UK Energy Research Centre

Review of Energy Policy 2023

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Introduction

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In this issue of our annual Review of Energy Policy we look back on events of 2023 and, with an eye on the upcoming general election, consider key areas of policy that a new government should address during their first 100 days in office.

The year began with the dissolution of the Department of Business Energy and Industrial Strategy and the formation of the Department of Energy Security and Net Zero (DESNZ), thus cementing a renewed focus by the Government on the security dimensions of energy policy. One of DESNZ's first actions was to publish the Powering Up Britain report which, in the continued drive to reduce reliance on Russian gas, promised to maximise the supply of UK gas. This was followed by the controversial approval of the Rosebank oil field and, as set out in the King's Speech, future licensing rounds for new oil and gas fields. In the review we focus on gas, highlighting the urgent need to develop a gas transition plan that moves beyond the emphasis on security of supply, towards managing uncertainty around the reduction in gas demand as we transition to low carbon energy, whilst also ensuring resilience and affordability.

Whilst 2023 has seen record investment in clean technology, the economic climate for the renewables sector has been tough. With interest rates reaching a 15-year high and amid ongoing inflationary pressures across the continent, investors and financiers have been challenged by the cost of borrowing, with notable projects pulled and no offshore wind bids submitted to the 5th Contract for Difference auction round. These issues have been further compounded by permitting issues impacting both electricity generation and networks. The Energy Act, arguably the biggest piece of UK energy legislation in a decade, was granted Royal Assent in October, and seeks to tackle some of these issues, whilst also protecting consumers, unlocking private sector investment and accelerating deployment of offshore wind; although it failed to address permitting issues in Scotland.

Much work remains to turn the legislation into reality. In this review, we have two contributions which focus on electricity market arrangements and network planning. These highlight the need for consumers to benefit from the low cost of renewables while ensuring security of supply, and how the strategic development of new networks will be essential to the energy transition. For transmission, we discuss how procedural changes are necessary to speed up the development of high-voltage lines, whilst distribution networks need to be planned so they can facilitate net zero pathways for heating and transport. With the announcements in the Autumn Statement intended to reduce grid connection delays and halve power line construction times, we also explore the tensions and trade-offs between the energy transition and the broader environment, highlighting that safeguarding natural environments both offshore and onshore should be an integral part of all energy policies.

With government focus on delivering high-profile infrastructure investment, the role of integrated local and regional energy systems can sometimes be lost. In the review we trace the development of policy for local and regional energy systems in 2023 and emphasise how action at the local level will be vital to delivering

net zero. The announcement by Ofgem of the establishment of a series of Regional Energy Strategic Planning roles across GB is therefore welcome. However, we underline the need to go further than changing regulatory structures. Securing the value of local energy systems also needs a strengthened mandate for the role of local authorities in delivering net zero, and consistent funding.

More attention is also needed on the demand-side of the energy system but, unfortunately, the current Government has back-tracked on several existing commitments. In September, following fallout from the Ultra Low Emission Zone expansion scheme, it pulled back on key green policies, delaying the phase out of fossil fuelled cars and boilers. Explaining that this was to ease pressure on hard-pressed households, the Prime Minister insisted that the 2050 target is not in question although he neglected to refer to the legislated 6th Carbon Budget. As the UK is neither on track for the roll out of electric vehicles or low carbon heat, these announcements were treated with scepticism and concerns that delays undermine the policy certainty required by both consumers and investors. On heat, we emphasise the need for the new government to provide clarity on the most appropriate home heating systems, while also providing finance for customers to insulate their homes. We also call for a new green deal for transport that will provide adequate funding for investment in the electric vehicle charging network and a ban on the sale of new plug-in hybrid electric vehicles by 2030. Similarly, on industry, we highlight an urgent need to develop a strategy for decarbonising dispersed industrial sites and to put electrification on a level-playing field with other carbon reduction options.

So where does this leave us as we enter 2024? In July, the Climate Change Committee concluded that the UK was not on track to meet its climate goals and that the Government needed to focus on delivery of its commitments. Since then, it has been one step forward and one step back. While much focus is on 2050, we need to remember that the UK also has a shorter-term target – to reduce greenhouse gas emissions by 68% by 2030 relative to 1990 levels. The expected term of the next government will take us most of the way to 2030 so they must urgently step up to the delivery challenge.

Time to Move on from the Fixation with Gas Security of Supply

Michael Bradshaw, Warwick Business School

On gas: the priority is to develop a gas transition plan that moves beyond the focus on supply, to demand, to manage the transition as gas demand falls whilst ensuring resilience and affordability.

In March the DESNZ published Powering Up Britain[1] that came with Energy Security[2] and Net-Zero Growth Plans.[3] Much of this was old wine in new bottles, but the priority given to gas security of supply in the Energy Security Plan was new. Accordingly, the Government intends "to increase the resilience in the gas system" by maximising supply of UK gas, maintaining and securing our gas import and export capacity, increasing system resilience, and ensuring long term investment in gas networks. The promise in the King's Speech to grant new oil and gas licenses every year is the latest demonstration of this security of supply fixation; but is this the right approach to manage future challenges to UK gas security?

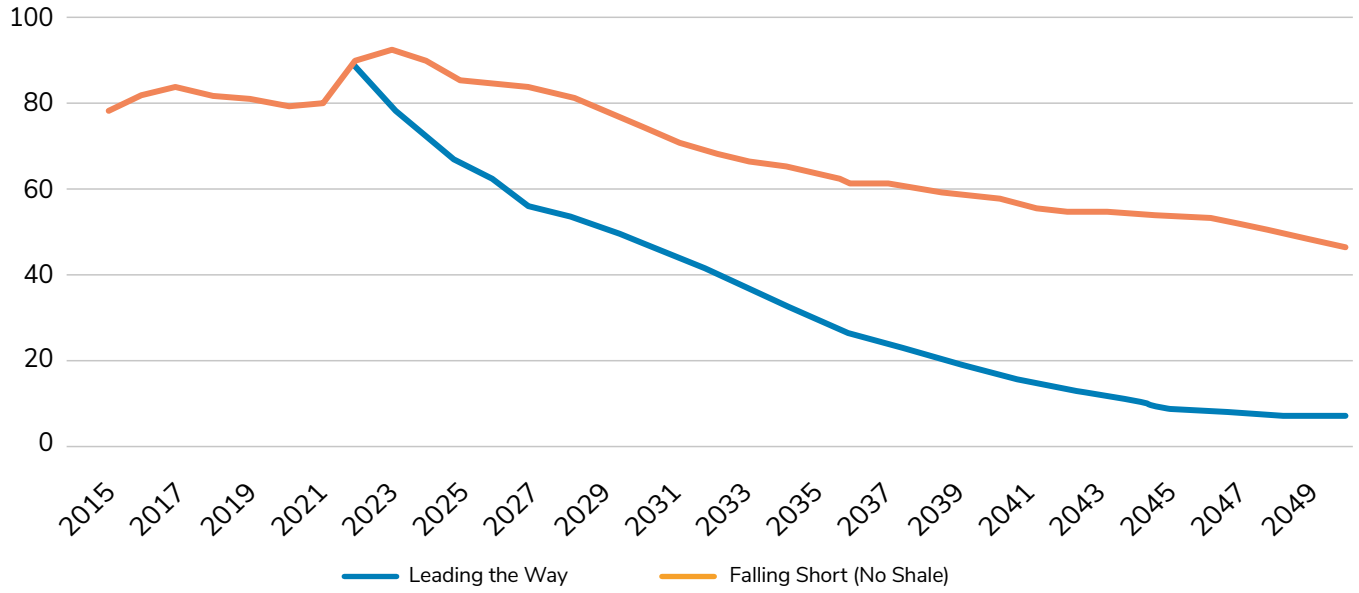
Even though domestic gas demand has fallen 29% from a peak in 2000,[4] it is the most important element of the UK's energy mix, accounting for 39% of total inland energy consumption in 2022.[5] Gas does three things: it generates power, providing flexible back-up to intermittent renewable generation; we use it in our homes for heating and cooking; and it is used in industry. The problem is that all of these uses generate GHG emissions, added to which the natural gas supply chain is a source of fugitive methane emissions. In the past, coal to gas switching played a key role in decarbonising our power system, but with coal gone, gas is now the problem.

