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SEPTEMBER 2021

Towards Net Zero

WATCH THE NUMBERS AND
REMEMBER THE ENERGY TRILEMMA

Engineering Net Zero
In partnership with our planet


ACTION
TODAY
FOR A
NET ZERO
TOMORROW.

Introduction

The issue of climate change has produced a bewildering flood of facts and figures that no one human being can possibly assimilate, assess, or evaluate. The response to climate change has been the pursuit of Net Zero, which alone is producing another torrent of 'facts', figures, claims, and counterclaims. As we approach COP26 the volume and diversity of such publications is growing fast. How are we to respond to this? Whether private individuals, communities, companies, governments, or professionals practicing in effected disciplines, we need to formulate our own action plans and signal to government the actions we believe are reasonable and acceptable.

This paper does not presume to provide the answer, but hopefully it will help to focus attention on some critical issues and increase awareness of the dangers of contradictory and sometimes misleading claims and the importance of a questioning attitude.

An obvious and early question about Net Zero, asked by many people, is "What will this cost?". In its Sixth Carbon Budget report (Ref 1) the Climate Change Committee (CCC) reassures us:

"Overall, by 2050 the operational savings under the Balanced Pathway more than offset the additional investment required in electricity generation".

But of course, there are many costs beyond those in electricity generation. Insulating millions of homes, changing heating systems in homes and offices, decarbonising transportation and industry, to name just a few. The Office of Budget Responsibility (OBR) (Ref 2) has cited the CCC as estimating the total economy-wide investment to deliver Net Zero as £1.4 trillion at 2019 prices. OBR assumed 25% of this investment would come from the Government, thus 75% would come from consumers. The HM Treasury report on the costs of Net Zero is due, but the truth of the matter is that we don't know what it will cost.

A more parochial but very pertinent question is "What will it cost me / my family / my business". Here again, is another unknown.

One thing is certain, the fundamental premise of the energy system is changing:

- **In the past** consumers could choose their fuel (coal, gas, oil, electricity) and the electricity system was designed to ensure that supply could meet demand. Indeed, the duties of the Office of Gas and Electricity Markets (OFGEM) clearly state that it must have regard to "the need to secure that all reasonable demands for electricity are met".
- **In future** many consumers will have no choice but to rely on electricity for all their energy needs, but the system will be designed to ensure that demand can be managed to match the available supply, which will be dominated by intermittent renewables. This may require some reinterpretation of the term reasonable demands.

Where demand exceeds supply there needs to be a system of resource allocation (i.e. rationing), and in a free market economy resource allocation is achieved by pricing. Supply goes down and price goes up. We are already seeing more price instability, with high spikes and even periods of negative power price. Indeed, The Times (Ref 3) recently cited a report which suggested that many of the existing onshore and offshore wind farms would have to be shut down when their existing subsidised contracts end because, due to the building of many more windfarms, market prices for power on windy days would be so low that without extended subsidy the existing windfarms would be uneconomic. We have previously commented on the potential for 'subsidy cannibalization' (Ref 4); Some have recognised a need for subsidy perpetuation. As the subsidies all come from levies on the consumer, it has to be asked: how do we rationalise this to the consumer?

Against this background, the Department for Business, Energy and Industrial Strategy's (BEIS) Energy White Paper (Ref 5) envisions empowered consumers managing their energy consumption using data provided through the Smart Grid. We reported on aspects of the retail market and its impact on the Net Zero system in an earlier report (Ref 6). One concern identified was the difficulty for consumers to access impartial objective information. To solve this, we recommended the creation of an Energy System Architect (ESA); one function of which would be to provide such information.

BEIS has now published a consultation document (Ref 7), prepared jointly with OFGEM, requesting comment on proposals for changes in the status of the Energy System Operator (ESO), which is currently owned by National Grid. It is proposed to create a Future System Operator (FSO) and many of the duties we envisaged for an ESA in our white paper have been included in the potential scope of the FSO. In proposing the ESA, we noted that many of the skills it would require were embodied in the ESO and this is recognised in the consultation. For the UK to achieve its decarbonisation targets it is critical that the consultation outcomes are implemented at pace.

