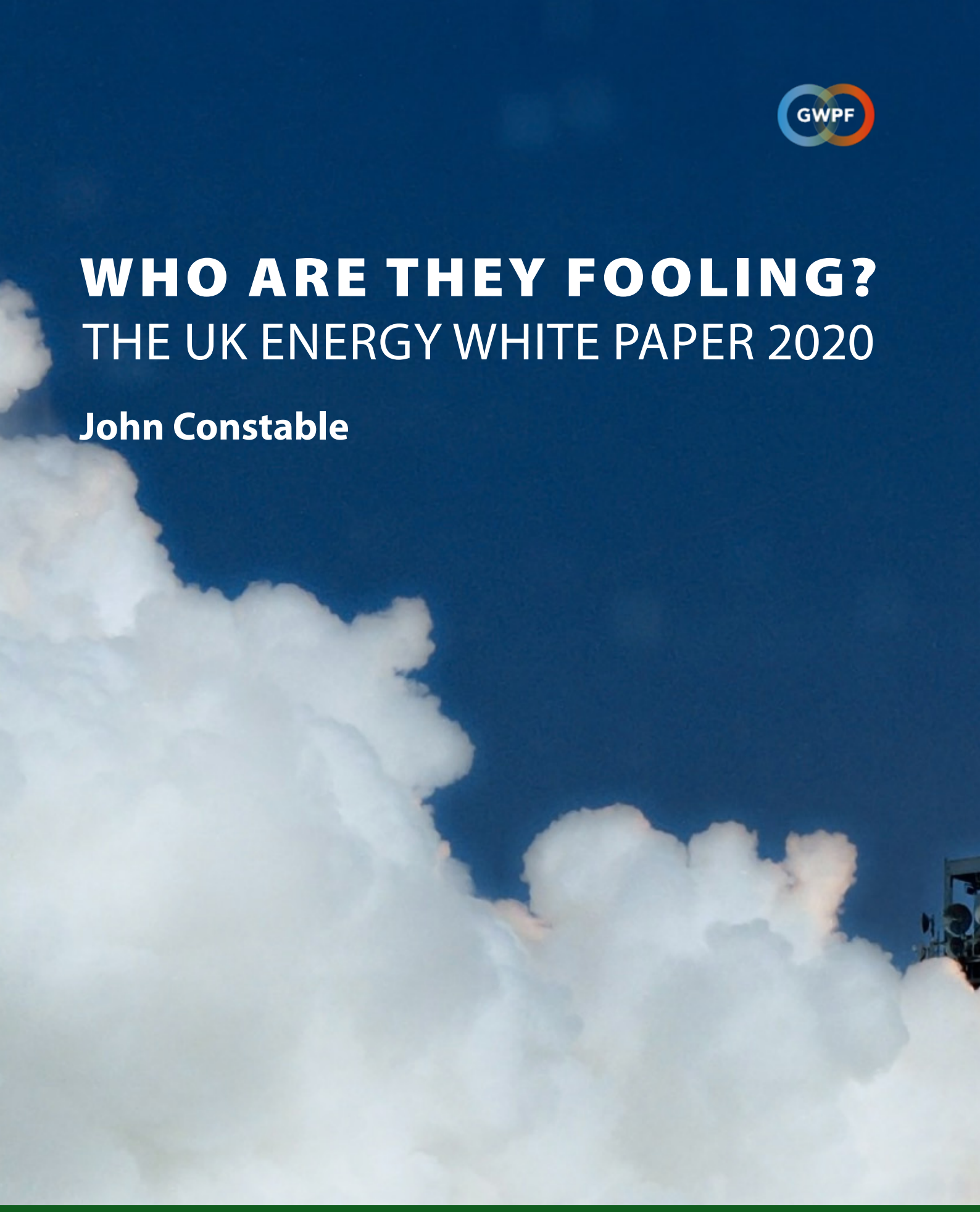

WHO ARE THEY FOOLING?
THE UK ENERGY WHITE PAPER 2020

John Constable

The Global Warming Policy Foundation
Note 24

Who Are They Fooling? The Energy White Paper 2020

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Note 24, The Global Warming Policy Foundation

Summary

An appendix to the UK's new energy white paper, *Powering Our Net Zero Future*, shows the 30-year plan for British decarbonisation is overwhelming dependent on cheap renewable electricity.[1] Even assuming, as government wrongly does, that offshore wind is already inexpensive and will become still cheaper in coming decades, the abatement costs per tonne of carbon dioxide are many times higher than mainstream estimates of the harms of climate change (the 'social cost of carbon'), with a cost to consumers of between £30 billion and £40 billion a year in 2050. Since offshore wind is not in fact cheap, the true cost is likely to be double the government's estimate, up to £80 billion a year, preventing the economic growth that government and its advisors expect to pay for the green revolution. Persisting in this policy will result in terrible socio-economic harm.

