How will the energy crisis affect households in UK districts?

Thiemo Fetzer, Ludovica Gazze, Menna Bishop (University of Warwick, *energycrisis@warwick.ac.uk*.)

25 Oct 2022

The energy crisis in Enfield: Executive Summary

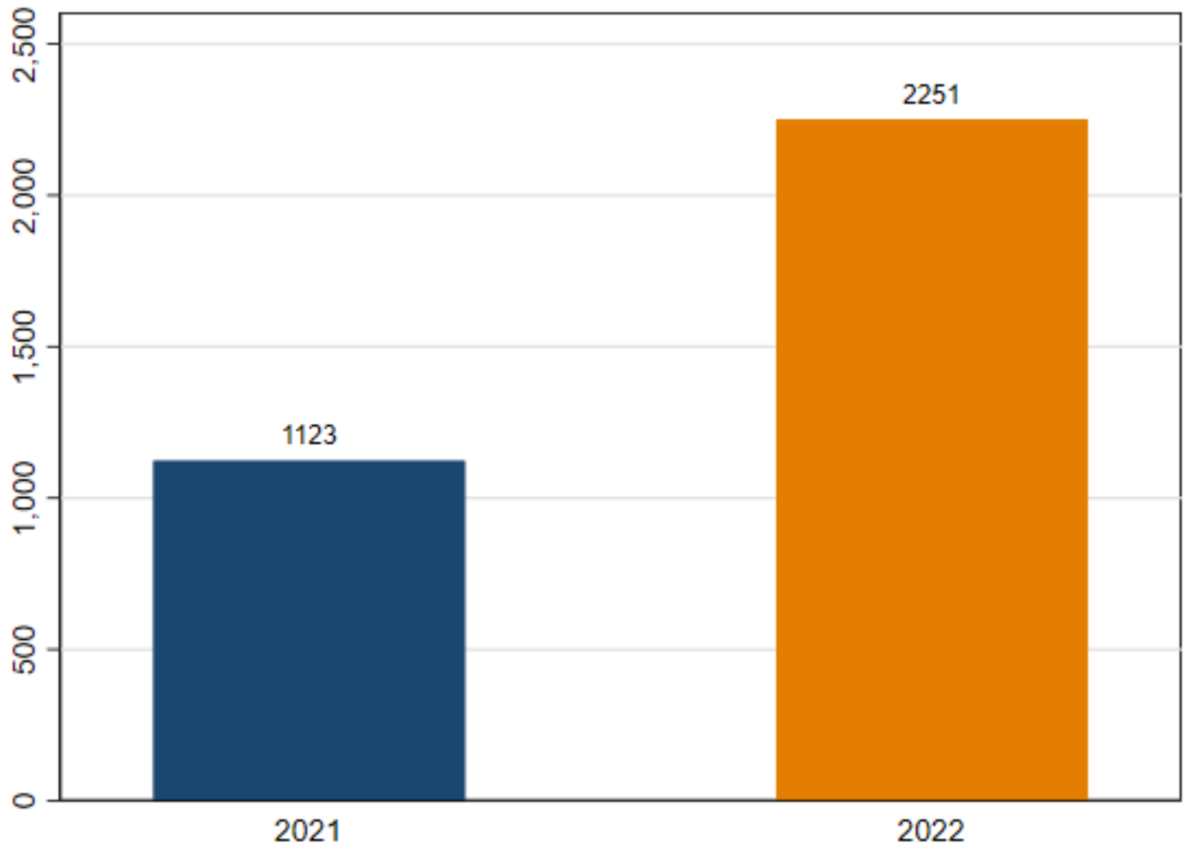
This report provides a summary of research that is carried out at by economists at the University of Warwick. We have modelled what the impact of the energy crisis is going to be across households in England and Wales and have developed this specific brief for Enfield. We find that the **average household in Enfield may see increases in energy bills of £1128 per year**, even with the existing government support in place through the Energy Price Guarantee (EPG). Without the EPG, average energy bills would increase **by as much as £1972** when measuring prices as per the Ofgem October announced prices. Naturally, the difference between the cost increase that households face vis-à-vis the market prices of energy will need to be paid somehow by the government, which invariably means **higher taxes, lower public spending or more public debt**. The shock is broad based and will virtually affect all households.