In the meantime, here are some ways that consumers can navigate the Net Zero maze.

Numbers Don't Lie

Never forget the old maxim, of which there are many variants:

Numbers don't lie – but they don't always tell the full story

Let's take a very basic example: the cost of electricity. According to OFGEM (Ref 8) the cost of electricity delivered to your home is made up as shown in Figure 1. The cost of generating the power is only 34% of the bill.

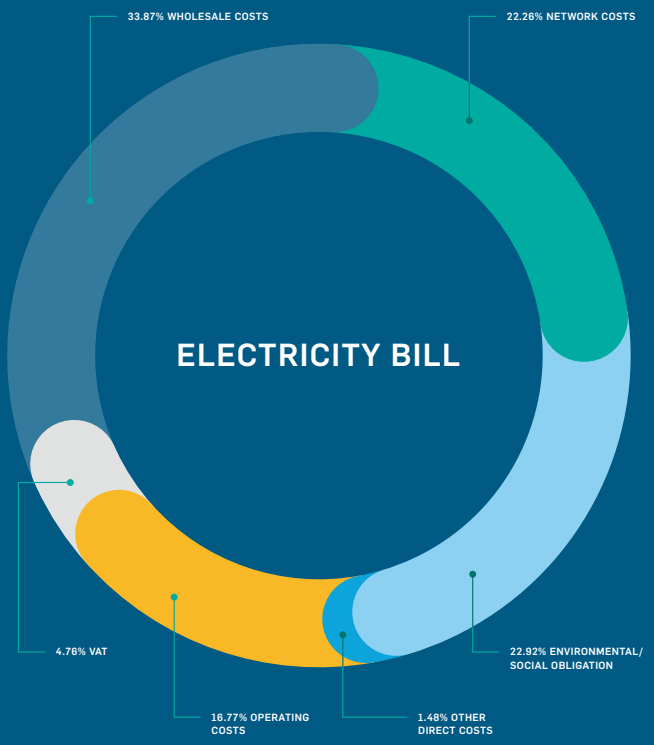


FIGURE 1 WHAT YOU ARE PAYING FOR IN YOUR ELECTRICITY BILL

There has been much celebration in BEIS and the renewable energy industry that the price of offshore wind energy has fallen from £150/MWhr to £40/MWhr; a vindication of the Government's policy to subsidise offshore wind and massively intervene in the electricity market to provide support to renewables. This has undoubtedly been a success and now underpins the whole plan to reach Net Zero. But the much quoted power cost of £40/MWhr is not the full story.

To manage a system with high dependency on intermittent renewables, there are many additional costs compared to a system with a high proportion of firm power (i.e. power that is always available on demand). These system integration costs include: additional stand by power (purchased through the capacity market), extensive modifications to the National Grid (paid for by all energy users), energy storage, demand side response (incentivising consumers to reduce peak time consumption), curtailment payments (when demand is low and renewable output is high we pay the generators even though we don't take their power), electricity imports through interconnectors. These costs are raised through charges across the system and are not reflected in the much quoted £40/MWhr.

Looking to the future, the available low carbon firm power sources (excluding hydro power) are nuclear and natural gas with carbon capture and storage (CCS). Currently there is no CCS operating in UK. Table 1 compares the 'headline' cost of generation assumed by the CCC (Ref 1) for offshore wind and nuclear in 2035 and lists the major system integration elements that are not included in the generation figures.