About the author

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ENERGY WHITE PAPER

Powering our Net Zero Future

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Who Are They Fooling?

Any discussion of climate change policy that fails to compare the implicit cost of carbon dioxide abatement with estimates of the harms resulting from climate change, in other words with the social cost of carbon, is obviously either lacking in rigour or is avoiding an inconvenient subject. Without such a comparison the public and indeed the responsible policy makers themselves can have no reasoned understanding of whether the mitigation that is being proposed passes the most basic of cost-benefit analyses: *Is the climate change mitigation policy economically rational, or is the cure worse than the disease?*

However, though basic, this standard is rarely even mentioned, let alone invoked in current discussion. In the last month, the UK has seen four major publications on the measures required to achieve net zero emissions by 2050. Firstly, a costing exercise from National Grid ESO,[2] secondly the Sixth Carbon Budget from the Committee on Climate Change,[3] thirdly the Treasury's *Net Zero Interim Review*,[4] and lastly the White Paper. Not one of these studies refers to SCC, while references to abatement cost are few and far between and slight at best. This is culpable maladministration.

Nonetheless, one of these slight references, in an appendix to a supporting document published alongside the White Paper does allow us to gain some insight into government views on emissions reduction costs. In Appendix A1 to *Modelling 2050: Electricity System Analysis* we find the pairs of figures reproduced in Figure 1.

These charts are intended to demonstrate that if hydrogen is deployed on a large scale, then electricity industry abatement costs can be reduced. Two electricity demand scenarios are modelled: Low (575 TWh) and High (672 TWh); for comparison, current final demand is about 280 TWh, so even the Low scenario doubles present demand. The first pair of charts represents abatement costs for reducing emissions from 25 g to 10 g CO_2e/kWh, i.e. 25 kg to 10 kg per MWh. Converting to 2019 prices, the estimated abatement costs range from £249 to £416/tCO_2e, depending on demand scenario and the price of hydrogen. The highest cost