Our estimates suggest that the energy shock may take **out a combined £110 million from residents in Enfield**, if homes for which we do not have data are comparable to those for which we have data. Rather than spending public money to subsidize energy consumption, we identify that there is a **large potential for energy savings** that could be mobilized in Enfield. We estimate that residents in Enfield could save at least 33% energy permanently if energy efficiency upgrades were implemented to the building stock; this corresponds to **realizing financial savings valued at market prices of at least £60 million per year**, along with CO2 emissions reductions of 123000 tons. In fact, if homes for which we do not have data are comparable to those for which we do have data, financial savings could be **as high as £86 million per year**. An estimate of the investment cost of making such upgrade investments in the 54229 properties for which the data suggests there is an energy efficiency improvement potential, focusing particularly on insulation and boiler upgrade measures, is £482 million.

How will the energy crisis affect Enfield and its residents?

The energy crisis is a broad-based economic shock that can threaten social and economic stability in the UK and it will see **households in Enfield hit hard**. Even with government support, for example, through the Energy Price Guarantee in place: we estimate that the average household in Enfield will see an increase in their energy bill of £1128 relative to prices from October 2021. Importantly, the government financial support to households is not itself without costs, as the government either will have to **borrow, cut spending, or raise taxes** in order to finance the energy price support package. As such, households will have to pay the price of higher energy either directly, or indirectly.

Figure 1: Impact of energy crisis on households in Enfield: Increase in annual average energy bills

