

Review of Energy Policy: 2017

A UKERC Policy Briefing

November 2017



Summary of recommendations

This is our second review of UK energy policy. It reflects on changes over the past 12 months, including the long-awaited publication of the Clean Growth Strategy.

Our main recommendations are:

1. 'Develop a strategy to avoid 'cliff edges' for the energy sector due to Brexit, including effects on interconnectors, the single electricity market for the island of Ireland, and nuclear power.
2. A White Paper that includes stronger incentives for energy efficiency across the economy, and an enhanced programme of low carbon heat demonstration and evaluation.
3. Learn from the success of offshore wind by extending competitive auctions in the power sector.
4. Minimise the costs of electricity system change and renewables integration by increasing incentives for flexibility.
5. Complement the additional funding for CCS innovation with a new strategy for deployment in the industrial and power sectors.
6. Ensure that vehicle taxation and other incentives are compatible with the target for phasing out new conventionally fuelled cars and vans by 2040. This should be complemented by a wider strategy for mobility that takes into account anticipated new services and business models.
7. A more comprehensive programme of action to involve citizens and communities in the clean energy transition, building on 'Green Great Britain Week'.
8. Identify opportunities for energy policy learning across the UK – particularly in the areas of heat, engagement and energy efficiency.

Executive summary

Jim Watson, Paul Ekins, Rob Gross

Events over the past year have added markedly to uncertainty about the future direction of energy systems. The election of President Trump has heightened concerns that climate change action will happen on the timescale required. The rise of nationalist politics has the potential to disrupt the international co-operation and innovation required to counter the challenges posed by climate change.

Closer to home, Brexit has dominated the political landscape, with huge uncertainties remaining over its impact on investment, policies and market arrangements in the energy sector. The planned withdrawal from Euratom could have significant consequences if alternative arrangements are not implemented in time (see Brexit and energy policy below).

Notwithstanding, this year has also seen some important developments. The Clean Growth Strategy¹ has finally been published. Obtaining cross-government agreement on such a wide-ranging strategy in the current political environment is a major achievement. It makes clear that decarbonising the energy system is a central part of the government's wider Industrial Strategy. Significant funding has been made available to support this ambition, particularly for innovation.

A number of announcements and trends have reinforced the Strategy. These include the planned phase out of petrol and diesel vehicles by 2040; the outcome of the most recent renewable energy contract auction; and the announcement, albeit tentative, that all homes will need to achieve an energy performance certificate Band C rating by 2035. The timescale for the petrol and diesel vehicle phase out could have been more ambitious. Nevertheless, it is likely to increase momentum towards the transformation of the vehicle market.

However, significant gaps remain in the government's plans for meeting emissions reduction targets whilst ensuring that other policy objectives are met. The Clean Growth Strategy acknowledges that more action is needed, particularly outside the power sector. This Review of Energy Policy highlights areas where urgent action is required, based on UKERC research and expertise.

A key priority among these is energy efficiency, which remains an essential component of the cost-effective pathway towards a low carbon energy system. As our briefing in September demonstrated², cost effective energy efficiency measures could reduce household energy use by 25% by 2030. This could bring many positive benefits including lower energy bills, better health and fewer households in fuel poverty.

The Clean Growth Strategy has given some prominence to energy efficiency across the economy. There were significant new announcements on standards for housing, the extension of the Energy Company Obligation (ECO) to 2028, and new funding for innovation and business efficiency. However, it is unclear why another call for evidence on energy efficiency has been launched, given that the government has already spent significant time considering options. There is also much more scope for action to help make businesses more energy and resource efficient (see Industrial energy efficiency).

Brexit and energy policy | Anthony Froggatt

Eighteen months after the Brexit referendum there is still little clarity on what the future relationship between the EU27 and UK will look like, including for energy and climate change. Our report with Chatham House⁶ detailed areas where action may be needed to allow continuing co-operation.

The UK government's White Paper stated 'we are considering all options for the UK's future relationships with the EU on energy'⁷. There has been some progress, and recognition that specific attention needs to be given to at least parts of the energy sector. A government position paper recognised the value of the future Northern Ireland and Republic of Ireland energy market framework citing 'the importance placed on cross-border cooperation in the Belfast ('Good Friday') Agreement'⁸. Maintaining and continuing the integration of the Single Electricity Market across the whole island should remain a priority.