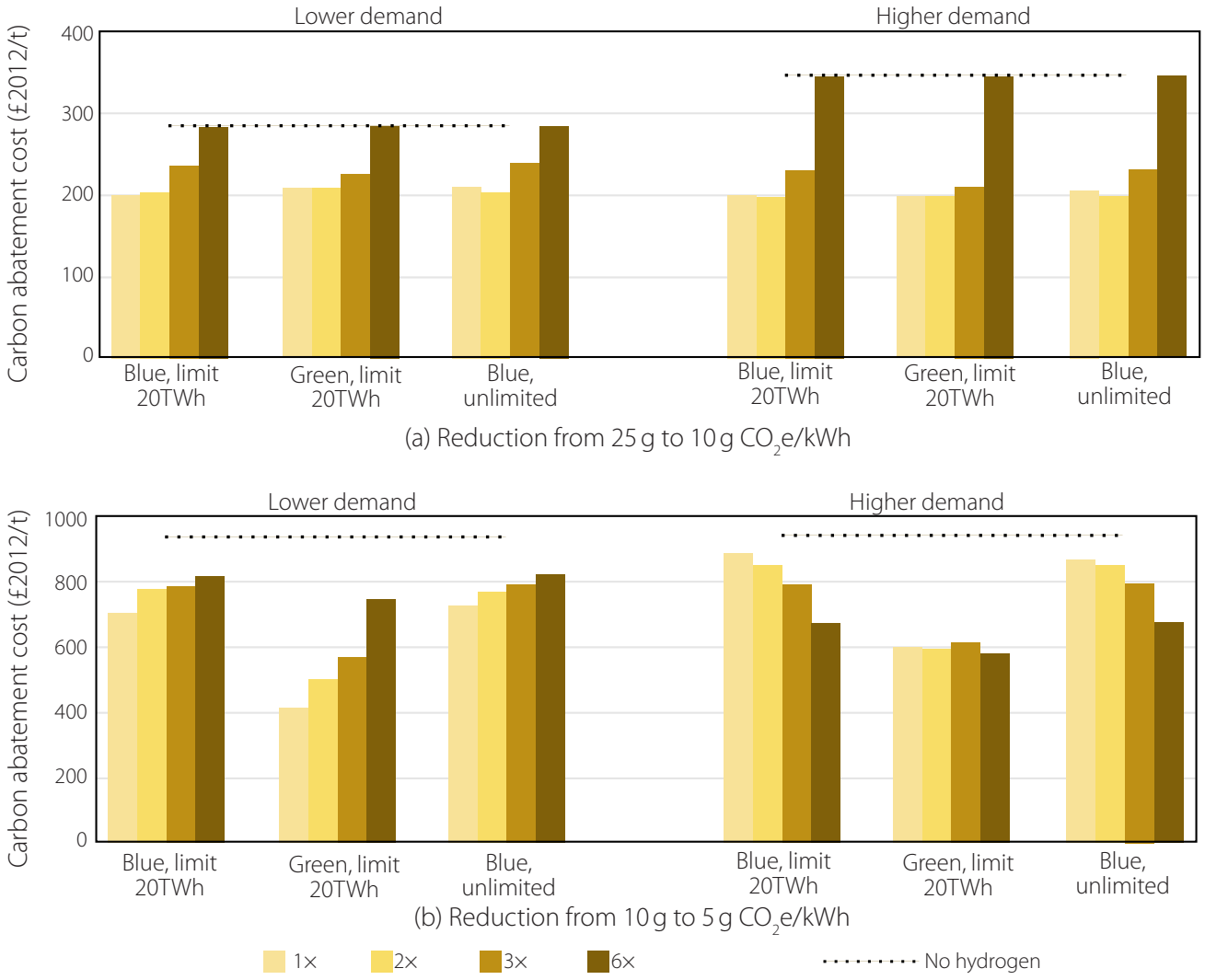


Figure 1: Abatement costs in the electricity sector.

Cost of reducing emissions from (a) 25 g to 10 g CO_2e/kWh, and (b) 10 g to 5 g CO_2e/kWh. In each case, the abatement cost is shown without hydrogen, and with hydrogen costing 1×, 2×, 3× and 6× the cost of natural gas. The graphs on the left are the Low Demand scenario and on the right the High Demand scenario. All figures in £2012. Source: White Paper supplementary analysis, Modelling 2050, p. 30.

is found in systems where hydrogen is not available to address the deficiencies of renewables.

The second pair of charts represents abatement costs for reducing emissions from 10 g to 5gCO_2e/kWh, and costs range from £495 to £1,124/tCO_2e, again in 2019 prices.

Even at the lower end, these greatly exceed mainstream estimates of the social cost of carbon, which stands at between £30 and £50/tCO_2e. At these prices, the total annual cost of reducing emissions from 25 g/kWh to 5 g/kWh would range between £3.6 billion and £8 billion per year.

No explanation is given in the *White Paper* as to how much of the marginal abatement cost curve (MACC) is represented in abstract in these figures, but the calculation is straightforward. Emissions from the UK electricity sector currently stand at about 200 kg of carbon dioxide equivalent per megawatt hour (0.2 tCO_2e/MWh), roughly ten times higher than the level at which the *White Paper* analysis starts.[5] In effect, the *White Paper* has concealed all but a fraction of the entire abatement cost curve; 90% is missing from the document. This is highly unsatisfactory, but typical of the notoriously secretive Department for Business Energy and Industrial Strategy, which, for example, ceased to publish estimates of climate policy impacts on prices and bills in 2014 and has resisted repeated requests to release the relevant data.[6] It seems that the marginal abatement cost curve has also been pushed into the shadows.

What, then, is the probable cost of the missing part of the cost curve, that of reducing emissions from 200 to 25 kg/MWh? The fragment of the curve actually published in the *White Paper* charts starts in the range £200–£400/tCO_2e. The upper end of this range is probably too high to represent the present-day average. Of course it is true that a megawatt hour from an offshore wind farm receiving double Renewables Obligation Certificates currently abates emissions at a subsidy cost of over £500/tCO_2e, some ten times the mainstream estimate of the social cost of carbon, but not all technologies are so heavily subsidised. On the basis of the numbers of Renewables Obligation Certificates generated overall and the number of megawatt hours generated, the present renewables abatement cost in the UK electricity sector is approximately £250/tCO_2e, almost exactly the lower end of the range of abatement costs presented in the *White Paper* as being required to reduce emissions from 25 to 10 kg/MWh.