Yesterday's problem, not tomorrow's challenge

Past policy reviews have commented on how the Government's strategy to gas security was based on an assessment that we had more than sufficient infrastructure capacity to meet domestic demand and that the UK benefited from a diversity of sources of supply. However, the growing level of import dependence – as domestic production declined faster than demand – resulted in an increasing reliance on global market signals to attract the additional supply needed to meet demand.[6] While global gas prices were low this strategy delivered both secure and affordable gas to UK consumers. All that has changed over the past 18 months as global LNG prices have skyrocketed as a consequence of Russia's war in Ukraine along with an 80% fall in pipeline gas exports to Europe. Prices have now fallen back somewhat, but the global LNG market remains volatile. On reflection, we can say that the UK has not faced a 'gas security of supply crisis.' Last winter passed without gas shortages, but we have, and are still experiencing a 'gas affordability crisis' that until the power market is reformed extends to electricity as well. It is true that many factors worked in Europe's favour last winter, but UK infrastructure proved to be both adequate and resilient, so much so that LNG imports increased 74% in 2022 as we acted as a bridge supplying LNG to continental Europe via our two interconnector pipelines.[7]

Given the current situation in the Middle East and the precarity of the global gas market, there is an understandable nervousness about gas prices this winter.[8] Europe's storage is full, but there is still a reliance on Russian pipeline gas in southern Europe and Russian LNG continues to arrive at European terminals. Industry analysts expect the situation to remain tight until the winter of 2024-25, but then things could start to change dramatically.

Figure 1: Gas Demand to 2050 Under Two Future Energy Scenarios Scenarios (BCM/yr)



These figures are based on supply and include gas in-transit through GB and not just domestic consumption.[10]

As the International Energy Agency's 2023 World Energy Outlook[9] details, between now and 2030 "*a wave of new LNG export projects is set to overturn gas markets*," so much so that there is talk of over-supply and much lower prices. This suggests an eventual return to a pre-crisis world where the LNG market supplies affordable gas to consumers.

A strategy to manage natural gas on the road to net-zero?

The Government is right to 'kick the tyres' to check that our infrastructure remains in good order, but the greatest challenge to future gas affordability is not security of supply, but security of demand. The Government's Energy Security Plan alludes to this when it states: "*Future demand for gas will decline as we decarbonise... This means that the gas system will need to change to maintain resilience against increasingly dynamic and unpredictable requirements*." This recognises that the transition to clean energy could create uncertainty in the gas market and it promises to act decisively to mitigate this risk. But its current plan does not explore the nature of the risk nor how it might be mitigated. Figure 1 shows two scenarios from National Grid ESO's 2023 Future Energy Scenarios.[10] Leading the Way assumes that the net zero target is met by 2046 as GB decarbonises rapidly with high levels of investment in world-leading decarbonisation technologies; while in Falling Short GB does not meet its net zero target by 2050, and although there is still progress on decarbonisation compared to today, there is a continued reliance on natural gas.

The key challenge for any government going forward is how to manage the uncertainty over the falling demand for natural gas in terms of its impact on the economic and technical viability of the various elements of the gas infrastructure that is in private hands. In their Second National Infrastructure Assessment,[11] the National Infrastructure Commission (NIC) recommended that: "*The Government should not support the rollout of hydrogen heating*," instead heat decarbonisation should be achieved through electrification. In 2022 domestic use accounted for 32% of gas demand, just behind power generation at 33%.[12] Thus, such a decision would have significant implications for future gas demand and for the gas network. The NIC promises a report soon on decommissioning of the gas network, some of which might be repurposed to transport hydrogen to industrial clusters. However, the challenge is how to keep the current system in place while there remains significant but falling gas demand. Failure to manage this will undermine the resilience of the system and threaten gas security.

In sum, what is required is not a security of gas supply plan, but a gas transition plan. Fortunately, this is now well understood by DESNZ, and it will undoubtedly be an issue for the Future Energy System Operator to address. However, the recent statements by Prime Minister Sunak rolling back some of the net zero targets and drilling for more oil and gas only serve to add confusion. A future government must get over this fixation with security of supply and come up with a coherent plan to manage gas in transition to ensure security and affordability.

Local and Regional Energy Systems

Jan Webb, Jess Britton and Ronan Bolton, University of Edinburgh

On local and regional energy systems: securing their value to society needs a clear mandate for the local role in net zero, consistent funding and changes in regulation to enable regionally integrated heat, power and storage.

Numerous reports examining contributions of local and regional energy systems to clean energy in Britain conclude that decentralised systems, integrated across heat, power, mobility and storage, are an important source of security, cost and carbon savings.[13,14,15] Benefits accrue both to the whole energy system and to local jobs, investment, welfare and environment. Recent UK Government policy referenced the value of a 'locally responsive' system in reducing costs by up to £10 billion a year by 2050.[16,17,18] In Wales and Scotland also, there has been increasing attention to multi-level energy governance.

Analyses typically conclude that local and regional governments are critical to securing such benefits, but changes are required to local powers and resources to enable systematic and sustained action. In a 2021 review,[19] we concluded that the Net Zero Strategy made some progress in creating a local net zero institutional framework, with BEIS (now DESNZ) responsible for coordination with local government, a Local Net Zero Forum, and ongoing funding for English Local Net Zero Hubs. However, lack of clarity on local powers and resources to deliver have persisted.[a]

Local and regional energy systems in 2023 UK policy

In March 2023, new UK Government policy, Powering Up Britain, fore-fronted energy security and net zero. It largely equated security to domestic supply, including new North Sea oil and gas, which is framed as a route to economic advantage via 'market-led, technology driven' policies.[3] Integrated local and regional, or decentralised, energy systems are largely absent, and reference to the potential savings of circa £10 billion per year by 2050 is now focused on a centralised flexibility market. The equation of energy security with supply-side interventions is matched by limited attention to the role of the demand-side or cross-vector integration in whole system resilience.

High-level statements on the value of local authorities in delivering net zero tend to be narrowly phrased as a responsibility to translate central government objectives into local action. This includes: housing retrofit[2], planning; and attracting private finance for green jobs and skills. Local government is expected to use its existing powers, assets and responsibilities across many areas with impacts on GHG emissions.[b] Documents reference some measures to increase capacity and capability: the Local Net Zero Forum (England), the five English Local Net Zero Hubs, pilot funding to

a. Local government business is fully devolved to the UK constituent Parliaments and Assemblies; hence the UK policy references to local and regional government are to England.

enable community-led energy projects and the Net Zero Go digital platform. Funding sources cited are not new, and the pattern of fragmented, short-term, competition funds is reinforced. Many local authorities are necessarily 'left behind' by competition funding, despite the need for government in every area to act on GHG emissions.

In March, UK Government published its responses to the CCC's 2022 Annual Progress Report and the Independent (Skidmore) Review of Net Zero. These documents contain frequent references to increasing local authority capacities and capabilities, and funding to empower local action. There are tentative commitments to consider the role of local energy planning in relation to efficient network planning.[20] The 2023 Carbon Budget Delivery Plan also specifies a role for the UK Infrastructure Bank to support local authorities through advice on developing and financing infrastructure. No new powers are however specified, and in response to the Skidmore Review, UK Government notes that it will not introduce a statutory duty for local authorities to take account of net zero targets, because of the '*existing high level of local commitment within the sector*'.[21] Government responses to the CCC's 2023 Progress Report[22] are similar, resisting new local powers or standardised local energy planning, although acknowledging Ofgem's local energy governance consultations.

