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UK Energy Policy and Net Zero

Energy security and the cost of energy is hugely important to the prosperity of the UK. Energy security is a real concern with over a third of energy used in the UK being imported. Particularly over recent years, during the all too frequent crises, energy affordability has become a major recurring worry for households and businesses.

While I can see sense in components of UK energy policy from the Department for Energy and Net Zero, I am not confident that some of the policy goals and timelines are appropriate. Energy policy has been reactive rather than strategic with own goals and missed opportunities[1]. Regulatory oversight by Ofgem has also been poor in some very important areas. Together this has contributed to a position where the UK has among the very highest domestic and industrial electricity prices among industrialised nations despite comparatively favourable energy resources, weather and geography.

I wouldn't consider myself a current expert in this area. I did work across the value chain in the energy industry for 15 years from the early 1990s, so I hope this initial thinking is not without foundation and can contribute to the debate – although quite where a joined-up inclusive debate is happening is unclear to me. I will have gaps in my understanding so am happy to be corrected on anything I have got wrong and to be persuaded of better policy alternatives.

Energy Market Policy Objectives

The headline energy market policy objectives that are a context for the content of this paper are:

1. More affordable domestic energy prices
2. Internationally competitive industrial energy prices that are also predictable enough to support investment decisions
3. A robust energy grid that is not gold-plated (to contain costs), but is resilient to shocks at key nodes and can accommodate variable renewable generation and electricity demand shifting strategies reduce overall system costs.
4. Reduce carbon dioxide emissions where it is economically rational to do so, including reflecting in investment and despatching decisions[2] the social, economic and climate costs of greenhouse gases
5. Improved domestic energy security of security with less reliance on imports

[1] For the sake of brevity, this paper only touches on a few areas

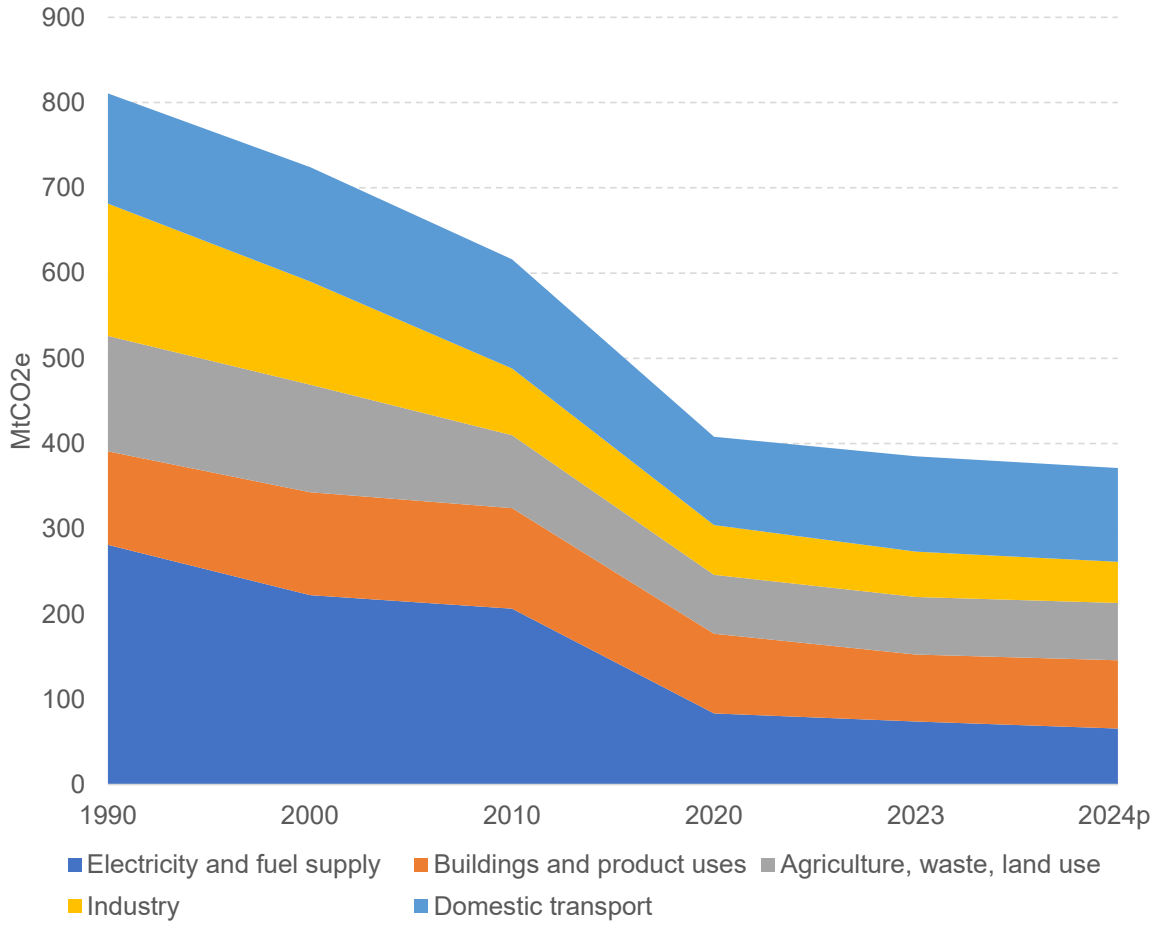
[2] Recognising that this is, to a large extent, a subjective value

