



# Reforming UK energy policy to live within its means

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**Abstract** The present pattern of taxation, charging, and providing support has accumulated over time in a haphazard way without the kind of strategic thinking that a long-term economic plan requires. This note sets out the sound economic and public finance principles that could guide the reform of energy taxes and supports primarily in the electricity sector. It argues for ending the RO and Feed-in Tariff schemes and replacing them by demonstrably successful CfD auctions which have dramatically lowered the cost of financing renewables. It argues for a state development bank to leverage cheap finance for low-carbon investments, reforming the form of the contracts, replacing the current alphabet soup of charges by the standard rate of VAT on all energy and instead funding climate change policies from general taxation, thus exempting the productive sector from distortive charges, and allowing the Carbon Price Support to resume its trajectory, restoring fiscal sanity and balance. Ending all support for the cheapest renewable electricity (on-shore wind) makes no sense and it would be better to have a single auction for all renewables that create learning benefits – which would rule out any subsidies to tidal lagoons

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## **Reforming UK energy policy to live within its means**

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### **Executive Summary**

In the July *Spending Review 2015* the Chancellor set out the task for the UK economy of living within its means and repairing public finances. The Budget aims to repair public finances while the Spending Review aims to control public expenditure. Energy policy impacts both sides of the budget balance – taxes and charges generate revenue while support for decarbonisation, energy efficiency and renewables requires financial support, much of which is directly funded by charges or taxes levied on energy consumers. The present pattern of taxation, charging, and providing support has accumulated over time in a haphazard way without the kind of strategic thinking that a long-term economic plan requires. This briefing note sets out the sound economic and public finance principles that could guide the reform of energy taxes and supports.

### **EMR, the LCF and reforming renewables support**

This note concentrates on the electricity sector as that has been the subject of the Electricity Market Reform (EMR) in the recent *Energy Act 2013* and is where the fiscal problems are most immediately apparent. Support to zero-carbon electricity (until the end of the decade entirely renewables) is escalating rapidly, and has more than trebled from £(2012) 992 million in 2007/8 to £3,138 m. in 2013/14 and is projected to treble again to £9.100 m. in 2020/21. These amounts would be considerably lower if the Renewables Obligation (RO) Scheme had been ended with the introduction of Contracts for Difference (CfDs) under the EMR, and the RO scheme should be replaced as soon as possible with CfD auctions, perhaps with just a single pot (or perhaps two if off-shore wind is

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<sup>1</sup> The author is a member of DECC's independent Panel of Technical Experts but is writing in his academic capacity and drawing only on published evidence, so that the views expressed here are his alone and cannot be attributed to DECC. I am indebted to the careful comments by my EPRG colleagues on this note and the highly productive interactions EPRG provides

necessary to meet targets). The 2015 CfD auction demonstrated that the weighted average cost of capital (WACC) could be lowered by 3.3% real, potentially saving £2.5 billion per year by 2020 and thereafter for 15 years, and perhaps more if the RO scheme is ended earlier than 2017. Properly funding a development bank on the German KfW model could leverage private capital and lower the cost of capital, and it is disappointing that the Green Investment Bank never achieved scale and is likely to be privatized.

The contracts can be further improved by paying only up to a limited number of MWh/MW capacity either per year or over a 10-15 year period. In the longer run a move to capacity auctions with payment on availability might better suit the objectives behind the renewables support programme.

Similarly, the Feed-in Tariff schemes, which have grown from £(2012)15 m. to £690 m. in four years, should be either replaced by CfD auctions for larger schemes, or massively scaled back for smaller schemes to cost parity with the revealed CfD prices, avoiding further regressive transfers to wealthier households for whom they are an excessively generous financial investment that should logically be subject to the same taxes as interest and dividends.