The government also stated that the UK will also be leaving the Euratom Treaty. A smooth transition would require a three stage process. The first is new domestic legislation, the Nuclear Safeguards Bill 2017-2019, which is currently

under parliamentary scrutiny. Without it, the UK cannot proceed to the second stage, which is the negotiation of a new safeguards agreement with the International Atomic Energy Agency, ensuring compliance with international non-proliferation requirements. Only then can the UK sign bi-lateral agreements with countries, enabling the exchange of nuclear materials and equipment. Negotiations on leaving Euratom have been ongoing, and the Secretary of State for leaving the EU said that he was encouraged by the progress made in the Fourth Round of Negotiations in September.

Despite this, the UK government has not given any indication of its desired outcome for its post-Brexit relationship with the EU's energy or climate regimes. The UK government and the European Commission have failed to publish any position papers on energy, so important questions remain unanswered. With effectively only 12 months of negotiating time remaining, concerns over the energy and climate change consequences of no deal are rising. A transitional arrangement may be required, particularly to avoid a 'cliff edge' for the power sector.

⁶Froggatt, et al. (2017) Staying Connected Key Elements for UK-EU27 Energy Cooperation After Brexit. ⁷BEIS. (2017) The United Kingdom's exit from, and new partnership with, the European Union. ⁸Northern Ireland Office and Department for Exiting the European Union. (2017) Northern Ireland and Ireland – position paper

At times, the focus on longer term solutions to high energy bills and associated fuel poverty has been overshadowed by the political debate about price caps. The need to protect consumers on low incomes is clear. But action should also focus on minimising bills rather than focusing solely on prices. As the Committee on Climate Change has shown, energy efficiency has more than offset rises in household energy prices between 2008 and 2016.

The unexpectedly low price for offshore wind in the most recent Contracts for Difference auction was very positive. Alongside other auctions around the world, this demonstrates how technology costs can be reduced through well designed policy.

This price reduction offers important lessons for government. First, it demonstrates the importance of policies that create markets for new technologies by complementing carbon prices. These policies should continue to be a central part of the government's approach to clean energy innovation, alongside the £2.5bn that will be spent on research, development and demonstration between now and 2021. This requires more certainty beyond 2020/21 about arrangements for further contract auctions and how they will be paid for. Dieter

Helm's call for a single electricity and capacity auction is one possibility. But this may not meet the needs of investors, and risks pushing up system costs by requiring each generator to self-balance³.

Second, as Helm emphasised, it reinforces the need to challenge assumptions about the economics of electricity. As technology costs fall, system costs will become more important. Our recent review of the evidence on the costs and impacts of intermittency⁴

concluded that costs remain modest with up to 30% of electricity from intermittent renewables, this is double today's share. International evidence shows that a more flexible electricity system will have lower integration costs.

Whilst the government and regulator have set out some plans for increasing system flexibility, there is more to do. The government has pledged to support further innovation. This will need to be accompanied by careful evaluation and changes to established market and institutional frameworks that were designed for a different system. It will also require companies and government to anticipate new risks (e.g. the potential for cyber-attacks) and to ensure that all consumers can benefit – including those on low incomes.

This year, our review also highlights the role of devolved administrations, particularly the Scottish government. Scotland is developing a distinctive Energy Strategy and the Welsh government has agreed new energy targets. Whilst the overall goals may be similar to those of the Clean Growth Strategy, these developments suggest a shift towards a more mixed approach to policy across the UK. This has the potential to improve effectiveness and accountability in areas such as energy efficiency and heat. However, opportunities for learning from this diversity across the UK should not be missed.

One of the most significant gaps in the Clean Growth Strategy is public engagement. As we discuss in this review, recent UKERC research⁵ has emphasised the need for a broad range of engagement strategies. Urgent work is required by government, companies and NGOs to involve citizens and communities in the energy transition. If such engagement is neglected, meeting the Strategy's goals is likely to be a much more difficult task.