COST ELEMENT	OFFSHORE WIND	NUCLEAR
Generation Headline Cost £/MWh	40 45	85-105
SYSTEM INTEGRATION COSTS		
Capacity Market	Required but not included	Not required
Grid Modifications	Required but not included	Minimal requirements
Energy Storage	Required but not included	Not required
DSR	Required but not included	Not required
Interconnector imports	Required but not included	Not required
Curtailment	Required but not included	Not paid
Decommissioning and waste	Required but not included	Included in generation cost

TABLE 1 COMPARISON OF INTERMITTENT AND FIRM POWER ENERGY SYSTEM REQUIREMENTS

So, there are many costs required to support renewables that are not included in generation costs. These costs will increase as the percentage of renewables in the system increases. CCC has estimated that the additional investment costs for its Balanced Pathway scenario (compared to a high carbon system) will rise to over £15bn/yr in the mid 2030s. It also states that 30% of these costs relate to network system strengthening to meet higher demand and no doubt to also address intermittency. In its original Net Zero report technical annex (Ref 9) CCC reported that the estimated additional integration costs for renewables compared to nuclear would vary depending on the level of penetration of renewables. They estimated that integration costs would be £10 £25/MWhr, up to penetration of 50 65% and would rise significantly at higher penetrations, they reported that IEA/NEA had estimated £40/MWhr at 75% penetration. All these estimates are however very uncertain, depending on many assumptions and it is instructive today to assess the challenges faced by operators of systems moving towards this goal, such as in California.

The only way to make rational system design decisions is to optimise on a whole system basis and with detailed and consistent operating assumptions. Comparison of generation costs without allowing for system impacts is grossly misleading. So even a simple question like 'what is the cost of power from different sources' cannot be simply answered.

£40/MWhr is not a lie – but it is most certainly not the whole story

The Energy Trilemma

For many years, the challenge of energy policy has been to address the 'Energy Trilemma'. The three competing pressures being: affordability, sustainability and security of supply.

It is always the priority of government to seek the most competitive energy supply so that our industry can compete internationally, and the cost of energy and goods supplied to the private consumer is affordable. Pursuit of the least cost energy option is a perfectly legitimate goal, provided that cost comparisons between options are on a level playing field and cost is always estimated on a 'whole system' basis.

Sustainability embraces a wide range of issues, most of which can be grouped as 'environmental impact'. Recently this has been dominated by climate change and greenhouse gas (GHG) emissions but there are many other considerations including: other atmospheric emissions, land use, water consumption, decommissioning and waste disposal, material resource depletion and labour conditions. As for GHG emissions, many of these have an international or global impact.

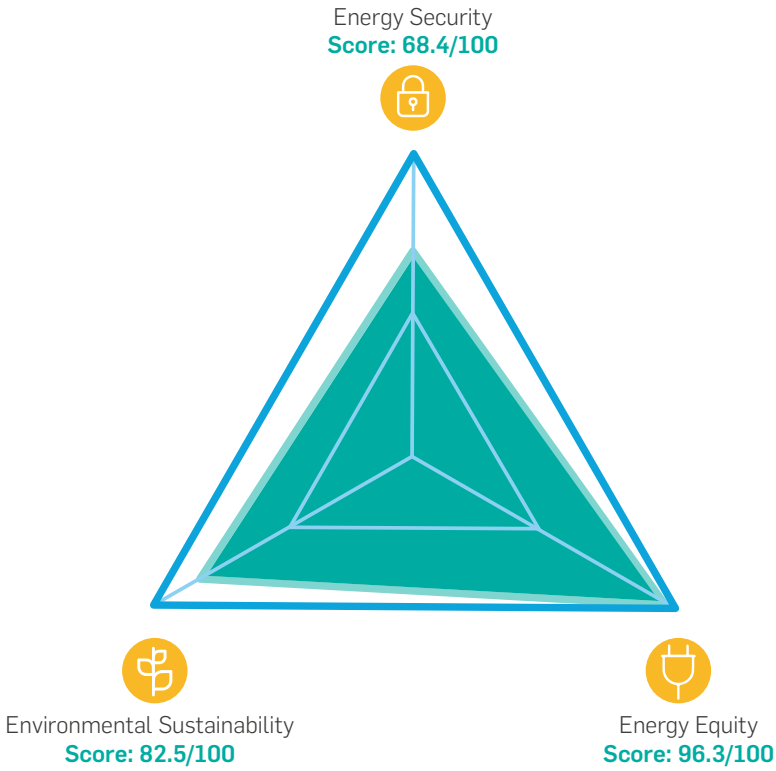
Security of supply is most easily seen as 'keeping the lights on'. Threats to security of supply vary with time and the nature of the system. They can include system adequacy and reliability, interruption of fuel supply, political disagreement, hostile action, industrial action and fuel market instability.

