

'Zero Carbon homes, under any definition will not be affordable'

*Arguing for the motion: Professor Doug King CPhys CEng CEnv FInstP FCIBSE FEI
Principal of King Shaw Associates Consulting Engineers, Royal Academy of Engineering
Visiting Professor in Building Physics* ⁶



Can you or I afford Zero Carbon Housing? Of course we can. In fact it's so affordable that I just wonder why we haven't all done it already.

Let's consider the typical approach to affordable zero carbon housing currently being showcased by virtually every major house builder. We'll use an air source heat pump to heat our houses during the winter and we'll power it with renewable energy from PV. Both of those technologies are extremely affordable.

The list price of an air source heat pump is little more than double the cost of a condensing gas boiler, but both of those are small in comparison to the overall cost of a new house. The cost of PV has fallen dramatically in recent years. Since the 1970s, when people first experimented with putting it on buildings, the cost has come down tenfold, so much so that it now only requires a Feed in Tariff subsidy of less than 38p/kWh to make it financially viable.

Of course PV doesn't generate much electricity on a winter's night when the heat pump has to work hard, but that doesn't matter as we'll just make sure that we generate enough renewable electricity in the summer to compensate for all the electricity we'll consume in the winter. Someone else will consume that electricity and so offset our winter carbon emissions allowing us to claim carbon neutrality.

However, we need to achieve an 80% reduction in carbon emissions right across the UK economy by 2050, homes included. New build housing will only account for a small fraction of the stock in 2050, so if we are to achieve these reductions we have to make all the existing housing near zero carbon too. If every house in the UK were to install sufficient PV to achieve the goal using the affordable approach then, on a sunny July day, the generation capacity will far exceed the total UK demand. Electricity will literally become too cheap to meter (a promise that was originally made by the nuclear power industry), for short periods at least.

We cannot store electricity on that scale so we will have a massive surplus available to export and right now the UK really needs export income. I'm sure that as Germany takes its nuclear power generation offline, Europe will welcome our surplus.

⁶ Doug King is founder of award winning engineering design practice, King Shaw Associates and Royal Academy of Engineering Visiting Professor of Building Physics. He is a recognised pioneer in the field of sustainable building design and has been involved in many ground breaking sustainable buildings including: Sainsbury's Greenwich Eco-Store; the Weald and Downland Gridshell; the Rolls Royce Factory at Goodwood; the Genzyme Centre in Boston, until recently the largest LEED Platinum building in the world, and the Innovate Green Office, the highest BREEAM rated building ever.

He is a member of CIBSE Council, of the RIBA Validation Panel, an advisor to The Ove Arup Foundation and co-chair of Low Energy Architecture for the World Renewable Energy Congress. He teaches sustainable design at Bath University and by invitation at universities across the world. He writes widely and was author of the highly influential report Engineering a Low Carbon Built Environment. This year he received The Royal Academy of Engineering Silver Medal for "an outstanding personal contribution to British engineering", in recognition of his work in the field of sustainability.

doug@kingshaw.co.uk

All we need to do is install 15 times the undersea cable capacity that we presently have to transfer the surplus power to the European mainland. This will cost about the same as building eight new nuclear power stations, but we don't have to worry – someone else will bear that cost, not us.

In the winter it will still be necessary to burn fossil fuels to generate electricity to power our heat pumps but, since most of our building heating already comes from imported natural gas, what does it matter if it's consumed in lots of domestic boilers or a few big power stations? Now, if every heat pump really works at the manufacturers' claimed efficiency we will only need about 25 new Combined Cycle Gas Turbine (CCGT) power stations (50% more than the UK's total existing generation capacity) to supply all our domestic heating. We don't need to pay for these power stations either, because the market will deliver them in response to the growing demand and CCGT power stations are much cheaper to build than nuclear, large-scale renewable or clean coal.

It really doesn't matter that the claimed efficiency of heat pumps cannot be achieved in reality (their performance drops rapidly at ambient temperatures below 5°). With the impact of global warming our winters are not going to be so cold anyway. The bonus of using this high technology approach to zero carbon homes is that by using PV manufactured in China and heat pumps manufactured in Korea we don't have to account for the embodied carbon emissions associated with manufacturing them. Let somebody else worry about abating those emissions.



Overall, UK fuel consumption may go up a bit, because one effect of the Renewable Heat Incentive is that you could get a better payback from investing in a bigger heat pump than by super-insulating your house and using a smaller heat pump. In fact if you use our affordable approach to making your home zero carbon you will be better off installing as little insulation as you can get away with under the building regulations, because you'll be paid a subsidy for the heat you waste

as well as the heat you need. This won't matter in carbon emission terms either, as you can simply generate more PV electricity to offset the waste and be paid a subsidy on that too!

So overall we're going to be on the zero carbon gravy train.

Under the green deal the banks will lend us the money to buy imported high technology equipment and we will pay off the capital and the interest (even at a premium rate) using the subsidies paid under the Feed in Tariff and Renewable Heat Incentive. Overall we'll save ourselves money by not investing in any other energy conservation measures as the technology will deal with all our carbon emissions. The required new electricity generation infrastructure and the subsidies will be paid for by levies on fuel which we won't affect us much because we are generating our own renewable electricity. The bulk of the cost will only be borne by those who don't have the collateral to raise the loans in the first place, like the elderly and unemployed.

Zero Carbon Housing – another great way of diverting taxpayers' money to the bankers and, like any good middlemen, the owners of zero carbon homes will make a healthy profit into the bargain. Can we afford not to be involved?