¹ BEIS. (2017) Clean Growth Strategy. ² Rosenow et al. (2017) Unlocking Britain's First Fuel: The potential for energy savings in UK housing. ³ Helm, D. (2017) The Cost of Energy: Independent Review. ⁴ Heptonstall et al. (2017) The costs and impacts of intermittency – 2016 update. ⁵ Chilvers et al. (2017) Public engagement with energy: broadening evidence, policy and practice

Industrial energy efficiency | John Barrett

Industrial energy demand accounts for 16% of the UK's total energy consumption⁹. In addition to this, an equivalent amount of industrial energy is required from outside the UK to satisfy our consumption¹⁰. While industrial energy demand has reduced significantly over the past 40 years, due to energy efficiency improvements and changes in our industrial structure, these reductions have slowed. The Clean Growth Strategy confirms some UK government funding to incentivise industry to acquire more energy efficient technologies and adopt energy saving measures, however a precise figure has not been specified and it fails to identify resource productivity within industry as an option.

While not all energy efficiency options have been adopted, recent research from the Centre for Industrial Energy, Materials and Products (CIE-MAP) shows that a considerable proportion of the 'Quick Wins' have been taken-up, increasing the challenge for further reductions¹¹. Energy demand for industry is concentrated in a small number of energy intensive sectors such as steel and cement, which have already achieved significant improvements in energy efficiency.

To understand the potential of future options for energy demand reduction in industry requires a more detailed analysis of outputs (i.e. materials and products), and how these can be produced and consumed more efficiently. Improving the efficiency of material use can improve the competitiveness of UK products and services, support economic growth and deliver substantial carbon emissions reductions. However, current drivers for industry to pursue material productivity strategies are weak.

CIE-MAP's recent assessment demonstrated that resource productivity strategies could collectively bridge the gap between currently outlined strategies and the level of ambition for the UK to achieve the 5th Carbon Budget¹². The UK's Industrial Strategy and the anticipated Waste and Resources Strategy need to recognise the role of resource efficiency as a key vehicle for driving energy efficiency in industry, and boosting UK productivity.

⁹ BEIS. (2017) Digest of United Kingdom Energy Statistics 2017. ¹⁰ Barrett et al. (2013) Consumption-based GHG emission accounting: a UK case study. ¹¹ Scott et al. (2017) Extending European energy efficiency standards to include material use: an analysis. ¹² Scott, K. (2017) Resource consumption, industrial strategy and UK carbon budgets

A rapidly changing electricity system

Keith Bell, Sarah Darby, Janette Webb

Whilst challenges have not fundamentally changed, the UK electricity system has continued to rapidly change. We have seen a series of firsts, including the first 24 hour period without any coal generation for over a century, and record highs in renewables generation. Welcome attention is being paid to how an increasingly decarbonised electricity system will be operated, and at least cost. Reductions in the cost of offshore wind, the Helm review, and proposals for price caps have all kept electricity costs high on the agenda.

Retail pricing

There has been much debate surrounding electricity retail prices, which is now centred on 'standard variable tariffs' (SVT). Many commentators, including Ofgem and the Competition and Markets Authority, have identified weak consumer response as a problem because most consumers have been slow to switch from expensive SVTs. However, most of the cheaper tariffs available are fixed term (and rate) deals which revert to more expensive SVT prices when they expire. Ofgem has encouraged the industry to reduce this disadvantage for consumers who are loyal to their suppliers.

The roll-out of 'smart' meters should eliminate billing concerns, enabling itemised billing and providing a breakdown of direct energy consumption costs versus those that facilitate reliable supply. It will also open up opportunities for innovative tariff arrangements, including those rewarding consumers for flexible energy use. The roll-out is well behind schedule, due mainly to delays in technical standard development, e.g. the forthcoming 'SMETS2' meters, and consumer reluctance. However, once installed, surveys suggest a generally positive consumer experience, particularly for prepayment customers¹³.

Cost of renewables

The recent Contracts for Difference auction revealed significant cost reductions for offshore wind, down from £114.49/MWh in the 2015 auction to £57.50/MWh. If delivered, these surpass contracts awarded to wind farms in Dutch and German waters in the last year. Depending on assumptions about fuel costs, this is significantly lower than that of gas-fired electricity.

The Clean Growth Strategy did not provide further detail on plans to replace the Levy Control Framework that limits the policy costs that can be added to consumer bills. Clarity on this is now urgent given that the Framework only runs to 2020/21. Just as important is clarity on future arrangements for low carbon contracts.

As we have argued elsewhere¹⁴, recent cost reduction successes reinforce the case for continuing the use of auctions for low carbon power that provide sufficient investor confidence and can be 'subsidy free'. We disagree with the Helm review that an economy wide carbon price and a single auction should replace these contracts.

This is unlikely to be as effective at driving further investment and cost reductions, and risks paying too much to integrate intermittent renewables into the system.