Policy and plans in 2023 therefore smack of devolving hard parts of delivery, without commensurate resources or institutionalised powers.[22] In a UKERC local energy modelling cross-sector workshop,[23] there was concern that meeting net zero targets is impossible without sustained and coordinated planning and investment across all scales of government. Routes to realising the whole system benefits from integrated local and regional energy systems hence remain in question. In this context, the Ofgem decision[24] to establish Regional Energy Strategic Planners (RESPs) is positive. The intention is to ensure coordination, and improved democratic accountability, across scales of governance and across heat, electricity and storage vectors, and network infrastructures. Proposals are high-level, requiring further decisions on powers and responsibilities; relationships to the independent Future Systems Operator (FSO) and interactions with energy network price controls. There is a risk that RESPs could be primarily facilitating flexibility services in a centralised market governed by the FSO. This could marginalise the more challenging cross-vector planning to secure benefits from integrated local/regional systems, including new heat networks. At this critical stage of institutional innovation, local and regional integration, making best use of distributed generation, storage and residual heat for heat networks, needs to be at the forefront.

b. These general commitments are reiterated in the 2023 Carbon Budget Delivery Plan, published at the same time and intended to respond to the earlier High Court judgement that the Net Zero Strategy was not compliant with the Climate Change Act. They are also reiterated in the UK Gov 2023 response to the CCC's 2022 Annual Progress Report. The UK CCC's 2023 report however concluded that policy development continues to be too slow and does not fill policy gaps.

Priorities for a new UK government

For an incoming UK government, accelerating the development of integrated local and regional energy systems could deliver relatively easy gains across costs, carbon savings, resilience, local regeneration and welfare. The technology, ambition and enterprise exist; new regulation, powers and devolved resources are needed to empower local, regional and Scottish and Welsh governments.

UK CCC[25] and other bodies[26] continue to state that recognising the value of local governance is insufficient for sustained action; important gaps in local powers remain, as well as policies and regulations that disincentivise action. Competitive, short-notice and short-term funding[c], lack of clarity about division of governance between central government, regulators, devolved and local government and industry[d] and lack of policy certainty are all obstacles. Instead, local capacity needs to be increased through longer-term, stable funding and coherent policy.[e] In Scotland and Wales, where regional and local energy planning is established across every local authority, there are continuing calls for more devolved powers to enable those plans, and commitments to a socially just energy transition, to be implemented. Systematic, area-based retrofit of building stock should also be prioritised. Progress will reduce energy bills, support local economic renewal, skills and jobs.

Local and regional integration across energy vectors, and balancing supply and demand at this scale, will require regulatory changes to ensure visibility of distributed power generation, storage and demand side flexibility. It also requires regional systems planning to include heat network development in areas of high demand, density and diversity, which will help offset the high costs of electricity grid reinforcement and stand-by power generation.

Broad agreement on the institutional reforms needed for local authorities to contribute fully to net zero energy encompass: funding; common methodologies for local energy planning, including integration with other scales of planning; and a clear mandate for the local role in net zero.[19] This consensus provides a ready template for a new government to enable integrated energy systems at local and regional scale. The associated renewal of local and regional democracy, through greater devolution of powers over energy, financial resources and planning, will ease the work required to meet UK net zero GHG emission targets and security priorities, while sharing the benefits more widely.

c. The Government notes, in its response to the Independent Review of Net Zero Recommendations (2023), that it continues to explore simplifying local net zero funding, but no details are provided. d. The Government has also noted, in response to the CCC's 2022 Annual Progress Report, that it is working with local authorities and their representative bodies to discuss their roles and responsibility in delivering net zero through the Local Net Zero Forum and commits to updating on roles and responsibilities as they continue to evolve, principally through the annual progress report. There is no mention so far of which exactly are those roles and responsibilities. e. The UK CCC 2022 Progress Report recommended development of an annually updated framework setting out how Net Zero Strategy will be delivered, clarifying roles and responsibilities across central, devolved and local governments, regulatory agencies, public sector and business.

Heating the Future

Modassar Chaudry, Meysam Qadrdan and Jianzhong Wu, Cardiff University

On heat: there is pressing need to provide clarity on the most appropriate heating systems, and a greater focus on energy efficiency, with finance to help customers insulate their homes.

As the year draws to a close, typical household energy bills in the UK are still approximately 55% higher than before the invasion of Ukraine[27]. The cost of heating, a fundamental component of the cost of living, has contributed significantly to the ongoing energy and inflation crisis faced by households. There was a glimmer of hope during the middle of the year as wholesale energy costs softened, leading to a reduction in retail energy prices. This reduction has resulted in an Ofgem energy price cap level that means the Energy Price Guarantee, introduced in 2022, is now surplus to requirements.

The continued reliance on gas boilers, electricity produced from gas-fired generators, and inadequately insulated homes leaves the UK exposed to international energy price fluctuations. In response, several policy initiatives have been introduced over the past few years, such as the Energy Security Bill of 2022[28] (updated in 2023), with the aim of achieving net zero, enhancing energy security and reducing energy costs whilst promoting economic growth. Key elements of this bill include exploring the role of hydrogen to heat homes and workplaces, accelerating home efficiency improvements, and scaling up heat pump installations.

Heat pump challenges

Despite these efforts, the heat pump market has not seen the desired growth. The UK Government established a Boiler Upgrade Scheme (BUS), offering a £5,000 grant towards the upfront cost and installation of a heat pump, in its ambition to grow the market to 600,000 installations per year by 2028. But after a full year of operation, only 69,000 heat pumps in total were installed in homes[27] and at the current trajectory the government installation target has little chance of being met. In fact, a 2023 European market report[29] places the UK at the bottom of more than 20 European countries for heat pump adoption (see Figure 2).

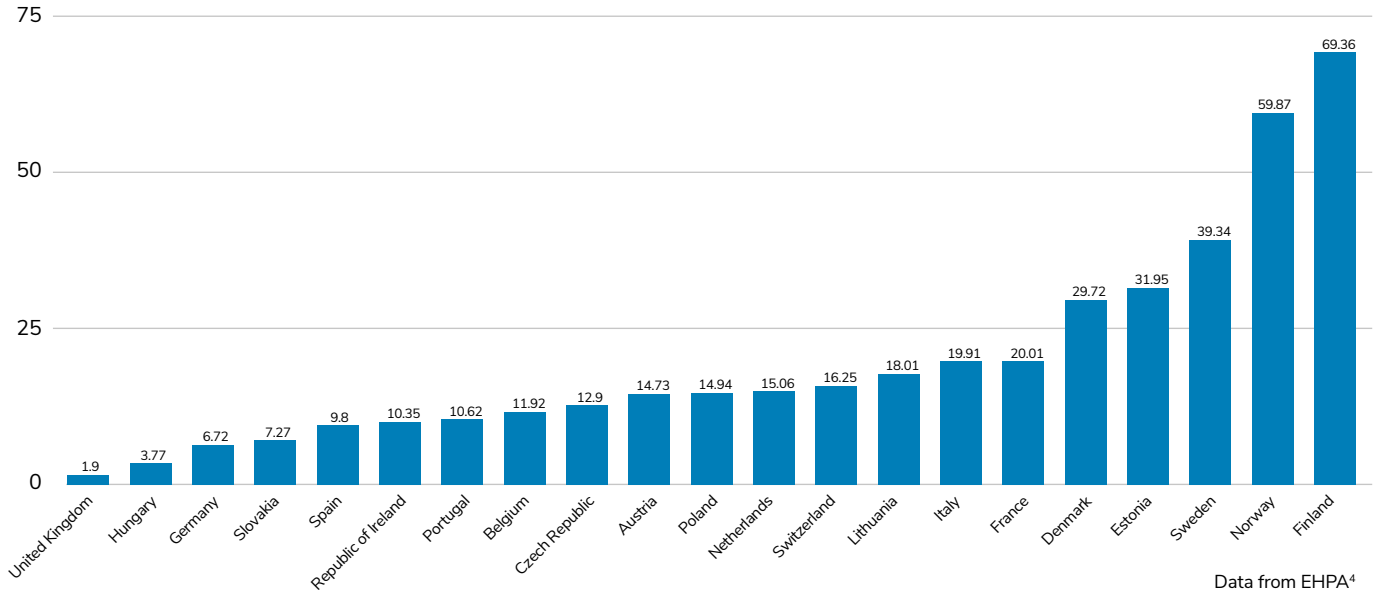
According to the Climate Change Committee (CCC), high heat pump costs, a limited number of installers, and the expense of associated energy efficiency measures, such as insulation, are the primary obstacles to heat pump installations. In an effort to stimulate demand, the government has recently raised the grant to £7,500. However, it has also made decisions to delay the total ban on new gas boiler installations until 2035 and effectively scrapped energy efficiency and Energy Performance Certificate measures for landlords.