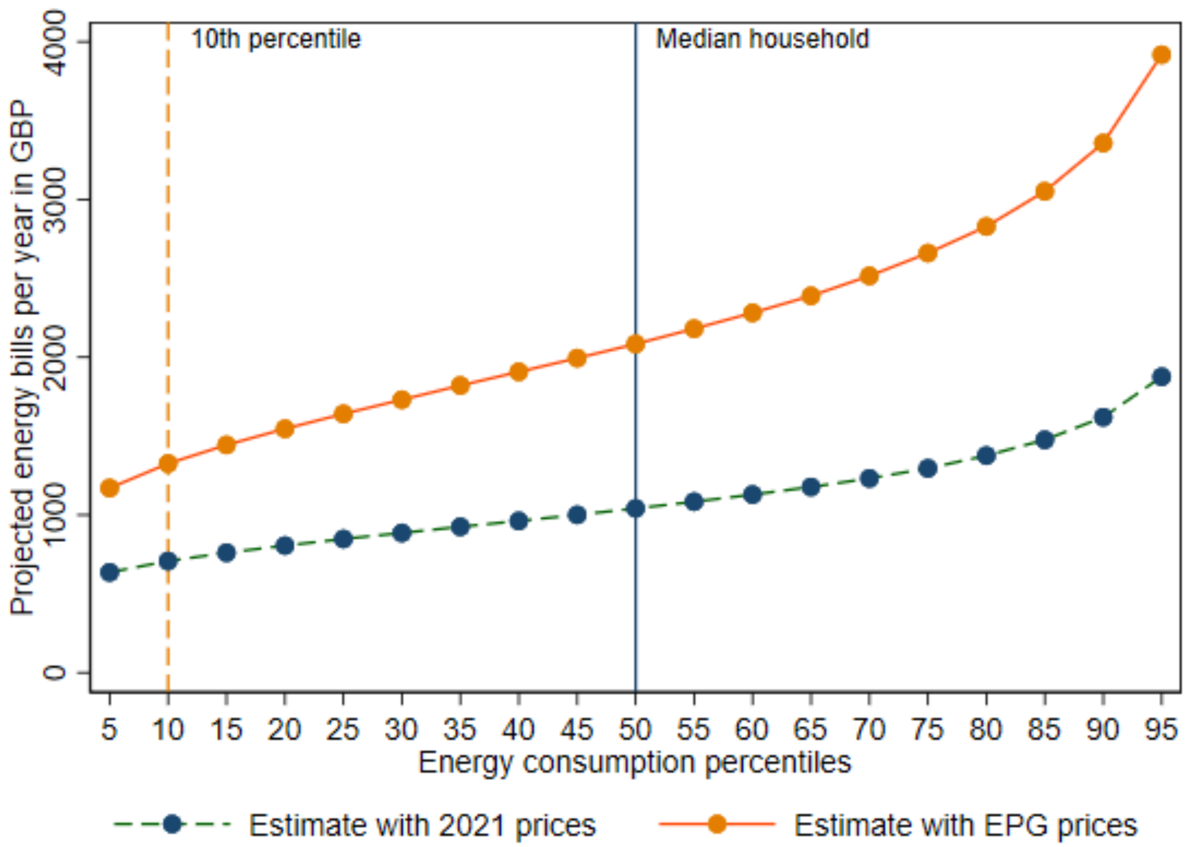


Importantly, **many households may be caught off guard by this drastic increase in energy bills.** Research has shown that many households **do not know how much energy they consume** (see Attari et al, 2010). The prime reason for this is that energy use simply was not top-of-mind, as energy prices have been very low for a long period of time. The absence of awareness to one's own energy consumption raises the importance for local government, local media, and local politicians to raise such awareness.

Moreover, **all households in Enfield will be affected by the energy price shock.** Even households who consume very little energy are projected to see a steep increase in their energy bills. These increases are expected to happen despite government support packages, such as the Energy Price Guarantee. Figure 2 illustrates the projected impact of the energy price shock in Enfield across the distribution of households based on their respective energy consumption. The median household in Enfield may expect to see an increase in their energy bills by up to £1042. That is, 50% of households will see their energy bill increase by more than £1042 per year, while 50% will see their increase in energy prices by less than that.

Still, **even households who already consume very little energy – which are typically among the poorest – will be hit hard.** Households at the 10th percentile of the energy consumption distribution (that is, 90% of households consume more energy than them while 10% consume less than them) are **projected to see an increase in energy bills of £618** despite the support from the Energy Price Guarantee. Households who have such low energy consumption typically live on a household income of less than £15,000 per year. For these households this shock, in the context of broader inflationary pressures, may cause a drastic decline in real standards of living which may threaten social cohesion and social stability.

Figure 2: Distribution of the projected change in energy bills across households in Enfield



To put things in perspective, the median household in Enfield lives in a flat property that was built during the 1991-1995 period with 2 habitable rooms and an approximate floor area of 48 square meters (517 sqft). Thus, it is clear that this energy crisis will affect many very regular families and citizens in your community.

Many households are already **financially squeezed due to the economic fallout from the pandemic,** more than a decade of **stagnant productivity growth,** and the resulting **falling real incomes.** This energy crisis thus may affect the material well-being of broad swathes of society, many of whom do not have a financial cushion to accommodate the shock.

Why is this happening?

The increase in energy prices is brought about by the Russian War on Ukraine and the subsequent dislocations in energy markets. This has been made most apparent in recent destruction of pipeline infrastructure in the Baltic Sea. It is a broad foreign policy expert consensus that energy is used as leverage in this conflict to sow an economic crisis in the West and through that, undermine the Western resolve to support Ukraine in its self-defence against Russia's aggression. This threatens the global peace order that was established after World War 2.

Why does saving energy make so much sense both in the short and long run?

