

Building Energy Usage



Heating and cooling of buildings

This part of the energy supply is responsible for the most CO2 emissions. The challenge here is really twofold:-

1. Buildings need to be better insulated so as to not get too hot in the summer or too cold in the winter
2. The heating and cooling supplies need to be powered off renewable electricity

Again the challenges vary by country. Countries in the tropics have little need for heating but do need air-conditioning. In the UK, our challenges are:-

1. Houses that pre-date 1920 do not have cavity walls that can be insulated, so need to be retrofitted with external or internal solid wall insulation.
2. Most houses are either heated by natural gas or oil
3. 15% Hydrogen in natural gas supply is still being trialled. 100% Hydrogen necessitates a swap out of existing boilers
4. Tradesmen will need to be re-trained in large numbers in order to facilitate the transition to solar, heat pumps or hydrogen as well as solid wall insulation.
5. Externally insulating houses often needs to be carried out for entire streets, otherwise it does not look good aesthetically. In some cases, external wall insulation will stick out further than the roof eaves, so the roof would need to be adapted.
6. Internally insulating houses is very disruptive to households and would meet a great degree of resistance.

Potential solutions for buildings are a combination of:-

Solar Panels

This will be sufficient to generate electricity during the day from about March through to October. In the UK, these are most suitable in Southern England. If you are out during the day, the spare capacity can be fed back in to the national grid offsetting the costs of using electricity during nighttime hours.

Battery Storage

This can provide a few hours in the evening of electricity from what was generated during the day

Heat Pumps

Heat pumps come in 3 different flavours:- * Air Source - most suitable for city dwellings if district heating is not an option. Challenges at the moment are that they do not provide as much heat as a gas boiler so your house needs to be fully insulated and radiators swapped for larger ones. * Ground Source - requires digging up your garden but makes sense for detached houses in the countryside which currently are reliant on oil for their heating * Water Source - suitable for buildings near lakes or other bodies of water

Heat pumps are 3 times as efficient as gas boilers. They do require electricity to power them but this could be supplied from solar panels/battery storage during the day. Challenges at the moment are that heat pumps do not provide as much heat as a gas boiler so your house needs to be fully insulated and radiators swapped for larger ones.

Hydrogen

- A trial has already successfully taken place at [Keele University which replaced 15% of natural gas with hydrogen](#)
- A further trial is due to take place in the Northern England in a small area to test the use of Hydrogen in real world conditions

External Wall insulation

District Heating Schemes e.g. burning municipal waste and using the heat to keep a district of a town warm.