The cheapest energy is the energy we don't use!

The UK boasts one of the least energy-efficient housing stocks in Europe. A famous adage reminds us that the cheapest energy is the energy we don't use. Nevertheless, energy efficiency installations in UK homes have declined dramatically from about 2 million per year in 2012 to only 200,000 in 2022[30], primarily due to the termination of the Warm Front program and reduced funding for the Energy Company Obligation scheme (the current iteration is ECO4).

It is well established that households with poor efficiency ratings will have paid on average an additional ~£1,000 on their energy bills this past year compared to those with well-insulated homes[31]. To address this issue, the Government introduced the Great British Insulation Scheme in late 2022, aiming to provide financial support for energy efficiency measures to approximately 300,000 properties over the next three years. Yet, according to the UK Business Council for Sustainable Development[32] at the current pace the scheme would take almost 200 years to

Figure 2: Heat pumps sold per 1000 households in 2022 in selected European countries



Data from EHPA[4]

insulate all homes. Given the limited nature of this scheme and importance of demand alleviation measures, the UK should adopt a more comprehensive and ambitious agenda to improve energy efficiency in all homes.

The hydrogen question

The Government does not expect to make a strategic decision on the role of hydrogen in heating until 2026. As part of the evidence gathering process two village trials were proposed to study the operational efficacy of hydrogen heating systems. One of these trials in Whitby, Cheshire was scrapped following opposition from residents who apparently wanted to keep their existing gas boilers or preferred a heat pump. The pushback highlights the challenges faced in imposing technological 'trials' without getting community support. The other potential hydrogen village trial in Redcar, North Yorkshire is at this stage, tentatively, moving forward.

Several independent advisory organisations such as the National Infrastructure Commission[11] and the CCC have also highlighted the many technical difficulties facing hydrogen becoming a viable and economic low-carbon heating fuel. Despite this, the Government has insisted that the gas network will continue to be part of the UK's energy system and that the role of hydrogen will be explored.

Large investment is flowing into replacing the iron gas mains so it can transport 100% hydrogen. National Gas[33] also launched the feasibility phase of 'Project Union' which will explore repurposing the existing transmission pipelines to create a low-cost hydrogen 'backbone'. Project Union will connect hydrogen production centres to industrial, heat, transport, and power consumers. Alongside the potential hydrogen village trial, this will provide the Government with the evidence to inform its energy policy on hydrogen. It therefore seems certain that the future of the existing gas network will continue to generate a lively debate.

Immediate priorities for a new UK government

The UK Government has a target to reduce energy demand from buildings and industry by 15% by 2030. A future government must re-prioritise this area of energy policy with bold plans to reduce energy demand in buildings and help customers improve insulation in their homes. The Green Deal and the recent Green Homes Grant are often cited as examples of policy failure with consumers and installers referring to the lack of clarity and delays in the administration processes, and a general absence of information on the benefits provided by the schemes. Despite this, these previous schemes offer learning opportunities, helping to design a workable system that will persuade

householders that energy efficiency measures are worth pursuing through a system of grants and favourable loans (zero interest financing).

To meet the Government's ambitious target of 600,000 heat pumps installations per year by 2028, significant financial assistance is required for upfront installation costs, including insulation, new central heating infrastructure, and radiators. For fuel-poor and vulnerable customers, additional grants should supplement the BUS. Shifting "green taxes" from electricity to gas should also be considered and prioritised in the near term for delivery over the course of the new parliament.

The Government's decision to water down the ban on new gas boiler installations in 2035 introduces uncertainty for consumers with regards to the choices available for heating systems. A prompt strategic decision is required from the future government regarding the role of hydrogen in heating. It should clarify whether electric heating is the default low-regret option and therefore the use of hydrogen will be confined to industrial clusters and nearby hard to electrify homes. These are the immediate choices where the Government could offer greater clarification that will in turn reduce uncertainty as we push on to meet our net zero obligations.

In conclusion, there is an urgent need for the future government to take immediate and comprehensive actions to tackle the challenges of decarbonising heating in the UK. These actions need to include a greater focus on energy efficiency, as well as providing clarity on the most appropriate heating systems. This will not only enhance energy security and alleviate costs but will also play a vital role in fostering a greener and more sustainable future for all.

Road to Zero or a Pot of Holes?

Jillian Anable, University of Leeds and Christian Brand, University of Oxford

On transport: a new green transport deal is needed to provide adequate funding for EV network investment, with plug-in hybrid vehicles banned by 2030. A carefully designed scrappage scheme must be developed to get the most polluting vehicles off the road.

Two years after publication of the 2021 Transport Decarbonisation Plan (TDP), the UK Government's approach to decarbonising transport can be categorised as somewhat of a U-turn. Despite comprehensive analysis concluding that even with all confirmed policies accounted for the sector tracks around 224MtCO_2e above the pathway set in the 6th carbon budget [34], the Department for Transport published a 'Plan for drivers'[35] that promises further prioritisation of the conveniences of motoring. The Plan represents a critical issue in the UK's transport policy: the absence of a holistic and fair approach that includes all modes and all citizens, including the 23% of households who do not own a car[36].

The year did see confirmation of the Zero Emission Vehicle Mandate (ZEVM) in September 2023[37]. Despite pushing back the phase-out of new petrol and diesel vehicles from 2030 to 2035, the central trajectory for cars has been retained: requiring 80% of new cars to be zero emission by 2030, increasing to 100% by 2035, with minimum annual targets also set out along this trajectory. Van targets have been watered down to allow more flexibility in the near term, but increased in the longer term, with penalties for non-compliance also reduced.[f]

Electric vehicle uptake will not be enough

The Climate Change Committee (CCC) has stated that the ZEVM is the single most important mechanism to deliver the UK's net zero commitment[38]. Whilst the ZEVM places an imperative on motor manufacturers to produce the vehicles, it is another thing to persuade consumers to buy them. The signalling that came with the changes to the 'internal combustion engine (ICE) ban' could undermine the urgency for both businesses and consumers, resulting in many more delaying their transition to electric. While electric vehicle (EV) sales are increasing, only 2.5% of cars

f. The revised ZEV sales targets were reduced to 16% in 2025, but increased to 24% in 2026, with penalties for non-compliance in 2024 also reduced.

were battery electric vehicles (BEVs) by the end of June 2023[39]. It is noteworthy that the average car age has slowly been increasing since before COVID-19. To the extent that this is at least partly due to consumers being cautious about switching to fully electric (i.e. BEVs), this trend could deepen. In addition, although there has been a long-term trend of falling, or at least plateauing, average annual per-capita car mileage, there has been a trend since pre-COVID for a general growth in car numbers.