Investment in plants with low short-run costs but significant capital costs, such as wind farms, depends on long-term contracting for cost recovery, as day-ahead or spot prices are low under windy, sunny conditions. There is a growing recognition of the challenges associated with reliable system operation under variable weather conditions. Greater attention needs to be paid to these issues, addressing engineering and market arrangements to deliver the most cost-effective solutions. Our recent evidence review concluded that, under UK-relevant conditions, the principal costs would amount to around £10/MWh of variable renewable output up to around 30% intermittent renewables. Furthermore, such costs will be minimised by increasing the incentives for system flexibility.

System flexibility

Reports published by BEIS¹⁵ and Ofgem¹⁶ included welcome promises to develop new regulations for battery storage and move towards the standardisation of electric vehicle charging points. However, these reports lacked detail, with development seemingly being left to industry players such as National Grid and the Energy Networks Association. Evidence of deeper thinking on market structures and price signals over the medium term that could enable cost savings through the optimisation of system flexibility is also lacking.

The initiation of the re-appraisal of balancing service needs represented by the National Grid 'Systems Needs and Product Strategy' consultation is welcome. As is the 'Open Networks' project led by the Energy Networks Association. The need for better coordination between transmission and distribution is vital given the growth of distributed energy resources. Network licensees will need to be closely involved in reforms of institutional arrangements. However, they are approaching the impending RIIO-2 price reviews and changes such as the split of National Grid's transmission owner and system operator activities. We therefore encourage strong leadership from Ofgem and BEIS to ensure that strategic initiatives bear fruit in a timely manner.

¹³ Ipsos MORI (2017). Smart Meter Customer Experience Study: Post-Installation Survey Report. ¹⁴ UKERC. (2017) Building our Industrial Strategy – Response to the Green Paper. ¹⁵ BEIS & Ofgem (2017). Upgrading Our Energy System Smart Systems and Flexibility Plan. ¹⁶ Ofgem. (2017) Our strategy for regulating the future energy system.

Still no sign of ‘Gas by Design’

Michael Bradshaw, Paul Ekins

Since last year’s review the crucial role of natural gas in the UK’s energy system has become even more apparent. In 2016 gas accounted for nearly 40% of total UK energy consumption and generated 41.7% of electricity.⁹ Over 80% of UK households currently rely on natural gas for their heating, yet the Clean Growth Strategy contains no clear vision for the role of natural gas, mentioning it only five times in 165 pages.

A future role for gas?

There is considerable uncertainty surrounding the future role of gas – an inevitable consequence of the need to reduce carbon emissions. In the current market, with falling gas prices and support from the carbon floor price, natural gas has outcompeted coal; yet growing renewable power generation requires natural gas to play a balancing role, rather than providing significant base load. This will be increasingly the role for gas-powered generation, with future requirements remaining unclear. Aging capacity will not be replaced on the basis of the traditional business model.

Natural gas plays a key role in meeting winter heating demand, a role which is incompatible with the scale of decarbonisation required. It is in this context that the system operator, National Grid, and distribution networks are lobbying for a new role for natural gas in the UK energy system, including use as a transportation fuel and feedstock for the hydrogen economy, which will require carbon capture and storage (CCS) as this is essential to using methane to produce hydrogen.

Still fixated on physical security of supply

The government remains fixated on the physical security of supply. It is recognised that domestic production will continue to fall in the 2020s and import dependence will increase. A report published by BEIS¹⁷ supported by a Cambridge Economy Policy Associated Ltd study¹⁸, considers the impact of future energy system transitions. Whilst we welcome the conclusion that the UK’s position is relatively secure, this analysis only focuses on security of supply. Uncertainty over the security of domestic gas demand is perhaps more likely to threaten the resilience of the system.

Gas supply: imports or shale?

As domestic production falls, imports of liquefied natural gas (LNG) will become increasingly important. The International Energy Agency¹⁹ predicts an extended period of over-supply, although the LNG industry maintains that a cut in investment now will lead to market tightening in the 2020s. As most of the UK’s LNG contracts are flexible, this could mean higher LNG prices just as the UK is turning to the global market. Alternatively, domestic shale gas production could have reached a material level and could serve to reduce the level of import dependence.

