The UK's Levy Control Framework for renewable electricity support: effects and significance

Article (Published Version)

Energy Policy 97 (2016) 193–201

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

The UK's Levy Control Framework for renewable electricity support: Effects and significance

Matthew Lockwood

Energy Policy Group, University of Exeter, United Kingdom

HIGHLIGHTS

- Gives an description of the Levy Control Framework.
- Analyses the effects of the LCF on UK renewable policy.
- Reviews possible purposes of the LCF.
- Evaluates the effects of the LCF on consumers and investors.
- Places the LCF in context of greater cost control over renewables across the EU.

ARTICLE INFO

Article history:
Received 1 April 2016
Received in revised form
14 July 2016
Accepted 15 July 2016
Available online 27 July 2016

Keywords:
Renewable energy policy
Investor confidence
Politics
Policy costs

ABSTRACT

There is a long-standing debate over price vs. quantity approaches to supporting the deployment of renewable electricity technologies. In the context of a recent shift from quantity to price-based support, the UK has also introduced a new form of budgetary framework, the Levy Control Framework (LCF). The introduction of the LCF has been very important for investors but has received relatively little attention in the academic literature. The paper gives an overview of the LCF, explores its effects on renewables policy, on consumers and on investor confidence arguing that an unintended consequence of its introduction has been to increase uncertainty, through interactions with underlying support mechanisms. A number of problems with the current scope and design of the LCF are noted. It is argued that the LCF is best understood as aimed at avoiding a political backlash against renewable support policy in a context where the benefits of such policy are concentrated economically and socially. The paper concludes by placing the LCF within a wider context of a shift towards greater budgetary control over renewable energy support policy across European countries.

1. Introduction

Over the last decade, Europe has been making progress on the expansion of renewable energy, while also bringing down greenhouse gas emissions (EEA, 2015). The fastest expansion has come in the electricity sector, with electricity from renewable sources in EU countries increasing from 14.8% in 2005 to an estimated 27.1% in 2014 (ibid: 43) and 29% in 2015 (Sandbag, 2016). The expansion of renewable energy has been arguably the most successful element in Europe's climate policy, since carbon pricing through the Emissions Trading Scheme has not had a major effect on fuel switching or investment decisions to date (Grubb et al., 2012).

However, at the level of individual countries, the expansion of renewable energy has not been entirely smooth. Belgium, Bulgaria, the Czech Republic, Greece, Italy and Spain have recently made retrospective changes (i.e. that affect future returns on existing investments) or retroactive changes (i.e. that affect future *and past* returns on existing investments) to renewable support policies, or introduced moratoria on new investments, all of which have had significant negative effects on investment (Keep on Track; Del Río and Mir-Artigues 2012, 2014; Behn and Fauchald 2015; Fouquet and Nysten, 2015; Gatzert and Kosub, 2016). [1]

Until recently, the government in the UK has largely avoided

E-mail address: m.lockwood@exeter.ac.uk

[1] See Fouquet and Nysten (2015) for full definitions of retrospective and retroactive measures.

http://dx.doi.org/10.1016/j.enpol.2016.07.026

any retrospective actions or sudden changes in the framework for renewable energy. However, in 2015, a number of changes were made, including a large and sudden reduction in support for solar PV and the bringing forward of removal of some technologies from support schemes, that have had a significant impact on investor confidence (HoC ECCC, 2016a, 2016b). One result has been that in 2015 the UK slipped outside the top 10 on the Ernst and Young Renewables Attractiveness Index for the first time since its inception. These events were driven in the first instance by a framework for renewable energy policy costs that was introduced in 2011, called the Levy Control Framework (LCF), which sets a cap on the total amount of support. In response to an anticipated breaching of the LCF, the government has attempted to use different policy levers, i.e. points of intervention varying across the different programmes covered by the Framework, to contain expected future costs.

The LCF is a significant development because it imposes a budgetary-based mechanism on top of existing quantity and price-based support schemes. It has the potential effect of subordinating renewable energy policy to budgetary policy, which could have implications for long term policy credibility. The LCF should be seen within the context of renewable investment 'bubbles' followed by damaging policy reversals in some other countries, as mentioned above, and can be seen as an attempt to avoid such problems. However, while the intention may have been to reduce policy risk, one of the immediate effects of the LCF has been to increase uncertainty for potential investors in renewables. A major reason for this is that the LCF interacts with a number of varying factors, including the wholesale power price and small scale renewable technology growth, the government's assumptions about which have not been made clear.

While the introduction of the LCF has had a major impact in the investor community – described by the Chair of the Institutional Investors Group on Climate Change as 'hugely' influential in investment decisions (HoC ECCC 2016a: 23) – it has so far attracted little notice in the academic literature. This paper aims to address this gap, and argues that the LCF has quite profound implications for renewable energy policy in the UK looking ahead. The paper also seeks to clarify the purpose of the LCF, and in particular whether it is *primarily* aimed at protecting consumers or at shoring up investor confidence, arguing that the latter is the most plausible. An evaluation of the LCF's design and record to date in meeting these aims is given.

The next section briefly lays out the wider context of the policy and political challenges of setting levels of renewable support, and challenges that have arisen in other countries. Section 3 then gives a brief description of the history of UK renewable energy support policy and the introduction and evolution of the LCF up to 2015. In Section 4, the effects and significance of the LCF for renewable energy policy in the UK are examined. Section 5 assesses various potential interpretations of the LCF, including purely political objectives. It also makes an assessment of the design and record of the LCF from the point of view of protecting consumer welfare and underpinning investor confidence. The paper concludes with some implications for the reform of the LCF, and places it within the wider context of moves towards budgetary control over renewable energy support costs across Europe.

2. Renewable support policy and politics

From a handful of pioneers in the 1970s and 1980s, such as Denmark, California and Germany, the development of support policies for the deployment of renewable energy has now spread globally. At the end of 2015, at least 173 countries had renewable energy targets, and an estimated 146 countries had support policies at the national or sub-national level, or both (REN21, 2016).

Support policies have come in a range of forms, including both price-based support such as fixed Feed-In Tariffs (FITs) and premium Feed-In-Tariffs, which offer a premium over the wholesale electricity market price, and quantity-based mechanisms such as Renewable Portfolio Standards (RPSs) or auctions, as well as investment-related policies such as tax incentives and grants (for a review see Batlle et al., 2012). While all of these approaches have been used across Europe, fixed FITs or premium FITS were the most popular through the 1990s and 2000s, although following pressure from the European Commission, there is now convergence on the use of auctioning. In the US, the RPS has been the more common form. As described below in more detail, the UK began with an RPS, but is now phasing out this approach in favour of a type of FIT which uses auctioning to set the price and requires the recipient to pay the difference if the market price exceeds the fixed price. The UK also added a conventional fixed FIT for small scale renewables in 2010.

