage

Net Zero and value for money.

Our homes use 35% of our energy and emit 20% of our carbon emissions.[20] Not only will a long-term energy efficiency strategy help permanently slash household bills, but it is also necessary for achieving the Government's targets of a 78% emissions reduction by 2035 and Net Zero by 2050.[21]

This report sets out an urgent programme that helps tackle fuel poverty, improve living standards and accelerate emissions reductions in the near term, 2022-2025, and a long-term plan to drive that public and private investment forward to achieve Net Zero, 2025-2050.

As the GHG proved, local leaders are more adept at implementing housing decarbonisation investment. In fact, PwC and UK Research and Innovation (UKRI) found Net Zero projects delivered through local and regional governments return £14 of benefits for every £1 spent.[22]

At the same time, local Government has more agency on social housing, allowing for an exploration of issues around pricing models for consumers and the complexity of mixed tenure in what were previously monolithic social housing developments but are now a patchwork as a result of the right to buy.

The former Chancellor, now Prime Minister, was clear that the UK Investment Bank (UKIB) can finance energy efficiency. A direction which was subsequently enshrined in the Bank's Strategic Plan.[23] And as this report argues, the design of the £900m fund for an urgent short-term programme to 2025 should ensure public and private partnership.

Similarly, this report does not expect nor argue for the total £55 billion cost of a long-term 2025 to 2050 social housing energy efficiency strategy to be borne by taxpayers. National Government should work with local authorities, the UKIB and other entities to ensure the energy efficiency revolution can crowd-in private capital from financial institutions and energy companies.

20 https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2020/12/CLC-National-Retrofit-Strategy-final-for-consultation.pdf
21 https://www.gov.uk/Government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035
22 https://www.ukri.org/publications/accelerating-net-zero-delivery/
23 https://www.ukib.org.uk/sites/default/files/2022-06/UKIB%20Strategic%20Plan%202022%20-%20Full_1.pdf

Recommendations.

- We are calling on the Government to rethink how it deploys the next waves of the SHDF for the remainder of the decade that the fund is committed. The competitive approach should end. Instead, the place-based approach to Net Zero energy efficiency rolled out at scale detailed in this report should be adopted. Such an approach will save people money on their bills while supporting jobs and local economic growth

- In the immediate term, the next phase of the SHDF should deliver £900 million between 2022 and 2025 to local authorities on the condition that the funding is targeted towards urgently upgrading around 180,000 of the most vulnerable low-income social housing tenants to deliver energy bill savings of up to £1,500

- The fund should be administered alongside UKIB and seek to mobilise new finance models to capitalise on the appetite for private investment in social housing energy efficiency and ensure local authorities and social housing landlords can raise the remainder of the total £2.7 billion investment cost of the social housing energy efficiency strategy to 2025

- The Department for Business, Energy and Industrial Strategy (BEIS) should allocate the funding based on the place-based breakdown and property type identified in our modelling, rather than via competitive bidding to provide local authorities with certainty and clarity to avoid scant administrative resources being spent on unsuccessful bids

- The remainder of the £1.9 billion should be deployed in the same way to 2028, to maintain the momentum, using the social housing stock as a catalyst for large-scale change in the housing stock at large

- There is a need for an additional investment of £16 billion between 2029 and 2050 to be deployed in the same way to upgrade all of the UK's remaining social housing properties to Net Zero standard by 2050.

Introduction from the Centre for Sustainable Energy.

We are an independent national charity supporting people and organisations across the UK to tackle the climate emergency and end the suffering caused by cold homes.

This report, commissioned by UK100, seeks to generate detailed data on the investment required to ensure the social housing stock in Britain meets Net Zero standards by 2050.

It acknowledges the considerable uncertainty around energy prices, especially after the Government ends the universal EPG in April 2023, and looks at what investment can be front-loaded to help protect social housing tenants from the worst impact of the energy crisis.

Finally, the report considers how upgrading energy efficiency to Net Zero standard across the social housing stock will contribute to longer-term economic growth and job creation.

Social housing typically consists of large numbers of similar properties, and social landlords tend to own multiple dwellings. Both factors help to reduce the barriers to implementing energy efficiency schemes at scale.

The analysis herein considers the range of upgrades that need to be made in the social housing sector to reduce energy bills to a level below those expected under a business-as-usual (BAU) scenario. It also looks at how the scale of savings might change under three different fuel price scenarios.

In England alone, there are 4.1 million socially rented dwellings, so investment in the social housing sector can play a huge role in developing the energy efficiency market by kick-starting supply chain development and increasing capacity.

The analysis uses our renowned National Household Model (NHM) and is conducted in line with NHM modelling protocols developed through years of work with the BEIS, and before that, with the Department for Energy and Climate Change (DECC). Scenario modelling in the NHM provides a robust and credible method for estimating the cost of energy efficiency upgrades delivered at scale.

Support for energy efficiency.

The importance of energy efficiency has long been recognised.

The 2007 Energy White Paper highlighted that policies aimed at improving energy efficiency are the most cost effective means of tackling emissions while improving energy security.[24]

Five years later, the Energy Efficiency Strategy put energy efficiency at the heart of a low-carbon economy, acknowledging its importance for reducing energy bills, boosting the economy in a sector with great potential for future growth, and driving innovation.[25]

A year later, however, rising energy prices hit the front pages when then-opposition Labour leader Ed Miliband pledged to cap energy bills if he won the next election.[26]

That same year, then-Prime Minister David Cameron responded to soaring energy prices with a pledge to "get rid of the green crap."[27]

The then-Conservative-Liberal Democrat Coalition Government proceeded to make a series of policy changes, including cutting spending on energy efficiency improvements[28] and introducing the "green deal" efficiency scheme,[29] later described by the National Audit Office (NAO) as a "fail[ure]."[30]

As Figure 1 shows, the number of homes getting insulated plummeted almost immediately and has never recovered.[31]

Insulation installation rates in the UK

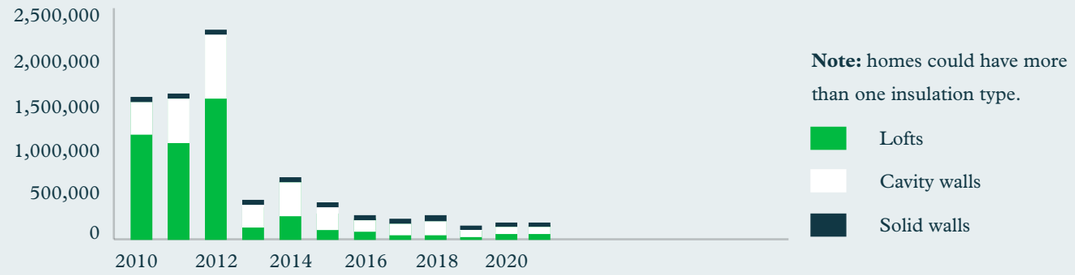

Figure 1: Home insulation installation rates in the UK, graph originally compiled by the Climate Change Committee from BEIS data[32]

24 https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/243268/7124.pdf
25 https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/65602/6927-energy-efficiency-strategy--the-energy-efficiency.pdf
26 https://www.bbc.co.uk/news/uk-politics-24213366
27 https://twitter.com/SkyNews/status/403293475765886976
28 https://www.gov.uk/Government/speeches/Government-action-on-energy-bills
29 https://www.gov.uk/green-deal-energy-saving-measures
30 https://www.nao.org.uk/report/green-deal-and-energy-company-obligation/
31 https://www.theguardian.com/environment/2013/may/29/cavity-wall-insulations-crash-green-deal
32 https://www.theccc.org.uk/wp-content/uploads/2022/06/Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf

Just one energy efficiency programme, the Energy Company Obligation (ECO) has been retained since its introduction in 2013 - but as an obligation on energy suppliers to encourage customers to take up efficiency measures, it has been criticised for being complex, time consuming and bureaucratic - which has amongst other things hindered customer uptake.[33]

In 2015, the new Conservative Government also scrapped the zero-carbon homes standard, which had been due to come into force in 2016.[34] Carbon Brief estimates around a million new homes have since been built to lower energy efficiency standards,[35] properties which will now require energy efficiency interventions in the future as a result.