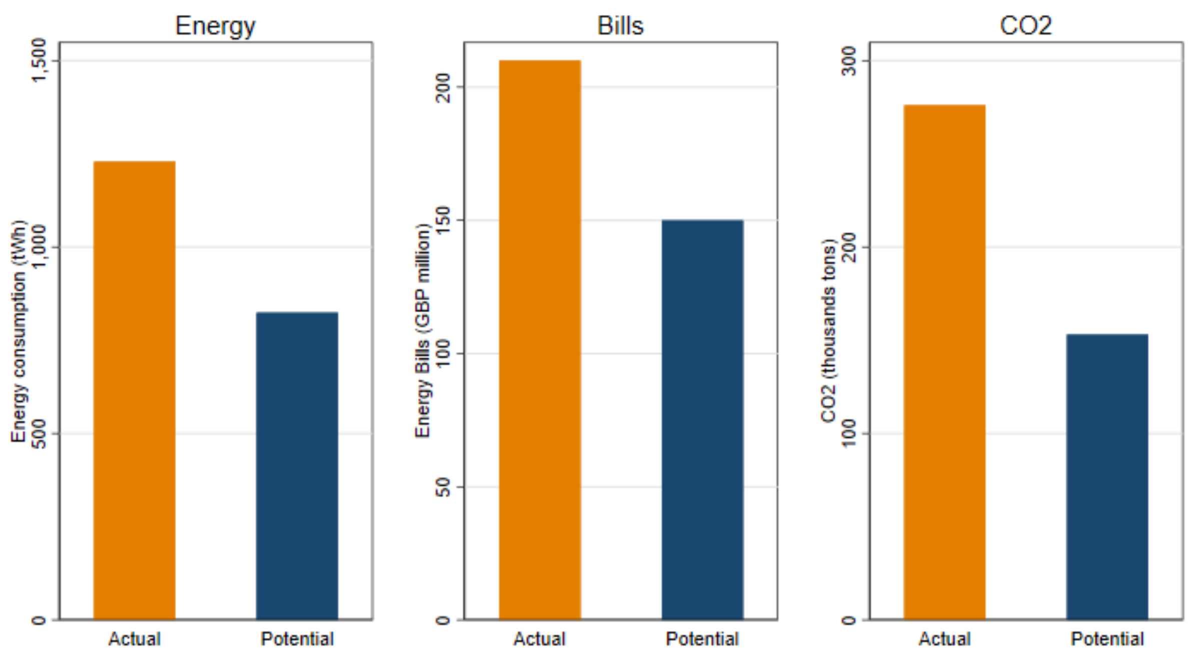
Irrespective of the motivations, the energy crisis is also an opportunity to rebalance the UK economy. Saving energy makes a lot of sense both economically and environmentally. And there is a lot of energy savings potential right here in Enfield. One of the main reasons why Enfield and its population will be so severely affected by the energy crisis is because of decades of **underinvestment in the existing building stock.** We estimate that at least 43% of Enfield's building stock could, if adequately retrofitted, contribute permanently to saving energy. Why has this not happened before? The answer is simple: the economics of energy saving investment were not there. For many homeowners, businesses, and the community in general, it simply did not financially make sense to invest in improving the energy efficiency of their property.

The dashed line in Figure 2 highlights this quite nicely: prior to the war, energy bills between the highest consuming households and the lowest energy consuming households hardly differed. Because **energy was very cheap** it didn't make a huge difference for households to save energy. The incentives to do so were very weak. In England and Wales, before the Ukraine war, households on incomes less than £15,000 had average annual energy bills to the tune of £1,161 per year, which contrasts to estimated energy bills among the highest earners with household incomes of £150,000 or more of £2,809 per year. So, despite the annual incomes between these two socio-economic groups differing by a factor of 10, energy bills between highest and lowest earners were only, on average, 2.5 times higher among the highest earners. That is why many people didn't pay much attention to energy. And as highlighted, many households, especially in the middle of society are not aware of the shock that may be coming because many do not know how much energy they use (see Attari, 2010)

The Russian war on Ukraine and the resulting energy price increases **have changed this.** And it is our view that the increase in energy prices will be **permanent.** Even with large scale natural gas imports through liquified natuaral gas (LNG) or with higher domestic production, possibly using methods with a questionable environmental track record such as fracking (see Alvarez, 2018), it is unlikely that energy will become as cheap as it was before the war. Physics is one factor in this equation: the process of liquification and regasification uses up a lot of energy implying a natural minimum markup on any LNG imports. Further, climate change and the need to **reduce our carbon footprint** will elevate energy prices structurally in the long run through the much-needed system of carbon taxation.

We estimate that all households in Enfield combined **could save more than £60 million in energy bills per year at current market prices.** In fact, if homes for which we do not have data are comparable to those for which we do have data, financial savings could be as high as £86 million per year. This savings potential arises because we estimate that the residential building stock in Enfield **could save up to 33%** of its primary energy consumption if buildings were properly insulated. We estimate that the building stock in Enfield alone **could save at least 123000 tons of CO2 per year.** The CO2 savings themselves have a monetary value: at present emissions trading prices of GBP 78 per ton of CO2, we estimate that the 123000 tons of CO2 emissions that could be saved are worth £9.6 million per year. With increased carbon prices, which will be added on to consumer bills in the future, these carbon costs will **raise future energy prices,** even if the war in Ukraine comes to an end and European energy supplies normalize. As such, saving energy is not just sensible in the short-term but also the longer term.

