Sustainability *first*

Let's Get It Right:

A suggested framework for improving Government low carbon interventions

A discussion paper by

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About Sustainability First

Sustainability First is small environment think-tank with a focus on practical policy development in the areas of sustainable energy, waste and water. In 2015, we will celebrate our fifteenth anniversary.

Our aim is to improve knowledge and understanding of complex multi-disciplinary issues in energy, water and waste. We develop implementable ideas which can make a difference for sustainability in these key policy areas – including the roles of economic and other regulators. We carry out research and analysis, publish papers and organise policy seminars. Our primary focus is on policy and solutions within the UK, but we draw on experience and initiatives both within and outside the UK.

Recent work on energy includes our major three-year (2011-14) multi-partner project **'GB Electricity demand – *realising the resource*'.** This involved a systematic look at the policies, regulatory approaches and commercial and consumer issues for development of an active demand-side in the GB electricity markets**.** All project papers are published on the Sustainability First website. Together with our earlier studies on energy efficiency, household smart energy meters, and smart energy tariffs & demand response, we have brought significant practical insight to the development of policies and measures for smart sustainable energy.

Recent work on water includes our 2013 discussion paper **'Water Consumers Today & Tomorrow – aligning the short- and long-term interests of water & sewerage consumers'**, followed by a Sustainability First roundtable on resilience in water supply in spring 2014.

We are a registered charity. Our trustees are: Ted Cantle CBE (Chair); Phil Barton (Secretary); Trevor Pugh (Treasurer); Derek Osborn CB; David Sigsworth; Sara Bell; Derek Lickorish MBE; and Richard Adams OBE.

Sustainability First projects are developed and delivered by associates and trustees. Sustainability First Associates are Judith Ward (Director, part-time), Sharon Darcy, Gill Owen, Rebekah Phillips, Clare Dudeney and Jon Bird.

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Responsibility for the findings and the recommendations and all errors rest with Sustainability First.

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1. Executive summary

Government intervention in the development of the low carbon energy economy is a necessary evil. There are several reasons for this. On the supply side, most of the technologies involved are still largely immature and currently more expensive than their longer term commercial potential, which even then might be more expensive than the fossil fuel equivalent. There is a social and political cost to power disruptions, which cannot always be reflected in the price of electricity. And, in future, we may no longer be able to rely on written-down fossil-fuelled generating plant to provide flexibility to balance supply and demand. On the demand side, interventions may be needed because customers, whether domestic or business, do not always respond as economists might predict to standard economic incentives.

As a result, a range of interventions has been introduced in the UK initially to support large and small scale low carbon electricity generation and investment in energy efficiency and demand-side response, and more recently major changes to the structure of the wholesale electricity market as part of the Electricity Market Reform package.

Government intervention, however, is prone to a number of drawbacks. It can encourage rent-seeking by those who stand to profit from the intervention and intensive lobbying of government by both those in favour of the intervention and those against it. It requires the setting of targets, either by amount or price, which inevitably turn out to be wrong because the government does not have perfect foresight, and therefore the targets may need subsequent adjustment. In deciding when and whether to make such adjustments, a balance needs to be struck between giving stability in policy to encourage investors and avoiding excessive costs to consumers and tax payers.

The government's track-record on delivering low carbon interventions is mixed. Some interventions, such as the Feed-In Tariff for small scale renewables and the various energy supplier-driven energy efficiency schemes, have delivered significant outcomes, while others, such as the Green Deal have been less successful. But many interventions have been subject to unplanned changes in direction as a result of unforeseen changes in costs or circumstances, where the changes introduced have tended to favour control of costs over the need to protect the interests of investors. The willingness of investors to commit to low carbon investments has suffered accordingly. Given the level of investment that is forecast to be needed to meet the government's low carbon ambitions, failing to maintain an environment that encourages investors to invest is, to say the least, unfortunate.

An examination of the reasons for the changes that have led to this failure of investor confidence suggests that a number of issues are involved:

- Setting robust targets is made more difficult by a lack of technical expertise within government on issues such as an understanding of the way technology-driven cost curves develop, and the consequent problem of assessing the robustness of information provided by parties with an interest in the outcome ;

- an over- reliance by officials on implicit assumptions contained in the economic modelling underpinning the decision ;
- the greater politicisation of energy policy decisions as a result of many small scale energy projects now impacting larger numbers of people;
- the risk of unnecessary changes to interventions when governments change; and
- the lack of collective long-term experience within government of introducing, and maintaining low-carbon intervention policies.

This last point results from the change in government approach to energy policy in recent years as a result of climate change ambitions, away from a general reliance on the free market to a policy of government intervention.

There should now be sufficient experience of the success and, perhaps more importantly the short-comings, of specific government interventions to do better in future. Based on a high-level assessment by Sustainability First of these interventions, together with an appreciation developed since 2010 of the likely issues that interventions may raise, this paper proposes a framework, or set of guidelines, and to articulate these clearly, to assist those introducing or administering low-carbon interventions. Such a framework could sit alongside the Better Regulation framework to guide officials:

1. **No retrospection.**
2. **Stability of intervention policy with well-defined and pre-determined break points.**
3. **Underpinned by well-understood cost curve predictability and development of a competitive supply-chain.**
4. **Use of economic modelling only where it adds value, with the assumptions and methodology behind the projections made explicit.**
5. **Dialogue with Brussels to ensure long term consistency with State Aids regime.**
6. **Be clear on the impact on different user groups (eg fuel poor, all-electric households, and intensive energy users).**
7. **Contracts may be preferable to legislation.**
8. **Price-based intervention often preferable to quantitative target.**
9. **Long term nature of investment requires a cross-party approach.**
10. **Learn from previous experience in UK and elsewhere and try to avoid conflicts with the single European energy market.**
11. **Progression from even-handed support for new technologies over a clear trajectory to a technology-neutral approach with a common price for carbon.**
12. **Keep number and amount of new interventions to a minimum and reduce complexity.**

Points 1 to 8 provide a suggested framework for the structure of any specific intervention.

Points 9 to 12 provide more general guidance on intervention policy in general.

Drafts of this paper have been reviewed by a number of interested parties and their comments gratefully taken into account. Moreover, in April 2015, Sustainability First held a roundtable where twenty-five participants were invited to the proposals in the paper and to 'road-test' the proposed principles as a future framework for the design of low-carbon interventions. The workshop drew on a wide range of experience, both from the low-carbon sector and the financial community, and was most useful in helping to refine the arguments in this final version of the paper.

We now offer this set of principles to those in government tasked with constructing new low-carbon interventions as a convenient way of encapsulating some of the lessons from the past with a view to more successful implementation in future. They may also be of use for those scrutinising proposed new interventions, such as the Energy and Climate Change Select Committee, the National Audit Office and those in the low-carbon and financial sectors, in seeking to comment on or provide advice to policy makers.