In 2019, the Conservative Party manifesto under Boris Johnson promised to "help lower energy bills by investing £9.2 billion in the energy efficiency of homes, schools and hospitals."[36]

And the 2020 Energy White Paper, published under then-Prime Minister Boris Johnson, added: "A major push on improving the energy efficiency of our homes will mean households can significantly reduce demand and save money on their bills."[37]

Later that year, the GHG scheme was opened to allow homeowners or residential landlords to apply for a voucher towards the cost of installing domestic energy efficient improvements.[38]

The scheme was closed less than a year later after the NAO stated it was "delivered to an over-ambitious timetable and was not executed to an acceptable standard, significantly limiting its impact on job creation and carbon reduction."[39]

A Local Authority Delivery spin-out scheme from the GHG was kept running to allocate £500 million to local authorities improve the energy efficiency of low-income households, helping reduce fuel poverty, and accelerate Net Zero action.[40]

In the wake of the 2021 Heat and Buildings[41] and Net Zero Strategies, the Government also launched a variety of energy efficiency programmes, including: SHDF;[42] Home Upgrade Grant (HUG);[43] Public Sector Decarbonisation Scheme (PSDS)[44] and Boiler Upgrade Scheme (BUS).[45]

Looking at social housing and local authorities, the schemes dedicated to fuel poor/low income houses have allocated around £2 billion in funding by 2025 to provide energy efficiency upgrades. All of them are competitive and short-term.

33 https://www.cse.org.uk/projects/view/1225
34 https://www.theguardian.com/environment/2015/jul/10/uk-scraps-zero-carbon-home-target
35 https://www.carbonbrief.org/analysis-cutting-the-green-crap-has-added-2-5 billion-to-uk-energy-bills/
36 https://www.conservatives.com/our-plan/conservative-party-manifesto-2019
37 https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf
38 https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme#full-publication-update-history
39 https://www.nao.org.uk/press-releases/green-homes-grant/
40 https://www.gov.uk/Government/publications/green-homes-grant-local-authority-delivery-scheme-phase-2-funding-allocated-to-local-net-zero-hubs#full-publication-update-history
41 https://www.gov.uk/government/publications/heat-and-buildings-strategy and add footnote after Net Zero which links to: https://www.gov.uk/government/publications/net-zero-strategy
42 https://www.gov.uk/Government/publications/social-housing-decarbonisation-fund-demonstrator-successful-bids
43 https://www.gov.uk/Government/publications/home-upgrade-grant-phase-2
44 https://www.gov.uk/Government/collections/public-sector-decarbonisation-scheme
45 https://www.gov.uk/apply-boiler-upgrade-scheme

In total, since the 2019 election, it is estimated that the Government has committed £6-7 billion of its £9 billion election manifesto pledge to energy efficiency, but with funds redeployed, re-announced or reframed with successive developments, the total allocated budget is unclear. As UK100 highlighted in Power Shift,[46] energy efficiency upgrades to existing buildings remain woefully under-funded. By comparison, Germany has committed £47 billion for the next three years (approximately £16 billion per year), solely for energy efficiency, as a part of a broader £148 billion Climate and Transformation Fund to be spent by 2026.[47]

The recent Energy Bill[48] has no targeted response to energy efficiency and the Climate Change Committee (CCC) 2022 Progress Report to Government stated that there is a noticeable policy gap with regards to energy efficiency and that progress in this area is significantly off track.[49]

The short-term and competitive nature of support and badly designed, highly-centralised programmes such as the Green Deal and GHG have only served to reduce capacity in the construction sector to support delivery.

In a letter sent to the Chancellor in November 2022, the CCC argued that reducing energy demand in UK buildings is currently the biggest gap in Government energy policy. The letter highlights that the UK's recent record on reducing emissions from buildings is poor, with fewer than 100,000 energy efficiency measures installed in 2021, compared to 2.3 million a decade ago.[51]

Ultimately, the Government has no clear, cohesive plan for energy efficiency, with available funding still small scale, short-term, competitive and piecemeal.

46 https://www.uk100.org/sites/default/files/publications/Power_Shift.pdf
47 https://www.bundesregierung.de/breg-de/suche/klima-und-transformationsfonds-2065714
48 https://bills.parliament.uk/bills/3311
49 https://www.theccc.org.uk/publication/2022-progress-report-to-parliament/
50 https://www.uk100.org/sites/default/files/publications/Power_Shift.pdf
51 https://www.theccc.org.uk/publication/letter-reducing-energy-demand-in-buildings-in-response-to-the-energy-price-crisis/

Spotlight on the current energy price crisis.

Due to the unprecedented scale and immediacy of the current energy price crisis, we first look at the impact of urgent energy efficiency measures on energy bill savings calculated using near-term fuel prices.

We calculated annual energy bill savings for different energy efficiency measures at two different prices: the October 2022 EPG and the prices projected in April 2023 for households who will not receive targeted support after EPG ends.

The October 2022 EPG unit prices are 34.0p/kWh and 10.3p/kWh for electricity and gas, respectively. In April 2023, the predicted unit prices are to be 65.3p/kWh and 18.2p/kWh.[52]

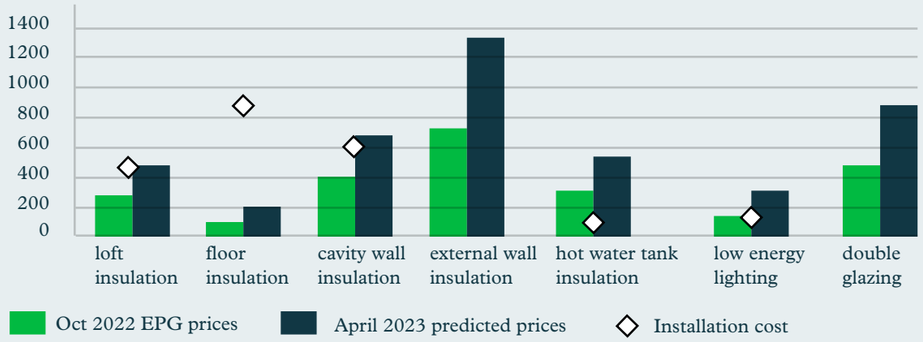

Figure 2: Installation costs and annual energy bill savings for a variety of energy efficiency measures (gas-heated semi-detached homes on a standard electricity tariff). Note that the installation costs for external wall insulation and double glazing are not shown for scaling reasons[53]

Figure 2 shows the installation costs and annual energy bill savings of various energy efficiency measures at the two pairs of unit prices given above. The savings are for a typical gas-heated semi-detached home on a standard electricity tariff. Loft insulation, cavity wall insulation, hot water tank insulation, and low energy lighting have payback periods of about a year or less (at the higher fuel price).

The urgent implementation of three low-cost, high-return measures, including cavity wall insulation, hot water tank insulation and low energy lighting, will save residents £1560 a year on their energy bills against April 2023 prices. The installation investment cost would be £820 per home, which this report argues could be borne by a new, urgent social housing energy efficiency programme.

The full range of measures would save residents of a typical gas-heated semi-detached home on a standard electricity tariff almost £4,500 a year on their energy bills. The installation cost of all of the measures would be around £17,500.

52 The latter figures are imputed from Cornwall Insight's recent April 2023 – June 2023 Price Cap prediction https://www.cornwall-insight.com/press/response-to-the-domestic-energy-price-guarantee-announcement/
53 Note, the graph does not show the installation costs of external wall insulation (approx. £10,000) and double glazing (approx. £6000). Also, "hot water tank insulation" is defined as going from no hot water tank insulation to 80mm

See Table 1 for more details.

