



How low should we go with low carbon retrofit? Robert Prewett

1. 2050 target.

There is a general consensus that climate change must be held to a less than 2 degree average increase. It is also generally accepted that in order to achieve this goal, the world as a whole must reduce its emission of CO₂ and other green house gases by 80%.

The UK Climate Change Act 2008 'adopted' this 80% goal.

While this is very ambitious target, the result of going beyond the 2 degree change is likely to be catastrophic for the mankind.

2. Where are we starting from in UK?

In the UK, we have an unusually high proportion of older buildings. 20% of our housing stock was constructed before 1919 (more than 4 million). This means we have a lot of solid wall properties with no insulation. Incidentally we also have a large number of properties with single glazing only.

If we look at energy use within the home, we find that energy consumed for space heating is the dominant category. In fact a massive 62% of energy supplied to homes is for heating.

The next biggest amount is 18% for hot water.

Homes account for 28% of all energy use in UK, so heating and hot water alone account for more than 20% of all UK energy use.

Clearly, targeting heating demand within the domestic sector can have a potentially significant contribution to the 80% reduction target. By simply insulating buildings we can save a huge amount of wasted energy.

3. From 'our' house to passivhaus?

The average annual heating requirement of a UK home is 15,000 kWhr (kilowatt hour).

If we compare this with a standard such as the new build passivhaus target, we can start to understand how much energy we waste:

UK average	150 kWhr per m ² of floor area per year
With the German Passivhaus standard	15 kWhr per m ² of floor area per year

So, if it is possible to reduce heating demand to Passivhaus standards, then we could at least stand a chance of meeting our targets CO₂ reduction within the housing sector. And if we were to introduce some renewable energy into the mix, we might do better than our 80% reduction.

4. Establishing a bandwidth?

Having worked on a range of house types my architectural practice have demonstrated that very large energy savings can be made, often without disturbing the architectural qualities of the host building.

Our experience suggests that aiming for between 15 and 40 kWhr/m²a is feasible. This target is more flexible than the passivhaus standard in order to recognise the differing constraints that existing dwellings place on the designer. Compared to the UK average of 150 kWhr/m²a, it represents an ambition that is high but achievable.

We think that the best retrofit lies somewhere within 'bandwidth'. We call this 'deep' retrofit.

5. Why should we aim for deep retrofit?

Retrofit can be crudely categorized into 3 categories: lite, medium and deep.

'Lite' retrofit such as draught proofing windows or adding some loft insulation is likely to improve comfort without making a very significant change to energy use.

'Medium' retrofit such as applying solid wall insulation and changing windows, may result in significant energy savings and some good comfort improvements. However, due to the fact that most medium retrofit is driven more by cost than by good design, it often ignores important detail issues or fails to look at the house as a whole. For this reason, medium retrofit can have some unexpected and unpleasant outcomes.

Deep retrofit we believe is the safest approach that can really deliver energy savings and comfort. It allows us to get 'back to the bones' of buildings and to deal effectively with buildings as whole systems, managing moisture and ventilation as well as insulation. Only by stripping building back to their essentials is it possible to intervene with existing building defects, make building properly draught proof and to install insulation without breaks. It also allows for the installation of ventilation ductwork which is required in draught proof houses. So as well as delivering on energy, deep retrofit is also most likely to deliver on comfort and health.