Putting much of this together, our own analysis and modelling done for the CREDS positive low energy futures work[40] suggests that the petrol and diesel ICE phase out for cars will take longer (yellow vs. green lines in Figure 3) with a modest uptick in tailpipe CO_2 and NO_X emissions as a result.

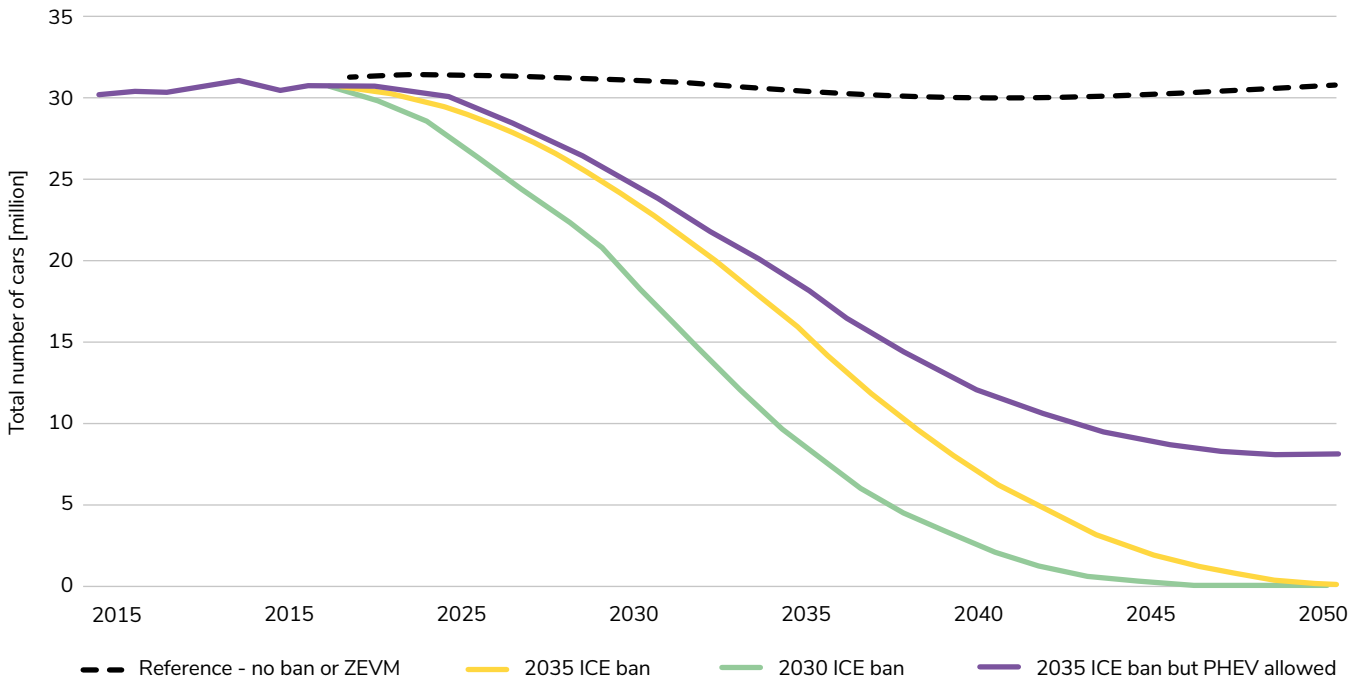
Recent RAC Foundation analysis found that a reduction in car mileage would be necessary to meet CCC carbon budgets even on the most ambitious car-electrification trajectories[41]. With BEVs needing to account for at least 37% of miles driven by 2030, meeting these levels would be "*a monumentally steep challenge, like climbing Everest on a bad day*".

Priorities for a new government

The often contradictory approach to transport decarbonisation policy in the UK reflects the tension between immediate economic and political pressures and the long-term imperative of decarbonisation. It would appear that the Government's strategy is to allow road traffic to increase and for the transport sector to continue to not pull its weight towards short and medium term carbon budgets.

A new government must therefore prioritise investment in EV infrastructure. The EV charging network has expanded by over a third over the past year according to Zapmap[42]. However, coverage is inconsistent and often unreliable. There is a particular imperative to roll out innovative solutions in residential areas. However, the VAT tax treatment of non-domestic charging needs to be equalised as 5% is currently levied at home, and 20% elsewhere, which results in a disproportionate burden on low-income households who are less likely to have off-street parking at home or at work.

Figure 3: Modelled projections of ICE cars in the UK - total car stock by phase out dates and type of 'ICE ban'



Source: adapted from modelling by Barrett et al (2022)[8] with additional analysis by UKERC (2021)[41]

Plug-in hybrid electric vehicles (PHEVs) need to be banned from 2030. The CCC made this recommendation in its 2023 progress report given that PHEVs have proven to be three- to five times less efficient than was assumed. PHEVs currently make up 41% of "EVs" in the UK car fleet, yet they tend to be high mileage (having become the preferred replacement for diesel cars, particularly within fleets) with only a small proportion driven on the battery on average. These cars are often heavier than is necessary and will lock in substantial amounts of fossil fuel capacity for years after the last ones are finally sold.

A carefully designed scrappage scheme must be designed that targets the most polluting vehicles and those least able to afford new cars, with credits that can be used to buy EVs (including second hand ones) or e-bikes or public transport tickets. Our research suggested that early action is paramount and recommended a market transformation approach targeting the highest emitting, least efficient vehicles now, in addition to the ZEVM. Phasing-in of the phase-out will cumulatively save 100 millions of tons of CO2 by 2050 thus reducing the need for radical action later on.[43]

There needs to be a renewed push for high quality, zero emission public transport, active travel and shared mobility services, with an emphasis on affordability and accessibility to reduce car dependency. This would adopt NIC recommendations[11] calling for major public transport upgrades in the most congested cities such as Bristol, Leeds and Birmingham to unlock economic growth, and an urgent and comprehensive review of rail priorities for the North and the Midlands. Measures like the recent £2 cap on bus fares to ease transport costs can encourage the use of public transport, but are insufficient to trigger substantive mode shift away from private car use.[44]

These recommendations need to be backed by a transport bill and the launch of a green transport deal. Politically, frequent ministerial changes have led to a lack of consistent policy direction in transport, with initiatives being introduced, withdrawn, or forgotten seemingly capriciously. This inconsistency undermines the creation of a coherent long-term strategy necessary for substantial decarbonization efforts. All measures of decarbonisation must be encapsulated, devising a strategy that follows the Avoid-Shift-Improve transport hierarchy recommended by the IPCC45 and includes a cohesive, nationwide strategy for public and active transport, with progress monitored annually as per the NIC's recommendation.[11]

Broadening the Scope of Industry Decarbonisation

Peter Taylor, Imogen Rattle and Ahmed Gailani, University of Leeds

On industry: there is a need to develop a strategy for decarbonising sites that lie outside large clusters, this should include measures to put electrification on a level-playing field with other carbon reduction options.