2. Introduction

Recent experience of government policies for reducing carbon emissions has shown that there are lessons still to be learnt about how to create and implement such policies in a way that both encourages private sector investment and maintains adequate political and budgetary control to ensure cost effectiveness. This applies to both supply-side initiatives, notably to support low carbon generation, and demand-side initiatives, aimed at encouraging energy efficiency and customer behaviour change. (Indeed, with the encouragement of domestic renewable generation and moves towards smart meters and smart grids, the supply- and demand-side are starting to merge.) This paper argues for a framework, or set of guidelines, to be used alongside the Better Regulation regime, to improve future policy delivery.

In order to construct such a framework, it is important to examine and take into account the arguments that have been raised against such interventions, as well as the lessons that can be drawn from experience with government interventions to date. Accordingly, the next section examines the arguments against intervention, notably made in a recent paper by Colin Robinson, and argues why intervention is nevertheless needed, recognising that policy needs to ensure that the problems that intervention introduces must be addressed from the outset. The following two sections examine a number of government low carbon interventions and draw lessons from this experience. The final section brings together the findings of the previous sections into a suggested set of guidelines.

3. Why government low-carbon interventions are necessary

There are many good and sound theoretical arguments against government intervention in markets[1]. Accordingly, any justification of intervention needs to be convincing, and the implementation of the intervention needs to take into account the arguments against intervention. In December 2013, the Institute of Economic Affairs published a paper by Professor Colin Robinson, "From Nationalisation to State Control"[2], in which he argued specifically against intervention in the areas of interest to this paper: security of energy supply and climate change mitigation. We list first his arguments in general against intervention (to which we shall return later) and then deal with the specifics.

Professor Robinson argues that:

- Intervention makes lobbying of the government highly profitable - what Professor Dieter Helm[3] calls, quoting Cohen and Noll, the "technology pork barrel" – to the detriment of the consumer and tax payer.
- Large incumbent energy companies, government and regulatory officials and research scientists all benefit from a more regulated market – again, to the detriment of the consumer and tax payer.
- For it to be successful, intervention requires perfect foresight by government – which is impossible.

Against each of these impediments, Professor Robinson concludes, the operation of the free market is a more effective remedy.

For some years in the UK, the electricity and gas markets did, of course, operate comparatively freely. The first 10-15 years following the privatisation of the electricity industry in 1990 shook considerable excess cost out of the electricity industry (and, in due course, also from the gas industry once the British Gas monopoly was broken), as competition was gradually extended from the wholesale to the retail market. And the "dash for gas", in terms of investment in new gas-fired power stations (not, it must be said, always driven by pure economics), ensured an adequate supply of new base load and peaking generation. This in turn meant that older base load plant, which by this time was largely written down, could run profitably as both mid-merit and reserve plant to deal with the daily and seasonal variation in electricity demand.

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[1] Intervention is taken here not to mean appropriate regulation of market behaviour to promote competition (which I suspect that Professor Robinson would not oppose), but a loading of the scales to achieve a specific market outcome.

[2] http://www.iea.org.uk/publications/research/from-nationalisation-to-state-control-%E2%80%93-the-return-of-centralised-energy-plann

[3] http://www.dieterhelm.co.uk/sites/default/files/Why_so_little_08.pdf

Ironically, it was the modification of the electricity market known as NETA (new electricity trading arrangements), introduced in 2000 to deal with concerns about possible oligopolistic influence over peak prices in the previous electricity pool arrangements that led to the increased concentration and vertical integration that we see today in the electricity market. The removal of the capacity element of the electricity price and the reliance of the new market on a purely energy-related price, together with high charges for suppliers being out of balance, introduced significant increased risk into the role of the electricity generators and suppliers. The easiest way to reduce this risk was to internalise it into a vertically integrated enterprise, which could then better match generation to its customers' usage.

Despite the creation of the "Big Six", the electricity market might have continued to be fit for purpose into the future[4], were it not for the need for the UK to reduce its carbon emissions, and specifically those associated with the generation of low-carbon electricity, in order to meet its commitments to address climate change. This has led to a wide range of government interventions[5] to deal with both encouraging the reduction of carbon emissions associated with the generation and use of energy, and the need to protect security of supply as this decarbonisation takes place. We explore Professor Robinson's arguments against intervention in each of these areas in turn.

Climate change

Professor Robinson argues that:

- The costs and benefits of any government action to deal with climate change are inevitably highly uncertain. There is "severe information failure".
- This places a premium on flexibility, but centralised intervention finds difficulty in accommodating uncertainty.
- One approach is to internalise the relevant externality, in this case introducing a carbon tax or carbon trading. But because of the uncertainty, he argues that it is very difficult to apply successfully.
- Moreover, the British government is not willing to rely solely on carbon taxes or carbon trading. Instead, it applies an approach in which carbon pricing is supplemented by numerous government incentives and administrative measures, some overlapping and not necessarily consistent with one another, and many of them applied only to electricity.
- The other approach is to rely primarily on decentralised action – market forces and local small-scale community initiatives.

It is not clear what small-scale community initiatives Professor Robinson has in mind, nor how they would address the issue that Lord Stern refers to as a result of the greatest market failure the world has seen (or what Dieter Helm more accurately describes as a public bad).

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[4] Depending on the findings of the inquiry by the Competition and Markets Authority. The recent changes to improve liquidity in the forward wholesale market were introduced to improve the competitiveness of the market for smaller players and new entrants, but have yet to demonstrate their effectiveness.

[5] "probably beyond the scope of any official in DECC to fully comprehend", The Return of the CEGB, Dieter Helm, June 2014, http://www.dieterhelm.co.uk/node/1381

But the need to incorporate flexibility to adjust to changes in information is a major theme of this discussion paper. And whilst the simplicity of a carbon tax or carbon trading is attractive and must be a long term goal (I argue below that a tax may be preferable to trading), there are two key reasons why policy for the short to medium term needs to be more complex:

- Most forms of low-carbon electricity generation, and associated technologies such as electrical storage, smart grids and smart appliances, are still immature and, inevitably, not yet cost effective. They need support if they are to move sufficiently far down the cost curve to realise their full potential. Different technologies are at different stages of maturity, with land-fill gas, photovoltaics and onshore wind having progressed the furthest. This does not mean continued support should be provided for all technologies indefinitely, since some may never be able to compete, but all need to be given a chance to develop[6].
- Neoclassical economists may assume that individuals maximise utility and firms maximise profits based on full and relevant information, but the real world is not like that. Companies and individuals persistently fail to invest in cost-effective measures to reduce their energy costs[7]. Individuals also, whether for reasons of lack of information or skill or because of competing priorities, fail to act "rationally" to respond to financial incentives to reduce their energy costs. If they are to be persuaded to take action, other measures – such as mandating energy efficient devices and processes, and making better use of behavioural economics and the results from the increasing number of studies of individuals' and companies' energy use – will be needed. Ensuring a coherent approach is a further theme of this paper.

3. Energy security of supply

On energy security of supply, Professor Robinson argues that, whilst there are some public good characteristics of security provision in energy markets, it is not obvious that there is significant under-provision so long as energy markets are competitive. Consumers want their supply of energy to be reliable and continuous and, to obtain this, they can be expected to be willing to pay. Consequently, sellers have powerful market-based incentives to supply energy products that provide security. Moreover, when a government declares itself responsible for some activity there is inevitably a tendency for others to opt out on the grounds that 'government will provide'.