The Trilemma is illustrated in Figure 2, as shown by the World Energy Council (WEC) Energy Trilemma Index (Ref 10). WEC uses Energy Equity as the measure of affordability and has a comprehensive system of quantifying Energy Trilemma performance in many countries. The UK scores highly (joint 5th with France) in this assessment, which also provides the historical trend analysis shown in Figure 2.

When considering alternative energy options, it is essential to consider all aspects of the Energy Trilemma. We can become fixated on one criterion, for example cost, but we must always cross check to ensure that satisfying this criterion does not lead to failure to satisfy the others. When seeking least cost options, we must always bear in mind that the short-term least cost option may not provide the best long-term value – and energy infrastructure must last a long time.

There are also further life cycle factors that need to be considered in decision making and costs. For example there are concerns regarding the sustainability and supply of the rare earth metals and raw materials needed for green technologies.

BALANCE



HISTORICAL TRILEMMA SCORES

Trend lines track the country's performance in each dimension, beginning with a baseline of 100 in the year of 2000

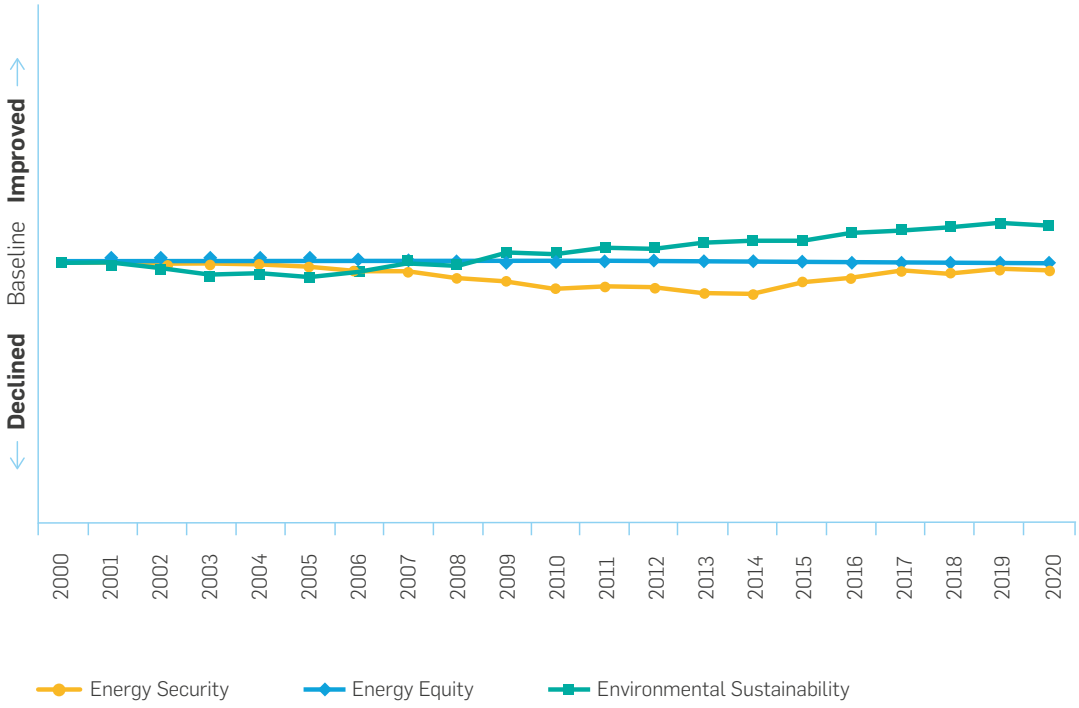


FIGURE 2 UK ENERGY TRILEMMA INDEX FROM WEC (REF 10)

Check the pace

As with many profound and important discoveries climate change could be viewed as having passed through three phases:

- **Realisation** – early proponents of humanity's impact on our climate were in a minority but steadily the facts convinced a wider community of scientists and commentators.
- **Awareness** – the impact of human-made emissions on climate was widely recognised and became the consensus of the majority of climate scientists, leading to awareness in the population as a whole and amongst political leaders and policy makers.
- **Acceptance** – the policy makers accepted that the issue presented an existential threat that demanded action.