On that basis, we can estimate that the annual cost of reducing emissions from their present level of 200 kg to 25 kg/MWh in the presence of growing demand to run heat pumps and power EVs would rise to between £29 billion and £34 billion per year. Reducing emissions from 25 kg/MWh to 5 kg/MWh would increase the total abatement cost of

achieving Net Zero in the UK electricity system to between £32 billion and £42 billion a year, with, as noted, an abatement cost per tonne of carbon dioxide many times in excess of the social cost of carbon.

Expensive though this is, it is an optimistic figure, and reliant on a very low estimate of the current and future cost of offshore wind. Indeed, BEIS assumes that offshore wind currently costs only £40/MWh and will fall to £30/MWh in the not very distant future, displacing many more costly abatement options.

However, the BEIS figures are simply not credible. The energy economist Gordon Hughes and I have shown that the BEIS paper that underpins the White Paper's conclusions is incompetent and worthless.[7] Hughes has also collated the audited accounts of the whole UK offshore wind fleet and has shown that the costs stand today about £125–152/MWh,[8] and that opex is actually on a rising, not a falling trend. These findings are consistent with at least two other empirical studies.[9],[10]

Assuming these real-world costs to be a better guide up to 2030, the annual costs of electricity sector decarbonisation would be several times greater than claimed by BEIS. Moving from 200 kg/MWh to the Net Zero level at the current offshore wind abatement cost would imply an annual bill of about £60–80 billion a year, perhaps higher if the white paper plans for at least 1 GW of floating offshore wind by 2030 are realised.[11] The total cumulative electricity sector cost to 2050 approaches £2 trillion, making the broad-scale electrification of the economy, on which the overall Net Zero policy depends, oppressively expensive.

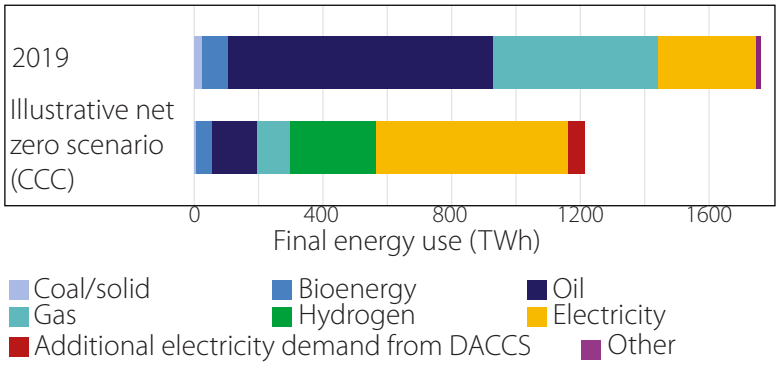
It should be needless to add that costs of this order will prevent the economic growth that government is relying on to absorb and dissipate the costs of decarbonisation. The UK economy would become dangerously unbalanced, with the unproductive renewable energy sector taking a large share of the capital wealth and consuming much of the national income, thus increasing costs for all other activities and reducing the standard of living to levels that are unlikely to be politically tolerable.

The degree to which Net Zero stands or falls on decarbonised electricity is worth emphasis. The *White Paper* and indeed the whole Net Zero strategy is an interconnected series of gambles – on hydrogen, on carbon capture and sequestration, on energy efficiency to contain demand, and so forth– but of these the central bet is on the electrification of heat and transport, and in turn this is itself a gamble on the falling cost of renewable electricity generation, and in particular on the falling cost of wind power. If renewable electricity on average and that from offshore wind in particular is expensive then the whole project fails, regardless of whether the ancillary gambles are successful or not.

The scale of the wager can be appreciated from the fact that the proposed electrification of heating and transport

would mean that over 50% of final demand in 2050 would come from electricity, as compared to about 17% today.[12] This is graphically represented in Figure 2, where the yellow bar and part of the green bar represents consumption of electricity.

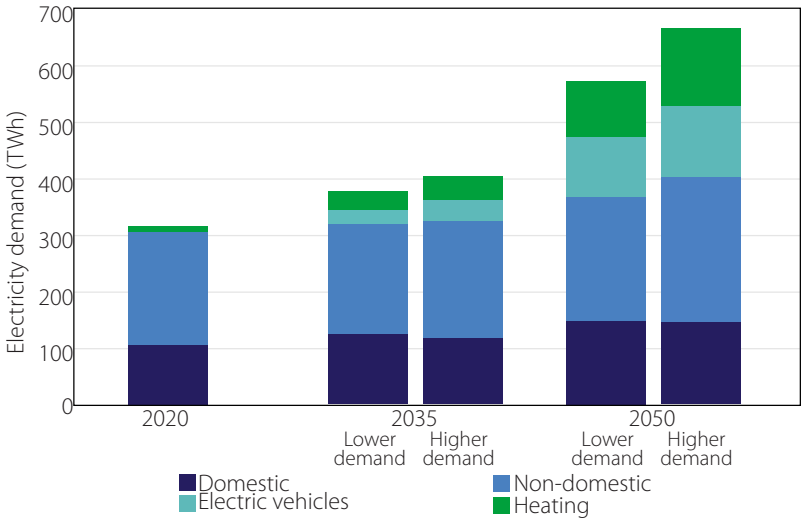
Figure 2: Illustrative UK final energy consumption in 2050.
Source: White Paper, p. 9.