Following the Scottish Government’s decision to indefinitely extend the moratorium on shale gas development, potential production is limited to England. Here the industry is at a critical juncture, with companies poised to conduct hydraulic fracturing. It will be some time however before a judgement can be made on the commercial value of shale gas. There will be no significant domestic production before the early 2020s and falling domestic gas production will mean demand will have to be met from other sources.

Don’t mention the ‘B’ word

The UK is fully integrated into a northwest European gas market, supplied by Norway and Russia, as well as domestic supply and some LNG. Should Brexit complicate the UK’s participation in this market it will likely increase the volatility of the National Balancing Point – the wholesale price paid for gas, and challenge future UK gas security.

While not a priority in the negotiations, the uncertainty created by Brexit is impacting the UK’s energy industry. ‘No-deal’ is likely to result in a change to the status of our two interconnector pipelines and would place the UK outside the new gas security measures approved by the European Parliament. It would also complicate gas trading with the Republic of Ireland.

Furthermore, Brexit could exclude the UK regulator Ofgem, and companies such as National Grid, from key EU institutions, meaning the UK will lose influence over participation rules for the single European gas market. In short, gas security is delivered by a fully-functioning domestic market that is part of a wider market. If Brexit serves to isolate the UK from this wider European context it could result in increased costs, greater volatility, and exposure to global market conditions.

While not a priority in the negotiations, the uncertainty created by Brexit is impacting the UK’s energy industry.

¹⁷ BEIS. (2017) Gas Security of Supply: A strategic assessment of Great Britain’s gas security of supply. ¹⁸ CEPA. (2017) A Review of Gas Security of Supply with Great Britain’s Gas Market—from the present to 2035. ¹⁹ IEA. (2017) Global Gas Security Review: How is LNG Market Flexibility Evolving?

Creating options for low-carbon heat

Janette Webb

Heating used in buildings accounts for 40% of UK energy consumption and a fifth of greenhouse gas emissions. Including industrial heat, this increases to nearly half of energy use and one third of emissions. The Committee on Climate Change identified that the 2030 carbon budgets will not be met in the absence of a heat strategy. The Clean Growth Strategy makes some headway addressing this, but lacks the necessary policies required.

The Strategy is right to emphasise action on energy efficiency in buildings. This should be integrated with incentives for low carbon heat. Our recent briefing paper confirmed the considerable benefits of household energy efficiency [2], demonstrating a cost-effective 25% reduction in household energy demand and social gains of up to £7.5bn to 2030. We therefore repeat our calls for a Heat and Energy Efficiency White Paper to set out comprehensive actions on affordability and new markets for heat technologies and services.

Options for low carbon heat

The Strategy proposes three heat pathways to 2050: electric, hydrogen, and biomass energy with carbon capture and storage (CCS), each with different implications. These heat pathways are diverse. Differences, interdependencies and trade-offs need to be understood and addressed: heat pumps use residual heat sources; gas is a combustion fuel and district heating is a distribution and storage infrastructure. The electricity pathway would entail a shift to electric heating, which would lead to challenges and costs due to seasonal variation in heat use, especially if unaccompanied by significant progress with energy efficiency. Hydrogen would require major investment in the gas grid, as well as methane reforming systems and new heating appliances. The emissions removal pathway notionally offers more flexibility, but concentrates hydrogen use in industry, with electric heating retained in buildings.

For the second and third pathways, CCS would be crucial. It is therefore frustrating that policies for CCS remain in a holding pattern. Whilst research, development and demonstration funding is welcome, the world-wide stalling of CCS has increased the risks that these technologies will not be cost effective when required.

Low carbon sources for district heating include heat recovered from industry, but this is largely absent in the UK.

Low carbon sources for district heating include heat recovered from industry, but this is largely absent in the UK. The Strategy makes a small (£18M) commitment to an industrial heat recovery programme, alongside funding for improving low carbon heating technologies, but if this is to contribute significantly, more investment is needed.

The existing Heat Network Investment Project is positioned as key to a competitive market, but investment would need to increase very substantially year on year to meet the envisaged scale of development. This is highly ambitious given the absence of heat planning and regulation, and the lack of UK expertise. The Heat Network Investment Project pilot used only £24M of the available £39m budget, indicating the challenges of scaling up and the need for a more planned approach.

Least regrets actions

The Strategy rightly targets off-gas buildings, with proposals to phase out installation of high carbon heating in the 2020s. Retrofit of buildings to high standards will be required to make this cost effective. Policies will therefore need to combine building and technology regulation, taxation and incentives, and should apply to every building.