Climate change took 30-40 years to pass through these phases. Covid-19, with its immediate and visible consequences, took less than six months. The response to climate change is the policy of Net Zero by 2050. It is a valid fear that the response to climate change may go through its own three phases:

- **Realisation** - that it is unachievable / insufficient.
- **Awareness** – that policies are inadequate.
- **Acceptance** – that 3°C+ is inevitable, followed by shift of priority to adaptation strategies.

The early signs are there, as exemplified in a recent article by Dyke, Watson and Knorr (Ref 11) which details the concerns of three eminent climate scientists that Net Zero is unachievable and belief in it has led to a delay in recognition that the only course of action is to drastically cut emissions, without delay.

Vaclav Smil (Ref 12, Ref 13) has shown how energy transitions are achieved over decades and how carbon emissions have increased inexorably, despite current policies. Our own analyses in our Engineering Net Zero publications suggest that in the UK we are falling behind the required building curve to achieve Net Zero and, furthermore, current policies (and lack of policy in certain areas) may put us even further behind and on a path to a sub-optimal system.

Carbon Capture and Storage was an essential component underpinning the scenario upon which the Climate Change Committee based its recommendations to the UK Government to pursue Net Zero by 2050 (Ref 14). In that scenario, by 2050, some 40% of the nation's energy would depend on CCS. The late Prof Sir David MacKay, former Chief Scientist at DECC, author of Sustainable Energy – Without The Hot Air (Ref 15), when interviewed (Ref 16) in April 2014, expressed his disappointment at the UK's lack of progress in developing CCS. What would he say today? Seven years on and still not one full scale demonstrator project under construction, let alone operational.

Prof MacKay also described the idea that renewable energy alone could power the UK as "an appalling delusion". Stating that "Humanity really does need to pay attention to arithmetic and the laws of physics – we need a plan that adds up" – again, seven years on and DECC's successor, BEIS, continues rapid renewables deployment whilst prevaricating over firm power (CCS and Nuclear) and we still await the UK's plan for Net Zero. Prof MacKay would no doubt be alarmed.

The uncertainty of forecasting future energy systems is amply demonstrated by the recent work of the CCC. In the space of just three years their assumed capacity for CCS in 2050 has reduced from 176 MT/yr (Ref 14) to between 75 MT/yr and 176 MT/yr (Ref 1). At the same time the assumed electricity consumption has remained about the same (about 650 TWhr/yr in the key scenario) but the percentage produced from intermittent renewables has increased from 60% to 80%. To accommodate this huge increase in dependency on intermittent renewables there are some heroic assumptions with regards to system flexibility.

The UK has made better progress towards Net Zero than many countries but, in the race to Net Zero, is falling behind the required pace. The longer this continues, the lower the probability of success. (Ref 17)

The engineering profession is about finding practical ways to achieve clients' objectives and delivering the solution, whether that be infrastructure, a manufacturing facility, an offshore wind farm or a nuclear power plant. It is not unusual to find that, after exhaustive analysis and 'optioneering', we must advise the client that their objectives are not achievable. This may be because the schedule cannot be achieved, the cost is outside the budget limit, or even because the technology does not exist to fulfil the objectives within the constraints imposed.

As engineers we set out to assess the engineering implications of the UK's Net Zero goal.

With the approach of COP26 and the very high profile the UK will have as Chair of this massively important event, we would hope to be confident that we can deliver Net Zero as intended. We do not yet have that confidence.