The cost of support programmes is most commonly borne by electricity consumers, either by passing the costs of subsidies through via suppliers, or via a levy. For example, amongst 23 European Union countries in 2013/14, 12 used levies on bills to cover these costs, eight allowed the pass-through of costs, and two used both routes (CEER, 2015).

As experience with renewable electricity support programmes has grown, it has become clear that policy makers have to balance a number of aspects of support policy design. One balancing act involves giving existing and potential investors sufficient *certainty* about policy direction to ensure that investment is forthcoming, while also *adapting* support mechanisms in the light of new information, especially about technology costs (Jordan and Matt, 2014).

For FIT approaches, a key challenge has been how to amend support levels when there is asymmetric information between private investors and policy makers about true costs of technologies. It was this problem of asymmetric information that led the UK to reject the FIT approach in the early 2000s in favour of an RPS design that was intended to force private actors to reveal true costs (Mitchell and Connor, 2004), although in practice it has still been possible for rents to be earned (Ragwitz et al., 2007). A closely related balancing act is the need to set *levels* of support sufficiently high to ensure investment, while at the same time ensuring that the resulting costs for consumers and *socially and politically acceptable*.

In practice, these two dynamics run in tandem, producing concurrent policy and political challenges. As Stokes (2013) shows in the example of Ontario, producer coalitions tend to press for high, stable levels of support, while both cost effectiveness and political sustainability concerns imply that subsidy levels should come down over time, but not so rapidly that investment is choked off. Because this balance is hard to get right, support programmes for some technologies and in some countries have been characterised by boom-and-bust cycles, as noted above.

Stokes (2013) concludes that policy needs to be adaptive, with opportunities for degression of support rates at certain points in time or deployment milestones. To do this effectively takes considerable effort and resource. For example in Germany, where degression has been relatively effective but still far from perfect, policy makers have regulated to make cost information available and committed resources to analyse this data as the basis for periodic adjustments.

It is within this context that recent developments in the UK must be seen. As described in more detail in the next section, changes introduced in the Electricity Market Reform process from 2010 onwards sought a particular set of solutions to the balancing

acts described here: creating greater certainty for investors by moving from an RPS to a FIT approach, while seeking to overcome the asymmetric information problem through auctions. Laid on top of these changes, the Levy Control Framework is a mechanism for limiting the overall costs of subsidy for consumers.

3. The Levy Control Framework

3.1. Renewable electricity support policy in the UK since 2002

Dedicated support for electricity from renewable sources in the UK started in the early 2000s, with the Renewables Obligation (RO).[2] This was a portfolio standard approach that set a target quantity of renewable generation, rising steadily over time from 3% of supply in 2002–03 to 20% around 2020 (Woodman and Mitchell, 2011). The RO was subsequently amended on several occasions but the basic principle of a quantity target was retained.

In 2008, the RO target was superseded by the binding target taken on under the EU's 2020 climate and energy package of 15% of energy to come from renewable sources by 2020, and an expectation that this meant around 30% of electricity from renewable sources. At the time the target was agreed to, renewable generation was 5% of the total; by 2014 the share had reached 18% and by the third quarter of 2015 it was 23.5% (DUKES, 2015; DECC, 2016a). The RO was mainly aimed at larger investments but in 2010, after lobbying from environmental organisations and the Renewable Energy Association, a Feed-in Tariff support mechanism modelled on continental European examples was introduced for small-scale renewables (under 5 MW).

In 2014, a new support mechanism policy for larger investments – Contract for Difference Feed-in-Tariffs (CfD FITs) – was introduced under the Electricity Market Reform process. Owners of a particular type of renewable electricity technology with a CfD FIT receive a payment equal to the difference between the wholesale electricity market price and a fixed price (known as a 'strike' price), but if the market price rises above the strike price, owners have to pay back the difference. In addition, rather than the government setting the strike price as with small scale FITs, the strike price is determined through an auction process, where the government periodically tenders a certain amount of capacity by a particular technology.

CfD FITs superseded the RO, which is now being phased out. While CfD FITs currently encompass just renewable electricity, they are an instrument targeted more generally at 'low-carbon' forms of generation, and if new nuclear power plants are built in the UK these would also be included in the CfD FIT regime. The government has already negotiated a CfD FIT of £92.5/MW h for the proposed new nuclear plant at Hinkley C.

Electricity suppliers in the first instance are required to meet the costs of all of these support programmes.[3] However, suppliers are then allowed to pass on the costs involved to consumers. Following a series of consultations over the early 2010s, the Government excluded energy-intensive consumers from these pass-through costs on competitiveness grounds in the 2015 Spending Review. It is also likely that businesses in the non-tradeable sector will seek to pass through most or all of these policy costs to final consumers as normal business costs. Thus the burden of pass-through costs largely falls on households.

Table 1
Levy Control Framework caps 2011/12 to 2020/21. Sources: DECC (2011, 2013).

	£m (2011/12 prices)
2011/12	1844
2012/13	2352
2013/14	2884
2014/15	3560
2015/16	4300
2016/17	4900
2017/18	5600
2018/19	6450
2019/20	7000
2020/21	7600

3.2. The Levy Control Framework

Up until 2010, there was no official limit on such pass-through energy policy costs. However, following the general election in 2010, the new Conservative-Liberal Democrat coalition government introduced a new approach. The Spending Review in the summer of 2010 set an overall cap on costs passed through to consumers created through energy policies by the Department of Energy and Climate Change (DECC), including renewable energy support policies. This was then formalised in what was called the Levy Control Framework (LCF) (HM Treasury, 2011). The LCF sets a cap on some policy costs every year, with the cap being set for a number of years ahead being set in Spending Reviews. Renewable electricity policy costs are included under the LCF but not the costs of other policies, such as the Capacity Market, the Warm Home Discount or the Energy Company Obligation for energy efficiency (HoC ECCC, 2016a). The LCF caps for the renewable electricity programmes for the first two Spending Reviews are shown in Table 1. There are at the time of writing no caps set for the LCF after 2020.[4]

Levy controlled expenditure in any one year can be written as:

$$\left[\sum_i PiQi\right] + \left[\sum_j (BjQj \cdot \mathrm{P_{ROC}})\right] + \left[\sum_k (Pk - R)Qk\right] \quad (1)$$

The first term represents spending associated with the small scale FIT. P_i are the administratively set tariffs per kWh of generation for each small scale FIT technology i, and Q_i represents generation from each technology. The second term represents spending associated with the Renewables Obligation, where P_{ROC} is the average price of Renewables Obligation Certificates in the ROC market, B_j are the bandings associated with each RO technology j, and Q_j is the generation from each technology. Note that the sum of the Qj in each year can be expected to be broadly related to the RO target for that year, although it will not necessarily be the same because some suppliers may choose to pay the buy-out price. Finally, the third term represents spending associated with the CfD FITs, where P_k are the strike prices for each CfD FIT technology k (either set administratively through the FiDER process or through bidding in auctions in the main CfD FIT process) and R represents the reference price. Q_k is the amount of generation rewarded under the CfD FIT scheme, which is determined in turn by the amount of capacity auctioned and average load factor for each technology k.