Interlink between Energy Policy and Climate Change Policy

Energy Policy has, to a significant extent, been driven by policy on Climate Change. (See my review and analysis of climate change here.)

The UK has successfully halved greenhouse gas emissions from the 1990 bench-mark from which global progress is being measured.

UK territorial greenhouse gas emissions



Source: DESNZ

However, how we got to this position was **not** primarily driven by climate change ambitions:

- Over 20GW of gas-fired power stations were built in the UK between 1991 and 2002 – the dash for gas. This was an economic decision, well before any carbon prices were applied. Building and operating gas-fired plants was cheaper than coal and the last coal fired plant closed in 2024. It was a fortuitous by-product that gas-fired power generation produces half as much carbon dioxide per unit of electricity generated as coal-fired generation.

- 2.6GW of the huge Drax power station has been converted to run on imported wood-pellets, (primarily from North American saw-mill residue), emitting around 12m tonnes of carbon dioxide each year. This, controversially, does not 'count' towards UK carbon emissions
- Energy intensive industry, and industry generally, has declined in / been out-sourced from the UK, some of this loss being self-inflicted by high energy prices. While beginning earlier, this trend very much continued in the 1990s and beyond with energy use in manufacturing halving since 1990. Only a part of the demand reduction has derived from greater energy efficiency.
- The UK imports an increasing amount of electricity. This now meets around 15% of electricity demand, costing around £250m per month, a not insignificant part of the balance of payments deficit.

Given these drivers, I think the moral leadership around climate change espoused by successive UK government is overdone, and the justification this provides to dramatically increased UK energy prices is flimsy.

Net Zero

I am a strong supporter of rational actions to mitigate the causes and effects of global warming and the importance of international consensus in driving this. We have an understanding and reasonable quantitative scenarios around the risk of global warming occurring[3], but there is significant uncertainty about the consequences of complex atmospheric, ocean and land processes inter-reacting. This may have profound impacts on some hundreds of millions of people on the planet and is a risk the we can't take. However, having made a strong start, with more to come, the pathway and short timescale being taken in the UK to achieve Net Zero is too much of a straight-jacket.

Current government policy is to reach clean power by 2030 and net zero for the economy as a whole by 2050. The second half of the carbon dioxide reduction will be much harder to achieve than the fortuitous circumstances that contributed so much to the first half of the reduction. 'Net Zero' is headline grabbing, is a signal, but one of limited import to other countries and might be technically achievable. However, I think that timescales will be practically unachievable and a net zero outcome also unachievable without a disproportionate level of subsidies when there are other urgent national priorities and a precarious deficit and debt position in a very uncertain world.

I fear that the current government, if it survives, will make unaffordable / ineffective / rushed policy decisions to try and avoid getting tangled up in court cases about Net Zero. The Climate Change Act probably needs to be revisited sooner rather than later.

[3] It seems very likely to me that we will breach 2 degrees of warming in the next 50 years.

Sector Analysis

To achieve net zero, major inroads will need to be made in each of the following sectors.