In principle, Professor Robinson is right. We do not, or should not, expect the government to intervene in other commodity markets (such as food or clothes) to ensure security of supply. There are, however, some features of the electricity market that differentiate it from other commodity markets. Because of the very limited ability to store electricity at present, there is

[6] Any support needs to take account of developments in other countries. It is wasteful to re-invent the wheel. Cost reductions in photovoltaics and offshore wind have come down because of worldwide trends, not because of UK deployment alone.

[7] See for instance https://www.gov.uk/government/publications/capturing-the-full-electricity-efficiency-potential-of-the-uk--2

a need to balance supply and demand accurately minute by minute. And because the prices most users pay do not respond to very short term signals (domestic customers' tariffs may be fixed for months on end and even the prices that large users pay may vary only at intervals of half an hour), short term demand is highly price-inelastic. Thus the onus for balancing supply and demand in real time rests largely on electricity generation[8], rather than on adjustments to customers' demands, and specifically on highly responsive power stations, such as open cycle gas turbines, that may only be required to operate a few hours a year, together with mid-merit plant, operated to manage the swing between low summer night-time demand and high winter peak.

The result is, in the current market structure where capital costs can only be recovered in the energy price, a highly volatile, and at some times very high, marginal electricity price, as generators attempt to recover their sunk capital costs over the number of hours in the year their plant is operating. This need not, of itself, require government intervention. In principle, customers can make their own decisions in relation to the amount of electricity they wish to use at a particular price. However, because customers respond to price signals generally at a slower pace than the speed at which the supply/demand balance can change (or, in the case of domestic customers, the lack of a price signal), relying simply on a price signal to regulate demand would be likely to lead to a greater number of power cuts. There is a social and political cost to any widespread power cut that resulted from an imbalance between generation and demand, not to mention an economic cost resulting from a power cut being unexpected in a country with a good record of security of supply. It is therefore inevitable that a government will have an interest in maintaining security of supply. The problem is exacerbated by the fact that, by virtue of the limited number of generating stations competing at the margin at any one time, and their size, the addition of a single new generating station to the national fleet can have a significant impact on the marginal price of electricity and hence on the income a generator earns from the rest of its fleet. This creates an incentive on major generators to operate at an overall margin of security that may be less than optimal for customers.

Together with the problem at peak, the transition to lower-carbon generation, together with the impact of the Large Combustion Plants Directive, is resulting in the closure of older coal- and oil-fired stations that otherwise would have been meeting mid-merit demand. Although this gap is being filled for the immediate future by previously mothballed CCGT plant[9], before long it will be necessary to encourage the building of new plant to meet this part of the demand curve. This is the reason for the government introducing a capacity charge as part of its changes to the electricity market. Although, in principle, a change to the structure of electricity prices to include a capacity element as well as an energy element is simply a market change that does not imply increased intervention (indeed, several electricity markets around the world include some form of capacity charge), in practice the establishment of the

[8] National Grid makes use of some short-term demand-side response (DSR) and DSR is likely to increase in future, but the argument remains generally true.

[9] The durability of plant designed to run at baseload to repeated thermal cycling has yet to be tested.

capacity price, whether set administratively or by auction, requires a central view to be taken of the level of security required and hence amounts to a form of intervention.

We therefore find that, for both reasons of climate change mitigation and security of supply, some form of government intervention is in fact needed. The next question to be examined is whether this has been done well and whether the warnings of commentators such as Colin Robinson and Dieter Helm have been addressed.

4. Has government low-carbon intervention successfully delivered the investment needed?

The aim of government intervention is to achieve an objective that the market alone would not have delivered. But to work with the grain of the market, intervention should not only achieve its objective but also keep intrusion to a minimum, be cost effective and avoid as far as possible negative and unintended consequences. In short, intervention should meet the needs of better regulation.

Has this happened? To look first at whether it has met its objective, it has to be said that low-carbon government intervention has had mixed success. To consider only two extreme examples, on the one hand, by 31 March 2014, the Feed-in Tariff Scheme had delivered 470,000 small-scale renewable generation installations with a total capacity of just under 2.4 GW[10]. This could be considered to be a success (at least in terms of the number of installations. The extent of its contribution to delivering a cost-effective low carbon economy is less clear). On the other hand, by the end of November 2014, only 8133 households had Green Deal Plans in progress[11]. In terms of the aims of the policy, this is widely considered not yet to be a success.

As to whether disruption has been minimised, the picture has often been one of frequent, unplanned changes in direction, which, while meeting (often, short-term) political objectives, have had a serious negative impact on the investment climate. Three specific examples illustrate the point: the Feed-in Tariff Scheme for small-scale renewables, and two other recent examples, reductions to the Energy Companies Obligation and the removal of the Renewables Obligation subsidy for large biomass generators and solar panel installations. There are also issues arising from the introduction of Electricity Market Reform and the Levy Control Framework.

The **Feed-In Tariff** was introduced in 2010 to encourage small-scale renewable generation of electricity (currently up to 5MW per installation), by paying a fixed sum per unit for electricity generated by eligible technologies, with a small additional tariff for electricity exported to the grid. Costs for the programme are borne by all electricity consumers through a charge in their annual bill. Specific rates are set for different technologies and at different scales of installation for those technologies. The contract term is 20 years, or 25 years for solar photovoltaic projects.

From the start, it was announced that the tariff level available for new generators would decrease annually, although would be fixed for a particular project, subject to inflation, for

[10] https://www.ofgem.gov.uk/ofgem-publications/91945/feed-intarifffitannualreport20132014.pdf

[11] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/388325/Monthly_Statistical_Release_Green_Deal_and_ECO_in_GB_18_Dec.pdf

the contract length once a project had been approved. The rate of degression would vary by renewable energy technology.

Less than a year into the scheme, in March 2011, the new coalition Government announced that support for large-scale photovoltaic installations (greater than 50 kW) would be cut. From 1 August 2011, the rate for installations over 50 kW would reduce from 19p/kWh to 8.5p/kWh for the largest qualifying installations (5MW), with the Government claiming that this would prevent the scheme from becoming 'overwhelmed'.

In October 2011 a second review of the Feed in Tariffs for low carbon electricity generation was announced, proposing to reduce the rates for small photovoltaic installations from December 2011 from 43.3p/kWh to 21 pence/kWh. The reason for this was that FITs for PV were being taken up too quickly and that the DECC funding allocation for FITs was in danger of being exceeded. At the same time, the cost of installing PV panels had reduced by around 50%.

The reduction was delayed until March 2012, following a successful appeal to the High Court by Friends of the Earth and two solar companies. In August 2012, a further review of the FIT brought an additional cut to 15.44p/kWh from November 2012, and this rate was set to remain until 1 February 2013. Again the reduction was due to the falling installation costs, and the fact that people were applying for the feed-in tariff scheme in numbers exceeding DECC forecasts and funding allocations. The new tariffs would also now be paid over 20 years instead of 25 years.