The framework then requires DECC to set policies such that the

[2] Prior to this, renewable electricity projects could benefit from the Non-Fossil Fuel Obligation, but this mechanism was mainly designed to support nuclear power, and while some bids were made to build windfarms with NFFO support, in practice few were built (Woodman and Mitchell, 2011)

[3] Technically, in the CfD Fit the immediate counter-party is a government backed company, but the costs incurred by that company in setting up CfD's is then allocated to suppliers through a formula based on demand they meet.

[4] The Committee on Climate Change has indicated that it believes that the envelope should be around £11 billion in the middle of the next decade, falling to £10 billion by 2030 (CCC, 2013).

central forecast of their costs are within the cap, with estimates produced by DECC and agreed as necessary by the Treasury and verified by the Office of Budget Responsibility (OBR), and with the Treasury having full access to the methodology behind forecasts. There is a 20% 'headroom' allowance for unexpected events, but overall the framework is designed to keep costs within the central cap. Where policies are forecast to overspend against the envelope, 'DECC will have to develop plans to bring spend back within the cap taking into account impact on energy bills and progress towards our targets' (DECC, 2011: 3). If this is not done the underlying threat is that the excess will be taken out of DECC's departmental budget. Moreover, DECC's plans for containing spending need to be approved by the Treasury (HM Treasury, 2011). The expectation is that changes that increase spending through one policy would be offset by a decrease in spend through another policy.

Up until 2015, the LCF did not attract a lot of attention because forecast spending appeared to fit comfortably under the cap. In its Annual Energy Statement in the autumn of 2014, DECC's view was that it the LCF would allow additional spending looking ahead rising from around £50 m in 2015/16 to £1bn in 20202/21 (DECC, 2014). However, going into the 2015 general election, this view was challenged by the think-tank Policy Exchange. In a May 2015 blog post, Richard Howard (2015) argued that DECC was being over-optimistic and had underestimated future costs of existing renewables policies within the LCF due to three effects.

These can be seen in terms of the elements in Eq. (1) above. The first was that declining market prices due to gas price falls meant that Contracts for Difference would be more costly because of the larger difference between the reference price (R) and strike prices. The second effect was that DECC had underestimated the scale of expansion of solar PV (i.e. elements of Q_i). The third was that DECC had underestimated how much electricity offshore wind farms would actually generate (i.e. the load factor which partly determined Q_k), due to technological improvements. Transitional arrangements for the introduction of CfD FITs had also cut into the overall budget more than anticipated (Cornwall Energy, 2015).

The overall result, Howard calculated, was that the entire LCF envelope out to 2020, i.e. reaching £7.6 billion by that date, was effectively already spent. There would be no room for a further expansion of renewables going forward. In June, Cornwall Energy (2015) estimated an *overspend* of the LCF cap of around £300 million by 2020. Then in July, the OBR released forecasts for the LCF that reached £9.8 billion in 2020/21 (OBR, 2015), not only well above the £7.6 billion cap but also slightly above the 20% headroom provision (Fig. 1).

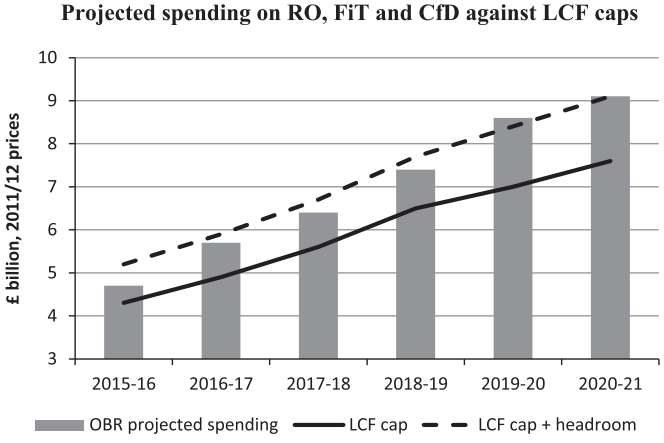

Fig. 1. Projected spending on RO, FiT and CfD against LCF caps. Source: DECC (2013), OBR (2015).

4. The Levy Control Framework and UK renewable energy policy

The immediate effect of the anticipated overspend on the LCF envelope was to drive policy change. As required, DECC quickly responded to the OBR forecasts by making a number of proposals for changes to support mechanisms.[5] The response differed according to what variables in the mechanisms that could be directly influenced through policy levers:

- For the small-scale FIT programme, this is the tariff levels (P_i in Eq. (1) above). Cuts in tariff levels would not only reduce spending directly, but could also be expected to dampen future investment, thereby lowering generation (Q_i in Eq. (1)) in future years. In the summer of 2015 DECC proposed sharp reductions in the FIT support rates for solar PV, and these were ultimately cut by between 64% and 85%.

- For spending under the RO there are fewer direct policy levers. The ROC price (P_{ROC}) is set by demand for Certificates and trading amongst utilities, and while the quantity of renewable generation (Q_j) is loosely related to the evolution of the Obligation targets, these have been set over a long period and suppliers can in any case pay the buy-out price rather than sourcing renewable electricity. Banding (B_j) was similarly set through legislation and would be difficult to change quickly. Because of these constraints, and because the RO was being phased out already to allow the phasing in of the CfD FIT, the approach by DECC was to accelerate the removal of support for certain technologies. DECC had already announced in April 2015 a phase out of RO support for solar PV by 2017. In July 2015 the Department announced that it would bring forward this phase out by a year. The conditions for biomass support under the RO were also changed. The new Conservative government had already announced that it was withdrawing support for on-shore wind through the RO in the form of a manifesto commitment, but the LCF situation was a powerful reinforcing factor. As industry analyst Cornwall Energy (2015: 4) put it: "…the closure of the RO and (probably) CfD to onshore wind cannot purely be viewed as a NIMBY-istic reaction to the development of big energy projects in the countryside; it should also be seen from the point of view of increasing consumer levies under a politically agreed cap on spending."
- Control over spending in the CfD FIT can be achieved through the auctioning process. As noted above, auctioning is often presented as a good solution to problems of asymmetric information, but in the context of budgetary control auctions are also attractive because they allow control over the pace and extent of expansion of support to renewables. The RO set a pathway for expansion, but this was set a long way into the future, whereas auctions give much greater fine tuning, since government decides when auctions are held and for what volume of capacity (helping to determine Q_k in Eq. (1) above). Following the publication of the revised OBR projections of LCF spend in July 2015, there was no information on further auction rounds for offshore wind under the CfD FIT until mid-November, when the Secretary of State announced that there would be further rounds, conditional on whether cost assumptions are realised. The 2016 Budget subsequently announced that £730 million would be available to 2020, with £290 million available for the next round in 2016.