Industry accounted for 14% of UK greenhouse gas emissions (GHG) in 2022, down 3% on 2021 largely due to a decline in manufacturing output.[25] Around half these emissions are from large coastal clusters of energy intensive industry, while the remainder come from thousands of, typically smaller, industrial sites widely dispersed across the country. Since publication of the Government's Industrial Decarbonisation Strategy (IDS)[46] in 2021, some progress has been made in developing the policy framework to encourage long-term emissions reductions. The focus of activity has been on funding carbon capture, use and storage and low carbon hydrogen projects in a first tranche of industrial clusters and through the development of new business models.[25]

Looking ahead, we see the need for a new government to broaden decarbonisation efforts in two key areas. First, supporting industries with the costs of switching to electricity and ensuring fair competition between low carbon hydrogen and electricity. Second, developing an overall strategy for decarbonising dispersed industrial sites.

Electrification

Analysis for the IDS shows that electrifying industrial processes could reduce GHG emissions by between 5 and 12 $MtCO_2e$ by 2050. However, UKERC modelling found this potential could be as high as 20 $MtCO_2e$, depending on the availability and cost of competing technologies, and that most of this abatement could be delivered in the next 15 years.[47] New electrification technologies that are not represented in current models, such as industrial heat pumps and electric furnaces, could deliver additional emissions reduction after 2040, making the long-term decarbonisation potential from electrification even higher.

In summer 2023, the Government ran a consultation on Enabling Industrial Electrification[48], which highlighted several barriers to uptake including low technology readiness, high electricity prices and capital costs, constraints on grid access and regulatory/policy uncertainty. Tackling these barriers will require the next government to take a range of actions, some of which are already identified in the consultation.

First, government should ensure that industry has access to a full range of low and zero carbon fuel switching options by expanding support for research, development and demonstration of novel electrification technologies and their associated supply chains. However, many of the new technologies are not commercially viable at current UK electricity prices, which are amongst the highest in Europe. Therefore, an urgent review is needed to explore the benefits of reducing industrial electricity prices and to identify the fairest way to implement any changes. This should go further than the measures set out in the British Industry Supercharger[49], which reduces electricity costs for the most energy intensive companies, to include a wider set of reforms to rebalance gas and electricity prices.

Second, industry must have faster access to new and upgraded electricity connections as the current waiting times can extend to several years. The current government recognises this and has promised an Action Plan to Accelerate

Connections. However, it is important that any changes explicitly recognise the challenges facing industry and do not only apply to grid connections for renewable generation and battery storage.

Finally, we suggest that government should explore whether new business models or additional support is needed to encourage greater electrification, particularly for smaller companies and dispersed sites.

Dispersed sites

In February 2023, the Department for Energy Security and Net Zero and Innovate UK launched a Local Industrial Decarbonisation Plan (LIDP) competition that offered £5 million in grant funding to support 'mini-clusters' of dispersed industrial sites to develop a collective approach to reducing GHG emissions. The winners are expected to be announced in early 2024. This funding is the first support specifically targeted at dispersed industry and should provide a valuable stimulus for the winning partnerships to investigate the best approaches to reducing their emissions. However, UKERC research[50] has identified that a longer-term overarching strategy will be needed to drive widespread decarbonisation across the whole of industry.

Priorities for a new government should include developing a tailored approach to decarbonisation that meets the specific needs of dispersed sites, drawing on lessons from both the industrial clusters and the recent LIDP competition. Current funding for decarbonisation activities is largely allocated through a competitive process. This has the potential to favour those organisations and areas with capacity to bid, rather than those with the most need to reduce their emissions. The Government has launched a plan for simplifying the funding landscape for local authorities.[51] A key part of this is to assess suitable distribution methodologies for new funding streams. Given that partnerships for industrial decarbonisation are not necessarily local authority-led, we recommend that the review is extended to explore the most effective approaches to all funding at the local level.

The decarbonisation options available to industry often depend on the deployment of supporting infrastructure. Dispersed sites would therefore benefit from greater certainty around the likely deployment and associated timelines for electricity grid upgrades and hydrogen and CO_2 pipelines. This would also enable a more informed discussion of whether and how some industry might need to relocate to take advantage of such new infrastructure, and of the economic and social implications for the places they leave.

A new government should also encourage more joined up thinking on decarbonisation by encouraging a place-based approach that maximises synergies and opportunities for decarbonising industry alongside buildings and transport. This could include an expansion of local area energy planning, while making sure that these plans fully include industry. Both these activities would be aided by an improved evidence base. We therefore believe there is a need for government to develop an industrial decarbonisation data strategy, including publishing data on the energy and emissions performance and costs of novel technology abatement options to help foster their development and deployment.

The strategy should explore what new data sets can be made public based on information currently being gathered as part of government programmes and establish any gaps that need to be filled.

Finally, it is important to note that a decarbonisation strategy is just one aspect of government policy affecting industry. Introducing a refreshed and comprehensive industrial strategy would provide businesses and other stakeholders with greater clarity on how a new government sees the role of industry in a low carbon economy.

Reform of Electricity Market Arrangements: Maintaining the Path to 2035 and Beyond

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On market reform: we need to encourage flexibility and investment in long duration energy storage without discouraging wind farm construction. Procedural changes to speed up the development of new networks are also essential.

The Government has adopted a target of zero carbon electricity by 2035 (subject to security of supply)[52] with its "British Energy Security Strategy" pointing towards 95% of electricity potentially being low carbon by 2030[53]. The Opposition has a target of completely zero carbon electricity by 2030[54]. Convulsions in the global gas market have highlighted the risks of depending on gas for heating and electricity production, whilst also making the cost saving of electrical energy from renewables even larger compared with fossil fuels. In this light, how should the electricity market be structured to ensure that there is sufficient investment in low carbon generation to meet decarbonisation targets, that energy users can benefit from the low cost of energy from renewables, and that electricity continues to be supplied reliably at least cost?

A changing energy system

A key difference between the future energy system and today's will be a growing dependency on variable energy sources for which planned production schedules are impossible. There will be periods during which the availability of renewable power far exceeds demand, and a need to avoid excessive "system cost" from meeting demand during periods of low renewable production and from strengthening the electricity network to carry energy from where it's produced to where it's used.

To that end, there has been much discussion of "flexibility", most notably the ability to flex demand and generation in response to the availability of renewable power. This needs to happen both on a GB-wide scale and locally which, it is argued, will reduce the amount of infrastructure that needs to be built. That, in turn, has led to suggestions for a radical change in wholesale market arrangements, to locational marginal pricing (LMP) with prices set, half-hourly, for each individual transmission substation, or 'node'. Advocates of LMP believe that this would better reveal the need for particular actions at specific times and locations, such as use of electrolysers to make green hydrogen and reduce curtailment of wind, charging or discharging of batteries, or imports or exports on a given interconnector. In a system with finite network capacity, it would also allow the market to be split geographically so that areas with an abundance of cheap, renewable energy will not have their price set by a marginal fossil fuelled generator needed to meet demand elsewhere.

One of the main claims of supporters of LMP is that it provides incentives to investors to build new assets in places that complement both what is nearby and the network's existing or planned capacity. However, this is highly contested, particularly by renewable developers who cite various impediments to development in specific locations. Critics of LMP warn that the uncertainties it introduces – not least, the revenues that generators would receive – would push up the cost of capital significantly for new developments and, potentially, lead to early closure of some existing generators. They also warn of a

danger that radical market reform will cause an investment hiatus at a time when, as the Climate Change Committee has noted, *"build rates, for generation and network capacity, must far exceed what has been achieved historically in a number of areas."*[55, g]

LMP is not the only game in town

What has been lacking to date is an in-depth assessment either of a package of measures to sit alongside LMP to soften its adverse effects, or alternatives that ensure more optimal location and dispatch of resources that takes a coordinated view of barriers, costs and opportunities. Possible alternatives include resolution of problems with the setting of tariffs for use of the transmission network, a return to 'invest and connect' rules for access to and development of the network, reform of the balancing mechanism and contracting for re-dispatch actions, and auctions for contracts for difference (CfDs) for low carbon generation on a zone-by-zone basis. CfDs continue to promise benefits both to generation developers in reducing risk, and consumers in reducing sensitivity to marginal prices set by fossil fuels although realisation of consumer benefits depends on learning lessons from how the contracts have been implemented to date. However, even with such interventions, it is increasingly apparent that delivery of electricity transmission network capacity is an especially critical issue.