Although the reduction in the cost of solar panels could perhaps have not been foreseen[12], the halving of the rate of tariff for small PV installations and the speed of attempted introduction was unanticipated, demonstrated by the success of the court case. The impact on the PV installers and those such as local authorities planning substantial numbers of installations was severe. This was particularly the case given the unexpected change and the lack of any review mechanism in the original framework for the Scheme. DECC commissioned an independent review in December 2011 to establish what lessons might be taken from this experience.[13] Amongst other proposals, the review suggested that DECC should find ways to provide sufficient investor certainty to secure the necessary investment without putting programmes and budgets at risk, but did not proses any ways of doing this.

The **Energy Companies Obligation** (ECO) is the latest in a long line of schemes to require the larger energy suppliers to deliver energy efficiency measures to domestic energy users. ECO was introduced at the beginning of 2013 to replace the Carbon Emissions Reduction Target (CERT) and the Community Energy Saving Programme (CESP). CERT and CESP ran between 2008 and 2012 and replaced the Energy Efficiency Commitment (EEC) that ran in two tranches from 2002 to 2005 (EEC1) and 2005 to 2008 (EEC2). EEC itself replaced the Energy Efficiency Standards of Performance (EESoP), which ran in three tranches from

[12] Although perhaps the possibility of such a reduction should have been considered

[13] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48487/6124-feedin-tariffs-lessons-for-the-future-report.pdf

1994 to 2002. All schemes, although they differed in detail, had broadly the same aim and operated in the same way, with a particular focus on the fuel poor. There were ever-greater attempts to segment the customer groups to whom measures were offered and / or to shape the different scheme outcomes (i.e. reduce carbon, lower bills).

These schemes were generally successful in encouraging significant amounts of energy efficiency measures such as loft and cavity wall insulation. The ECO is currently worth £1.3 billion a year, paid for through a charge on customers' electricity bills (which is however arguably a more regressive form of funding than through public expenditure).

It was the fact that the ECO charge contributed an increasing amount to customers' energy bills that led the Government, amidst the row over energy bills in autumn 2013, to propose changes to ECO as part of a package to reduce domestic energy costs. Following a consultation, the Government's decision was announced on 22 July 2014, the impact of which was to cut the annual ECO target by a third.

The proposed changes provoked a considerable response. In March, Energy Spectrum[14] commented:

> "This politically motivated short-term fix has shown how mid-scheme interventions are rarely without downsides. The decision to alter ECO to lessen bill impacts has highlighted how inflexible, high-cost and complex the current programme is. It has reintroduced "boom-and-bust" concerns for contractors and has been destabilising for suppliers that are expected to reflect changes in lower prices."

In February 2014, Inside Housing reported[15] that proposed cuts to the energy company obligation have thrown social landlords' retrofit plans into disarray. The buy-out price for ECO[16] had dropped from £140 per tonne of carbon in November 2013 to around £45. This was enough to kill off many projects. Also in July, the Association for the Conservation of Energy (ACE) published research indicating that the number of energy saving installations installed under government schemes had fallen from 1.65 million in 2012-13 to 661,000 in 2013-14[17].

The **Renewables Obligation** has, in name at least, been a zone of comparative tranquillity compared with ECO, having been in place since 2002 (itself replacing the Non-Fossil Fuel Obligation, which had operated from 1990). It is currently the government's principal means of supporting large-scale renewables generation, although it is due to be phased out as support for low carbon generation through contracts for difference under the Electricity Market Reform becomes available, with no support under the Renewables Obligation for new

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[14] Energy Spectrum Issue 417, Cornwall Energy, 17 March 2014

[15] http://www.insidehousing.co.uk/7002141.article

[16] One of the provisions of ECO is that suppliers can buy themselves out of the ECO obligation by getting others to meet the obligation. The buy-out price thus provides a market price for ECO interventions.

[17] http://www.theguardian.com/environment/2014/jul/04/home-insulation-installs-have-collapsed-because-of-uk-policies

generation projects after March 2017. Changes to the scheme have however not escaped criticism. Originally, a single rate of support was provided for all renewables technologies[18]. However, in 2009 banding was introduced to enable different technologies to attract different levels of support. The banding levels were to be reviewed every four years. No physical limits were set on the amount of capacity to be supported in each band.

In October 2011, as part of the banding review, the Government proposed a cap on the amount of new build dedicated biomass generation. The cap, not to apply before April 2013, would be set at around 800-1000 MW. In August 2013, after several further rounds of consultation and in the face of strong opposition from the biomass industry (but, it must be said, with strong support from various green groups) the Government announced an administrative cap of 400MW[19].

In May 2014, DECC issued a consultation to close the Renewables Obligation to new solar photovoltaic generating stations above 5MW from April 2015. Apparently, the move was necessary as deployment of the technology was "already significantly ahead of expectations" and posed a "substantial risk" to the government's ability to manage the Levy Control Framework budget. This is two years ahead of what was originally planned. According to analysis by NPD Solarbuzz in May 2014[20], proposals for 215 ground-mounted solar photovoltaic farms in the UK will be re-evaluated in light of DECC's plans. In August 2014, four of the UK's leading solar companies sought a judicial review on the proposed closure of the RO subsidy scheme. The case is the third legal action launched by the solar industry against government subsidy cuts in three years.

Electricity Market Reform provides a further example of a government low carbon intervention unintentionally resulting in investor uncertainty. The Government's intentions were originally announced in 2010. Final details including the laying of the necessary secondary legislation took place in June 2014. In an article in the Daily Telegraph on 30 January 2014, Lord Jenkin of Roding wrote:

> "For investors in the electricity market, there is probably more uncertainty now than there was four years ago when the Government launched its ambitious electricity market reform proposals. My discussions with the independent generators and their probable financiers have made it abundantly clear that this new investment will be unlikely without three major changes in the current design: a longer maximum contract length; a more realistic price cap; plus a penalty regime that is not completely prohibitive. If these changes are not made, it will, in practice, be impossible for the companies to raise the finance for investment in new capacity."

[18] Although several phases of the preceding NFFO had included banding.

[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/230495/Part_B_response.pdf

[20] http://www.solarbuzz.com/news/recent-findings/proposed-uk-policy-changes-cause-215-solar-pv-farm-prospects-be-re-evaluated-ac

By November and December 2014, in oral evidence to the Energy and Climate Change Committee industry witnesses seemed generally happier with the degree of progress but said that the pace of progress was making it difficult for smaller companies to keep themselves informed. There were also concerns about the lack of information about the level of support after 2020[21]. We have yet to see how effective the EMR strategy is in practice and, if changes need to be made, how investors' concerns will be taken into account.

The **Levy Control Framework** (LCF) is designed to provide a limit on the total additional cost electricity users will face from a range of "green levies". Whilst controlling expenditure on low carbon initiatives is clearly necessary, the LCF provides a cap on the total expenditure incurred under three separate and not wholly related schemes, the Renewables Obligation, the small-scale Feed-in Tariff and the Warm Homes Discount, and is set to include the cost of the Feed-in Tariff Contracts for Difference. Unforeseen expenditure on any one of these could therefore restrict the amount available for spending on any of the others, as can a different electricity market price from that assumed when setting the strike price. And so funds anticipated as available under a particular scheme may be withdrawn, possibly at short notice. No indication has been given as to what will happen if the spending cap is insufficient.