Total final energy consumption (FEC) shrinks dramatically, from just under 1,800TWh to 1,200TWh per year, but electricity grows in absolute terms and becomes dominant. It does so both directly and via the production of hydrogen (the green bar), where its role will be an important minority share, as well as through direct air carbon capture and storage (DACCS, the red bar). Allowing for the electricity used for hydrogen production, somewhere near 60% of total FEC is projected to be either electrical energy or derived from it. Bureaucracies have a well-known tendency to put nearly all their eggs in one basket since it makes for a tidy desk. However, it is also proverbially unwise.

For the High Demand scenario of just over 670TWh, about 127TWh would be required for road transport, and 146TWh for domestic use, with a very large part (259TWh) for non-domestic use, as shown in Figure 3.

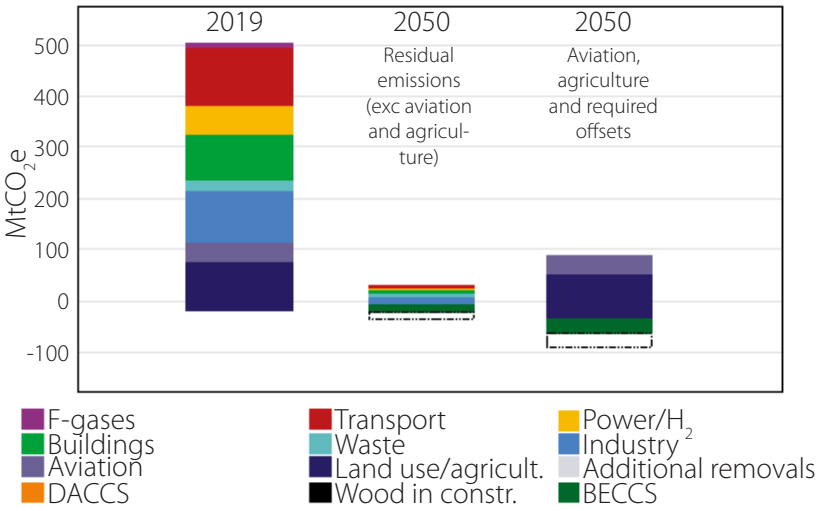
Figure 3: Electricity demand, Net Zero scenarios.
Source: White Paper, p. 42.



Taken together, these charts show that the Net Zero decarbonisation program, as summarised in Figure 4, is critically dependent on electricity. And since nuclear is marginalised in the White Paper, with only the faintest of faint praise, all hopes are pinned on the availability of low-cost renewable electricity.

Figure 4: UK Emissions, Net Zero Scenario.

Source: White Paper, p. 43.



But the wager on electricity could actually be still larger. The BEIS authors comment that 'deep decarbonisation in most sectors' will be achieved 'through electrification', adding ominously that 'electricity may need to do more if other sectors cannot deliver'. Total reliance on electricity could easily exceed 60%. That is not intrinsically a bad idea – electricity is a superior carrier – but the means of generation must be cheap, and as we have seen that is extremely unlikely to be the case.

This White Paper relies on the accuracy of BEIS's plans and expectations for electricity generation. It is therefore reprehensible that BEIS has released a small portion only of the abatement cost curve for the electricity supply industry, omitting their estimates of the cost of reducing emissions from today's 230 kg/MWh to 25 kg/MWh, restricting their discussion to estimates for reducing emissions from 25 kg to 5 kg/MWh. The figures released are alarming but insufficient to permit full evaluation of the core of the decarbonisation project.

Pressure must be brought to bear on Mr Sharma, the Secretary of State for BEIS, to publish the full abatement cost curve for the electricity sector, together with the rationale, if any, for the assumptions underlying it.

As it stands, the *White Paper*, like the Committee on Climate Change's *Sixth Carbon Budget,* and the Treasury's *Interim Report*, provides more evidence, as if it were needed, of growing bureaucratic policy momentum towards Net Zero.