Energy efficiency measure	Annual kWh saving (gas)	Annual kWh saving (electricity)	Annual bill saving under EPG (£)	Annual bill saving at predicted April 2023 prices (£)	Installation cost (£)
Draught proofing	200	0	20	40	180
Loft insulation	2,550	0	260	460	470
Floor insulation	1,070	0	110	200	850
Cavity wall insulation	3,890	0	400	710	680
External wall insulation	7,450	0	770	1,360	9,230
Hot water tank insulation	3,120	0	320	570	40
Low energy lighting	-290[54]	520	150	290	100
Double glazing	4,682	0	480	850	5,930

Table 1: Installation costs and annual energy bill savings for a variety of energy efficiency measures (gas-heated semi-detached home on a standard electricity tariff)

54 Low energy lighting gives off less heat than inefficient light bulbs (by definition) so slightly more gas kWh are needed to maintain the same temperature in rooms (hence the negative saving)

An urgent energy efficiency programme for social housing from 2022-2025.

The modelling undertaken in this report suggests that £2.7 billion over the next three years could enable energy efficiency measures capable of delivering Net Zero to be installed in 180,000 houses, but importantly it could also support over 20,000 jobs across the country and kickstart an energy efficiency programme that could deliver at scale.

As Table 2 demonstrates, we have calculated that these measures would need a total investment of almost £2.7 billion, with £900m of this coming from public investment. The estimation for the initial public investment needed in the short-term to kickstart the social housing market retrofit is calculated based on real-world examples of the current public/private investment in Net Zero projects - such as Bristol City Leap,[55] and guided by the range of estimates used in other areas.

Estimates on private capital that can be leveraged with public investment vary. In 2015, a Government report estimated the figure to be between £1.13 and £1.60,[56] more recent insight from the energy efficiency industry suggested £5.[57] Based on the available information, our research uses the assumption that £1 of public investment could leverage £2 of private finance. Taking these guiding parameters, we've used the annual investment costs generated by the model and allocated this proportion of the total to Government investment, proposing that the remainder could be private investment if the Government can create certainty for the nascent, growing markets across the UK.

Year	Net investment cost (£ billion)	Number of properties with Net Zero standard energy efficiency measures installed	Public investment required (£ million)	Jobs supported/ year
2022	0.16	11,238	60	2,969
2023	0.51	33,697	160	9,123
2024	0.84	56,187	280	15,345
2025	1.18	78,642	400	21,255
Total	**2.69**	**179,764**	**900**	

Table 2: Net investment costs, total properties with Net Zero energy efficiency measures installed, public investment required and resulting jobs supported 2022-2025

The SHDF has allocated spending of £1 billion to November 2022, of the total £3.8 billion committed for the next decade from 2019. The Government has done so with a competitive, short-term funding model, and the funding is only available in England. From November 2022, we don't know what is next for the SHDF. Our modelling demonstrates that a targeted, non-competitive £900 million fund, deployed by local authorities and delivered over the next three years could slash energy bills for some of the most vulnerable social housing tenants by over a third - up to £1,500 a year.

55 https://www.energyservicebristol.co.uk/cityleap/
56 https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/438763/bis-15-340-relationship-between-public-and-private-investment-in-R-D.pdf
57 https://www.theeeig.co.uk/media/1096/eeig_report_rebuilding_for_resilience_pages_01.pdf

A medium-term energy efficiency programme for social housing from 2026-2029.

As the need for longer term energy security must be a priority, we have also used the model to calculate how the remaining £1.9 billion of the SHDF could be effectively deployed across the decade in which SHDF is to be spent, to ensure that all local authority areas are decarbonising their social housing in a place-appropriate manner.

Year	Net investment cost (£ billion)	Number of properties with Net Zero standard energy efficiency measures installed	Public investment required (£ million)	Jobs supported/ year
2026	1.44	101,105	460	27,825
2027	1.71	123,595	560	33,652
2028	2.12	146,052	700	40,000
Total	**5.27**	**370,752**	**1,720**	

Table 3: Net investment costs, total properties with Net Zero energy efficiency measures installed, public investment required and resulting jobs supported 2026-2028

As Table 3 demonstrates, by the end of 2028, an investment of £1.7 billion would see a further 370,752 properties reach Net Zero energy efficiency standards, supporting 40,000 jobs. The model highlights that with existing public funding commitments, deployed through a place-based approach, the SHDF could be allocated in a way that sets a course for a longer term embedded approach to decarbonising the housing stock.

Net Zero social housing by 2050.

Beyond the current energy crisis, we optimised a long-term energy efficiency programme to achieve Net Zero social housing by 2050 while saving residents money on their energy bills.[58] The headline results, aggregated at regional level, are presented in Table 4. This table sets out:

- The total number of social housing dwellings in the region (retrofitted or not)
- The maximum number of jobs expected to be supported by retrofitting social housing
- Net investment costs, which is the difference between the Net Zero energy efficiency programme cost and the BAU cost (£35.6 billion)
- The percentage reduction in average annual energy bills per dwelling compared to the BAU scenario.

Region	Number of social housing dwellings	Jobs supported	Net investment cost (£ billion)	Energy bill reduction (%)
East/West Midlands	771,128	13,459	8.9	7.7
East/London/South East	1,699,420	26,561	18.4	5.3
North East	270,048	5172	3.5	5.8
North West	583,347	10,866	7.6	5.3
Scotland	594,617	10,277	7.5	7.8
South West	324,948	4864	3.2	6.4
Wales	222,075	4696	3	9.3
Yorkshire and the Humber	423,441	7667	5.2	5.8
Total/average	**4,889,024**	**83,560**	**57.4**	**6.7**

Table 4: Headline results of the modelled energy efficiency programme (aggregated at regional level) which achieves Net Zero social housing by 2050

58 These results were created with a flat fuel price scenario and a constraint to reduce energy bills (compared to BAU) by at least 5% over the modelled time period. See the methodology section for more detail

Investment requirements and job creation.

We estimate the total net investment needed to upgrade the energy efficiency of Britain's social housing stock to meet Net Zero by 2050 and permanently reduce households' energy bills by an average of almost 7% will be approximately £60 billion.[59] This investment could support over 80,000 FTE jobs. The largest investment required is in the East of England, South East, and Greater London (regions with more socially rented properties), with the lowest total needed in Wales, the South West, and the North East.

Crucially, this analysis does not consider the costs (or benefits) associated with training, electricity decarbonisation, or grid modernisation. It also does not consider the potential economies of scale cost savings of mass installation linked to a nationwide energy efficiency programme, which could be significant if supply chains and price fluctuations were more stable than at the current time. Moreover, it does not consider the social, economic, and environmental cost of following a BAU path and hence of not achieving the 2050 Net Zero target.

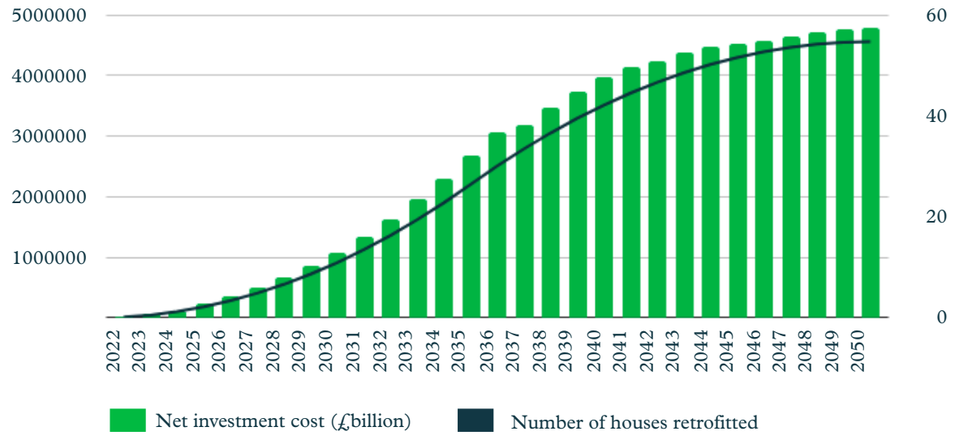

Figure 3: Cumulative net investment cost and number of social homes with energy efficiency upgrades under the analysed programme to get the social housing stock to Net Zero by 2050

Figure 3 highlights an annual breakdown of the cumulative net investment required to 2050 to deliver Net Zero social housing (£57 billion) as well as the number of social housing properties with energy efficiency upgrades over the same time period (over 4.5 million).