Figure 3: Energy, financial and CO2 savings potential in Enfield's building stock



It is also important to point out that **there is no free lunch.** Short term interventions in energy markets have a price tag. The government's **Energy Price Guarantee temporarily reduces energy prices** for consumers in a way that disproportionately benefits better-off households (see Fetzer, 2022). Yet, as a society, the cost of the energy price guarantee or any price-support mechanisms will need to be paid for. The government would pay for the difference between the market price and the subsidized prize. It needs to finance this subsidy somehow. From a budget perspective, this can take the form of either **higher taxes or cuts in government spending.** Yet, there is a third way which is to ensure that households consume permanently less energy. This has several advantages because saving energy:

- **Saves** households large amounts of **money permanently** not just as a one off
- **Reduces our carbon footprint** accelerating the net zero transition to avert the worst consequences of climate change which itself has a monetary value
- Can help **avert higher taxes and/or further budget cuts** that may be needed to fund energy subsidies such as the Energy Price Guarantee that often benefit households that are better off and consume more energy and that are distorting incentives to save energy

- Can help **build resilience** and blunt the ability of Russia or other energy suppliers which often are non-democratically governed to use energy as weapon or leverage

- Lastly, there is some work that suggests that energy efficiency can also pay off in the long term by **boosting property values** (see Dalton and Fuerst, 2017) and reduce the default risk of mortgage borrowers (Guin et al, 2022) thereby contributing to financial stability.

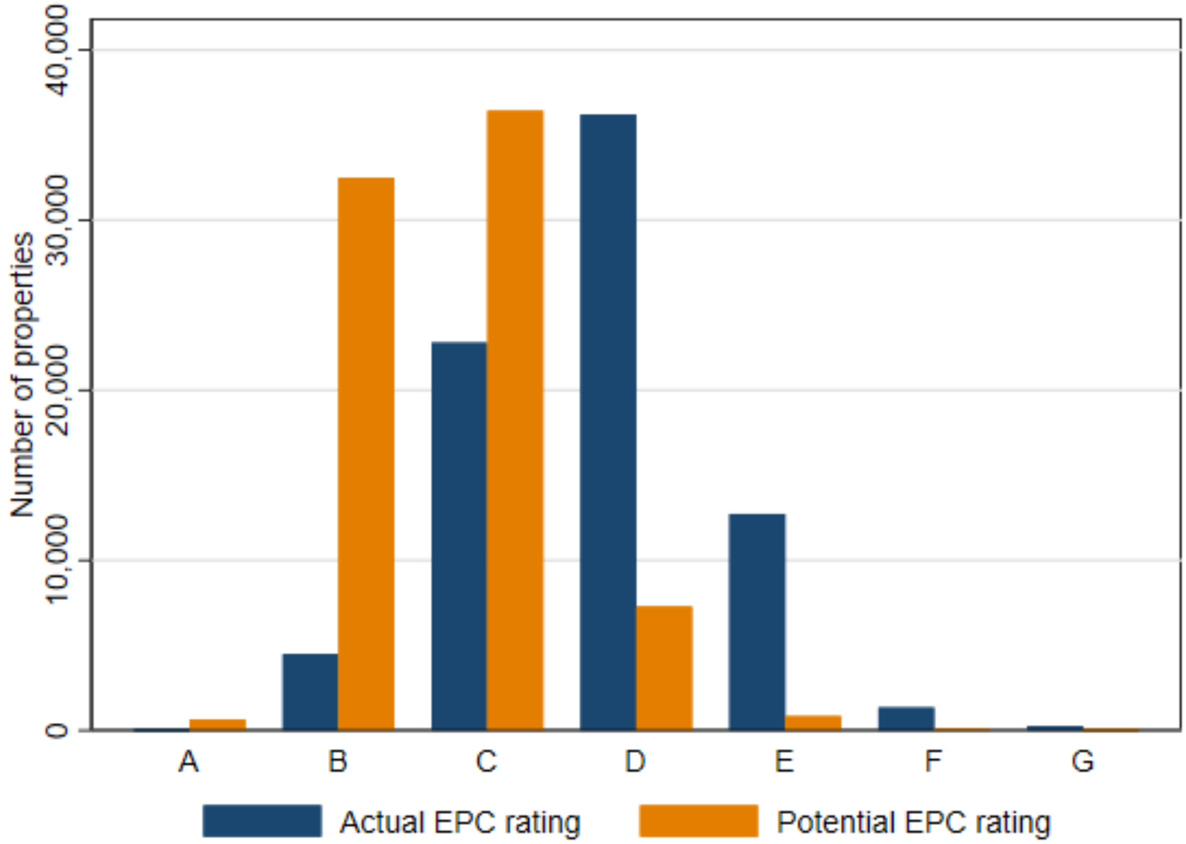
What can be done in Enfield to mobilize the energy savings potential?