DECC's assurances that the LCF limit will be sufficient to allow the financing of sufficient new low carbon generation is predicated on DECC's own forecasts of both the levelised cost of electricity by type of generation and wholesale electricity prices. However, a number of commentators, for example Moody's on 1 July 2014, have suggested that power prices could be significantly lower than DECC's assumptions, in particular if international gas prices are lower than DECC suggest[22]. It is therefore possible that expenditure on Contracts for Difference may be significantly higher than DECC currently forecasts. This leaves potential low-carbon investors with the unpalatable choice of guessing whether, if electricity prices do turn out lower than DECC estimate, the government will increase the LCF limit or will try to limit the target volume to reduce the impact on electricity customers and/or tax payers.

Parliamentary scrutiny of the LCF has focused so far mainly on the control of expenditure[23] rather than on the potential effect on investors. Potentially, uncertainty would be reduced if there were separate caps for each scheme and if there were an explicit review process timed to occur well in advance of the cap being reached.

The transition from the Renewables Obligation to FIT contracts for difference has caused particular problems in the offshore wind sector. The RO encouraged considerable activity when it became available for offshore wind in 2008, with DECC forecasting up to 18 GW by 2020. But progress stalled when EMR was announced in 2010 because of lack of clarity on terms and the final strike prices only being announced in December 2013. Earlier in 2013, a

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[21] http://www.parliament.uk/business/committees/committees-a-z/commons-select/energy-and-climate-change-committee/inquiries/parliament-2010/implementation-of-electricuty-market-reform /

[22] Given the link in some wholesale gas contracts to the oil price, this now seems more likely.

[23] http://www.nao.org.uk/wp-content/uploads/2013/11/10303-001-Levy-Control-Framework.pdf

http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenergy/872/87202.htm

survey of companies in the offshore wind sector said that: "Many surveyed companies cite the government's apparent support for natural gas, cuts to onshore wind subsidies and planning delays as signs that the UK government is not fully supportive of offshore wind."[24]

Finally, the Government's **Green Deal Home Improvement Fund** was closed by DECC in July 2014, only six weeks after opening, following a "surge in applications", leading shadow climate change minister, Jonathan Reynolds, to call for an investigation by the PAC. Reynolds said that the closure "will leave many customers who have paid £100 for a Green Deal Assessment out of pocket, with little prospect of them having the work they were promised done, and an insulation industry in despair at the stop-start nature of government policy."

The situation in some other countries is, however, even worse:

- In February 2014, the Spanish Government reduced dramatically and retrospectively its support structure for wind power. As a consequence, less than 0.1MW of wind capacity was added in Spain during the first half of 2014, according to research published by industry association AEE on 29 July 2014. The Association said that investment in the sector had been halted by regulatory reforms that meant a reasonable return on projects could no longer be assured.
- In Portugal, tariffs for micro-producers reduced drastically for 2014.
- In Victoria, Australia, a major energy retailer has imposed a $51 a year levy on customers who have installed solar panels, to meet the cost of the extra strain on the grid that the use of panels is causing. The move, which is supported by the Victoria State Government, is likely to be followed by other suppliers.
- Similar retrospective actions have occurred in other countries (eg Italy) and led to those affected commencing legal action through the courts.

Given the massive level of investment forecast to be needed in the low carbon sector over the coming decades, it is perhaps not surprising that these frequent changes in policy have faced criticism from a range of sources, not just those directly affected. The CBI has argued for some years, and most recently at its 2014 energy conference[25], about the need for stability in energy policy if energy investment is not to be damaged. And the Public Accounts Committee, in its report on Infrastructure Investment[26] in June 2014 concluded that "the complexity and changing nature of government policies, particularly in the energy sector, risk[ed] delaying much needed investment." It recommended that "Departments should explicitly factor in the potential impact of complexity and uncertainty on investors when making or changing policies affecting infrastructure."

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[24] http://www.cleanenergypipeline.com/Resources/CE/ResearchReports/UK-offshore-wind-supply-chain_why-clusters-matter.pdf

[25] http://www.cbi.org.uk/media-centre/news-articles/2014/07/long-term-thinking-on-energy-needed/

[26] http://www.publications.parliament.uk/pa/cm201415/cmselect/cmpubacc/406/40602.htm

Jefferies utilities analyst, Peter Atherton (then with Liberum Capital), has argued that it was wrong to assume that investors were hostile to market uncertainty. Instead, he suggested that there was a division between "good uncertainty" and "bad uncertainty"—the former concerned with the "bread and butter" issues that analysts were used to examining in order to determine company valuations; the latter related to arbitrary political interventions that were impossible to predict[27]. Moreover, Atherton and Guillaume Redgewell argued in May 2013[28] that "investors should be under no illusions that the government of the day will seek to protect itself and the consumer (who are also the electorate) by heaping most of the financial pain on to investors."

The stop-start history described in this section for many low-carbon interventions, leads us to conclude that something clearly needs to be done. However, aside from expressing concern, most commentators and critics have not to date come up with concrete proposals for improving the general approach by government. The rest of this paper therefore discusses how to address at least some aspects of "bad uncertainty" with respect to low carbon interventions and proposes a way forward.

5. Why has government low-carbon intervention been so problematic?

Why is it that government low-carbon interventions have so frequently gone awry? An examination of the examples outlined above suggests that the dilemma at the heart of the issue is the need to balance a satisfactory incentive for private sector investors to commit expenditure (often long-term) with the need to control the cost of such intervention and avoid wasting money. The problem is made worse by the factors identified in section 3 above by those who query the benefits of any intervention: the need to make forecasts and set targets, and the fact that many people have an interest in what those targets are. There are a number of interlinked issues that arise:

- **The need for adjustment:** Setting targets, either for physical amounts or in terms of price, implies the need for forecasts, which inevitably turn out in practice to have been wrong. The result is that the targets subsequently need changing and if the possibility of change was not made clear when the intervention was announced, investors can be left wrong-footed. Moreover, having been caught out once, they become more reluctant to invest in future. An illustration of this is given by EY's *Renewable Energy Country*

[27] Cornwall Energy conference on the CMA reference of the Big Six energy suppliers, 3 June 2014, quoted in Energy Spectrum, Issue 428

[28] http://www.thegwpf.org/report-crisis-uk-energy-policy-inevitable/

Attractiveness Index[29], published on 2 June 2014, which warned that the appeal of the UK renewables market to investors and developers has now fallen "dramatically". EY's Environmental Finance leader is quoted as saying: "Policy tinkering and conflicting signals once again become too much for investors and developers to handle." In September 2014, and again in March 2015, EY in their updates to the Index said that the UK as a destination for investment in renewable energy had fallen to its lowest level for 12 years.