Figure 4 shows the installation rates of all the energy efficiency measures across different regions as a percentage of total social housing dwellings per region. It indicates the comparative scale of work required and the number and type of energy efficiency jobs supported.

For example, there are likely to be more nationwide installation jobs created for air source heat pump experts, but fewer cavity and external wall insulation jobs in the South East, London, and East of England (because the English Housing Survey suggests that more cavity walls in this region have already been filled).

59 This is the difference between landlord costs in the Net Zero energy efficiency programme and landlord costs in a BAU scenario (it does not include fuel costs)

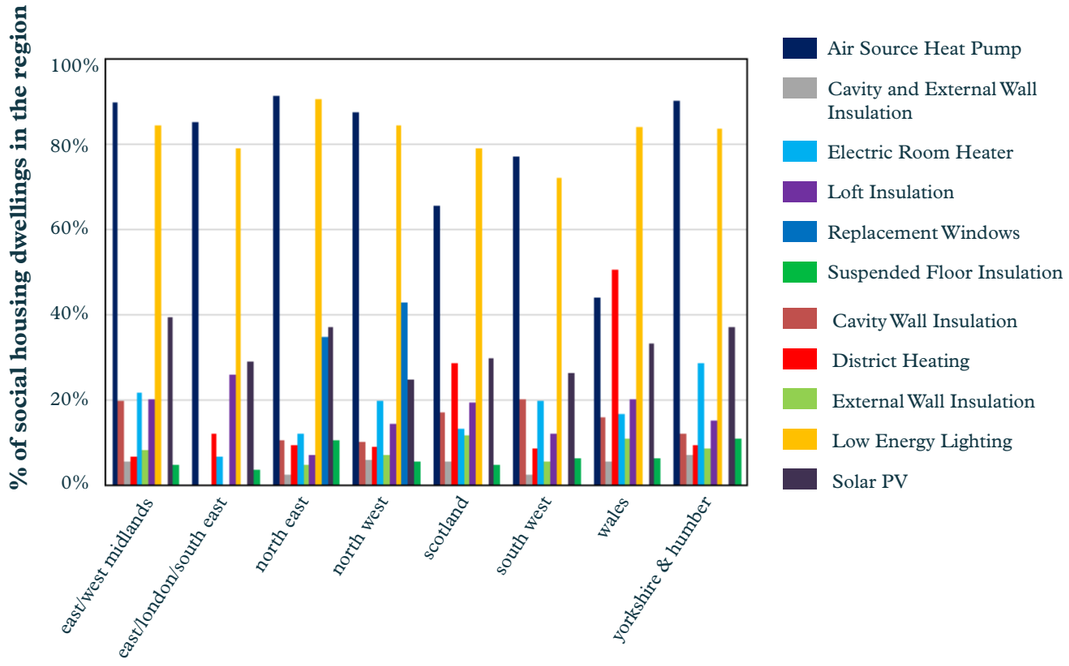

Figure 4: Percentage of social housing dwellings to receive individual measures per region by 2050

A measure of caution should be exercised when interpreting results for Wales and Scotland due to the extrapolation used to create the Welsh and Scottish social housing stock from the English stock.

Over the long term to 2050, the number of measures installed and hence the investment and number of jobs steadily ramp up from the start of the Net Zero programme, peaking in 2036, with over 80,000 FTE jobs supported. The ramping up phase allows adequate time to train new entrants to the sector.

And although fewer jobs are supported from 2036 onwards, this does not mean that workers will need to be reskilled. In the same time period, a social housing energy efficiency market would drive demand for skilled energy efficiency workers since the rest of the stock also needs to reach Net Zero emissions for the Government to meet its 2050 Net Zero target. Social housing only accounts for roughly 20% of the total UK housing stock.[60]

The Net Zero social housing energy efficiency programme proposed here would support a wider UK housing energy efficiency programme by ensuring a large proportion of the workforce already have the skills and expertise needed for the tasks.

60 Approx. 17% in England: https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/1088500/EHS20-21_Social_Rented_Sector_Report.pdf, approx. 23% in Scotland: https://www.gov.scot/publications/housing-statistics-2020-2021-key-trends-summary/pages/6/#:~:text=As%20at%2031st%20March%202020,23%25%20being%20social%20rented%20properties., approx. 16% in Wales: https://gov.wales/sites/default/files/statistics-and-research/2019-09/dwelling-stock-estimates-april-2017-march-2019-225.pdf, approx. 16% in Northern Ireland: https://www.communities-ni.gov.uk/system/files/publications/communities/ni-housing-stats-18-19-full-copy.PDF

Kickstarting the market.

As highlighted above, this study focuses on social housing as a discrete part of the energy efficiency challenge. There are multiple reasons why tackling the social housing stock first makes sense. Firstly, there is a lot of work underway already to address the efficiency of social housing - with 64.3% of housing association homes already having an EPC rating of C or above, compared to 35.6% of owner occupied homes.[61]

Interest from private finance in the social housing sector has developed in recent years. According to the Green Finance Institute (GFI), the number of environmentally and socially aware investors in the sector has grown, and as a result, so too has the amount of sustainable and sustainability-linked loan and bond finance funding for energy efficient upgrades to social housing.[62] Indeed, GFI and other sector expert groups, including UKGBC, have highlighted that the social housing sector has an important role to play in developing the local supply chains needed to deliver domestic energy efficiency at a scale[63] and offers a valuable model for how to decarbonise all UK homes in the coming years.[64]

Evidence also suggests social housing can exert a strong influence on energy efficiency supply chains through procurement and training.[65] Starting with social housing means that many homes can be transformed at speed, creating a pipeline of guaranteed work that encourages people to enter the sector.[66]

The supporting documentation for the current SHDF highlights how the scheme will support the creation of green jobs in the wider energy efficiency market.[67] Yet, whilst the SHDF is beginning to address this issue, insight from Ashden demonstrates that current Government schemes provide an initial pipeline of work but offer less than 5% of the funding needed to decarbonise social housing. Ashden highlights a need for more policy certainty from the Government - including financial incentives, regulation, public engagement and increased investment.[68]

The National Housing Federation (NHF) has made a series of recommendations to the Government in its decarbonisation guide for housing associations, which include the need to build on the SHDF and identify other Government grants and funding mechanisms to enable social housing energy efficiency progress.[69]

61 https://www.housing.org.uk/globalassets/files/climate-and-sustainability/nhf_nz_report_08_med_q.pdf
62 https://www.greenfinanceinstitute.co.uk/wp-content/uploads/2022/10/GFI-RETROFITTING-SOCIAL-HOUSING-1.pdf
63 https://www.ukgbc.org/news/insulating-the-economy-the-chancellors-statement-was-a-start-but-is-it-draught-proof/
64 https://www.greenfinanceinstitute.co.uk/wp-content/uploads/2022/10/GFI-RETROFITTING-SOCIAL-HOUSING-1.pdf
65 https://shap.uk.com/wp-content/uploads/2020/12/wyca-final-report-1.pdf
66 https://climatechampions.unfccc.int/uk-social-housing-retrofit-could-help-alleviate-fuel-poverty/
67 https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/1016303/shdf-wave-1-competition-guidance.pdf
68 https://ashden.org/sustainable-towns-cities/retrofit-solving-the-skills-crisis/
69 https://www.housing.org.uk/globalassets/files/climate-and-sustainability/nhf_nz_report_08_med_q.pdf

Impact on household energy bills.

This section explores the impact of the Net Zero energy efficiency programme on social housing tenant energy bills in more detail. Figure 5 shows the percentage reduction in energy bills for three scenarios compared to a BAU scenario over the modelled period (2022-2050). The variation across the regions is due to differences in climate and housing quality as well as in the package of measures identified for each area.