[5] See the written Ministerial Statement by Lord Bourne of Aberystwyth on 22 July 2015, Available at: https://www.gov.uk/government/speeches/levy-control-framework-cost-controls

The development of the Levy Control Framework marks a significant shift in the nature of renewable electricity support policy in the UK. Through the 2000s, the main approach (i.e. the RO) was essentially a *quantity*-based measure, but one that provided a steady projected increase in renewable generation into the future. In 2010 the Feed-in Tariff was introduced as a complementary policy for small scale renewables, which was essentially a *price*-based mechanism with an open-ended approach to quantity. Since 2014 the RO has been superseded by the CfD FIT, which is a *price*-based measure with indirect control over quantity via the setting of auctions. The LCF however, has brought all of these mechanisms under a *budgetary*-based approach.

It is important to grasp how far the LCF brings renewable energy policy within the scope of budgetary policy.[6] The LCF is based on "a strong presumption that agreement would not be given outside of a Spending Review process for changes [in renewable electricity support policies] that take central projections above the agreed cap- including for additions of new policies to the framework" (HM Treasury, 2011: 4). This implies that it is Spending Reviews, rather than, say, carbon budgets, which are the primary framework for setting the direction and extent of renewables policy. Renewable electricity support policies are also subject to any changes in the Treasury's budgeting framework (ibid). This relocation of energy policy under budgetary policy is symbolised by the supervisory role that the Treasury now plays, effectively overseeing the evolution of renewable energy policy.[7] An emphasis on budgetary control over policy impact was noted by the National Audit Office in 2013, which found that the levy control board (the joint DECC and Treasury governing body for the LCF) "examines how deployment of renewable technologies affects costs charged to the Framework but it has not tracked the resulting progress towards decarbonisation." (NAO, 2013: 20).

These considerations raise the possibility that the realisation of renewable energy targets might be prevented through the imposition of budgetary targets. So far, this does not appear to be the case. While the formal EU target is for renewable energy rather than electricity, the UK's National Renewable Energy Action Plan does have an expectation that 30% of electricity will come from renewable sources by 2020.[8] In 2015 the share of renewables was 24.7%, and with further capacity growth factored in to the LCF it seems likely that this electricity target will be met. Late last year the Committee on Climate Change also calculated that even with the changes to support in 2015, the expansion of renewable under the LCF to 2020 is compatible with the rate of expansion that the Committee consider necessary to meet carbon budgets.[9] However, because of the uncertainty built in to LCF expenditure as described in Section 2 above, because caps for LCF spending beyond 2020 have not yet been determined, and because there is a political element to the setting of the LCF cap as discussed further below, it is still possible, at least in principle, for the two sets of objectives not to be consistent.

5. Protecting consumers and underpinning investor confidence

It is clear that the Levy Control Framework sets a cap on spending for renewable electricity support. However, it is not entirely clear what the *purpose* of the framework is. That some confusion exists can be seen in some of the evidence given to the Energy and Climate Change Committee enquiry on investor confidence, with one investment manager stating that: "I think it would help if it was clear what the LCF stands for. What is it trying to achieve? How does it fit within the overall framework of reaching the 2020 goals? ".[10]

One technical reason put forward for the introduction of the LCF is the reclassification by the Office of National Statistics at the end of the 2000s of the costs of renewable support on bills as a tax, and the payments given to generators as public expenditure (DECC, 2011).[11] This reclassification was apparently made on the grounds that the costs of renewable electricity support are levied in such a way that they assessment is based in turn on the approach taken in the European System of Accounts, which was updated in 2010. However, this argument cannot per se account for budgetary control, which is the key element of the LCF.

Another argument, put forward by some in government at the time of the introduction of the LCF,[12] is that it was becoming clear that the sums involved were going to become significant towards 2020, and have a potential macroeconomic effect. Costs therefore needed to be brought under the ambit of budgetary planning. However, since the amount raised for support to renewables under the LCF is spent immediately, this is in effect a hypothecated tax which will have distributional effects but no major macroeconomic effect. This point also applies to the idea that the LCF is somehow related to the austerity policies of the coalition and subsequent Conservative governments. The cost pass-throughs covered by the LCF may be counted as tax, and payments to owners of renewables as public spending, but since they largely cancel each other out they are revenue neutral, and reducing or limiting the total LCF envelope will have no mitigating effect on the government deficit or public debt (DECC, 2011).

A more relevant and convincing reason found in official documentation is about impacts of policy on consumers. The LCF is framed as ensuring that energy policy is 'consistent with economic recovery and minimising the impact on consumer bills.' (HM Treasury, 2011: 3), and averting the possibility that 'spending [on policies] on an ongoing basis could lead to an unsustainable increase in electricity bills' (DECC, 2011: 4). However, even within this account there are two potentially distinct rationales. One is that the purpose of the LCF cap is aimed at protecting the *welfare of consumers*. The other is, in the words of the Energy and Climate Change Committee (HoC ECCC, 2016a: 23–24), that "it provides an assurance that costs to consumers will be kept under control, which is important because uncontrolled costs can undermine public support for policy measures" which in turn is essential for overall *investor confidence*.

5.1. Effects on consumers

We first consider the role of protecting consumers. Since heavy

[6] Some accounts (see for example Benson and Russell, 2014) do not appear to have taken on board that LCF elements, which are now far larger than any low-carbon spending directly out of tax, now form part of the budget.

[7] A widely held view is that energy policy under the current government is effectively made by the Chancellor George Osborne rather than the Energy Secretary Amber Rudd; see for example: http://www.conservativehome.com/platform/2015/10/dennis-clark-rudds-energy-policy-failure-and-how-shemust-turn-it-around.html

[8] In late June 2016, a referendum on EU membership was held and was won by a majority favouring that the UK should leave the EU. The length of time that this process will take is uncertain at the time of writing. At the earliest this could be in 2018, but could be after 2020. It is also uncertain whether the UK will retain 2020 targets for renewable energy, and what these will be.

[9] https://www.theccc.org.uk/publication/technical-note-budget-management-and-funding-for-low-carbon-electricity-generation/

[10] Lilia Stoyanova, Director at the Townsend Group, investment managers for the Environment Agency Pension Fund, ECCC (2016b).

[11] At the point that the LCF was introduced, the ONS had ruled on the RO but was still considering whether the small scale FiT should be similarly classified. However, on the basis that the RO decision made it very likely that the ONS would reach a similar conclusion on the FiT, the government moved to include the FiT within the LCF as well.

[12] Personal communication, political advisor in DECC, 29 February 2016.

industry is exempt, as noted in Section 2.1 above, and other businesses can be expected to pass through policy costs ultimately to households, 'consumers' here means the domestic sector.