- **Shortage of resource and understanding:** The need for adjustment is made worse by poor information in setting the targets in the first place. Problems arise from a shortage and depth of capacity in relation to the subject area by the officials who are tasked with developing the policies. In part, this is not surprising: a full understanding requires a detailed economic and regulatory knowledge of the entire energy sector and its supply chain and the energy investment community, how domestic and business customers use energy and what influences this, and how to drive and encourage take-up of innovation – and all of this in a climate where both politicians and industry trade bodies have strong and strongly expressed views. But it is not helped by the shortage of resource, both policy and technical, available within DECC, the time pressure under which officials are often working and the long-standing practice of both ministers and officials moving jobs frequently[30]. There are four key consequences:

    - **The need to rely on external sources of data:** It is impossible to set targets without adequate sources of external data. But many of those data sources will originate from individuals, companies, academics or trade associations that have an active interest in the outcome of the target set. Without adequate resources it is difficult for officials to assess whether, and to what extent, there is an element of negotiation, and hence a lack of objectivity, in the data put forward.

    - **Lack of understanding of technology-driven cost curves:** One key reason why intervention is needed is that most low carbon technologies are immature and need assistance to bring their prices down. But policy makers have continually been caught out by the pace, or lack of it, at which costs have changed. There is a great deal of academic literature on the topic, summarised most recently in one of the working papers[31] issued by UKERC as part of its Energy Strategies under Uncertainty project. This literature could be put to better use by policy makers, and provide a counter to special pleading and lobbying.

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[29] http://www.ey.com/UK/en/Newsroom/News-releases/14-06-02---UK-renewables-investor-appeal-continues-to-fall

[30] See DECC's independent review of lessons to be learned from the FIT scheme, which identified lack of resource, time pressure and lack of strong leadership as contributing to the problem.

[31] Technology Assessment Methods and Uncertainty http://www.ukerc.ac.uk/support/tiki-download_file.php?fileId=3627

- **Over-dependence on economic modelling:** Because of the complexity of the issues involved, officials have come to depend increasingly on the input of external economic consultants. This, together with the need to complete regulatory impact assessments, has meant a greater reliance on deriving results from economic models. These models, particularly when used to derive forecasts, are based on assumptions and proprietary software, the details of which are often not made publicly available. Because the models provide apparent quantification, the outputs are often treated as if they provide a higher level of accuracy than may be warranted. In fact, the answers frequently depend crucially on the assumptions and models they are based on and, as a result, should not necessarily be relied on – but increasingly seem to be.

- **Lack of experience of effective intervention:** From 1990 to about 2010, the approach to energy policy was largely market-driven and, except at comparatively small scale, non-interventionist. When more recently intervention became larger scale, there was little experience to fall back on and no guidelines on how to do it successfully. This has resulted in a piecemeal introduction of a large number of interventionist measures, many of which overlap, with widely different costs of carbon emissions saved, and, all prone to the problems identified above.

- **Influencing the policy makers:** One aspect of the impact of lobbying on policy makers has already been mentioned above – the reliability of data from external sources when the parties concerned have an interest in the outcome. But it is not just those with a direct financial interest in the outcome of target-setting who may be lobbying the government. The more that energy policy moves towards small-scale and local interventions, the more the interventions impact increasing numbers of voters, many of whom may focus on the negative aspects, which are often local, such as visual amenity, inconvenience, impact on local resources, rather than on the wider and more positive aspects, such as energy security and curbing carbon emissions, which tend to be national or global. There is a similar dichotomy on timescales between short term issues, such as costs and the electoral cycle, and longer term benefits such as avoiding climate change.

There is no easy solution to these many issues and therefore no silver bullet. But an active awareness of the implications of these issues should help policy makers when developing new interventions in future. Since it would not be reasonable to expect officials to examine all relevant precedents before embarking on a new intervention – we have seen that shortage of resource is one of the problems – our proposal is therefore for a check list of guiding principles for use when designing a new intervention.

Our conclusion therefore is that policy makers would benefit from a set of basic principles that can be used, alongside the Better Regulation framework[32] (where this applies), to guide those tasked with setting up new low carbon interventions or revising existing interventions in order to help them to avoid the problems of the past. If these or similar principles were clearly articulated and systematically applied, the costs of intervention would be reduced and

[32] https://www.gov.uk/government/publications/better-regulation-framework-manual

the cost of capital kept low as investors would be less concerned about the risk to their investment from policy changes. Inevitably, problems cannot be ruled out but the process of seeking to identify the likely source of such problems and incorporating mechanisms for dealing with them should mean that they should be fewer and smaller than in the past. What follows is a proposal for such a framework. It is being put forward by Sustainability First to promote discussion and to encourage those interested to examine the framework and to suggest improvements.

6. A suggested framework for government low-carbon intervention

What form should such a framework of principles take? It would be naïve to argue simply for stability in intervention policy. Facts and situations change and political acceptability depends on ensuring policies remain cost-effective for customers and the tax payer[33]. But it would be equally naïve of policy makers to continue to set policies for intervention that fail to take account of lessons that should already have been learnt from experience to date. In some areas, improvements have already been made. Examples are the commitment to a periodic banding review for the Renewables Obligation and the introduction of auctions for more mature renewables technologies and the capacity market in the Electricity Market Reform framework. But these improvements have been piecemeal and there needs to be a common and consistent approach. The approach needs to recognise the potential conflicts in advance (cost-effectiveness against investor certainty, the objectivity of data from external sources, complexity, inability to predict the future), and address them in setting up the intervention, rather than be forced to make un-anticipated changes at a later stage.

A suggested framework for the design of any new intervention should therefore include the following :

1. **No retrospection**

It goes without saying that the action that would have the most destabilising impact on investors would be a retrospective change to a support regime that undermined the business case for investment already undertaken on a particular project. This has not occurred to date with any intervention in the UK, although as noted above it has happened in Spain and Italy.

[33] "A policy that imposes higher-than-necessary costs risks failing if public support is lost. Investors who believe the policy will not be sustained will be reluctant to put up money. If policy to address emissions is not seen as cost-effective, the degree of ambition also risks being curtailed." Policy Exchange: Going, Going, Gone 2013 http://www.policyexchange.org.uk/publications/category/item/going-going-gone-the-role-of-auctions-and-competition-in-renewable-electricity-support?category_id=24

As well as no retrospection within a particular intervention scheme, support that has been awarded to a project under a previous scheme ("grandfathering") should not be curtailed. Care also needs to be taken with lead times for changes as, for larger projects in particular, investment may have to be committed well in advance of seeking support from the intervention. Such investment can be wasted if the notice period for any change is too short.

2. **Stability of policy with well-defined and pre-determined break points**

The biggest concern of investors is unanticipated changes to intervention policy. When a low-carbon intervention policy is announced, the impression is usually given that the intervention is permanent and can be relied upon for investment decisions. This is perhaps not surprising; policy makers like to think they make permanent changes to policy. But as we have seen above, change is inevitable when circumstances change[34]. In order to balance the needs of investors and the public purse, any new intervention should, at the time it is announced, include information about break-points at which the direction of policy and the level of targets is to be reviewed. Although this may appear to add to the risk that investors face, in practice the likelihood of change is always present whether or not announced and this approach would allow investors to factor this risk into their initial investment decisions. The break-points can be set in relation to date (ie after x months or years) or, if this appears to be too risky, in relation to target achievements or expenditure (eg after x MW of installations or £y m of support).