UK territorial greenhouse gas emissions by sector, 2024 provisional

Source: DESNZ

Notes:

1. Total UK net territorial greenhouse gas emissions are estimated to have been 371 MtCO2e of which 78% was carbon dioxide
2. 66% of building and product use is residential, primarily gas for heating and cooking
3. Most emissions from the agriculture are not related to energy use but to livestock waste treatment
4. This excludes UK-based international aviation and shipping emissions, approximately 40 MtCO2e

<u>Electricity Supply</u>

Now that coal is gone from the UK Energy mix, (well done to all involved and affected), Net Zero for power generation by 2030 will mean a switch from gas to renewables. The cost of CCGT gas-fired generation [4]at around £75/MWh, excluding a carbon cost component, is cheaper than most UK renewable energy where current strike prices for new offshore[5] wind are around £90/MWh and nuclear around £100/MWh. Solar is broadly competitive with gas but in the UK it is much less effective when it is most needed - in the long, dark winter period. and increasingly comes at the cost of blighting rural communities and the loss of agricultural land.

It will require an unnecessary large subsidy to replace gas plant that still has economic life and can secure long-term gas supplies at levels around the current long-term forward market prices. Artificially creating stranded assets or failing to utilise existing assets where it is economic to do so would be, in my view, unwise.

[4] Noting also the long lead times in securing new turbines for CCGTs

[5] On-shore wind is less costly but the land use required to reach large scale production and the effect it can have on communities means this can only meet a small fraction of needs

Significant fossil fuel generation will likely need to continue to be retained for system peaks[6], balancing and backup purposes. If the UK wants data centres, (surely we do?), local gas-fired generation may well be a requirement.

While there have been, and will no doubt continue to be, periodic oil and gas price shocks, structurally there is likely to be a glut of oil and gas when the economics of the industry are to get it out of the ground quickly once drilled. At long term forward price levels, gas generation, excluding a carbon price penalty, is likely to remain significantly cheaper than new nuclear or offshore wind. We need to question whether we want to fully relinquish this in pursuit of Net Zero when the UK has made such significant progress already with carbon dioxide reductions and will be going further.

Transport

With ever improving battery technology, reduced cost of manufacture, (sadly mainly in China), and legislation banning new non-electric car sales from 2030[7] this should mean that transport emissions of carbon dioxide will progressively reduce. Whether the accelerated demise of the UK car industry at the volume end of production is a price worth paying is questionable, but that horse has bolted.

Buildings

Adoption of domestic Heat Pumps is a key next step in transition away from fossil fuel use in the UK. As things stand this will be difficult to achieve even without the supply chain issues. Without a fairly drastic alteration in the balance of electricity and gas cost, voluntary take up is likely to be limited. Electricity costs roughly 4-5 times the price of gas and the efficiency of heat pumps being around 300% - it doesn't stack-up even with carbon levies on electricity removed. Households also need to feel they have choice and can make economically rational decisions in their own interests – forcing this will be a mistake. Ceasing use of gas for domestic heating by 2050 therefore seems very optimistic and very costly.

Industry

Again, without a high level of subsidy, likely over 100% of capital costs, to account for the disruption, a forced conversion from has to electricity may simply hasten the demise of industry that is already reeling from high costs and competitive international providers with low barriers to UK market access.

Agriculture and Waste

Much of the emissions here are not energy related, but relate to waste treatment. Good agricultural practices around manure management and with emerging feed additives can go a distance to reducing carbon dioxide, methane and nitrous oxide but are unlikely to achieve more than a 50% reduction by 2050.

[6] Most likely OCGTs

[7] Hybrids from 2035

Carbon Capture and Storage

In a Net Zero world this would allow some carbon dioxide to continue to be produced. I am highly sceptical about the economics of Carbon Capture and Storage other than for bespoke industrial process applications. I cant pretend to know enough about the how the technology might potentially advance, hence why research in this area should continue to be supported, but seeking to extract carbon dioxide at a concentration of around 425ppm from the atmosphere with current technology seems to be very energy intensive and so doesn't make sense until there is a surplus of very low marginal cost renewable energy that will not otherwise be used by battery / pumped-storage / demand-shifting schemes etc.

This, admittedly cursory, analysis suggests to me, that Net Zero is a bridge too far in the timescales set down. Not revisiting the Climate Change Act could result in distracting legal action and knee-jerk, unaffordable policy.