The LCF has been criticised for not reflecting accurately the likely evolution of the burden of policy costs on consumers. First, the spending envelope includes only policy costs relating to renewables, and not the costs of other policies, notably the Capacity Market, (a security of supply mechanism set up under the Electricity Market Reform that pays owners of generation capacity and those offering demand side reduction to be available for specific periods). According to HoC ECCC (2016a) the government will include Capacity Market spending within a more widely defined LCF, but not within the cap as currently set. The National Audit Office (NAO 2013: 28) argues that "including some consumer-funded electricity market support schemes but not others…risks undermining the utility of the Framework as a mechanism for considering the affordability and relative merits of spending on different interventions."

In addition, only the *direct* costs of renewable support policy are included in the LCF, rather than the net costs reflecting full system and market effects (HoC ECCC, 2016a). For example, when the wholesale electricity market price falls, this lowers the reference price (R in Eq. (1) above), and increases spending under the LCF because the gap between the strike price and the reference price increases. However, in a competitive market, lower wholesale prices should feed through to lower retail prices, so that the overall increase in costs to the consumer should be much lower (in a perfectly competitive market there would be no increase). Secondly, the merit order effect of higher renewable electricity generation should also suppress wholesale prices. According to evidence given to the Energy and Climate Change Committee enquiry on investor confidence, for every £1 spent on subsidising offshore wind, there is a 60p reduction in wholesale prices via this effect (HoC ECCC 2016b, Q203). Against these two effects, a higher proportion of variable renewable generation has implications in terms of balancing costs.

Overall then, it can be argued that the LCF does not currently function well as a mechanism for protecting consumer welfare by limiting electricity policy costs, because it does not accurately capture the net effects of all relevant costs.

At the same time, there are reasons to doubt that the primary function of the LCF is to protect the poorest and most vulnerable domestic energy consumers. A commonly made point about policy costs passed through to energy consumers is that the distributional effects are particularly regressive, representing a greater proportional burden on the poorest households and the 'fuel poor' (e.g. Ekins and Lockwood, 2011; Chawla and Pollitt 2013; Thumin et al., 2014). This is partly because of limits to the income elasticity of demand for energy, but it is also because poorer households tend to pay more on average for each unit of energy as they are more likely to be on pre-payment meters or on standard variable tariffs (Preston et al., 2010). Some households in these lower deciles will benefit from offsetting income supplements and energy efficiency measures, but the targeting of these is poor (Chawla and Pollitt, 2013). In this context, the LCF might be seen as an attempt to protect such consumers. However, this argument is undermined by the fact that wider government policy has had, if anything, the opposite effect on the poorest households. Wider tax and spending policies since 2010 aimed at reducing the government deficit have hit these households the hardest, reducing net incomes most in the bottom three deciles (Browne, 2010; Browne and Elming, 2015; Hood, 2015;). Within this wider context, therefore, it is difficult to interpret the LCF as being primarily about protecting the welfare of the poorest households.

5.2. Effects on investor confidence

A second potential rationale for the LCF is that it will underpin investor confidence in renewable energy policy by limiting costs, not so much for the poorest households but for the public in general, thereby maintaining public support for policy. The wider context for financing support to renewable energy through cost pass-through to consumers since the late 2000s has been particularly challenging. Underlying energy costs rose through the 2000s, while real wages in the lower and middle part of the labour market were stagnant, and have fallen since the financial crisis in 2008 (Gregg et al., 2014; Goos and Manning, 2007). With the resulting squeeze on living standards in which energy costs played a significant role, the political salience of energy rose sharply.[13]

Over the same period, attitudes to taxes have hardened; the proportion of respondents supporting an increase in tax and spending fell from a level of around 60% in the early 1990s to around 30% by 2010, with the decline accelerating from the start of the 2000s.[14] This period also saw the setting up of the Taxpayers Alliance, an anti-tax lobby group with considerable influence and reach through the media.[15] Environmental policy costs on energy bills received an increasing amount of attention, being progressively relabelled by the end of the 2000s as 'green stealth taxes',[16] especially in parts of the print media (e.g. Derbyshire 2008a, 2008b; Henderson, 2009; Moore, 2009; Shaw 2010; Ingham, 2010; Mortished and Whitwell, 2010; Leach and Gray, 2010; Wardrop, 2011; Macrae, 2011; Poulter, 2011). While renewable energy remains broadly popular (DECC, 2009; DECC, 2016b), there is limited willingness to pay for it – in a 2010 survey, for example, Spence et al. (2010) found 36% of respondents unwilling to pay anything more for renewable electricity, and 88% unwilling to pay more than £10 a month.

At the same time, the distribution of the financial *benefits* from renewable electricity policy has been quite concentrated. The vast majority of wind power assets in the UK are owned by the six large energy utility companies and other large and medium sized wind companies. The remainder are owned almost all by landowners. The distribution of ownership of solar PV is more complex, with about half of assets now in the form of larger installations owned by companies and half owned by households as roof-top installations.[17] How ownership of roof-top solar is distributed is not known, but it is likely to be concentrated amongst better-off households (Grover, 2013). Only a very small proportion of renewable energy assets −60 MW in 2014, representing around 0.3% of the total (DECC, 2014b) – are community owned. The concentration of the benefits of renewable energy support policies in the hands of corporations, especially the six large utilities, is also difficult politically, since these companies are generally unpopular.

In such a context the underlying fear, expressed for example by

[13] In October 2012 a source in the Prime Minister's office was quoted as saying: "This is very big. Energy prices is one of the biggest issues on the doorstep and we are determined to do something" (Wintour and Carrington; 2012). As prices peaked in 2008, the then Prime Minister Gordon Brown intervened, convening a summit with energy companies to broker rebates for those most affected. Prices remained high as the coalition government came into office. In the autumn of 2013, energy costs rose to the top of the political agenda again following a speech by the then Leader of the Opposition, Ed Miliband. At this point the Conservative Primate Minister, David Cameron, announced that tariff rules would be changed to avoid overcharging by utilities.

[14] http://www.bsa-data.natcen.ac.uk/

[15] http://www.taxpayersalliance.com/our_history

[16] Vallely (2008) cites Conservative Party spokesman Peter Ainsworth arguing that the disguising of stealth taxes as green taxes has so "poisoned the well of public goodwill that I'm beginning to wonder whether green taxes will ever be possible".

[17] https://www.gov.uk/government/statistics/solar-photovoltaics-deployment

Garman and Aldridge (2015: 7) is that "Ramping up [policy costs] …significantly in coming years would lead to a high risk of a more sustained public backlash, which might be stoked and amplified by influential critics of climate policy in parliament and in the media. This could cause an unravelling of the entire policy framework that underpins the low-carbon transition in this country."

These fears are partly based on experiences in other countries across Europe, most of which have the same approach to financing the policy costs of renewable electricity support as the UK, i.e. from cost pass-throughs or levies on bills (CEER, 2015). As noted above, several of these countries (Belgium, Bulgaria, the Czech Republic, Greece, Italy and Spain) have made retrospective or retroactive cuts in support rates and introduced moratoria on new investments, mostly triggered by surges in cost (Keep on Track; del Río and Mir-Artigues, 2012, 2014; Fouquet and Nysten, 2015; Gatzert and Kosub 2016). These policy changes have had major negative effects on investor sentiment, and in some cases have led to legal action (Behn and Fauchald, 2015).