An interesting recent example is the domestic Renewable Heat Incentive. The guidance on the Ofgem web site says:

> 'The government has to keep the Domestic RHI in budget. It does this by reducing the tariff rates paid to new applicants if uptake of the scheme is higher than expected and more than is affordable. It's known as 'degression'.
>
> Tariffs will be subject to review every quarter, although the tariff rate will only reduce if the uptake is above a specified amount. If a tariff reduction is due to take place, we'll let you know about it through our website a month before it comes into effect.
>
> A tariff reduction only affects people who have not yet made an application. People who successfully submit an application before the reduction takes place will not be affected.
>
> People who installed a renewable heat system before the scheme opened are protected from a tariff reduction and will always receive the original rate'.

Parts of this are good: break points announced in advance, criteria for change explained, no retrospection. But the notice period of one month for any change in the tariff is far too short for manufacturers, installers or anyone planning to invest in eligible equipment.

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[34] "When my information changes, I alter my conclusions. What do you do, sir?" attributed to John Maynard Keynes.

3. **Underpinned by well-understood cost curve predictability and development of supply chain**

The work done by UKERC on planning in uncertainty and research on the likely cost curves of new technology was noted above. While surprises can always happen, better use can be made of expert knowledge and experience overseas to understand the likely future trend of prices, particularly if there is global demand for the technology. Care, of course, needs to be taken to guard against advice which is little more than veiled lobbying, either for or against the technology (differing views on the economic value of onshore wind perhaps being one recent example).

4. **Use economic modelling only where it adds value and explain the assumptions and methodology behind the projections**

Economic modelling, particularly if the issue is complex or full of uncertainties, cannot substitute for rigorous economic analysis. Where quantification is needed, for instance for an impact assessment, the uncertainties need to be fully and publicly set out. Any policy conclusion based on economic modelling must also be accompanied by a full and transparent set of assumptions and access to the underlying model for interested parties to make their own calculations. The alternative, simply to take the results on trust, is no basis for investors to use for their investment decisions.

5. **Dialogue with Brussels to ensure long term consistency with State Aids regime**

During the time that energy policy was driven largely by market forces, EU issues about competition policy and state aids had less bearing on policy. Increasing numbers of UK policy interventions have meant that more dialogue has been needed with Brussels on state aid issues. The European Commission itself has recognised the need for guidance and, following consultation, adopted in April 2014 new rules on public support for projects in the field of environmental protection and energy[35]. The first decision under these rules was made in July 2014 to give the green light to the UK capacity market and FIT Contracts for Difference for renewables, which attracted some criticism from European NGOs[36]. The decision on the nuclear contract for differences followed in October 2014. It will be important to understand how the Commission's approach to interpreting its new rules is developing as new decisions emerge and, at the very least, it will be necessary to factor in sufficient time for this process. The amount of time taken by the Commission to investigate whether the nuclear CFD constituted state aid clearly delayed the start of work on Hinkley Point C.

It should also be remembered that low carbon interventions may increasingly emanate from European Union initiatives. The proposed interventions framework is also relevant here and the Institutional Investors Group on Climate Change has argued along similar lines in its

[35] http://europa.eu/rapid/press-release_IP-14-400_en.htm

[36] http://www.energypost.eu/brussels-sets-dangerous-precedent-european-energy-policy-clearing-uk-capacity-market/

response to the European Commission Green Paper –"A 2030 framework for climate and energy policies"[37].

6. **Be clear on the impact on different user groups (eg fuel poor, all-electric households, intensive energy users)**

Where policies have costs on customers (rather than on tax-payers), how the costs are distributed to different user groups is important. Across the different cost elements that go to make up the price of electricity and other low carbon interventions, a range of approaches has arisen from full cost-reflectivity to socialisation (an averaging of the cost across a geographical region or customer group). These approaches have arisen historically either by accident or through an attempt in some cases to provide protection or incentive to particular groups. The result today is incoherence across a range of interventions which fail to achieve any particular social or economic differentiation. When establishing a new intervention or when reviewing existing policies, the impact, not just of the single intervention itself but of the totality of interventions on a particular class of customers, needs to be examined so that the political objective for that group is fully understood and achieved. Key groups to be considered are the fuel poor, all-electric domestic households[38] and intensive energy users. But greater consideration also needs to be given to the fact that energy, and electricity in particular, is not a single commodity with a single cost, but its cost and value vary by time of day and year and location. The extent to which these different costs feed through into prices for customers, to provide incentives or protection, needs to be the result of positive decision-making rather than by accident.

This is not the place to discuss the benefits of different approaches, which will be the subject of further work by Sustainability First.

7. **Contracts may be preferable to legislation**

With very few exceptions over the years, it has always been the case that a government contract can be relied on by the signatory. On the other hand, commitments based on legislation or regulations can be changed by ministers / parliament with comparative ease. Investors are therefore more likely to feel their investment is safe if it relies on a contract with government rather than on legislation.

8. **Price-based intervention often preferable to quantitative targets**

Both price-based interventions and quantitative targets have their drawbacks. Both are prone to special pleading by various lobbies and both require forecasts to be made, which will inevitably be wrong and require adjustments to the targets. Advocates of quantitative targets,

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[37] http://www.iigcc.org/files/publication-files/IIGCC_Investment-grade_climate_policy_the_next_phase_for_Europe.pdf

[38] The cost of interventions has gone largely on electricity bills, whereas households relying on electric heating tend to have lower incomes: http://www.consumerfutures.org.uk/files/2013/05/The-hardest-hit.pdf

such as underpin the EU emissions trading scheme, claim that such targets guarantee the delivery of an outcome and leave the market to decide how to achieve it. However, in circumstances where there is uncertainty about the precise annual targets to be achieved and the costs of doing so, there are theoretical arguments for preferring price-based interventions. Moreover, where investments have a substantial lead time, the volatility in the price resulting from quantitative targets, together with the possibility that the price will go to zero in the event of over-supply, is likely to increase the cost of capital and deter investors.

The EU emissions trading scheme has, from its outset, suffered from over-allocation of permits resulting from vigorous national lobbying. This has been compounded by the inability to agree a mechanism to adjust the targets when emissions were lower than forecast as a result of the economic downturn. In the UK, the Renewables Obligation, which uses quantitative targets, has only managed to retain this approach by the use of "headroom", ie setting its annual targets at least 10% higher than the expected production of renewable obligation certificates. As a result the price of ROCs has tended to remain within the range of £40-55/ROC. This approach – continually adjusting quantitative targets to maintain a price level – has really been price support in disguise and depends on accurate estimation of "headroom". Indeed, there were concerns earlier in 2014 that DECC had underestimated the growth in renewables output for 2013-14, which would have a serious impact of the buy-out price for ROCs for 2013-14 and spill over into 2014-15[39].

Although a price-based intervention can lead to uncertainty about the total level of support and thus the cost, such an approach is likely to prove more palatable to investors but, whichever approach is adopted for a particular intervention, clear review points set in advance will provide a more stable framework.