We also fear that, although the issue of climate change has clearly reached into public consciousness and is at the stage we described as 'acceptance', public awareness of Net Zero and its implications remains much lower. Net Zero needs to be subjected to far more detailed scrutiny; there are clearly signs of realisation that, with the plans currently envisioned, we may not achieve the solution we need. If this is the case, then COP26 should be the venue for that realisation.

OUR PLANET. IS IN TROUBLE.

What Next?

So, what can we, as individuals, do to contribute to mitigating climate change and realising Net Zero? The purpose of this paper is not to prescribe how to reduce our carbon footprint, there is plenty of advice to lower thermostats, drive less miles and do it in electric vehicles, give up flying for vacations, eat less red meat etc. Each individual, community, company and government must consider its specific circumstances and be responsible for the choices made; there is no 'one size fits all'.

One essential requirement is that choices are made based on the best information we can get and that we treat all information, claims and counterclaims with scepticism, always seeking independent corroboration. Taking our lead from Smil and MacKay we could further develop our first maxim:

"The numbers don't lie, and we need a plan that adds up using objective analysis, basic arithmetic and the laws of physics"

We recommended the creation of an Energy System Architect (ESA) to provide a plan for the transition to a Net Zero energy system – low carbon energy is the foundation of achieving net zero. The ESA would be totally independent of any specific technology or other interests, and would hold policy makers to account where policy failings prevent implementation of an optimal plan or where proposed strategies are clearly unachievable. The CCC may appear to many to have the responsibilities we described for the ESA; in fact it does not have a remit for system design and delivery, neither should it. We need a system in which there is constructive tension between the CCC strategists and those responsible for system delivery. Currently BEIS is the nearest we have to an ESA. However, BEIS is the author of many of the policies intended to deliver the CCC strategy, it does not have the technical capability required of the ESA. Furthermore, experience has shown that government policy departments are generally not best suited to programme delivery.

Beware the Greenwash

There is much mythology around Net Zero and a lot of 'greenwash' and dubious marketing claims selling 'clean energy' or energy saving.

We called for a transparent independent audit of green energy deals in our Retail Market report (Ref 6) and noted the calls from Scottish Power and others for action by BEIS and OFGEM on this issue.

Even though sustainability has been overshadowed by greenhouse gas emissions, there are also many other sustainability and environmental impacts that should be considered when evaluating energy options, but they are rarely mentioned. We will address some of the whole life sustainability issues presented by various green technologies in a future paper.

We addressed some of the common Net Zero mythology in our ENZ 'myth-buster' (Ref 17), an updated abridged version is presented in Table 2. This is not intended to be a comprehensive listing, rather it illustrates some of the common misconceptions or doubtful claims that must be challenged if people are to be able to make informed choices about their energy use. Belief in the first three myths would set the believers on a path to believing the fourth myth, undermining their support for a broad technology spread, including technologies providing essential firm power.

Achieving Net Zero will require massive behavioural change, which can only be achieved with the consent of the population. Such consent will be difficult to achieve without access to trusted objective independent analysis of the data and the alternative options available.

National Grid ESO recently published its Future Energy Scenarios (FES) 2021 (Ref 18). This is a substantive analysis of four credible alternative scenarios that describe how the energy system might evolve towards 2050. The ESO has published similar annual FES reports over the past 10 years. FES 2021 clearly identifies many risks to achieving Net Zero and policy decisions that are urgently needed. We respect the detailed work done by the ESO but it is of concern that with less than 30 years to go, the industry is still modelling alternative scenarios with no indication of a move to deterministic development of deliverable plans.

The CCC provides scenarios but no plans, FES does the same and BEIS insists that markets will determine the 2050 system configuration – and then intervenes in the markets with no declared strategic plan. There is real danger that production of scenarios showing the theoretical possibility of meeting Net Zero will generate a false sense of security. The time for scenario modelling is over, we need soundly based plans based on risk-based engineering analysis and we need them now. Scenarios are in danger of becoming another form of greenwash, myths that we can reach Net Zero and everything is under control.