Seen in this light, the events of 2015 show both the strength and the weakness of the LCF as a mechanism for underpinning investor confidence. By taking a forward look at likely expenditure and signalling limits to that expenditure, the Framework arguably prevented a situation emerging later where the UK government would have to take retrospective actions, which are particularly damaging to investor confidence (HoC ECCC, 2016b Q230). However, partly because of the sudden changes in mid-2015 triggered under the LCF framework, and the uncertainty it has created about the future, there has still been a negative impact on investor sentiment. In July 2015, the UK lost its position in the top ten of the Ernst and Young Renewable Attractiveness Index, which it has held since the Index was started in 2005. A survey of the Low Carbon Finance Group network of senior energy financiers in August and September of 2015 found that while the UK is viewed as an attractive country with low sovereign risk, the announcements and proposals made in mid-2015 produced a 'serious erosion of confidence in the …renewable energy market' (Hamilton, 2015: 1). Survey respondents reported that investment and credit committees[18] in the UK were nervous about the direction and stability of policy, and one reported 'increased uncertainty in the banking and sponsor community of the impact of ongoing UK Treasury spending review of the LCF.' (Hamilton, 2015: 4).

The single biggest short-term concern was the resulting lack of clarity about future CfD allocation rounds. The introduction of the CfD FITs was specifically intended to reduce risk for investors,[19] by providing them with a long-term, fixed price contract for low-carbon electricity rather than the variable price of a RO certificate. In principle, the LCF was also supposed to provide reassurance to investors by indicating the size of the available pipeline looking ahead (HoC ECCC, 2016a, 2016b). However, the unintentional effect of the LCF has been to introduce several new sources of uncertainty.

One is that, as described in Section 2.2 above the factors that determine policy costs are variable and uncertain but the LCF caps are fixed, which means that uncertainty about whether caps will be breached is built into the design of the Framework. This variability can be large; as HoC ECCC (2016a, 2016b) points out, the estimate of spend under the LCF in 2020/21 changed by £3.25 billion between autumn 2014 (in the DECC Annual Statement) and summer 2015 (the OBR Forecast). Uncertainty about expected spending arose not only from sources like underlying future electricity prices but also from political decisions, such as whether or not biomass co-firing in the large thermal Drax plant would obtain State Aid approval from the European Commission, and therefore whether allowance for this needs to be included in the LCF spend (Cornwall Energy, 2015). There is likewise uncertainty about whether the large tidal lagoon project at Swansea Bay will be included or not. Another source of uncertainty arises from the fact that resources for support under the CfD FITs in the LCF are further divided into 'technology pots'. Allocations between these pots can and has changed, and investors do not have certainty about whether this may happen again in the future. Since support costs per MWh differ by technology, a reallocation of support between pots within the overall LCF budgetary cap would have implications for the available capacity to bid for under the different pots. Finally, there is currently no certainty about the LCF envelope after 2020, which is affecting the long term investment climate (Deben, 2015; Hamilton 2015, HoC ECCCa 2016a, 2016b; Johnston, 2016). The period after 2020 is also complicated by uncertainty about whether or not a new nuclear plant will be built and operational within the next LCF period (2021–27), since support to nuclear would be a large item.

Some of these uncertainties arise from factors that investors and other market actors already face. However, because the assumptions and methodology used by DECC in calculating LCF spending projections have not been made public, these actors cannot make their own assessments of the risks involved. Indeed some industry actors believe that part of the variability in estimates of 2020/21 spending over the course of 2015 was due to changes about assumptions made in the calculation of LCF spending (HoC ECCC, 2016a: 28). This lack of transparency has been widely criticised (ibid).[20]

6. Conclusion and policy implications

The Levy Control Framework is a new and significant development in renewable support policy in the UK, with potentially wide ramifications. In this paper I have argued that the LCF has already had important effects on renewable energy support policy, accounting for much of the unexpected policy change in 2015. Various sources of uncertainty are built into the calculation of future costs under the LCF, which combines with a fixed cap creates permanent uncertainty about whether future caps will be breached.

The wider significance of the LCF is that it places a budgetary mechanism on top of existing price-based and quantity-based mechanisms for renewable electricity support. It relocates support to renewable energy from the spheres of energy and the environment to the sphere of budgetary control, and brings the politics of cost to bear more explicitly on renewable energy policy. It also implies a shift of the locus of policy control from the Department of Energy and Climate Change to the Treasury. Thus far the imposition of budgetary control does not imply that renewable electricity targets will not be met, but the development of the LCF nevertheless raises this possibility in future.

The purpose of the LCF is not wholly clear. It is not clear that the LCF can best be interpreted as part of efforts by governments since 2010 to protect consumers from policy costs, especially the poorest households. If the LCF is aimed at this purpose, it is not well-designed, since it does not include all policy costs and does not reflect full system costs for consumers. Even if protecting the welfare of consumers is not the primary purpose of the LCF it

[18] These bodies in banks and institutional investors are key to approving funds – see UNEP/SEFI/Bloomberg/Chatham House (2009: 14).

[19] See Ed Davey's comments at: http://webarchive.nationalarchives.gov.uk/20121217150421/http://www.decc.gov.uk/en/content/cms/news/pn12_0146/pn12_0146.aspx

[20] http://www.carbonbrief.org/levy-control-framework-unanswered-questions

should be reformed to meet these criticisms.

The LCF is most readily understood as a measure to prevent the undermining of public support for renewables policy by containing costs, and thereby shoring up investor confidence. As Stokes (2013: 496) observes, "Enacting and implementing an ambitious renewable energy policy is a politically difficult task", and in a wider context of squeezed incomes over a large part of the population and a political environment hostile to tax, the task is even more difficult. In this sense, the LCF can be seen as an attempt to provide a solution to managing potential tensions between goals for expanding renewable energy (seen in the 2020 and 2030 European climate and energy packages) on the one hand and the costs to energy consumers on the other (HoC ECCC, 2016a, 2016b). It can also be seen as a measure to avoid what has happened in some other European countries where investment booms, especially in solar PV, have led to retrospective and retroactive policy reversals and moratoria.

The experience of 2015 suggests that while the LCF has so far avoided the worst of these effects, the policy changes it has triggered have nevertheless undermined investor confidence in the UK, which has been high to date, somewhat. Investors have also been frustrated by their inability to develop their own analysis of the uncertainties built into the LCF because of the government's lack of transparency on assumptions and methodology for the calculation of forecasts. Improving the transparency of the calculation of LCF projections would therefore help the effectiveness of the Framework as a tool for underpinning investor confidence in the renewable electricity sector.