Artificiality in setting of wholesale Electricity Prices

The demand for electricity varies substantially across each half hour across the year – i.e. higher during the day than at night, and higher during the winter. Some generation capacity will therefore only be used a small part of the time and therefore needs to recover it's fixed and capital cost over a reduced number of hours of actual generation.[8]

The UK wholesale electricity market price uses a Pay as Clear system where the spot price is based on the price bid by the last (marginal) generation unit in the merit-order stack called to meet electricity demand in each half hour.

This is an economically logical pricing system that makes sense in providing for a spot price, as a reference price for Contracts for Differences and other financial instruments and for price transparency and in sending price signals to make generation available and for investment. However, in a market where essentially zero marginal cost renewable generation is increasing and is subject to the whim of the wind and the sun peeping through the clouds it makes less sense.

The UK Emission Trading Scheme and Carbon Price Support adds around £35/MWh[9] to the wholesale market cost whenever gas sets the marginal price of electricity, which remains the case for a substantial part of the time. Again, this made sense when there was a need to differentiate between high-carbon coal generation and lower-carbon gas generation, but this is no longer the case in the UK. A simple solution of exiting from the carbon pricing mechanism, given that UK relatively recently agreed to link it with the European carbon pricing, might be more problematic than is assumed.

[8] The system also needs to pay for reserve capacity, including to cover variable renewable demand and ancillary services such as system stabilisation and balancing

[9] Assuming £88/tonne CO2e and 400kg/tonne CO2 emissions from gas-fired plant

This combination of issues seems to me to increase the potential for market gaming and super-normal profits for some generators and canny traders. Indeed, the Electricity Generator Levy had to be introduced in 2023, and is scheduled to last until 2028, is set at 45% on revenue from generation that exceed £75/MWh. This was scheduled to raise £14 billion, indicative of the sheer scale of the supernormal profits, which are paid by consumers, and was another artificial fix in the market structure.

Windfall Profits from Energy Crises

A big question is who is making the windfall profits when oil, gas and electricity prices go up. Oil and gas producers and power generators who have not contracted all their production will make windfall profits to the extent they have a 'long' position (own, or have exposure to more of an asset than has been sold because you expect prices to rise). I also fear that billions have gone into the pockets of energy traders, who often have a better appreciation of what is going to happen and financially structure 'long' positions. Their corporate affairs will be structured so that the profits from this activity will be made in low corporate tax jurisdictions, likely not the UK.

I really do hope that Ofgem have 'open book' access to the medium and long terms contracts the electricity generators and gas wholesalers have in place for supply to the UK. This would be commercially confidential and as such no for the public domain, but the broad findings from Ofgem analysis of any market abuse should be. Even the volume level to which these contracts are held seems unknown in the public domain currently.

Protecting consumers from high prices and from price shocks

In many markets ranging from soya-beans to iron-ore to oil, producers are typically keen to fix the price they will receive for much of their production to provide a measure of revenue certainty. This is particularly the case when they are deciding to make a big new investment. In a similar way, the price of most new generation, nuclear or renewable, is typically agreed forward, for up to 20 years, by the government via Contracts for Differences guaranteeing price levels[10].

Similarly, wholesalers/consumers are keen to fix the price they will pay to provide a measure of expenditure certainty. Price-risk management assumes ever greater importance where the commodity, such as energy, forms a large part of their household/business costs.

[10] Current strike prices for new offshore wind are around £90/MWh and nuclear around £100/MWh.

This mutual interest has meant we have had forward/futures markets, (with the addition of price-risk managers and speculators), pretty much since the beginning of commerce.

While the energy supply markets progressively[11] 'liberalised' the Regional Electricity Companies, as were, would contract forward for planned demand, with more or less of a portfolio of contracts bought years in advance through Contracts for Differences and through Power Purchase Agreements of up to 15 years with generators busy building new gas-fired power stations in the 1990s and early 2000s. Prices for the customers that had no choice in where to buy their electricity or gas were reasonably effectively regulated by Ofgem Supply Price Control[12].