In addition to this suggested framework for designing specific interventions, there are also additional lessons to be learnt about the design of energy policy interventions as a whole:

9. Long term nature of investment requires a cross-party approach

Given the size, long-term nature and importance of the investment needed to achieve the low-carbon transition, politically-driven changes in approach need to be avoided if possible. Few of the issues involved are ideological: in general terms, all political parties share a broadly similar vision of the nature of the energy market and of the low-carbon challenge[40]. Political debate seems to be more about speed and effectiveness of policy implementation than about fundamental differences of direction. But the uncertainties caused by possible changes to

[39] Energy Spectrum, Issue 434

[40] The cross-party declaration on climate change orchestrated by green alliance is a good example: http://www.green-alliance.org.uk/leaders_joint_climate_change_agreement.php

interventions driven by the prospect of political change do affect the climate for investment. As a consequence, some commentators have proposed attempting to remove the politics from the debate by calling for a systems architect[41]. It is clear that, as argued above, greater coherence and expertise is clearly needed in the development of energy policy. But it is not possible to remove the politics entirely from the issue, since if the lights do go out it is the government that will be blamed. And, there is bound to be a political interest at the local level from the greater number of smaller scale generation projects, for the reasons indicated above. However, the things that need to be carried out to avoid this happening are long term and need to offer assurance to investors that interventions will last beyond the five year electoral cycle.

Given the scale of the task and the amount of investment needed and potentially at risk, we need as much consensus as possible in the field of energy policy. It has been done before. Before the 2010 General Election, there were bilateral discussions between the Labour and Conservative Parties on the need for new nuclear power stations with the result that the two party manifestos were very similar in this respect. While there will undoubtedly remain differences of detail, the political parties should, for the sake of investment stability, seek to establish the degree of consensus that can be achieved on low carbon energy policy.

10. Learn from previous experience in UK and elsewhere and try to avoid conflicts with the single European energy market

The problems and solutions implied by low-carbon interventions are far from unique to the UK. We can learn a great deal from the successes and problems that others have faced from the introduction of interventions, and from the technology innovations that have been developed elsewhere. No new intervention should be introduced without a detailed study of similar experience abroad. With very few exceptions, a bespoke solution unique to the UK is likely to be less successful.

Making further progress on the Single European Energy Market is important for all arms of the trilemma: affordability, security of supply and climate change. Other European member states are also developing strategies for dealing with the same issues as the UK. As far as possible, we should aim to align our interventions with those of other countries and at least avoid direct policy conflicts.

[41] See, for example, http://www.ncl.ac.uk/sustainability/news/item/why-the-energy-industry-needs-a-system-architect

11. Progression from even-handed support for new technologies over a clear trajectory to a technology-neutral approach with a common price for carbon

In the long term, it is clear that the most economically efficient approach to support a low carbon economy is to adopt a single technology-neutral support mechanism based on a common carbon price or quantitative emissions targets. But, as indicated above, many low carbon technologies are still immature and are not yet ready to compete on this basis. However, technology-specific support is particularly prone to special pleading and rent-seeking. As Dieter Helm has written:

> "These rent-seeking pressures, combined with the different time horizons to which the policies apply, make the policy failure likely to remain high. The implications for policy design are profound: economic efficiency and political expediency are likely to conflict in climate-change policy, especially where these policy costs are imposed in the future (and faced by future politicians and governments). It is in these circumstances that the case for market-based instruments is especially great. Almost all climate-change measures benefit from a rising price of carbon, and the price of carbon allows the market to sort out the more efficient supply- and demand-side responses."[42]

Policy Exchange has proposed a way of grasping this nettle for renewable electricity generation by means of a series of auctions[43]:

> "The government argues that the need to retain a portfolio of options for long-term decarbonisation means it should not be too eager to cut off uncompetitive technologies' support in the near term. Nevertheless, at some point, if the policy is to accomplish the government's stated aim for cost-effectiveness, it will need to overcome this squeamishness about ending support to technologies that cannot bring their costs down. Policy Exchange has previously argued for criteria by which government should decide which technologies to support – technologies which have long-term global potential to contribute to greenhouse gas mitigation, and where government support can play a role in maximising global cost reductions."

DECC has indicated an intention to move towards technology-neutral auctions as EMR develops in the 2020s[44]. It is to be hoped that the government keeps its nerve.

Auctions may not be appropriate in all areas of intervention. It is difficult to see how this could be applied in the domestic arena for, say, solid wall insulation or smart heat pumps. However, all technology-specific interventions need a well-defined exit strategy, leading to a

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[42] http://www.dieterhelm.co.uk/sites/default/files/Why_so_little_08.pdf

[43] See footnote 18.

[44] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/324176/Implementing_Electricity_Market_Reform.pdf

single technology-neutral approach. This should include the opportunity for review and break points as indicated above.

12. **Keep number of interventions to a minimum and reduce complexity**

Whilst a degree of complexity is to be expected, given the immaturity of low carbon technology and the need to create incentives appropriate to a wide range of agents, this must be kept to a minimum and time-limited[45]. There also needs to be better coordination and consistency between interventions introduced by different government departments. A particular example is the interaction between the zero carbon homes policy of the Department for Communities and Local Government and the domestic consumer-oriented interactions of DECC.

Conclusions and Next Steps

Articulating a set of clear principles along the lines of those proposed above would assist greatly in creating and delivering low carbon interventions that create a better balance between the needs of investors and the protection of consumers and the public purse. Indeed, by encouraging greater thought about the longer term delivery of policy, such principles could well encourage greater caution in the setting of targets and a desirable bias towards undershooting goals. Since, as we have seen, these goals frequently need adjustment, this would reduce the likelihood of wasted expenditure, a useful aim in itself.

Moreover, these interventions do not take place in a vacuum. The resulting investments may have visual, planning or amenity impacts, impact on skills requirements and jobs, affect household bills, affect the availability of resources for other issues or create the need for changes in the behaviour of individuals and companies, for example in energy uses, if they are to succeed. Without an ability to engage the public fully on these issues and gain support for the need for intervention, we are left with a democratic deficit, which will make the delivery of the interventions much more difficult to achieve, not to mention the ability to gain cross-party long term support for them. This paper is not the place to develop this argument, but it is an essential part of the solution. Sustainability First proposes to return to these questions in the future.

[45] Not a problem confined to the UK. The German Court of Auditors in August 2014 called the German Government's Energiewende expensive, disorganised and inconsistent: http://www.euractiv.com/sections/energy/german-government-criticised-energy-transition-307927

Drafts of this paper have been reviewed by a number of interested parties and their comments gratefully taken into account. Moreover, in April 2015, Sustainability First held a roundtable where twenty-five participants were invited to discuss the proposals in the paper and to 'road-test' the proposed principles as a future framework for the design of low-carbon interventions. The workshop drew on a wide range of experience, both from the low-carbon sector and the financial community, and was most useful in helping to refine the arguments in this final version of the paper.

We now offer this set of principles to those in government tasked with constructing new low-carbon interventions as a convenient way of encapsulating some of the lessons from the past with a view to more successful implementation in future. They may also be of use for those scrutinising proposed new interventions, such as the Energy and Climate Change Select Committee, the National Audit Office and those in the low-carbon and financial sectors, in seeking to comment on or provide advice to policy makers.

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