Beware the Dogma of Competitive Markets

Since 1979 an over-riding doctrine of successive governments has been that competitive markets will deliver optimal solutions and the most cost-effective services. This period covers the entire career of even the most senior public officials, thus the 'markets will fix it' dogma is deeply entrenched in government. Privatisation in 1990 initiated the competitive market for electricity. Major market reform was implemented in 2013 with the expressed intention to enable the mobilisation of low carbon technologies.

Prof Dieter Helm conducted a review of the cost of energy in 2017 (Ref 19) and concluded, among other things, that the scale and complexity of market interventions by government was so great that few, if any, could even list them all, let alone understand their combined effect. He considered that the current energy policy, regulation and market structure were not fit for purpose in the approach to a period of profound and rapid change.

Offshore wind (OSW) has made great strides in reducing the LCOE (levelised cost of electricity) of power produced from an initial level of three times market price to close to current market levels for assets yet to be built. BEIS has undertaken massive market intervention in order to initiate the OSW market and this has effectively 'frozen out' other technologies. The notionally competitive market has effectively been abandoned and BEIS has become the de facto central buyer of electricity as described by Prof Dieter Helm (Ref 20).

Any notion that our energy system for 2050 will be determined by competitive selection of the most appropriate technologies should be dismissed. Currently it is being determined by BEIS on the basis of economic modelling and with no public evidence of an engineering and operations based strategic plan.

We have previously called for BEIS to install a Chief Engineering Advisor in parallel to the scientific advice.

Mind the Gap

The UK is moving from an energy system based on diverse fuels that were preferentially deployed in different sectors to a system where all sectors will likely be dominated by electricity.

The diversity in future will be in the energy source used to generate the electricity. The future total energy system will be dominated by the choice of generating technologies and the management of the gap between demand and available supply. The economist would make the choice of generating technology on the basis of lowest cost. The engineer, whilst recognising the need to minimise cost, may give more weight to system operability and reliability. The most critical decision to be made is: what proportion of intermittent renewables should the system have?

	MYTH	TRUTH
1	The CCC reports show us how we can achieve Net Zero in 2050.	CCC produces scenarios using economic modelling to demonstrate feasibility. These are not engineering based designs and are not claimed to be 'plans'.
2	We can achieve Net Zero using 100% renewable energy.	Of course, we could. This would require building enough capacity to compensate for intermittency, and energy storage at a scale never achieved, using technologies that are not currently available. Germany's Energiewende has seen renewables rise from 7% of generation in 2000 to 35% in 2019. This was accompanied by a doubling of domestic electricity prices taking Germany from one of the lowest in Europe to the highest.
3	Renewables are the lowest cost method of power generation.	It's not that simple. There are substantial system wide costs incurred to manage renewable intermittency. These are not reflected in LCOE comparisons. As the proportion of renewables increases these costs will rise further. HM Treasury estimates the cost of renewable subsidies to be £10bn per annum in 2020.
4	I have a contract with a green energy supplier, I only use 100% renewable energy.	Your supplier may say that, but its 100% certain that you don't. There is no way to separate green electricity from black or brown. At times of low renewable output everybody is dependent on firm power generation and often on interconnectors bringing nuclear from France or unabated gas fired from Holland.
5	Hydrogen is a carbon free source of energy.	Free hydrogen does not exist in nature. Hydrogen is an energy store and carrier, it must be manufactured in an energy intensive process, either from methane (producing large amounts of CO_2) or from water.
6	CCS is a proven technology and the UK has a virtually unlimited capacity to store carbon.	Multi-user CCS systems as proposed in the UK are not proven. Each subsystem (carbon capture, CO_2 transport, CO_2 injection) is proven. It's true the UK's depleted oil and gas fields have huge storage capacity. Currently there is no CCS demonstrator in operation and there is no proven commercial framework for financing and operating a complex multi-user system.
7	We need to move quickly, we should pick one low carbon technology and run with it, mass deployment will lower the price.	Despite the need for speed, it is unwise to develop a system that is over-dependent on one technology.
8	Demand side response (DSR) through the Smart Grid, energy storage and interconnectors will cover the periods of low generation from intermittent renewables.	DSR (which was introduced in the 1970s) will help to reduce peak demand. Its impact will depend on pricing structures and the effectiveness of the Smart Grid. Energy storage will also smooth demand in both peaks and troughs. We have no energy storage technology to manage inter-seasonal variation in heat demand. Two-way interconnectors will also smooth out load variation. DSR, energy storage and interconnectors are a convenient way for system modellers to 'plug the gap' when models can't balance supply and demand.
9	We have a competitive electricity market. Power companies will select technology that gives them the best performance.	There is no technology selection by competitive market. BEIS determines what technologies will be built through its multiple interlocking market interventions.