As we concluded in last year's review, there is an urgent need to demonstrate the different technologies and pathways for low carbon heat, to inform future decisions and to learn what works best in different contexts. The Renewable Heat Incentive will be critical, but because it pays per unit of heat produced it excludes those without the upfront capital to invest. Zero interest loans, already available in Scotland, need to be universalised.

There is scope to learn from Scotland here. The Scottish Government has established a national energy efficiency programme, and is consulting with local government powers for heat and energy efficiency strategies. Whilst the Strategy moves in this direction in England, specific policy mechanisms should be strengthened. The target of retrofitting homes to EPC Band C by 2035 is included, but qualifications on grounds of practicality and cost will blunt its effectiveness. There is also no plan to reinstate the zero-carbon homes standard. The bigger challenge of professionalising the entire energy efficiency industry also needs to be addressed.

Transport: more than electric vehicles

Jillian Anable, Christian Brand

The past year has seen a strong leap in sales of plug-in electric vehicles in the UK. An average of 4,000 have been sold per month (1.5% of all sales) during 2017 so far, up from just under 3,000 in 2016. This momentum has been reinforced by the announcement of a target to ban the sale of new internal combustion engine petrol and diesel cars and vans by 2040, coupled with investment in electric vehicle charge points and hydrogen refuelling infrastructures.

At the same time, sales of new cars have fallen, especially in the business sector, with sales of new diesel cars plummeting by a third in the wake of Dieselgate²⁰. Road traffic has increased by 1.7% over the year, albeit largely driven by population growth. Beyond the attention on ultra-low carbon, light duty vehicles, there is a lack of a holistic strategy. Energy demand, particularly from heavy goods vehicles and aviation, continues to challenge the ability of this sector to contribute to economy-wide clean growth targets.

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The value of targets

The target to end the sale of all new conventionally fuelled cars and vans by 2040 is welcome, though targets from other governments and companies suggest it could have been more ambitious. Its assertive announcement in the Air Quality Strategy²¹ and reiteration in the Clean Growth Strategy represents a strong signal to consumers and businesses alike. This is especially important as the market for plug-in vehicles is reaching a critical point in the trajectory from early adopters to mainstream purchasers²², whereby confidence in the longevity of the technology carries more weight. There is only so much that a target on its own can achieve. Crucial underpinning investment in charging infrastructure has also been announced, company car tax is now based on both emissions and range, and major vehicle manufacturers are repositioning themselves towards electric vehicles. However, efforts could be undermined by changes in Vehicle Excise Duty which will no longer differentiate between cars after their first year of registration.

No target for energy demand in use

The devil is in the detail of the target. As worded, it leaves the door open for fossil fuel demand in the form of hybrid and plug-in hybrid electric vehicles. Overall, policy is blinkered with respect to energy demand in use, failing to acknowledge the proportion of miles undertaken on the electric charge and the challenge of incentivising charging behaviour for optimal grid-wide decarbonisation.

So far, early market success has been with cars, not vans; vans are the fastest growing element of road traffic, yet an uncertain fit in many cases for electric propulsion.

Crude assumptions and gaps in understanding may account for the wildly varying assessments of what might be possible, and when. For instance, the Clean Growth Strategy states “at least 30% of new car sales are expected to be ultra-low emission vehicles by 2030 and possibly as many as 70%”. This is a very large margin of uncertainty, particularly given that it does not incorporate vans, and the CCC’s sectoral scenario for the fifth carbon budget stating that “the combination of plug-in hybrids and battery electric vehicles reach [around 60% in 2030] of new car and van sales”²³.

The transport sector is about more than cars and vans

The transport sector continues to lag behind other sectors; energy demand is 15% higher and emissions essentially no lower than 1990 levels. The fastest pockets of growth, including traffic on trunk roads (not in urban areas), air travel and freight demands, are all waiting for government strategies to steer demand management and fuel diversification. Brexit may impact on these long distance demands, potentially increasing global movements, not to mention the reliance on the EU Emissions Trading Scheme as a mechanism to address aviation emissions.

The Cycling and Walking Investment Strategy to 2040 could have been much more ambitious. The funding detailed amounts to less than £2 per head annually outside London, as compared to £24 a head in the Netherlands. Meanwhile, a true revolution may be happening in spite of a lack of steering by policy, in the form of the rise of on-demand and shared mobility, manifested by new services and business models such as car-sharing, ridesourcing, bike-sharing and crowdsourcing delivery. These are fundamentally changing the landscape of travel and transport and deserve more attention at this pivotal point, where the momentum towards electrification needs to keep pace with rising demand for long distance and on-demand mobility and services.