As we quantified, there is a lot of energy savings potential in Enfield that can be mobilized and tapped into. Energy savings measures will have two components: **short-term and medium- to longer term measures.**

Permanent energy savings measures

Enfield has around 126030 residential properties as per the council tax register. We have granular data that allows us to study energy consumption from a sample of about 62% of Enfield's building stock, that is 77864 properties. Research from the Office of National Statistics suggests that the data we work with here is broadly representative of the overall building stock. Most of the properties have notable improvement potential in terms of their energy performance certificate as is shown in Figure 4 tabulating the actual and the potential energy performance certificate (EPC) rating of the building stock for which we have data. In total, there is improvement potential in 54229 of the 77864 properties for which we have data.

Figure 4: Number of properties by their current and potential EPC rating in Enfield

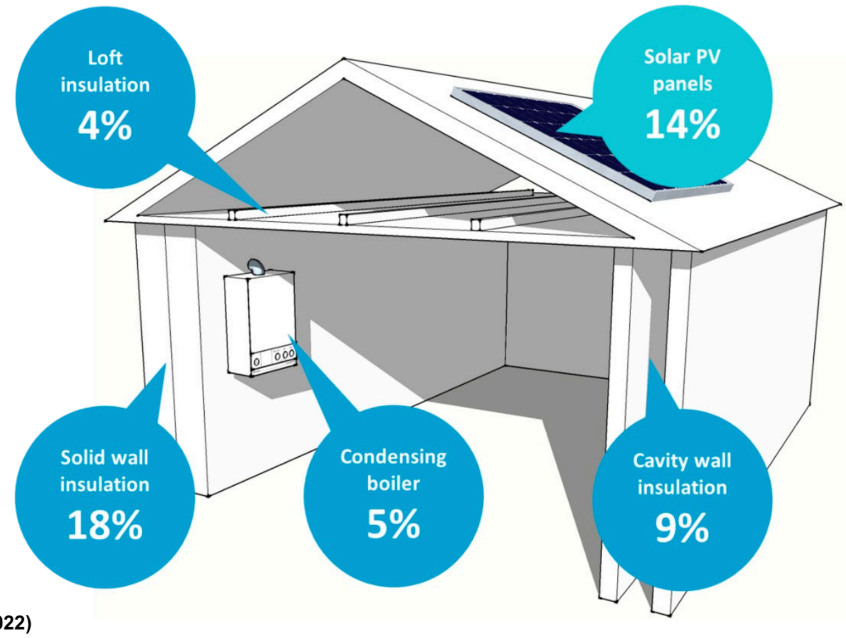


The most common measures to improve the energy efficiency of properties that have been shown to have real impact are:

- Cavity wall insulation
- Solid wall insulation
- Floor, roof and loft insulation
- Condensing boiler replacements

The UK's Department of Business, Environment and Industrual Strategy (BEIS) regularly studies the energy savings potential using real data on actual consumption. These are based on individual level meter-reading data and not just modelled energy savings that draw on laws of physics and thermodynamics (see BEIS, 2022). They are visually summarized in Figure 5.

