Questions and problems getting to Net zero from October 2022 to 2050

Our recent post on the CPRE website was very critical of the overblown and unsupported ambitions expressed by Governments on achieving net zero by 2050. It emphasised the many complex and inter-related engineering activities involved, and pointed to the difficulty of controlling and co-ordinating the technical challenges, funding, timescales, and associated risks and uncertainties. Bemoaning the apparent lack of expertise and understanding within Government, our suggestion was that teams of qualified experts in a range of engineering disciplines should be set up to guide the decision-making process and help reconcile ambition with practical reality.

There are a myriad of questions and problems looking for answers if we are to achieve the desired outcome for the most demanding project of our life time and our current post looks at some of the issues such teams should seek to address.

We can start with the implications for our own homes. Official guidance points to the installation of heat pumps and extra insulation as the main contribution of the household sector to net zero. Yet we know that heat pumps will not be viable for many existing properties unless radiators are replaced and insulation standards improved. Even this latter creates problems as there is the risk of interstitial condensation in walls and roofs. In all, there will be significant costs (and who is to bear these?), disruption and in some cases planning challenges to make our homes compliant with the power output of a heat pump. There are also implications for housing on the planned switch to electric vehicles as all homes will eventually require the installation of an expensive wall charger (though how a cities like Bristol and Bath are supposed to cope where so many properties have no allocated parking space is a major issue).

In the quest for net zero, one problem begets another problem, one question answered leads to another question raised. The electrification of homes and vehicles will send shock waves through our entire economy. At the lowest level, one major task will be the upgrading of power cables into our homes. As each EV charger adds the equivalent electrical power of three small houses to the national electric load, both the local distribution lines in our streets and neighbourhoods and the regional lines will need upgrading, as will the National Grid's transmission lines. The resulting estimated 81% increase in electricity demand will require a comprehensive upgrade in generation facilities and we urgently need a plan laying out how the manpower and material needs are to be provided, bearing in mind that there will be a global requirement for these resources.

An essential part of the journey to net zero is the adoption of renewable energy. While there is much talk of the price of wind and solar power plummeting, the fact remains that, while here in Britain the wind often blows, it is equally true that the sun does not always shine, especially when it is most needed in winter. Unless viable engineering solutions are found to enable power to be stored renewables cannot be counted on to supply base load requirements. This raises initial questions of whether battery technology will have advanced sufficiently to enable this to be done economically. It also raises further questions about whether enough of the materials required for manufacture such as lithium, cobalt and copper will be available and whether they can be sourced without giving rise to environmental problems.

The initial response to these questions is not encouraging. It is estimated that current battery manufacturing capabilities will need to be in the order of 500-700 times bigger than now to support an all-electric global transport system. The materials needed just to allow the UK to transition to all electric transport involve amounts of materials equal to 200% of the annual global production of cobalt, 75% of lithium carbonate, 100% of neodymium and 50% of copper. Scaling by a factor of 50 for the world transport indicates a demand in excess of known reserves of these materials. In addition, it has also been suggested that at the end of their life, these batteries, and the wind and solar power generators, produce more tonnes of hazardous waste per unit of electricity produced than a decommissioned nuclear power plant. (Note:-It will be a different sort of hazardous waste to a nuclear plant so not directly comparable.)

These questions ripple out raising yet further issues to which answers need to be found now. Some of these relate to supply matters, such as the stranglehold which China currently has on the supply of the so called rare earths and what can be done to prevent an OPEC type situation for the green agenda by way of developing different sources or materials. Other questions relate to costs and timing and contractual arrangements. The cost of electrifying transport and heating in the UK is estimated at £3tn over 30 years, or £100bn each year. That is an HS2 project every year. To retrofit the UK's housing stock will cost an estimated £2tn and take 30-40 years, a task that has hardly been started. Overreaching all of these issues are the questions of funding (what costs should be borne by the consumer, what by the taxpayer and what through yet more Government borrowing?), and security as all these matters must now be seen through the lens of geopolitical instability caused by the war in Ukraine.

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