However, even reformed in this way, a measure that places a limit on pass-through costs to households alone is unlikely to be a satisfactory means by itself to create a truly politically stable basis for the expansion of renewables. Clear, long-term frameworks of the type required to produce particularly strong investor confidence and a low risk premium, as in Germany (HoC ECCC, 2016b Q278) or Denmark usually require the kind of genuine cross-party commitment that can most easily be built in political systems with proportional representation (Schaffer and Bernauer, 2014), equitable income distributions, political support from strong supply chain industries built through active industrial and innovation policy, and arguably a wider distribution of policy rents (Lockwood, 2015).

An interesting question is whether the LCF will be adopted in other European countries. The UK is unusual in having brought renewable energy under budgetary control in such a formal multi-year framework. In the Netherlands budget caps for the SDE/SDE+ support systems for renewable electricity are set by the Ministry of Economic Affairs, Agriculture and Innovation, but only on an annual basis. However, across the EU, even in countries with very relatively strong political support for renewable energy, such as Germany, there have been moves away from open-ended support to frameworks which involve capacity growth corridors with triggers for automatic reduction of support rates. In several European countries, including Ireland, Portugal, France, Denmark and the Netherlands have been moving from price-support (FIT) schemes to auction based schemes, which as discussed above increase the ability of governments to exercise control on rates of expansion. The European Commission has encouraged this direction of travel (2013) and under State Aid rules will require auctions from 2017 onwards.[21] It is therefore possible that other European countries will continue to move in the direction of greater budgetary control over renewable energy expansion, of which the Levy Control Framework is the most comprehensive form to date.

[21] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/? uri=CELEX:52014XC0628(01)&from=EN

Acknowledgements

This work was supported by The Engineering and Physical Sciences Research Council (EPSRC) [EP/K001582/1]. I am grateful to Kirsty Hamilton of the Low Carbon Finance Group for discussions on investor confidence, and to an anonymous reviewer of an earlier draft of this paper for useful comments.

References

Batlle, C., Pérez-Arriaga, I.J., Zambrano-Barragán, P., 2012. Regulatory design for RES-E support mechanisms: Learning curves, market structure and burden-sharing. Energy Policy 41, 212–220.
Behn, D., Fauchald, O.K., 2015. Governments under cross-fire? Renewable energy and international economic tribunals. Manchester Journal of International Economic Law 12 (2), 117–139.
Browne, J., Elming, W., 2015. The effect of the coalition's tax and benefit changes inhousehold incomes and work incentives. Briefing Note BN159, Institute for Fiscal Studies, http://www.ifs.org.uk/uploads/publications/bns/BN159.pdf.
Browne, J., 2010. Distributional analysis of tax and benefit changes. 2010 Spending Review briefing, Institute for Fiscal Studies, 21 October 2010, http://www.ifs.org.uk/publications/5313.
Chawla, M., Pollitt, M.G., 2013. Energy-efficiency and environmental policies and income supplements in the UK: Evolution and distributional impacts on domestic energy bills. Economics of Energy and Environmental Policy. 2, 21–40.
Cornwall Energy, 2015. Counting the cost – DECC battles to control spending under the LCF. Energy Spectrum. Issue 479, 29 June 2015.
Council of European Energy Regulators (CEER), 2015. Status review of renewable and energy efficiency support schemes in Europe in 2012 and 2013. CEER, Brussels.
Deben, 2015. Letter from Lord Deben, Chair of the Committee on Climate Change, to Amber Rudd, 22 September 2015, available at: ⟨https://documents.theccc.org.uk/wp-content/uploads/2015/09/220915-CCC-letter-to-Rt-Hon-Amber-Rudd-MP.pdf⟩.
Del Río, P., Mir-Artigues, P., 2012. Support for solar PV deployment in Spain: some policy lessons. Renew. Sustain. Energy Rev. 16, 5557–5566.
Del Río, P., Mir-Artigues, P., 2014. A cautionary tale: Spain's solar investment bubble. International Institute for Sustainable Development, Geneva.
Department of Energy and Climate Change (DECC), 2009. Renewable Energy Awareness and Attitudes Research 2009: Management Summary. DECC, London.
Department of Energy and Climate Change (DECC), 2011. Control Framework for DECC Levy-funded Spending – Questions and Answers. DECC, London.
Department of Energy and Climate Change (DECC), 2013. Annex D: Levy Control Framework Update – Extending the Framework to 2020/21. DECC, London.
Department of Energy and Climate Change (DECC), 2014. Annual Energy Statement 2014. DECC, London.
Department of Energy and Climate Change (DECC), 2016a. Energy trends: Renewables. DECC, London.
Department of Energy and Climate Change (DECC), 2016b. DECC Public Attitudes Tracker – Wave 16. DECC, London.
Derbyshire, D., 2008a. The price of turning green: Labour's wind farm plan will cost every family £260 a year. Mail Online, 27 June 2008.
Derbyshire, D., 2008b. Wind turbines are "unreliable and will cost each home £4,000" claims think tank. Mail Online, 24 June 2008, ⟨http://www.dailymail.co.uk/news/article-1029143/Wind-turbines-unreliable-cost-home-4-000-claims-think-tank.html⟩.
Digest of UK Energy Statistics (DUKES) 2015 DECC, London.
Ekins, P., Lockwood, M., 2010. Tackling Fuel Poverty During the Transition to a Low Carbon Economy, Joseph Rowntree Foundation.
Fouquet, D., Nysten, J.V., 2015. Retroactive and retrospective changes and moratoria to RES support. Policy Briefing, 2020 Keep on Track, ⟨http://www.keepontrack.eu/contents/publicationsbiannualnationalpolicyupdatesversions/policy-briefing6-retroactive-and-retrospective-changes-and-moratoria-to-res-support.pdf⟩.
Garman, J., Aldridge, J., 2015. When the Levy Breaks: Energy Bills, Green Levies and a Fairer, Low-carbon Transition. Institute for Public Policy Research, London.
Gatzert, N., Kosub, T., 2016. Determinants of policy risks of renewable energy investments Working Paper, Department of Insurance Economics and Risk Management. Friedrich-Alexander University.
Goos, M., Manning, A., 2007. Lousy and lovely jobs: the rising polarization of work in Britain. Rev. Econ. Stat. 89, 118–133.
Gregg, P., Machin, S., Fernández-Salgado, K., 2014. Real wages and unemployment in the Big Squeeze. Econ. J. 124, 408–432.
Grover, D., 2013. The British Feed-in Tariff for small renewable energy systems: Can it be made fairer?. Policy Paper, Grantham Research Institute on Climate Change and the Environment, ⟨http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/britishfeed-in-tariff-renewable-energy.pdf⟩.
Grubb, M., Laing, T., Sato, M., Comberti, C., 2012. Analyses of the Effectiveness of Trading in EU-ETS. Climate Strategies, London.
Hamilton, K., 2015. Summary of UK Low Carbon Finance Survey. Low Carbon

