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Follow the Science, Not the Sheep The need for urgency on the road ahead

The drive towards net zero by 2050 will be a challenge: technically, financially, and socially. What is clear is that there is no single silver bullet, and a suite of interventions will be needed. We are past the point of indecision and now need to act at speed if we are not to pass the tipping point in the climate emergency. Furthermore, we need to be Led By Science; Not Led By Sheep. We need to develop a strategy based on sound knowledge of technology options tailored to the UK, and we need to do so in a way that is equitable across the population. If we act without deep evidence of the consequences of actions, we run the risk of creating wider social underclasses. This is true across the whole energy system including heat, electricity and transport. But how do we predict what might happen thirty years in the future?

We need to look back thirty years to realise how difficult it is to predict what things will be like in 2050. In 1990 I had a pager, but no mobile phone. My computer had considerably less power than a modern phone. Video conferencing was the fantasy of Star Trek! What is clear is that as we try to ease our way of life, we will continue to need energy. Energy is electrons, electricity is electrons, liquid and gas fuels are electrons, consumer products are electrons. How can we achieve zero carbon energy with increasing demand?

In fact, the transport sector highlights some of the issues of a changing emissions landscape. Transport use was significantly affected in 2020 due to the lockdown and CO₂ emissions did fall. So did nitrogen oxide emissions. But particulate matter emissions rose significantly? This was because of changes in atmospheric chemistry caused by the reduction in the other emissions. This has been seen in the UK and most starkly in China. Actions have consequences and we need to be aware of these before we make policy changes.

So, 2020 was the year that electricity demand fell significantly, primarily due to the pandemic lockdown. But it is now bouncing back. Except for nuclear energy, mainstream low carbon energy (wind and solar) is highly weather dependent. There are days of high-capacity generation and days where it is very low. Storing electrical energy over long periods is problematic and so a more efficient form of energy storage is needed. Liquid fuels are the most convenient form, but these cannot and should not be derived from fossil carbon if we are to achieve net zero. We need carbon, it is the element of life and of materials. We should not be talking of decarbonising but **de-fossilising** society: we need to recycle existing carbon in a similar but more efficient way than nature does in the photosynthetic cycle. Germany is leading the way in that respect, led by long-term investment in innovation from the Bundesministerium für Bildung und Forschung (BMBF). Initiatives such as the Kopernikus Projekte¹ are already converting carbon dioxide into transport fuels using Power to X (P2X) technologies that store energy over seasons and can fuel existing combustion engines but with reduced emissions over the complete lifecycle.

Again, if we look to mobility, we can see an opportunity for P2X to accelerate the defossilisation of transport at a faster rate than we currently foresee using electric vehicle technologies alone. The road to 2050 has an envisaged route, but like many journeys there may be diversions or more

¹ www.kopernikus-projekte.de/en/home

preferable routes available. As an example, while internal combustion engines vehicles are to be phased out from 2030, there will be legacy vehicles for many years afterwards. Power to X technologies can provide alternative synthetic fuel to power these vehicles without the need for new fossil oil to enter the supply chain. This will allow defossilisation to be accelerated while maintaining social justice in the low carbon transport transition.

This science and technology led approach can provide the basis for the drive to net zero, but it also needs policies to be developed based on the science, industries to adapt to the required changes and financing to provide the glue to hold everything together. This 'quadruple helix' approach will provide a framework for acceleration while at the same time applying due diligence. There is a balance to be had between a commercial pull and political push. Given the task at hand it is unlikely that fiscal interventions alone will be sufficient, and that financial investment will be required, transitioning industries and workforces towards a zero-fossil carbon future and a new way of working. In respect of fiscal interventions, it is essential that a realistic price is placed on carbon emissions and that low carbon products are rewarded through tax relief instruments.

While the UK emissions trading scheme (ETS)² has set a mechanism of carbon tax, the current value of £15³ is significantly lower than the costs of carbon capture, even if a widespread CCS programme were to be established. It is widely predicted that the EU ETS price will reach €100 by the end of the decade. It is therefore recommended that a more appropriate ETS or 'cap and trade' price is set to encourage a faster transition away from fossil carbon. A second recommendation is a shift in VAT mechanisms so that the use of fossil-based fuels and products is charged at the full 20% while the transition to fossil-carbon-free fuels and products is encouraged by reducing the VAT on these to 0%.

Furthermore, policy revisions are required on the definitions of carbon dioxide mitigation through avoidance as well as capture. These policies were developed to address the needs of carbon capture and storage (CCS) but require revision to acknowledge the significant role that carbon dioxide utilisation and carbon recycling can be made in the transition. This needs to be addressed urgently to enable a rapid commercial transition and to advise revisions to the Science Based Targets framework.⁴

The situation is very much like treating a femoral wound. A plaster will help in the very short-term, but to solve the problem the flow of blood must be stemmed to the wound through a tourniquet. To avoid GHG emissions we need to stop the flow of fossil carbon.

² www.gov.uk/government/publications/participating-in-the-uk-ets/participating-in-the-uk-ets

³ <https://ember-climate.org/commentary/2020/12/24/carbon-price-risk/>

⁴ <https://bit.ly/3d25Pd8>