### **Reforming energy taxation**

UK energy charges and taxes are a mess and need reform according to standard good public finance practice. Energy (both gas and electricity) should be subject to standard rate VAT, and all charges for environmental purposes (climate change mitigation, R&D and deployment support) should be financed from general taxation (whose receipts will be adequately enhanced by raising energy VAT from 5% to 20%). This would avoid subjecting production to distortive revenue raising charges and restore competitiveness, as production does not bear VAT costs and lowering environmental charges will reduce their costs. Now is an excellent time to do this as energy prices have fallen. The Carbon Price Support (CPS) should ideally be reinstated on its original trajectory, and its adverse competitive impact will be offset by exempting industry from environmental charges. Clearly it would be desirable if other EU countries also accepted the logic of the CPS, failing which it is understandable that the CPS may need moderating, and the shortfall in carbon pricing addressed through higher supports to low-carbon energy.

## 1. The Government's long-term economic plan

In the July *Spending Review 2015*<sup>2</sup> the Chancellor set out the task for the UK economy of living within its means and repairing public finances. The Budget aims to repair public finances while the Spending Review aims to control public expenditure. Energy policy impacts both sides of the budget balance – taxes and charges generate revenue while support for decarbonisation, energy efficiency and renewables requires financial support, much of which is directly funded by charges or taxes levied on energy consumers. The present pattern of taxation, charging, and providing support has accumulated over time in a haphazard way without the kind of strategic thinking that a long-term economic plan requires. This briefing note sets out the sound economic and public finance principles that could guide the reform of energy taxes and supports.

The Chancellor bases his case on the need to reduce the deficit and cut the public debt, but the health of public finances depends on the asset as well as the liability side of the public sector balance sheet. If debt is issued to fund profitable investments that have a higher rate of return than the cost of borrowing, then the country's balance sheet of assets and liabilities is strengthened, not weakened. At present, and certainly for the near-term foreseeable future, the cost of Government borrowing is at an all-time low in both real and nominal terms. Low-carbon technologies are inherently capital-intensive but have low variable costs, so the cost of delivering power from such technologies is highly sensitive to the cost of finance. At low rates of discount, nuclear power and mature renewable technologies become more attractive, as do many other infrastructure investments such as transport projects and those with a long-term pay-off, notably research and development.

There is a serious danger that the combination of policy instability and an insistence of funding energy projects entirely from private finance and foreign direct investment will considerably raise the cost of low-carbon power and adversely impact energy consumers. In contrast, Germany has been very successful in mobilising public funds for such investments through development banks like KfW, which mobilises private capital cost effectively through its AAA

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<sup>2</sup> At <https://www.gov.uk/government/publications/spending-review-2015-a-country-that-lives-within-its-means>

government backed rating.<sup>3</sup> To cite a 2013 post by Bloomberg *New Energy Finance*:<sup>4</sup> “Europe has seen the most investment from development banks since 2007, receiving roughly half of the global total (\$217bn). Most of these funds came from KfW, the German development bank, and the European Investment Bank.” Such investments create productive capital, in contrast to public bail-outs of banks, which, while essential for ensuring future private sector financing, merely restore private sector balance sheets. While it might merely crowd out private investment if state development banks invested directly in commercially viable projects, there is a potentially strong case for providing public sector equity and debt finance to projects that require subsidy as the cheapest way of providing that subsidy.

Even if the pro-growth concept of a publicly financed development bank is currently unappealing (witness the haste with which the Green Investment Bank is to be privatized), there remains the urgent need to create a financial environment that is fit for the purpose of meeting our legislated climate change targets. This note will concentrate on electricity, which is currently the more urgent priority, and then address the taxation of other energy sectors once the principles have been set out.