Lack of transmission infrastructure results in failure to utilise the available low carbon energy and long delays to connection of new resources. A huge amount of new network capacity is needed[h] but major transmission developments have taken as long as 14 years, due in large part to the way in which the planning system works. Public acceptance of developments and safeguarding of local environments are essential but how can agreement be reached on the least bad options?

g. According to AtkinsRéalis, "up to 16GW of new generation is now required each year, every year", to meet the UK's 2035 electricity decarbonisation target and, "The highest ever annual build rate in the UK was recorded in 2017, with 6.5GW of gas and renewable generation brought online.". h. For example, National Grid, owner of the electricity transmission network in England and Wales, says that "five times more power lines need to be built in the next seven years than in the past 30".

Resilience of electricity supply is essential. Signals from any current or proposed energy market structure are unlikely to incentivise investment in the kind of energy storage capacity needed to ensure the adequate meeting of demand during an extended winter 'wind drought'. As the National Infrastructure Commission has pointed out, citing work by UKERC, a mix of facilities is needed to provide security of supply over timescales of minutes to months, and current industry arrangements are unlikely to deliver them.[11]

What about the demand side?

The above discussion has focused entirely on the supply side. Changes on the demand side are essential, not least if the end use of energy for heat in buildings, mobility and industrial processes is to be decarbonised and energy efficiency improved. Innovation is also needed if the potential for flexible demand is to be realised. Much of that depends on the retail market in which some parties have started offering specific services or products to support electrification and flexibility. However, the recent energy price crisis has revealed many problems with the retail market which is now the subject of a specific government review.[56]

Delivering reform

In conclusion, will the Government, either in the months before an election or with the mandate that comes after it, be bold enough to make significant changes to the planning regime to allow network capacity to be built more quickly? Will it have faith in a "Strategic Spatial Energy Plan"[i] developed by the new Independent System Operator and Planner that says where, at a regional level, the best places for different kinds of energy system resources would be which, in turn, sets the need for capacity on, in particular, electricity, hydrogen and CO_2 networks?

Changes to electricity sector commercial and regulatory arrangements are essential. If nodal locational marginal pricing is ruled out, at least in the short-term, other measures must be developed and enacted much more quickly than the sector has typically made changes. As many observers have noted, pace is now more important than perfection.[57]

i. For further discussion of the SSEP, see the section of this Review on electricity networks.

Strategic Planning of Electricity Networks: Playing the Long Game

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On network planning: a more strategic and long-term approach is required. Distribution networks need to be planned in order to accommodate net zero pathways for heating and transport.

Given the rapid expansion of renewable generation required to decarbonise the power sector and the increasing electrification of transport and heating, there is now a consensus amongst key stakeholders that a strategic approach to planning the electricity networks is required. A challenge facing the new government will be to implement a regulatory framework for strategic network planning, in a way which balances the interests of network companies, consumers and broader society.

Electricity networks and regulation

Since the privatisation of the electricity supply industry in the early 1990s the electricity networks have been regulated monopolies. This means that any investments in new assets require approval by the regulator (Ofgem) as part of their price control reviews. Generally, a cautious approach has been taken, with network expansion costs only approved if a company provides evidence that the system cannot accommodate demand for new connections.

This incremental approach to expanding the networks has been sufficient as the assets inherited from the nationalised era formed the backbone of the system and demand for electricity remained relatively stable and predictable. However, transitioning to a net zero power system by the mid 2030s will require a paradigm shift in how networks are regulated, with a greater emphasis on long-term planning and investment ahead of need.

Transmission planning and the Future System Operator

The need for a strategic approach to network planning and investment has been recognised by government and Ofgem.[58] A consultation in May 2023 highlighted the role of the Future System Operator (FSO)[j] in developing a Centralised Strategic Network Plan. Once published, this will be the basis for identifying 'load-related' electricity network investments, both onshore and offshore, deemed necessary to meet decarbonisation targets.[k] It is seen by Ofgem as building on the existing long-term planning approach,[l] but will be used in a more strategic and prescriptive way. It will be used as a basis to narrow the range of credible near-term net zero pathways and to provide recommendations to government and the regulator on the strategic choices they face.

Also published was a series of recommendations by the government's Electricity Networks Commissioner which focused on accelerating the delivery of large transmission projects.[59] One of the key recommendations was that the new FSO, in collaboration with DESNZ, should develop a high level Strategic Spatial Energy Plan. This would assess demand across different energy vectors, the options for energy production and storage, and their locations relative to the capacities of different energy networks. It would inform energy sector investment, national planning guidelines and regulation, the idea being that linking policy, consenting and regulatory approval would help compress the timeframe from options assessment to commissioning of projects.

Decentralised planning at the distribution level

Although the Net Zero Strategy[18] points strongly towards electrification of mobility and heat, there remain uncertainties around the main drivers of distribution network investment: the uptake of electric vehicles and heat pumps. This is due to a high level of local variation in the timing of transitions, the degree of flexibility that can be assumed, and the available network headroom.

The need for a sector-wide, consistent approach to network planning at the local level has been recognised by Ofgem in its recent decision on 'Future of Local Energy Institutions and Governance'[60]. This proposes the creation of Regional Energy Strategic Planners within the FSO and signals that Ofgem itself is aware of the need for improved planning coordination across the regional networks. A key task for these regional bodies will be to improve coordination and consistency of scenario planning at this level of the system. Some of these challenges were brought to the fore during 2023 following a case taken to the Competition and Markets Authority by Northern Powergrid, one of the electricity distribution network operators (see box on following page).

j. As facilitated by the Energy Act 2023, the FSO – referred to in the Act as the Independent System Operator and Planner – will take over the functions of the existing ESO which is part of National Grid from 2024. It will be a public agency regulated by Ofgem and be responsible for operating the system and long term-planning of the electricity and gas networks. k. The CSNP was the outcome of Ofgem's 2022 Electricity Transmission Network Planning Review. l. In advance of the first formal CSNP, an interim process has been in place. Focusing on offshore wind, the ESO developed a Holistic Network Design (HND), through which a number of onshore transmission investments deemed highly likely to be required to enable the integration of 50 GW of offshore wind by 2030 were identified. In late 2022 Ofgem decided to award the incumbent regulated transmission owners £20bn funding to develop these projects as part of their price control deliverables through a mechanism they term 'Accelerated Strategic Transmission Investments' (ASTI). The HND and ASTI built on the Offshore Transmission Network Review launched back in July 2020. This approach to transmission planning incorporates 2050 Future Energy Scenarios into a Ten Year Network Development Plan and identifies projects through a Network Options Assessment.