Liberalisation gave rise to many new energy suppliers. This gave rise to significant waste of money in the costs of duplicate billing systems, the costs of managing electricity price risk, in advertising and in the transaction costs of changing suppliers. A benefit was the emergence of suppliers like Octopus and OVO who invested in modern IT systems to run customer service. Added to the problems, and the cost to consumers, was the lamentable regulation of electricity suppliers that went bust. This cost bill-payers hundreds of millions of pounds. Perhaps even more materially, energy bad debt has grown massively and is a substantial cost that every consumer pays. There is a significant risk that Bad Debt costs will continue to escalate exponentially as unemployment increases. (Automatic) linking of bad debt to Universal Credit could make a significant inroad into this and perhaps allow for a fairer burden of bad debt costs for those on standard credit payment terms for whom energy may be less affordable. Together these issues add up to a meaningful amount by which energy bills could be reduced if it was managed in a better co-ordinated way.

So – what to do with an electricity market that has significant issues throughout the value chain?

A tentative idea for a change to the energy market structure

Nationalise electricity and gas supply[13] (not generation / production) into a single integrated organisation

Please don't groan, nationalisation here has nothing to do with transfers of huge fixed assets that are power stations or electricity networks. It should be relatively

[11] Industrial / 100kW / retail

[12] Subsequent to this the Ofgem regulation of the wild-west electricity supply market when anyone with a computer and an address could set themselves up as an energy supplier was lamentable. This cost consumers hundreds of millions of pounds yet no one at Ofgem, nor Government and Department that encouraged this, faced personal consequences for this fiasco. The planning and implementation of the roll-out of smart metering was another major avoidable blunder for which no one has been held to account.

[13] Maybe even heating oil purchasing, but not transportation

straightforward and should come at a relief to many existing suppliers who claim to be making very little money or indeed losses.

I define electricity supply here as Energy Purchasing, Metering & Billing and Customer Service. It excludes energy production and generation.

Gas and electricity supply are really natural monopolies with relatively low value-add, but a lot of scope to get the basics wrong. There is a standardised product (electrons/gas molecules), fairly uniform bills, what should be standard meters[14] to count usage and the same customer service queries. Some companies such as Octopus appear to have largely resolved the customer service problems that are in their control, so the technology and supporting processes could/should now be made universal.

This could be run on a fixed fee type arrangement by one or more of the current competent energy suppliers. Other existing suppliers could be fairly and simply recompensed for the nationalisation based on a simple formula (e.g. given margin per kWh (or per customer) x typical annual energy usage x assumed customer retention in years = £100/customer as an illustrative value. This margin would continue to be charged to consumers by the nationalised energy supplier. The compensation for the nationalisation to existing suppliers could be paid via an 'earnout deferral' type mechanism over several years at no funding cost to taxpayers or consumers because of the savings made.

Benefits

As well as resolving key current problems, it opens up several future opportunities to reduce overall system costs:

- Along with incorporating the current and future long term purchase agreements for nuclear and renewables the nationalised supply would be able to build a portfolio of medium-term Contracts for Differences and other financial instruments that could significantly mitigate energy price shocks.
- Financial savings from removing the duplicate processes and infrastructure of multiple energy retail supply companies[15]
- More uniform and accountable customer service
- Stops electricity retail supply companies going bust when they make energy price risk management / other mistakes and the loading of this cost on other energy consumers
- Better enable the benefits of the smart metering to be realised by centralise communication to households and business supporting demand shifting to manage down overall system costs
- The national energy supplier would be able to liaise with the grid operator to reduce overall system costs. This would be particularly beneficial e.g. in the case of using large scale electric vehicle charging and battery storage to help

[14] The initial botched roll-out of smart meters is another thing OFGEM and DESNZ need to take responsibility for

[15] Of which there are around 20 presently

balance overall grid supply/demand, potentially also at a more localised level to relieve local distribution network constraints
- More readily enable business to contract energy supply prices for longer / rolling periods helping avoid international energy price shocks.
- Easier to communicate and apply social tariffs
- More straightforward application of feed-in tariffs and price signals for domestic solar/battery installations
- Enable a better link between bad debt and the universal credit system to reduce the overall cost and burden of bad debt
- Paves the way for a scheme that could send better price signals and incentivise the adoption of electric heat pumps by rebalancing gas and electricity prices at a household level.