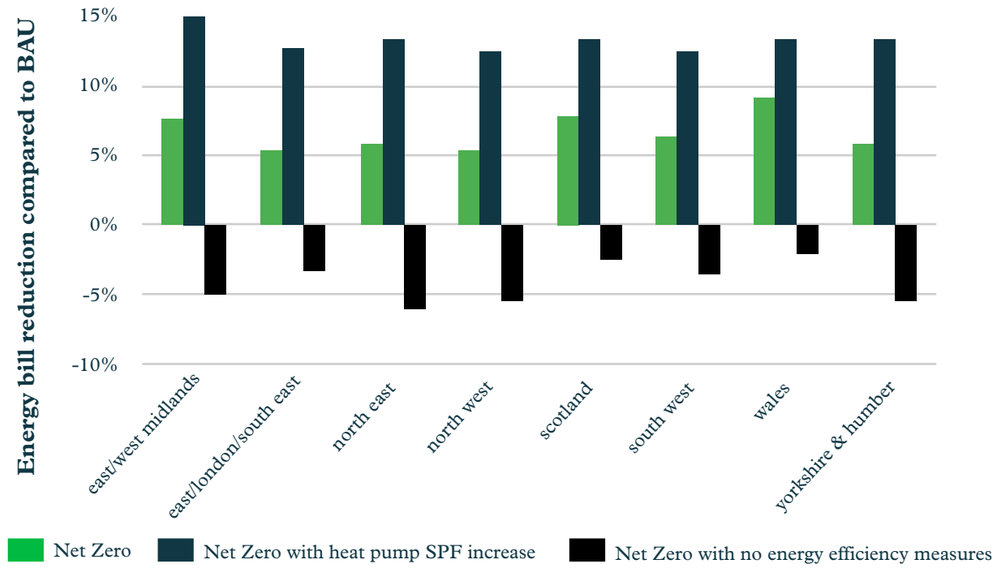

Figure 5: Percentage reduction in energy bills for three energy efficiency upgrade scenarios compared to a BAU scenario 2022–2050

The first scenario in Figure 5 is "Net Zero", the same scenario that produced the results in Table 4 (fuel price scenario one, with the model set not to consider any options or combination of options that didn't reduce fuel bills by 5% compared to BAU). The second scenario is "Net Zero with heat pump SPF increase", where SPF is Seasonal Performance Factor, a measure of heat pump efficiency. The scenario is essentially the same as the first scenario, but it is assumed that the heat pumps are more efficient.[70] The significant extra reduction in energy bills between "Net Zero" and "Net Zero with heat pump SPF increase" shows the impact on running costs of air source heat pump efficiency. The third scenario is "Net Zero with no energy efficiency measures," which is a scenario where heat is decarbonised through individual heat pumps and community heating, but no other measures are installed. Energy bills in this scenario increase between 2.1% and 6.1% compared to BAU. This highlights the importance of providing adequate support for the roll-out of energy efficiency measures, in addition to efforts to decarbonise heat supply – this is all the more important given that air source heat pump efficiency tends to be higher in better-insulated buildings.[71]

70 SPF for heat pumps of 2.65 is assumed in Scenario 1. This is based on average measured performance under the Renewable Heat Premium Payment Scheme (RHPP). However, it is considered to be relatively conservative, and it should be noted that published average figures for SPF and CoP (coefficient of performance) values for heat pumps vary considerably across sources. Scenario 2 here, therefore, assumes an SPF of 3.3 rather than 2.65 (a 25% increase)

71 This is because heating systems in more thermally efficient buildings can be operated at lower flow temperatures, and heat pump efficiency increases as flow temperature falls

Effect of different fuel price scenarios.

We looked at three different fuel price scenarios: one, where fuel prices remain constant to 2050, the second where the electricity price no longer tracked the gas price but was more reflective of actual costs, and the third was assuming gas and electricity prices will continue to rise over the next decade. The amount of savings people made were very different in the three scenarios.

Here we unpack the sensitivity of these three long-term (2022-2050) fuel price scenarios. The Net Zero energy efficiency programme optimisation was used with fuel price scenario 2 (decoupling of gas and electricity prices) and fuel price scenario 3 (increased fuel prices for the next decade). For both fuel price scenarios, the model tested different combinations to understand the impact of changing fuel prices in the model.[72]

Figure 6 shows the percentage reduction in energy bills (national average) compared to the BAU scenario between 2022 and 2050, highlighting the difference in cost and savings when testing out the different scenarios. In the model, as the energy bill reduction constraint increases more non-heat efficiency interventions are required to reduce energy bills, so the total net investment cost required increases.

The energy bill reductions are much greater for a similar level of investment in fuel price scenario 2 (between 8%-16% reduction in bills) compared with fuel price scenario 3 (2%-6% reduction in bills). This is because the Net Zero energy efficiency programme decarbonises heat by electrifying it, and the electricity price is much lower in scenario 2 (after 2025), which makes heat pumps relatively cheaper to run.

Fundamentally this indicates that the Government's ambition to reform the electricity market to decouple prices from gas would be beneficial to efforts to achieve Net Zero more efficiently, effectively and fairly. These different scenarios highlight that total investment required to deliver Net Zero social housing by 2050 could range from as little as £45 billion to over £80 billion.

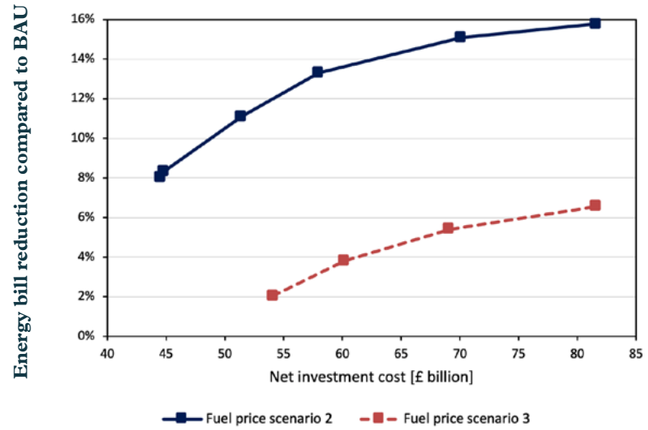

Figure 6: Energy bills (national average) reduction scenarios - comparing BAU (2022 – 2050) with different amounts of total investment and fuel price scenarios

72 The optimisation was run multiple times with different constraints on energy bill reduction (increasing in increments of 2.5% from 0% reduction compared to BAU)

Methodology.

The National Household Model.

The NHM is a domestic energy policy micro-simulation software tool that was built for the UK Government by the CSE in 2012. It uses information from national housing surveys and presents a detailed representation of the physical characteristics of England's housing stock and the types of occupants who live in these homes. The NHM allows its users to create policy scenarios and explore the potential impacts on domestic energy demand over time. In 2020, CSE rebuilt the NHM in the Python programming language for BEIS, increasing its legibility by making it more directly structurally analogous to the BREDEM (BRE Domestic Energy Model) and SAP (Standard Assessment Procedure) specification documents. It remains the primary modelling tool used by BEIS to create new housing energy efficiency scenarios and model the impacts of housing energy policies.

Housing stock extrapolation.

Modelling a Net Zero energy efficiency programme for social housing in Great Britain (between 2022 and 2050) required us to process the English Housing Stock dataset. We scaled the dwelling types and characteristics of the English social housing stock based on the numbers of socially rented flats and houses in Wales and Scotland because there is no sufficiently similar data available for the latter countries. The English Housing Stock dataset is based on the English Housing Survey 2016 and 2017 Combined Year Dataset and was produced by the Building Research Establishment (BRE) for BEIS specifically to support modelling with the NHM. The number of socially rented flats and houses in each country comes from Government housing statistics from the devolved administrations. We cross-referenced key parameters from these against the new stock figures for Great Britain to check alignment. The use of summary EPC data for social housing, as reported by devolved nation assemblies, was considered to create an improved stock. However, the information available was not detailed enough, nor thought to be robust enough, to make this possible.[73]

Energy efficiency measures considered.

The measures considered within this analysis are described below, along with a high-level summary of the logic of their application.[74] Not all of these measures are applied to every social housing dwelling. The particular combination of measures chosen for different regions is determined by the model for different scenarios, which are described in detail in later sections.

73 Northern Ireland was not included in the modelling due to a lack of available data on Northern Ireland's social housing stock. The difference between Northern Irish and English housing stock would render an extrapolation of English data of marginal analytical value

74 Note that the U-values used for all non-heat measures are the threshold and improvement values from the Building Regulations Part L 2021

1) Individual or communal heat pumps.