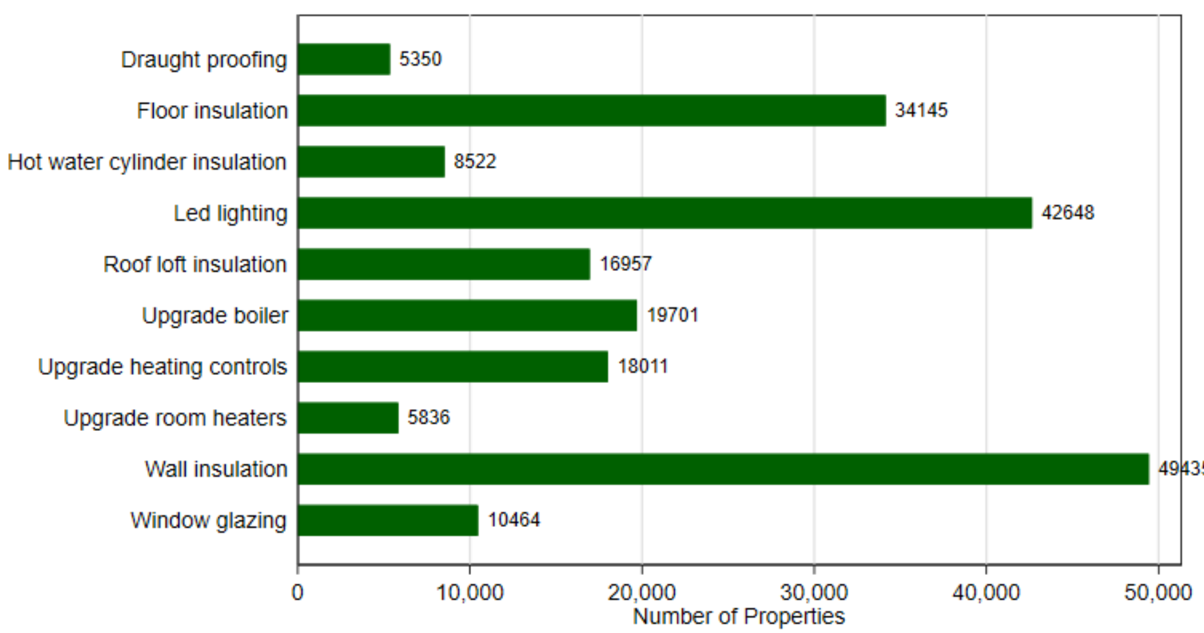
Figure 5: Typical gas savings in 2019 from energy-efficiency upgrades installed in 2018 in England and Wales (electricity savings are shown for Solar PV installations)



Source: BEIS (2022)

So what can be done in Enfield in the at least 54229 properties for which we identified energy-savings potentials? The data on the EPC's provides a range of measures that are quoted. This can give an idea of the scale of the task at hand to realize these energy savings to shape a more sustainable future.

Figure 6: Number of energy efficiency improvement recommendations by recommendation type in Enfield



In Enfield, we estimate that at least 49435 properties would benefit from improved wall insulation such as solid- or cavity wall insulation. Further, 16957 properties would benefit from roof- or loft insulation, while 34145 properties could benefit from floor insulation. Further, there are at least 19701 properties that could benefit from condensing boiler upgrades. There are smaller measures that may be less invasive and less costly, but the savings could add in the short- and long-run.

This suggests that there is a lot of room for improvement in terms of energy savings. Here are 4 steps you can take to secure resources to make these investments happen right here in **Enfield**:

- Local councils could secure funding from their *local net zero hub* to promote energy efficiency investments in your council.
- Local councils could refer households to large energy suppliers for retrofits under the *ECO Flexible Eligibility scheme*.
- Local councils could refer households to existing *government energy efficiency schemes*.
- Local councils could help people navigate the retrofitting process with simple permitting procedures, lists of contractors, and schemes to support training of new contractors.
- Local councils could secure funding to retrofit social housing through *BEIS-backed Social Housing Retrofit Accelerator* designed to support you to successfully bid into the Government's Social Housing Decarbonisation Fund.

Households can also save money through ***temporary energy savings measures,*** including:

- Local councils could identify energy savings potentials in buildings that are managed by the council or through the social rented sector. Councils could offer a reward scheme or a cut to service charge that is communicated to all residents if they achieve a certain energy savings target.
- Local councils could encourage other private and social rented providers similar incentives. These would mostly self-fund as the lower energy bills can be passed on.
- There is large energy savings potential simply arising from changing daily routines, for example encouraging households to lower the cooling temperature settings on their thermostats by 1 degree (19C) like many other European countries are doing, turning off devices on standby, changing lightbulbs or using electrical appliance use, such as dishwashers or laundry machines to off-peak hours.