Finance Group, London.
Henderson, E., 2009. £250bn: The real cost of wind power. Sunday Express, 15 November 2009, ⟨http://www.express.co.uk/news/uk/140456/250bn-The-real-cost-of-wind-power⟩.
Hood, A., 2015. Benefit Changes and Distributional Analysis. Post-Budget Analysis. Institute for Fiscal Studies, London, http://www.ifs.org.uk/tools_and_resources/budget/505.
House of Commons Energy and Climate Change Committee (HoC ECCC), 2016a. Investor confidence in the UK energy sector. Third Report of Session 2015–16. HC542, ⟨http://www.publications.parliament.uk/pa/cm201516/cmselect/cmenergy/542/542.pdf⟩.
House of Commons Energy and Climate Change Committee (HoC ECCC), 2016b. Oral evidence: Investor confidence in the UK energy sector HC 542, Tuesday 9 February 2016, ⟨http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/energy-and-climate-change-committee/investor-confidence-in-the-uk-energy-sector/oral/28877.html⟩.
Howard, R., 2015. Dear Energy Secretary, I'm afraid to tell you there is no money. Blog post, 12 May 2015. Policy Exchange, ⟨http://www.policyexchange.org.uk/mediacentre/blogs/category/item/dear-energy-secretary-i-m-afraid-to-tell-you-there-is-nomoney?category_id=13⟩.
Ingham, J., 2010 Energy bills "will hit £2,500 a year". Daily Express, 8 December 2010, ⟨http://www.express.co.uk/news/uk/216135/Energy-bills-will-hit-2-500-a-year⟩.
Johnston, S., 2016. Calls for Levy Control Framework reform grow. Utility Weekly, 7 July 2016, ⟨http://utilityweek.co.uk/news/Calls-for-Levy-Control-Framework-reform-grow/1259612#.V4Y1itj2aUk⟩.
Jordan, A., Matt, E., 2014. Designing policies that intentionally stick: policy feedback in a changing climate. Policy Sci. 47, 227–247.
Keep on Track 2020. Policy paper on retrospective changes to RES legislations and national moratoria. European Renewable Energies Federation, Brussels. (http://www.keepontrack.eu/contents/publicationsbiannualnationalpolicyupdatesversions/kot-policy-paper-on-retrospective-changes-to-res-support–october-2013-update.pdf).
Leach, B., Gray, R., 2010, Wind farm, subsidies top £1 billion a year. The Telegraph, 23 January 2010, ⟨http://www.telegraph.co.uk/news/earth/energy/windpower/7061552/Windfarm-subsidies-top-1-billion-a-year.html⟩.
Lockwood, M., 2015. The political dynamics of green transformations: the roles of policy feedback and institutional context. In Leach, M., Newell P., Scoones I., (eds.) The Politics of Green Transformations (January 2015), pp. 86–101.
Macrae, F., 2011. Green "stealth tax" to encourage wind farms and nuclear power will hit poor the hardest. Mail Online, 28 June 2011, ⟨http://www.dailymail.co.uk/sciencetech/article-2008892/Green-stealth-tax-encourage-wind-farms-nuclear-power-hit-poor-hardest.html⟩.
Mitchell, C., Connor, P., 2004. Renewable energy policy in the UK 1990–2003. Energy Policy 32, 1935–1947.
Moore, C., 2009. Wind power will make Britain the dirty old man of Europe – onshore wind as an energy source is expensive, unreliable and will scar the landscape. Telegraph http://www.telegraph.co.uk/comment/columnists/charlesmoore/6618002/Wind-power-willmake-Britain-the-dirty-old-man-of-Europe.html.
Mortished, C., Whitwell, T. 2010 Green energy levy would add £20 to bills. The Times, May31 2010, ⟨http://www.thetimes.co.uk/tto/business/industries/utilities/article2533984.ece⟩.
National Audit Office (NAO), 2013. The Levy Control Framework. HC 815, Session 2013–14.
Office of Budgetary Responsibility (OBR), 2015. Economic and Fiscal Outlook – July 2015. Supplementary Table 2.7 2013, OBR, London.
Poulter, S., 2011. Energy bills "to double in five years" as customers are hit by switch to green power. Daily Mail 11 July 2011, ⟨http://www.dailymail.co.uk/news/article-2013325/Green-power-push-double-energy-bills-years.html⟩.
Preston, I., White, V., Guertler, P. 2010 Distributional Impacts of UK Climate Policies. Centre for Sustainable Energy, Bristol (http://www.cse.org.uk/downloads/file/distributional_impacts_of_UK_climate_change_policies_june_2010.pdf).
Ragwitz, et al., 2007. Assessment and optimisation of renewable energy support schemes in the European electricity market – final report, OPTRES. Intell. Energy Eur. http://eeg.tuwien.ac.at/eeg.tuwien.ac.at_pages/research/downloads/PR_61_OPTRES_FINAL_REPORT.pdf
Schaffer, L.M., Bernauer, T., 2014. Explaining government choices for promoting renewable energy. Energy Policy 68, 15–27.
Shaw, A., 2010. Energy bills will rise to fund £75bn "dash for wind power" as Britain tries to hit climate targets. Mail Online, 8 January 2010, ⟨http://www.dailymail.co.uk/news/article-1241548/Energy-bills-rise-fund-75bn-dash-wind-power-Britain-tries-hit-climate-targets.html⟩.
Spence, A., et al., 2010. Public Perceptions of Climate Change and Energy Futures in Britain. Understanding Risk Working Paper 10-01. Cardiff University, Cardiff, http://psych.cf.ac.uk/understandingrisk/docs/final_report.pdf.
Stokes, L., 2013. The politics of renewable energy policies: the case of feed-in tariffs in Ontario, Canada. Energy Policy 56, 490–500.
Thumin, J., et al., 2014. Research on fuel poverty: The implications of meeting the fourth carbon budget. Report to the Committee on Climate Change, ⟨https://www.theccc.org.uk/wpcontent/uploads/2014/11/CCC_FinalReportOnFuelPoverty_Nov20141.pdf⟩.
Treasury, H.M., 2011. Control framework for DECC levy-funded spending. HM Treasury, London.
UNEP/ SEFI/Bloomberg/Chatham House, 2009. Private Financing of Renewable Energy: A Guide for Policymakers.
Vallely, P., 2008. The eco-crunch: can Britain still afford to go green? Independent 24, June 2008.
Wardrop, M., 2011. Green taxes make up 20 per cent of household energy bills, campaigners warn. Telegraph 9, June 2011.
Wintour, P., Carrington, D., 2012. Fuel price row: Cameron tries to firm up energy tariff plan. Guardian, 19 October 2012.
Woodman, B., Mitchell, C., 2011. Learning from experience? The development of the renewables obligation in England and Wales. Energy Policy 39, 3914–3921.