The Net Zero scenarios assume that decarbonisation of heating is achieved through electrification and therefore depend on zero-carbon electricity being available from the grid before 2050. A zero-carbon electricity grid by 2035 is widely considered necessary for the UK to meet its 2050 whole-economy decarbonisation target.[75] Dwellings that currently have fossil fuel-based heating and hot water systems are retrofitted with individual air source heat pumps or connected to a community heat network supplied by a large-scale heat pump (note that the term 'community' is used here to describe all scales of community/district networks).

For the purpose of this (non-spatial) analysis, it is assumed that any dwelling other than a detached house could potentially be connected to a community network. The proportion of social housing dwellings connected to a community system is limited to the same level as per detailed modelling completed by CSE using the THERMOS tool[76] A SPF for heat pumps of 2.65 is assumed. This is based on average measured performance under the Renewable Heat Premium Payment Scheme (RHPP).[77] However, it is considered to be relatively conservative, and it should be noted that published average figures for SPF and CoP (coefficient of performance) values for heat pumps vary considerably across sources. For example, eligibility requirements under the BUS state a calculated minimum SPF of 2.8,[78] whilst figures assumed in SAP are considerably lower.[79] If a dwelling in the model is shown to have an existing individual electric heating system that is expensive to run (i.e., room heaters, electric underfloor heating, warm air, electric boiler, etc.) then this is also replaced with either a heat pump or connection to a community heat network.

Storage heaters are retained as they provide potential for flexible demand. Heat system sizing is dependent on the type of heating and relies on benchmarks from the SAP worksheet and NHBC (National House Building Council) standards.[80,81]

2) Electric panel heaters.

Secondary heat sources using non-renewable fuels are replaced with electric panel heaters, and where the secondary source also provides hot water, a hot water tank with electric immersion is installed. This provides a secondary domestic hot water source to the heat pump or district heating.

3) Solar PV.

For properties that do not already have solar PV panels, a 3kWp system is installed where half the roof area (minus any existing solar thermal) is of sufficient size. A 3kWp system was selected as this allows smaller roofs to be utilised and results in a higher overall installed capacity. Orientation, over-shading, and roof pitch are also considered.

75 CCC, "The Sixth Carbon Budget." 2020

76 (i.e., 9.6%, based on a levelised cost of wholesale network heat of 6p/kWh). THERMOS (2021). Available at: https://www.thermos-project.eu/thermos-tool/what-is-thermos/. Note that this data is based on analysis of six major UK cities and therefore may not be representative of the whole of the UK. It should also be noted that in practice private housing would often need to be part of the network and financed

77 UCL, "Analysis of Heat Pump data from the Renewable Heat Premium Payment Scheme (RHPP) to the Department of Business, Energy and Industrial Strategy: Compliance with MCS Installation Standards." 2017

78 https://www.legislation.gov.uk/ukdsi/2022/9780348232349/part/3

79 BRE, "The Government's Standard Assessment Procedure for Energy Rating of Dwellings, version 10.2." 2021

80 Peak space heating demand: https://nhbc-standards.co.uk/8-services/8-1-internal-services/8-1-10-space-heating-systems/

81 DHW tank size: https://nhbc-standards.co.uk/8-services/8-1-internal-services/8-1-5-hot-water-service/

4) Solar thermal.

Where there is no existing solar thermal system and roof space permits, a 3m^2 system is installed and orientation, over-shading, and pitch are taken into account as above.

5) Loft insulation.

Where there is a loft in the dwelling and the existing loft insulation U-value is worse than 0.35, it is improved to 0.16.

6) Wall insulation.

An area weighted wall U-value is calculated from all the exposed external wall areas. If this is worse than 0.70 it is improved to 0.55. Uninsulated cavity walls are filled, and solid walls/filled cavity walls are given external insulation.

7) Window replacement.

An area weighted wall U-value is calculated from all the vertical windows (rooflights are not considered). If this is worse than 2.0 it is improved to 1.4. Windows are double glazed, with soft coat, Argon filled, and 100% draught-proofed.

8) Floor insulation.

Where there is a ground contact floor area with a suspended floor in the dwelling and the floor U-value is worse than 0.7 it is improved to 0.25.

9) Low energy lighting.

Low energy lighting is installed where there are fixed lighting outlets fitted with inefficient filament lamps.

The analysis does not consider the installation of mechanical ventilation. However, where multiple measures are installed this may become necessary in order to reduce risks associated with damp and mould growth in more airtight properties. Extra extractor fans can cost in the region of £200-300/fan (excl. VAT), and positive input ventilation systems (PIV) can cost around £2,000.

Cost of energy efficiency measures.

To model accurately the cost of installing social housing energy efficiency measures to meet Net Zero, reliable input data was needed for the cost of installation of each measure listed above. Additionally, the cost of replacing the existing and new energy efficient heat measures at end-of-life (REPEX) and the cost of maintaining and running them (OPEX) were required to compare the ongoing costs of a BAU scenario against the costs of the various Net Zero scenarios.

The building fabric, heat, and solar measure CAPEX data primarily came from BEIS datasets,[82,83,84] which provide a range of costs for different-sized buildings and systems. The data was published earlier than 2022, so it was up-rated using the "Regular maintenance and repair of the dwelling" category in the latest consumer price index (August 2022).[85]

We removed VAT where necessary based on the typical rate of VAT for each measure at the time the data was published. We used THERMOS output data for six major UK cities from another recent CSE research project to calculate an average cost per dwelling of constructing and connecting to a district heating system.[86] In addition, we used it to estimate an indicative proportion of social housing for which district heating systems are likely to be more financially viable compared to individual air source heat pumps.

Finally, we conducted a thorough literature review to find cost data for the remaining measures and for typical REPEX and OPEX costs, using the most reliable and reputable sources. In the case of external wall insulation in particular, we were careful to ensure that the costs reflected good quality fire resistant materials rather than the lowest costs on the market. To validate this cost data, CSE's Household Energy Services team were initially consulted, followed by the Carbon Coop, Urbed, Savills and the NHF, who all provided insight into recent trends and factors that may influence the accuracy of the data. Based on these insights, we made minor adjustments to the cost data to better reflect current real-world conditions.

Whilst care has been taken to collate data that is as robust as possible within the scope of this study, various factors can affect the cost of measures and labour. For example, the BEIS measure cost data is primarily based on surveys with installers who have carried out installations in private housing, and therefore the effect of any scale economics that might take place within the social housing sector is unlikely to be reflected in this data. Also, costs may fall as technologies and their supply chains become more mature and widespread under a UK-wide energy efficiency programme. Conversely, they may increase in some cases where industry standards such as PAS 2035 are required as a condition of funding. They may also be subject to supply chain shocks, as seen during the pandemic, and the rate of inflation will affect prices up to 2050. We have not attempted to predict the impact of all of these different factors on costs assumed during the period modelled. For this study, VAT has also been removed and no Government grants are considered.

82 BEIS (2017) Domestic cost assumptions – what does it cost to retrofit homes? Available at: https://www.gov.uk/Government/publications/domestic-cost-assumptions-what-does-it-cost-to-retrofit-homes
83 BEIS (2020) Cost of installing heating measures in domestic properties. Available at: https://www.gov.uk/Government/publications/cost-of-installing-heating-measures-in-domestic-properties
84 BEIS (2021) Solar photovoltaic (PV) cost data. Available at: https://www.gov.uk/Government/statistics/solar-pv-cost-data
85 https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/consumerpriceinflation/august2022
86 City Decarbonisation Delivery Programme (CDDP) phase 2

Domestic fuel price scenarios.

We collated domestic fuel prices for October 2022 from several sources. Electricity unit rates and standing charges for standard and time-of-use tariffs, as well as gas unit rates and standing charges, were obtained from Octopus Energy.[87] These prices were set by the October 2022 EPG. We assumed the electricity export rate to be the Outgoing Octopus rate, one of the highest export rates on the market.[88] We obtained the prices for fossil fuels such as heating oil, LPG, coal, wood, and biogas from an energy cost comparison website, where the fuel prices are averaged over suppliers.[89]

Wholesale fuel prices are predicted to remain high up to 2030 and possibly beyond.[90] Accurately predicting fuel prices far into the future is not possible so instead, we have considered three scenarios, which are explained below.