TABLE 2 NET ZERO 'MYTHBUSTER'

OUR NET ZERO FUTURE.

A Lesson from Covid-19

Many have been quick to point out that there are some parallels between Covid-19 and Climate Change. The pandemic is far from over and we should not be complacent, but there are grounds for optimism.

Changing Behaviour, Information and Leadership

To contain the pandemic, it was necessary to implement massive behavioural change at the personal and societal level. Similarly, in the case of climate change, behavioural changes in patterns of working, leisure, travel and even diet will be needed. If the changes in travel and working patterns implemented in the pandemic were sustained, they would contribute to containing global warming.

The Covid threat was so immediate and severe that government used legislation and police enforcement on the streets to impose behavioural change. To promote public acceptance of such measures the Government provided daily status reports from the highest level. Then, to ensure the successful roll out of the vaccination programme, a Minister was appointed to oversee the measures.

The time scale of the climate change threat is orders of magnitude longer (although recent 2021 anomalous weather events are bringing some focus today), the sense of urgency to implement change is lacking, there is no single Minister responsible for delivery. There is some recognition that to date the Government's response is lacking. This is acknowledged in the Prime Minister's Ten Point Plan (Ref 21) and the Energy White Paper (Ref 5). Nevertheless, the pace of the actions to achieve Net Zero is inadequate, the annual progress reports to Parliament by CCC are becoming predictable; comprising a few bright spots, a litany of missed targets and recommendations not implemented, and an exultation to try harder.

The volume of information supporting the development of measures to implement Net Zero is much greater and more complex than the Covid response measures. But to achieve the required behavioural change, this information must be condensed into a persuasive public information campaign with transparency and clarity of message and purpose.

The future net zero energy system can be likened to one of the largest, most complex orchestras ever assembled. It must then play a fiendishly complicated musical score with many conductors (empowered consumer generators) standing behind the main conductor. In addition, this orchestra needs to play in time with multiple other orchestras playing the music of industry, infrastructure, transportation, data and so on, but without being in the same location. Everyone needs to play with the same commitment and purpose.

Conclusions

We are not on course to achieve Net Zero.

Government is not providing the leadership required, consumers are confronted with unreliable information and have no 'single point of truth' that can provide trusted information and analysis.

We need a step change in performance, a clearly expressed strategy developed by an authoritative technology neutral body and a willingness to challenge the dogma of competitive markets and eliminate misleading greenwash. The proposed creation of the Future System Operator is an opportunity that must not be missed; there should be no compromise in setting out the functions of the Energy System Architect, which may be combined with the FSO. However, there is a clear potential for internal conflict between the FSO's operating responsibilities and the strategic planning responsibilities of an ESA. An operator will design a system to minimise operating risk – the easiest way to do that is to build in redundancy (at a cost). The system architect must strike the balance between the operator's needs and optimising system cost.

The current consultation regarding the FSO, and including many of the functions of the ESA, is an absolutely critical consultation for the future of our energy system. We urge government to expedite its review of responses and bring forward proposals without delay. Although implementation will require primary legislation there is much that can be done now to prepare detailed plans and inform the required Bill, so that the FSO/ESA can be mobilised immediately on Royal Assent of the required legislation.

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