Using scenarios in regulation: a summary of Northern Powergrid's appeal

As part of the RIIO-ED2 price control for the electricity distribution networks,[n] an effort was made to incorporate a 2050 planning time horizon into the individual business plans submitted by the DNOs. Based on their own regionalised versions of the national Future Energy Scenarios (FES) produced by the transmission Electricity System Operator, each company chose a central scenario for load growth on which to base its business plan. Rather than accepting these company forecasts, Ofgem based its revenue determination on the scenario from the FES with least electrification – *System Transformation*. It then introduced 'Uncertainty Mechanisms' to enable additional revenues to be released if demand on the networks exceeds this baseline. However, this approach was challenged in a case brought to the Competition and Markets Authority by Northern Powergrid who argued that an inconsistent use of scenarios by the regulator in its appraisal of costs led to a misallocation of revenues across different categories, jeopardising its ability to finance activities. In its final determination published in September, the Competition and Markets Authority called on Ofgem to clarify its approach to the use of net zero scenarios in appraising company business plans.[o]

Ofgem has also consulted on reforms to its price control process, to ensure clear and consistent procedures for identifying and remunerating strategic investments across the energy networks. Also under discussion is the 'whole systems' evaluation of network options, such that there is a level playing field between the different network options, including distribution network reinforcement, hydrogen conversion and the construction of heat networks.[m]

The direction of travel

The past year has seen a growing list of proposals, consultations and acronyms around the topic of strategic network planning but slow progress towards outcomes. A key target for the incoming government should be to speed up development of the transmission network, which is increasingly important and requires urgent reform of processes within the networks sector and spatial planning. However, care will be required around the construction of the new institutional architecture underpinning strategic network planning. This should be done in a way which draws on the growing evidence base and builds confidence amongst investors and the general public.

Now that the Energy Bill has received royal assent, important next steps will be to ensure that the new FSO is adequately resourced to fulfil its statutory duties and that its role and authority are sufficiently clear relative to those of Ofgem, the transmission owners, the DNOs and government. It needs the capabilities to advise on complex trade-offs and societal challenges, and not only to model the 'optimal' system.

In the medium term, Ofgem will need to follow through on regulatory reforms and ensure that strategic network planning becomes further embedded in the price control framework. A welcome development would be a more robust appraisal of the benefits – or otherwise – of strategic investment ahead of need at the distribution level. This would assist in the efficient planning of DNO and supply chain resources, along with helping reduce the disruption associated with reinforcing the system.

m. A positive development in this respect has been introduction by Ofgem of a Coordinated Adjustment Mechanism, potentially creating a level playing field by enabling revenue to be transferred between the different networks, depending on the consumer benefits case. n. Between April 2023 and end of March 2028 the total revenue across the electricity distribution sector will be a minimum of £22.2bn. o. CMA partially upholds appeal on energy distribution licence changes. Access here. Following this decision, Ofgem's proposals were published in early November 2023.

Tensions and Trade-offs in the Energy-Environment Nexus

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On the environment: in key policy documents there has been a softening in language from 'impact' to 'consideration'. Environmental protection must be safeguarded throughout policy and more funding needs allocating to research the impact of renewable developments.

The past year has seen an active policy space for energy and the environment as both issues become increasingly pressured, with climate change and biodiversity loss making ever more headlines and causing concern across sectors. COP28 is set to strengthen greenhouse gas emissions reduction targets worldwide, whilst the UK government is already committed to deploy 50 GW of offshore wind by 2030 and plans to quintuple solar by 2035, all of which will impact vast swathes of natural habitat. There are tensions and trade-offs between the energy transition and the environment, as well as potential for mutual co-benefits as nature and natural capital will be greatly influenced by changes in land-use and land management decisions. The UK Government's 2030 Strategic Framework for International Climate and Nature Action[61] is unusual in setting out a framework for action on energy and the environment in parallel: joined-up thinking that is important across the board, given the competing pressures in both areas.

A shift in focus

There has been a shift in the focus of policy documents towards speeding up consenting of renewables deployment, with the UK's Electricity Networks Commissioner Nick Winser publishing an independent report in August 2023.[59] The Offshore Wind Environmental Improvement Package[62] specifically aims to reduce offshore wind consenting time from four years to one year. Although these documents still include mechanisms for environmental protection, the reduction in consent time nevertheless causes concern that environmental implications may not be considered thoroughly. This is reflected in the shift in general wording of policy documents from 'environmental impact' towards 'environmental consideration' which questions whether this constitutes reduced consideration of environmental factors.

Assessment of the latest overarching energy policy documents (2022-23) for the UK, Scotland and Wales highlights that Scotland's Draft Energy Strategy and Just Transition Plan[63] is the only document with a clearly stated vision to embed environmental protection: it will *"ensure the energy transition supports Scotland's ambitions for restoring nature and reversing biodiversity loss, including through avoidance of negative impacts and promotion of nature-based solutions"*. This specific integration of environment in energy policy is likely to be important in the energy transition. In contrast, the UK's Powering up Britain: The Net Zero Growth Plan[3] does not mention environmental risks from expansion of renewables, although it does contain a chapter on natural resources and progress to reduce emissions from / decarbonise this sector. Wales's document, Working Together to Reach Net Zero: All Wales Plan 2021-2025[64] is high-level and makes no mention of environmental risk due to renewable energy expansion. This however needs to be seen within the context of the Well-Being of Future Generations Act 2015, which emphasises sustainable development.

Land-based policies influencing renewables

In 2023 the UK Government released its updated Environmental Improvement Plan[65] which builds on the 2018 25-year Environment Plan to restore nature, reduce pollution and increase prosperity. Over the last two years government has put into operation the three main elements of the Environmental Land Management (ELM) policy[66] and released a framework for Nature markets[67]. Each of the above policies impact on and provide opportunities for renewable energy deployment and management as part of a wider land-use strategy that takes increasing account of nature, through becoming more focussed on natural capital and ecosystem services. This is thought to provide a vital launchpad for providing habitat gains in the UK alongside land-use change. In late 2023 DESNZ's new Biomass strategy[68] was released, emphasising sustainable biomass sourcing and production. Defra also introduced Sustainable Farming Incentive (SFI) payments for miscanthus growers for five biodiversity-related interventions, including managing flower-rich grass margins. A Land-Use Framework for England is due out which should provide further clarity on how land might best be used by large-scale renewables.

Biodiversity Net Gain is now a core part of UK strategy and aims to ensure that wildlife habitat is improved overall following a construction project. The policy proposes a requirement to achieve 10% biodiversity net gain on new housing, industrial and commercial projects, coming into operation early in 2024. There are additional proposals underway for Marine Net Gain (MNG) with a public consultation published in March 2023.[69] Net Gain is expected to have a substantial impact on renewables planning and development both on land and offshore and may restrict the sites available for renewable energy deployment. It also provides opportunities for renewable energy sites to convey additional biodiversity benefits and provide offsets for other projects. For offshore wind a new industry-funded Marine Recovery Fund will support delivery of strategic compensatory measures and should be able to receive payments by the end of 2023.

A new government's first 100 days

Any new government will need to consider energy and the environment carefully to ensure all needs and commitments are met for both issues.

A key area of action should be the strengthening of policy documents and plans for energy to ensure that biodiversity, ecosystem services and natural capital are enhanced and the environment is protected. Such documents could include a Land and Marine Use Strategy that strengthens the Land Use Framework.

A robust system should be developed within biodiversity net gain that allows landowners and seabed license holders to access all data regarding possible biodiversity interventions, so they can explore how they fit in with government incentives and disincentives. There also need to be advisories released on methods to achieve biodiversity gain on land and offshore in different local conditions.

Funding also needs to be allocated to evidence gathering work on land and in offshore areas considered suitable for renewable energy production, to enable a more joined up landscape-based approach to renewable energy development: similar to that already proposed for Habitats Regulation Assessments alongside an extensive programme of marine surveys to assist offshore wind proposals within The Crown Estate[70]. This should include increased funding for researching the environmental impacts of renewable energy technologies including floating offshore wind, solar and biomass, with a view to innovating on multiple land uses and providing environmental benefits.

Sustainable Farming Incentive payments through ELM also need to be widened in scope to include solar and wind farms and to include further diversity of habitat options for renewable energy farms. This will ensure that the expansion of renewable energy provides long-term environmental benefits.

By making these priorities, a new government would set a clear trajectory towards providing environmental protection and connectivity alongside sustainable energy generation, ensuring these two important priorities are addressed in parallel.

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