At the time of writing, the original length of time covered by the EPG, two years, has been reduced to six months. It will be reviewed in April 2023, when more targeted support is expected to be announced. We have decided to keep fuel prices flat at the October 2022 EPG level between 2022 and 2024 for all scenarios because it is likely that many social housing tenants will be the recipients of more targeted support.

Fuel price scenario 1.

All fuel prices remain constant between 2022 and 2050. The unit rates for electricity and gas remain at 34.0p/kWh and 10.3p/kWh, respectively.

Fuel price scenario 2.

Fuel prices remain constant between 2022 and 2025. From 2030 to 2035, the gas price decreases to a 2021 value of 5.63p/kWh and remains at 5.63p/kWh to 2050. From 2025 onwards, the electricity price is calculated from the gas price using a linearly decreasing multiplier to represent a decoupling of electricity and gas prices, an aim stated in the Government's recent Energy Prices Bill.[91]

87 https://octopus.energy/blog/how-the-energy-price-guarantee-works/
88 https://octopus.energy/outgoing/
89 https://nottenergy.com/resources/energy-cost-comparison/
90 https://www.cornwall-insight.com/press/energy-prices-to-remain-significantly-above-average-up-to-2030-and-beyond/
91 https://www.gov.uk/Government/news/Government-introduces-new-energy-prices-bill-to-ensure-vital-support-gets-to-british-consumers-this-winter

Fuel price scenario 3.

All fuel prices remain constant until the end of 2024. From 2024 to 2030, the electricity and gas prices increase to the previously predicted October 2022 price cap unit rates before the EPG. From 2030 to 2035, the electricity and gas prices decrease to 2021 values of 20.99p/kWh and 5.63p/kWh, respectively. The prices then remain constant from 2035 to 2050.

Figure 7 shows electricity and gas unit prices, under each scenario, over the modelled time period (2022-2050). The vast majority of social housing is heated using either electricity or gas. Note the price projections for time-of-use electricity tariffs and community heating (via a large-scale heat pump) in each scenario follow the same shape as the respective electricity price in Figure 7. The price projections for other fossil fuels (e.g., heating oil) in each scenario follow the same shape as the respective gas price in Figure 7. The standing charges for all fuels have been kept flat in each scenario.

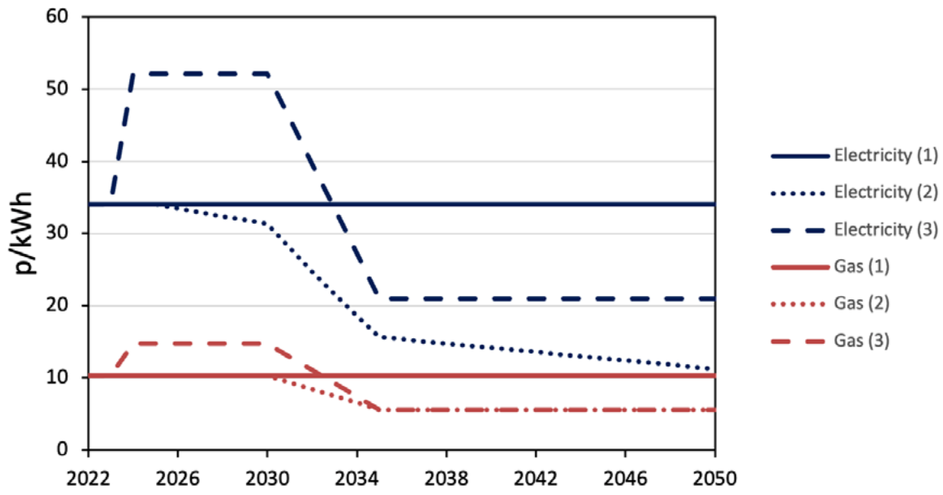

Figure 7: Three modelled scenarios for domestic electricity and gas prices

Net Zero energy efficiency programme optimisation.

The main aim of the NHM modelling is to determine the minimum investment needed to retrofit the social housing stock to achieve Net Zero whilst ensuring that energy bills for tenants remain lower than in a BAU scenario. A target date of 2050 was agreed upon, which is in line with the Government's statutory commitments. The model runs from October 2022 to October 2050.

The following is an outline description of the energy efficiency programme optimisation.

Firstly, we calculated the average annual energy bill per social housing dwelling and overall landlord costs (CAPEX, REPEX, and maintenance OPEX) under a BAU scenario for each region. The BAU scenario represents a 2022-2050 pathway where no measures are installed that reduce energy demand or decarbonise heat.

Next, we calculated overall installation costs for every combination of the seven non-heat supply measures for each region. These measures alter the heating requirements and hence the heating system capacity as well as costs. Within each region, the model then selects the measure combination with the lowest overall installation cost for which the average (over each year in the modelled time period) annual energy bill per social housing dwelling is less than the BAU energy bill by a specified percentage (therefore delivering energy bill reductions for social housing tenants).

The net investment required is the difference between the overall installation costs in the BAU scenario and the Net Zero energy efficiency programme scenario.

Estimating the jobs dividend.

We used a 'top-down' approach to calculate the number of jobs that could be created as a result of the retrofit programme, which is common in the literature in this area. This method uses an employment intensity factor: an estimate of the number of jobs created per million pounds of investment. The alternative (bottom-up) approach involves estimating the time needed for each type of retrofit measure installation. Unfortunately, we were unable to find sufficient accurate data to support this method within the scope and timeframe of this project. In addition, a bottom-up approach also makes it difficult to estimate the number of jobs created indirectly from the investment.

In the International Energy Agency's 2020 World Energy Special Report on Sustainable Recovery,[92] employment intensity factors are given for various sectors. These are compiled based on existing literature, industry engagement, surveys of Government statistical accounts, and macroeconomic modelling. The report estimates that, in advanced economies, 10-20 jobs would be created per million US dollars of capital investment in the building energy efficiency sector. This number is based on the gross direct and indirect jobs created. We used the median value of 15 jobs per million US dollars from the report and converted this to UK pounds (2020 conversion: 1 GBP = 1.28 USD).[93] We divided by the "Regular maintenance and repair of the dwelling" CPI ratio between 2020 and 2022 to give us an employment intensity factor of 17.6 jobs per million pounds investment. Note, 'jobs' in this case refers to gross direct and indirect full-time equivalent (FTE) jobs supported by the investment. The direct jobs are those created to deliver the social housing energy efficiency measures (e.g., heat pump installer). The indirect jobs are those in the supply chain, including manufacturing and administration.

Another report, by Transition Economics,[94] estimates the employment intensity factor for social housing energy efficiency specifically to be 33.46 jobs created per million pounds investment. We chose not to use this value, as it appears to be something of an outlier in comparison with the other figures in the literature. However, it does demonstrate a degree of uncertainty in the values and suggests that the value of 17.6 jobs per million pounds investment may be a conservative estimate.

92 International Energy Agency, "Sustainable Recovery: World Energy Outlook Special Report." 2020
93 https://www.exchangerates.org.uk/GBP-USD-spot-exchange-rates-history-2020.html
94 Transition Economics, "Can an infrastructure stimulus replace UK jobs wiped out by COVID19 crisis?" 2020

The annual investment required for the retrofit programme is the sum of the capital and maintenance costs for the measures installed each year. The capital costs include the up-front cost of insulation measures, replacing old heating systems with renewable heating systems, and replacing the new systems when they reach end-of-life. The annual investment figure is then converted into an annual number of jobs supported by the retrofit programme each year, using the employment intensity factor described above.

Reporting results at local authority level.