Way forward

With the crisis unfolding, households may feel helpless and even more disconnected from the central government. Yet, our research highlights that empowering households to unlock the savings potential in their own homes is key to their wellbeing and to the country's decarbonisation goals. Therefore, it is imperative for local government and local councils to devise ways to ensure that the existing schemes reach households. Our team will be happy to assist in identifying barriers to take-up of energy efficiency investments, in designing programs to overcome these barriers, and in finding out “what works”. Such a partnership can make your district an example to follow in the whole country.

Methodology

This section briefly summarizes the methodology that we used to produce this report and the data that went into this. A (much) more detailed presentation of this can be found in Fetzer, Gazze and Bishop (2022). A detailed policy brief on the economic implications of the Energy Price Guarantee and other measures that could be taken to boost energy savings is outlined in Fetzer (2022).

Energy Performance Certificates

The UK collects data on the energy performance certificates (EPCs) and makes these available in the public domain for research purposes and non-commercial use. This data provides, for each property that is listed, an estimate of the total energy consumption along with an estimate of potential energy consumption, coupled with the recommendations that are needed to be implemented in order to attain that lower level of energy consumption. The modelled measures of energy consumption are taking into account a range of factors but is mostly relying on the physical attributes of the building such as the materials that were used for construction; the types of windows; the ventilation along with a range of other factors. The engineering view arrives at an estimated volume of energy consumption measured in kWh. We have broken this down into the energy requirement for space heating, hot water generation and electricity use for lighting.

Naturally, the physical energy consumption of a property not only depends on the attributes of the properties, but also of who lives there. The EPC data falls short, because it does not incorporate who and how many people live in a property. Each of these unobservable factors could drive energy consumption above- and beyond what is captured by the physical attributes of the property.

We leverage additional data to anchor the theoretical energy consumption with actual meter-reading based data from actual energy consumption that we match and link to the EPC data. This effectively rescales the energy consumption and can help bring the data closer in line with actual consumption data.

NEED Anonymized Household Energy Consumption Micro Data

Through the National Energy Efficiency Data Framework (NEED) data on energy consumption is analysed by the Department for Business, Energy & Industrial Strategy (BEIS). Anonymized meter-level micro-data is shared with the research community. This provides the annual gas- and electricity consumption of around 4 million households. The data is augmented to include a range of building characteristics such as the property age, the built type, the region- and a few other characteristics that can also be found in the EPC data.

We rescale the EPC-implied energy consumption measure to capture consumption data that is actually found in this meter-reading data based on the percentiles. That is, if a property has similar characteristics in the EPC and the NEED data and is in a similar percentile of the energy-consumption distribution, we rescale the EPC measure to match the actual energy consumption data. This method is called matching-moments in econometrics. This rescaling takes into account property characteristics and actual consumption information but may still fail to account for the demographics of areas and the ensuing energy consumption preferences. To do so, we also use a second rescaling method.

Local Area Consumption Data

BEIS publishes very granular energy consumption data down to the individual postcode level both for electricity- and natural gas as long as a postcode has at least 5 readings. For each postcode, the data provides both the mean- as well as the median energy consumption. We compute the corresponding matching moment – that is the mean or median – in the EPC data and then derive a rescaling factor that is mapping the EPC-NEED augmented mean/median to ensure that this mean/median coincides with the mean/median from the postcode-level energy consumption.

Potential mismeasurement

It goes without saying that this approach is not without measurement error. Yet, this is the best approach that can be used to construct local energy demand measures in a way that we can link to energy savings potential in the UK housing stock. More could be done with more granular data that is available for research use. In fact, BEIS could provide for a linked dataset that matches the EPC data with actual meter-reading data. Yet, it has so far not done so and such a linked dataset is also not available in the Secure Research Service (SRS) of the Office of National Statistics, which is a pathway for academics to work with microdata under a strict, but very slow and bureaucratic access control protocol.

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