However, none of these documents offers a convincing economic justification for that direction of travel. In essence the public is being asked to take the government's plans on trust. There is every reason to refuse. What evidence is available suggests that BEIS's estimates of cost are major understatements, with abatement costs that are in excess of even catastrophist figures for the Social Cost of Carbon. It may well be rational to have a climate policy; but after dozens of defensive publications Her Majesty's Government has not yet shown that it has rational policies.

If we learn anything from the White Paper, it is that the British government is now insusceptible to reasoned and empirical criticism on the subject of renewable energy and climate change. This cannot end well. The civil service and the weak and ignorant politicians they lead may be able to fool themselves, and for a while they may even deceive some part of the public, but ultimately what we *think* about the viability of these policies is unimportant. The matter will be decided, finally and without appeal, by the underlying physics, which is to say by the unfavourable thermodynamics of the renewable energy sources that have been administratively selected.

We need only substitute BEIS for NASA, and renewable energy and climate policy for the shuttle and the space programme, to make Richard Feynman's observations on the Challenger disaster sharply pertinent to the Net Zero case:

> Let us make recommendations to ensure that NASA officials deal in a world of reality in understanding technological weaknesses and imperfections well enough to be actively trying to eliminate them. They must live in reality in comparing the costs and utility of the Shuttle to other methods of entering space. And they must be realistic in making contracts, in estimating costs, and the difficulty of the projects. Only realistic flight schedules should be proposed, schedules that have a reasonable chance of being met. If in this way the government would not support them, then so be it. NASA owes it to the citizens from whom it asks support to be frank, honest, and informative, so that these citizens can make the wisest decisions for the use of their limited resources. For a successful technology, reality must take precedence over public relations, for nature cannot be fooled.[13]

The UK Energy White Paper, *Powering Our Net Zero Future*, is neither frank, nor honest nor informative, and with a suspiciously homogeneous consensus throughout the Whitehall machine and its clients, only politics can protect the British people from the revenge of an unfoolable Nature.

Notes

1. https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future
2. https://www.nationalgrideso.com/future-energy/future-energy-scenarios
3. https://www.theccc.org.uk/publication/sixth-carbon-budget/
4. https://www.gov.uk/government/news/net-zero-review-publishes-initial-analysis-of-green-transition
5. See Table 5E, "Estimated carbon dioxide emissions per GWh of electricity supplied 2017 to 2019", *Digest of United Kingdom Energy Statistics* (2020), p. 95.
6. https://www.gov.uk/government/publications/estimated-impacts-of-energy-and-climate-change-policies-on-energy-prices-and-bills-2014
7. https://briefingsforbritain.co.uk/the-costs-offshore-wind-power-blindness-and-insight/
8. https://www.ref.org.uk/ref-blog/365-wind-power-economics-rhetoric-and-reality
9. Aldersey-Williams et al. 'Better estimates of LCOE from audited accounts – A new methodology with examples from United Kingdom offshore wind and CCGT'. *Energy Policy* 128 (2019) 25–35.
10. Montford, A. *Offshore Wind: Cost Predictions and Cost Outcomes*. The Global Warming Policy Foundation, forthcoming.
11. White Paper, p. 16.
12. White Paper, p. 41).
13. https://science.ksc.nasa.gov/shuttle/missions/51-l/docs/rogers-commission/Appendix-F.txt

About the Global Warming Policy Foundation

The Global Warming Policy Foundation is an all-party and non-party think tank and a registered educational charity which, while openminded on the contested science of global warming, is deeply concerned about the costs and other implications of many of the policies currently being advocated.

Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice. Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

The key to the success of the GWPF is the trust and credibility that we have earned in the eyes of a growing number of policy makers, journalists and the interested public. The GWPF is funded overwhelmingly by voluntary donations from a number of private individuals and charitable trusts. In order to make clear its complete independence, it does not accept gifts from either energy companies or anyone with a significant interest in an energy company.

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3	Ross McKitrick	An Evidence-based Approach to Pricing CO_2 Emissions
4	Andrew Montford	Climate -- Public Understanding and Policy Implications
5	Andrew Montford	Consensus? What Consensus?
6	Various	The Geological Perspective Of Global Warming: A Debate
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22	David Whitehouse	The Next Solar Cycle and Why it Matters for Climate
23	Gautam Kalghatgi	The Battery Car Delusion
24	John Constable	Who Are They Fooling? The UK Energy White Paper 2020.

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