The NHM generates modelled results at both the national and regional ('Government Office Region') levels. It cannot provide reliable results at more local scales because the survey sample sizes are insufficient – that is, the survey does not record the details of enough actual houses to allow reliable statistical analysis below the level of regions. To overcome this limitation, we disaggregated the regional results, weighting this by the proportion of social houses in each local authority. We derived the weights by combining the English, Welsh, and Scottish EPC data with Experian and ONS Postcode Directory data. The Experian data is used to determine which EPCs are for social dwellings and the ONS Postcode Directory data is used to determine which Local Authority the dwelling is in. Counts of dwellings are then made at regional and local authority levels and proportions are calculated and applied to the NHM results.

CSE insight.

This study estimates the total investment needed to retrofit the social housing stock to meet Net Zero to be approximately **£60 billion** and finds that the transition will require over **80,000 skilled workers.** There are nearly five million social housing properties spread across the UK. These figures demonstrate the scale of the energy efficiency challenge but also suggest that sufficient investment in this discrete element of the UK's domestic building stock could catalyse the market transformation required to upgrade the energy efficiency of the whole residential stock.

Our analysis indicates that the investment identified could not only help prevent further increases in household energy bills but permanently slash them for residents. But to be effective, the energy efficiency strategy and policy environment should support the roll-out of energy efficiency measures while decarbonising supply.

We have shown the results of the modelling are sensitive to changes in fuel prices, as well as to assumptions about the performance of heat pumps. There is considerable uncertainty around the trajectory of fuel prices over the period to 2050, and energy efficiency upgrades to the renovation standards set out within Building Regulations may not be sufficient to protect consumers from price rises that are higher than those assumed in this study.

Finally, the creation of new jobs will need to be accompanied by support to develop industry skills quickly so that new heating system installs are of sufficient quality to realise the anticipated scale of reductions in energy bills and carbon emissions.

Recommendations.

The latest wave of funding for the flagship Government scheme for social housing energy efficiency, the SHDF, will close for applications in November 2022.

Taking the insights from the research above into consideration, we set out below a series of recommendations for a cost-effective social housing energy efficiency strategy to support some of the most vulnerable households through the energy crisis while supporting jobs, growth, levelling up and accelerating action on Net Zero.

Certainty. Clarity. Capitalisation.

- We are calling on the Government to rethink how it deploys the next waves of funding for the remainder of the decade that the fund is committed. The competitive approach should end. Instead, the place-based approach to Net Zero energy efficieny detailed in this report should be rolled out at scale. Such an approach will save people money on their bills while supporting jobs and local economic growth
- In the immediate term, the next phase of the SHDF should deliver £900 million between 2022 and 2025 to local authorities on the condition that the funding is targeted towards urgently upgrading around 180,000 of the most vulnerable low-income social housing tenants to deliver energy bill savings of up to £1,500
- The fund should be administered alongside UKIB and seek to mobilise new finance models to capitalise on the appetite for private investment in social housing energy efficiency and ensure local authorities and social housing landlords can raise the total £2.7 billion investment cost of the social housing energy efficiency strategy to 2025
- BEIS should allocate the funding based on the place-based breakdown and property type identified in our modelling, rather than via competitive bidding to provide local authorities with certainty and clarity to avoid scant administrative resources being spent on unsuccessful bids
- The remainder of the £1.9 billion should be deployed in the same way to 2028, to maintain the momentum, using the social housing stock as a catalyst for large-scale change in the housing stock at large
- There is a need for an additional investment of £16 billion between 2029 and 2050 to be deployed in the same way to upgrade all of the UK's remaining social housing properties to Net Zero standard by 2050.

By providing the certainty of a long-term commitment to 2050, the Government can help establish the market confidence necessary to build robust supply chains and unlock workforce investment. It will help ensure a long-term social housing energy efficiency programme catalyses wider energy efficiency market growth and uptake. The long-term commitment will also accelerate progress towards the UK's Net Zero goal, support 83,560 jobs, and boost local economies.

Glossary.

BRE Domestic Energy Model (BREDEM) - a methodology for calculating the energy use and fuel requirements of dwellings based on their characteristics. It is suitable for use in research work, such as stock modelling. It shares some features with the SAP methodology, but allows users to adjust inputs which are fixed in SAP, making it better suited to certain analysis tasks.

Building Research Establishment (BRE) - a centre of building science working to raise the standards of the built environment in the United Kingdom, owned by charitable organisation the BRE Trust.

Capital expenditure (CAPEX) - funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment.

Centre for Sustainable Energy (CSE) - an independent national charity that shares knowledge and experience to help people change the way they think and act on energy by giving advice, managing innovative energy projects, training and supporting others to act, and undertaking research and policy analysis.

Consumer Prices Index including owner occupiers' housing costs (CPIH) - CPIH is the most comprehensive measure of inflation. It extends CPI to include a measure of the costs associated with owning, maintaining and living in one's own home, known as owner occupiers' housing costs, along with council tax.

Department for Business, Energy and Industrial Strategy (BEIS) - a Government ministerial department which aims to lead economy-wide transformation by backing enterprise and long-term growth, generating cheaper, cleaner, homegrown energy and unleashing the UK as a science superpower through innovation.

Department for Levelling Up, Housing and Communities (DLUHC) - a Government ministerial department for housing, communities and local Government in England and the levelling up policy.

Energy performance certificate (EPC) - a rating scheme to summarise the energy efficiency of buildings. The building is given a rating between A (Very efficient) - G (Inefficient). EPCs are legally required whenever a property is built, sold or rented.

Energy Price Guarantee (EPG) - the recent Government scheme to reduce the unit rate of electricity and gas (to 34.0p/kWh and 10.3p/kWh, respectively) so that a household with typical energy use in Great Britain pays, on average, around £2,500 a year on their energy bill. The scheme was originally supposed to be in place for two years but recently it was announced that it would be reviewed in April 2023 (support is likely to be more targeted after that).

Green Homes Grant (GHG) - a UK Government scheme which has now closed which subsidised the cost of energy efficient home improvements in England.

Heat and Buildings Strategy (HBS) - this 2021 Government Strategy sets out how the UK will decarbonise our homes, and our commercial, industrial and public sector buildings, as part of setting a path to Net Zero by 2050.

Kilowatt peak (kWp) - the unit of measurement for the output of a PV system. kWp describes the maximum output in kilowatts that a PV system can produce.

Levelling Up White Paper - a Government policy paper which sets out their plans for how to spread opportunity more equally across the UK.

National House Building Council (NHBC) - aims to raise the construction standards of new homes in the UK and provide consumer protection for homebuyers through its 10-year Buildmark warranty. NHBC is the UK's largest provider of new home warranties.

National Household Model (NHM) - is a simulation model for domestic energy policies devised by the CSE for BEIS, as an open-source tool for projecting the effects of policy and other legislative changes on the energy and emissions of the UK domestic housing stock.

Net Zero Strategy (NZS) - this 2021 Government Strategy sets out policies and proposals for decarbonising all sectors of the UK economy to meet our Net Zero target by 2050.

Operational Expenditure (OPEX) - the money that a company spends on an ongoing, day-to-day basis in order to run a business or system.

Positive Input Ventilation (PIV) - a whole house system that draws fresh, filtered outside air into a house and removes stale, unhealthy air from inside. It is an effective cure for condensation and dampness.

Public Sector Decarbonisation Scheme (PSDS) - this UK Government scheme provides grants for public sector bodies to fund heat decarbonisation and energy efficiency measures.

Replacement Expenditure (REPEX) - the expenditure incurred or projected to be incurred for replacement of capital assets on completion of their useful life.

Social Housing Decarbonisation Fund (SHDF) - a UK Government funding scheme for registered providers of social housing to apply for funding to improve the energy efficiency of their social homes.

Standard Assessment Procedure (SAP) - the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin energy and environmental policy initiatives.

THERMOS - a free, web-based energy planning software that provides accurate heat and cold network options analysis instantly within one web-based, user-friendly tool. Developed by the THERMOS EU-funded project, the software is designed to optimise local district energy network planning processes and sustainable energy master planning to facilitate the deployment of new low-carbon heating and cooling systems and a fast upgrade, refurbishment, and expansion of existing systems.

UK100 - UK100 is a network of local leaders who have pledged to shift their communities to Net Zero with cleaner air ahead of the Government's legal target.

U-value - the rate of heat loss through a material.


UK
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