²⁰ SMMT. (2017) SMMT Vehicle Data: Car Registrations, October 2017. ²¹ DEFRA. (2017) UK plan for tackling roadside nitrogen dioxide concentrations. ²² Brand et al. (2017) Modelling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach. ²³ CCC. (2017) Meeting Carbon Budgets: Closing the policy gap, 2017 Report to Parliament.

Engaging society with the energy transition

Nick Pidgeon, Christina Demski and Darrick Evensen

In the 2016 review we outlined some of the most the important reasons for engaging wider society in the energy transition. Failing to account for public values in decision-making can lead to public resistance to the adoption of low carbon policies and technologies or ineffective implementation; both outcomes have potentially significant economic consequences.

There may be areas where meeting the UK's low carbon energy goals will be facilitated through responding in a timely way to emerging citizen concerns and action; the current debate regarding air quality in UK cities is a case in point.

We argued in 2016 that the government's approach needs to draw upon comprehensive evidence regarding public engagement in order to overcome barriers to change and harness untapped citizen actions. One year on that need has become more urgent, given the rapid pace of technological and business innovation in the area of energy demand and supply.

More public engagement required

The level of UK and devolved government engagement with society regarding the coming energy transition has been variable. It is disappointing that the Clean Growth Strategy makes relatively few references to citizens or the public, as actors in the energy transition. Although UKERC fully endorses its aspiration that "clean growth has to be a shared endeavour between Government, business, civil society and the British people", it remains to be seen how this aspiration will be put into place in practical terms. It must capitalise upon the broader public mandate for a low carbon transition amongst UK citizens²⁴.

In the Strategy, the UK government proposes a Green Great Britain Week to engage people in the importance of tackling climate change and air quality. Whilst a step in the right direction, this will require significant funding and commitment on the part of organisers if it is to succeed, alongside suitable independent evaluation. It falls short of the sustained year-on-year engagement effort that is required to meet the size of the clean growth challenge. Here we simply repeat the observation that UKERC research has shown the sheer diversity of ways that people are already engaging with the energy system.²⁵ This evidence suggests that at a minimum, Green Great Britain week should aim to harness some of that diversity and potential, facilitating maximum bottom-up participation by individuals, citizen groups, and other organisations engaged with the low carbon energy agenda.

Learning from Scotland

The Scottish Government has, by contrast, explicitly recognised the need to engage citizens with the wider energy transition in its Energy Strategy consultation.²⁶ UKERC's response to this strategic approach was supportive, documenting some of the methods through which this might be achieved, and the opportunities and issues that might form the focus of future engagement efforts.²⁷ It will be important that the Scottish Energy Strategy, when it is also published, draws upon the available evidence in order to put into practice a firm commitment to engagement.

Cost of energy

As discussed earlier in this review, the cost of energy has continued to have a high profile in the past year. The independent Helm Review has focused on how to keep prices as low as possible. In itself, this is a laudable goal, but focusing too heavily on price reduction could lead to myopic pursuit of policies that keep costs down at the expense of other important goals.

Recent UKERC research conducted through surveys has revealed that personal concerns about energy costs only play a small role in the public's perceived importance of energy affordability; beliefs about government and energy company responsibility and concerns about equity appear to be more important.²⁸

Whilst the survey respondents on average see the public having some responsibility for paying for energy transitions (12% of total cost), they assign substantially high proportions to energy companies (45%) and the UK Government (32%). Furthermore, a follow-up nationally representative survey shows that the public is more willing to pay for the costs of the transition, including increases in costs on bills, if they view key actors in the UK energy system (i.e., energy companies and Government) as giving voice to the public, and being honest, open, and respectful.

²⁴Demski et al. (2015) Public values for energy system change. ²⁵Chilvers et al. (2016) Mapping energy participation: A systematic review of diverse practices of participation in UK energy transitions, 2010-2015. ²⁶Scottish Government. (2017) Draft Energy strategy. ²⁷Demski et al. (2017) Public engagement with energy system change in Scotland.

²⁸Demski et al. (2017) Public prioritisation of affordability within the UK energy transition.

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