# Energy price rises – problem or opportunity?

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Energy prices rise headlines have grabbed our attention. What can be done? Is this a problem or an opportunity? In February 2021 the wholesale price of a therm of natural gas in the UK was 50 pence. By October 2021 the price was fluctuating between 300 pence and 400 pence per therm. Whether or not you have a clear grasp of what a therm is, the fundamental price increase is clear.

> For those interested a therm is 100,000 British thermal units (BTU). A cubic foot of natural gas has an energy content of about 1,000 BTU. Values vary from source to source with 1,047 BTU per cubic foot being not untypical. Taking the energy value of 1,000 BTU per cubic foot, a therm can be considered to represent 100 cubic feet of natural gas at standard temperature and pressure. The BTU is measure of energy with 1 BTU = 1055 J. So, 1 therm is equal to 105.5 MJ or 29.31 kW h.

In the UK the cost for a kW h of gas will vary according to supplier, but in 2019 for domestic supply the price was around 3.8 p / kW h. A therm at this rate would cost 111 pence. However, if the price of wholesale for a therm is 300 pence, we can envisage that the price for the domestic customer could readily rise to 10 pence per kW h for gas. By comparison electricity in the UK costs around 17.4 p/kW h.

Tariffs can help smooth variations in wholesale prices, but at some stage these costs will be passed on to customers. So, are there any solutions? More wind turbines and solar farms would help us generate more electricity from renewables. Currently though, we do not rely on electricity for our heating in buildings. In addition, electricity has traditionally been about four times as expensive per kW h than gas. However, as is evident from the headlines about wholesale gas price increases, the relative position of the cost of electricity and gas is changing. So, accelerating the implementation of more wind and solar farms is in my view a good thing to do in order to provide enhanced energy security, increase the availability of renewables-based energy supply, and ultimately reduce the traditional high price of electricity. However, there are additional reasons to go with more wind and solar. Our demand for and supply of energy is highly variable. There are times when wind is plentiful and times when the atmosphere is calm. The diurnal variation in solar energy supply is well understood combined with occlusion due to cloudy weather. Nevertheless, both solar and wind have significant potential to provide energy to enable production of green hydrogen. Periods when there is an excess of energy from wind and solar or dedicated construction of floating offshore wind platforms can be used to electrolyse water and produce hydrogen that can be used for high load applications such as heavy haulage as well as heating and of course as an energy store, for use during periods when it’s not sunny or windy and to smooth the energy supply versus demand cycle. Such changes in infrastructure can take several years to decades, but are essential interventions using technologies that are feasible, viable and at scale, affordable.

While some additional wind turbine and solar farms are already planned and in progress, more need to be implemented. In addition, we need to increase our attention to floating offshore wind and green hydrogen production at scale and the associated changes needed for gas supply and heavy haulage transport. These measures are, however, not a solution to 2022's energy price rises.

The good news is that so much can be done to enhance the envelope and environment within our homes now. The UK is known as the cold 'person' of Europe as our homes are often cold and draughty. There are reasons for this as many of our buildings date from a period when the energy vector was based on coal and it was important to have good ventilation within our buildings. Indeed, the benefits of good ventilation are now recognised as going far beyond providing oxygen for coal combustion to providing a steady supply of fresh air to ensure management of carbon dioxide levels along with other gases and pollutants. In addition, the right flow of air in the right places in your home can aid in timber and other materials health as well as managing moisture levels and ensuring that condensation does not become a problem.

Some of the measures that we can implement to improve the energy performance of our homes include improved thermal insulation of the roofs, external walls and ground floors, doors and windows, as well as considering the use of heat pumps instead of boilers. Indeed, insulating the roof tends to be one of the most cost-effective measures and over 98% of our homes have this measure implemented to some extent. The thermal performance of external walls can in some cases be improved by addition of a thermally insulating material in combination with a protective layer, ideally with both being from sustainable sources. We can refurbish worn and ineffective seals in sash and casement windows, and doors, recognising that some permeability is actually helpful in maintaining a healthy environment within our homes, and that hermetic sealing as sometimes associated with glazing solutions may not actually be the correct holistic solution. An often-overlooked area is the ground floor in a building which can be responsible for 15% of the thermal loss from a building and contribute significantly to drafts.

Many of our buildings have suspended floors and Q-Bot Ltd has developed robotic technologies specifically to provide a means to install thermal insulation within this hard to access area, avoiding the need to remove furniture, carpets and floor boards. The robot is about the size of a boot box and can be fed in through a small hatch in the floor and subsequently traverses the underfloor cavity, then sprays a thick layer of thermal insulation on the underside of the floor. This measure can reduce heating bills by 15%, help reduce the quantity of planet harming gas being consumed and help every home be much more comfortable to live in as thermal gradients within rooms are reduced.

Q-Bot has grown from an idea to a company employing around 50 people. The robots work alongside our skilled staff, undertaking the repetitive tasks and functions in confined environment where you would not want a human working. This is an example of cobotics where robot technology and people work alongside each other. This generates value to the customer through an enhanced building, value to society through reduced harmful emissions associated with heating and high-value employment through skilled long-term work with advanced technologies. There are millions of homes in the UK alone where

improvements to the floor thermal insulation would be beneficial, which would also generate new employment for thousands of people.

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