A large 'contracted' energy market and a small 'spot' market

The opportunity that follows from the above is for more stable energy prices. The nationalised energy supply organisation would enter into Power Purchase Agreements / Contracts for Differences with electricity generators / gas producers to the level it deems appropriate, and the opportunities for contracting presented to limit price shocks feeding through to consumers in the medium term. Holders of Contracts with the nationalised energy supplier would be required to bid to be despatched at marginal cost. The spot wholesale electricity market would continue to function to despatch generation and set the market price, however this would have a much smaller impact in feeding through to consumer prices. The spot gas market would similarly continue.

The detail and implications of this would need thinking through much more thoroughly, but in many respects it is a technical change requiring limited investment. It returns us to a system akin to the one that existed before the UK energy supply side of the market was liberalised.

Security of Supply Balance of Payments

In 2024 43.8% of energy used in the UK was imported. The vast bulk of this being gas and oil/petroleum products. The UK holds around 67 days of average daily inland oil consumption, but much less in terms of gas. The previous governments decision not to fund the net cost[16] of the continuation of the Rough gas storage facility is highly questionable. The world is too uncertain for us to 'wing-it' relying on the market.

The drive for renewables and nuclear is necessary to support security and diversity of supply, recognising that much of the existing nuclear generation will reach end-of-life soon. This should not, however, be 'at any cost'. Careful consideration of

[16] The net cost should be much les than the total cost as, within the primary mission of security of supply, there are opportunities to 'Buy Low and Sell High'

alternatives, including replacement gas generation, should be considered at strike prices above £100/MWh.

While it will only make a very modest difference to security of energy supply, and no difference at all to the market price of energy, abandoning the punitive taxation on North Sea oil and gas is still worth hundreds of millions of pounds in high-value jobs and tax revenue. This measure was a prime example of the government actively sabotaging the UK economy for political posturing reasons, particularly now that the case for moral leadership in this area is weaker now than it has ever been. Artificially curtailing UK oil and gas production does not reduce global production by a single drop of oil or puff of gas; it actually increases it by requiring the shipping of it to the UK from elsewhere in the world!

Summary of Recommendations to help achieve these Policy Objectives

1. Explore the outline proposal to nationalise electricity and gas supply and the opportunities this gives rise to including for more stable and somewhat lower UK consumer energy prices.
2. Continue to utilise current gas plant where it is economic to do so and consider building replacement gas-fired generation capacity, particularly on existing sites that will otherwise close where diversity of supply / reserve power needs merit this.
3. In pursuit of reducing greenhouse gases, and to provide for greater insulation from gas and oil price shocks, continue electrification where economic to do so, inclusive of a social cost of carbon. This will spread the electricity infrastructure costs across a greater demand and reduce unit prices. However, and to be taken into account in the planning, until there is a surplus of clean electricity generation to support this, the benefits of doing this are much lower.
4. Take full advantage of the potential for demand management and demand shifting provided by smart metering and by grid-scale battery technology.
5. Continue to foster innovation that can reduce the cost of clean power.
6. Continue to closely scrutinise national transmission and local distribution network planning, investment, delivery and return. With billions being spent, and paid for by consumers, we must avoid a repeat of the costly fiasco that has been the upgrading of the national water supply and sewage treatment system.
7. Someone, sadly taxpayers/consumers, has got to pay for the net costs of increasing gas storage
8. Remove the restrictions on new developments and mitigate the punitive taxation on North Sea oil and gas so that the UK Treasury is the beneficiary rather than foreign governments.
9. Revisit the Climate Change Act and the net-zero commitments
10. Given that greenhouse gases are an international rather than domestically contained issue, consider whether it is more cost effective to spend what would be excess cost and subsidy money in the UK in pursuit of net zero, in enabling parts of the developing world to adopt solar power in preference to fossil fuels. There is a much bigger 'bang for your buck' with local direct use of

power in reliably sunny climes avoiding costly power grid connections, high development costs and rather more inclement weather in the UK. This would clearly need to be done in a transparent way with reliable, trusted international partners and with UK political buy-in.

11. Ofgem open book access and analysis of medium and long-term retail energy contracts
12. Remove Standing Charges from electricity bills as a simple administrative change which helps low-income households with low consumption and, modestly, reinforces electrification incentives
13. Removing carbon policy costs from electricity supply to general taxation to encourage electrification

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