## **2. Electricity taxes, charges, and support mechanisms**

Good economic policy requires not just that the Government controls its own expenditure wisely, but that it designs policies that deliver its objectives at least cost for the public as well. The UK’s energy and climate change policies have been largely designed to put the cost of meeting these objectives on consumers through charges, but the Office of National Statistics treated them as taxes, while the payments to those providing the services are public expenditure. They both appear in the Budget but they offset each other so their impact is neutral. To control a part of the resulting cost, the Government introduced the Levy Control Framework (LCF) as part of Electricity Market Reform (EMR). The LCF covers the Renewables Obligation (RO), Feed-In Tariffs (FITs, including the Contracts for Differences, CfDs) and Warm Home Discount (WHD). The LCF is set at £7.6

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<sup>3</sup> See <https://www.kfw-entwicklungsbank.de/International-financing/KfW-Entwicklungsbank/>

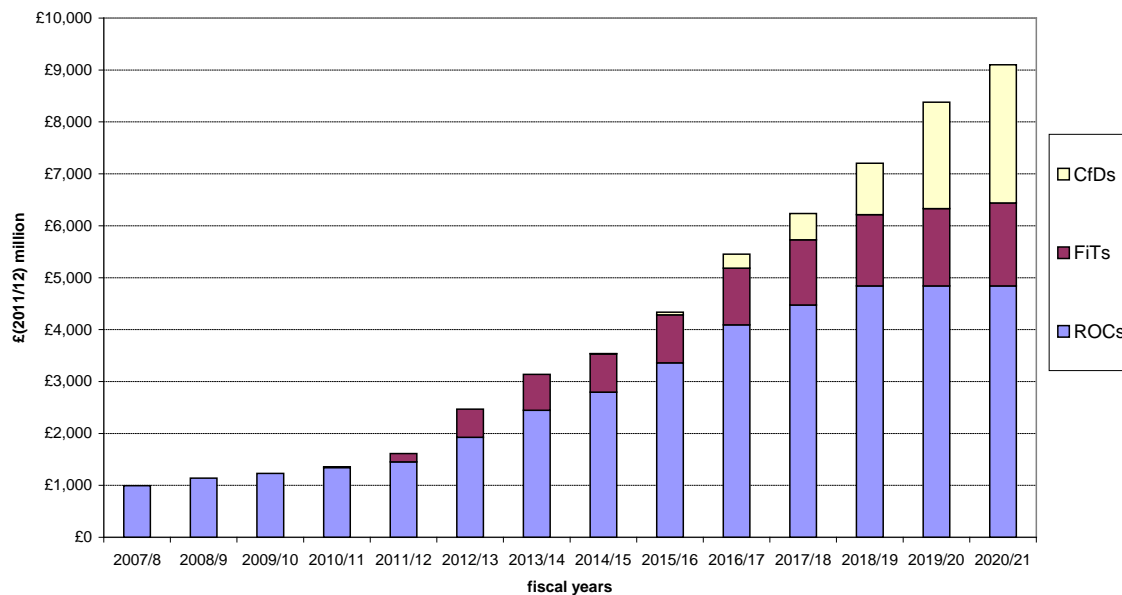
<sup>4</sup> At <http://about.bnef.com/press-releases/development-banks-finance-record-amount-in-clean-energy/>

bn for 2020/21 (in 2011/12) prices or about 0.4 of 1% of projected 2020 GDP. It is important to recognize that the LCF does not cover a range of other substantial expenditures including energy efficiency programmes such as ECO and others shown in Figure 3, capacity payments (of about £1 billion from 2018/19) and CCS demo plants and other R&D (NAO, 2013).

EMR attempted to improve the efficiency of meeting the UK’s climate change and renewables targets, but is facing pressure to scale back various support schemes. Figure 1 gives expenditure out-turns and projections for one set of supports to renewable energy, through the RO Scheme (issuing Renewable Obligation Certificates, ROCs) for larger renewable schemes, FiTs for smaller schemes, and the CfDs intended to replace ROCs by 2017.

Figure 1 shows that the LCF limit of £7.6 billion in 2020/21 is in danger of being breached, for three main reasons. The first is that the RO Scheme continues at its very generous levels when logically its replacement by CfDs should have been signalled at the 2011 RO Rebanding Review. The RO scheme should have ended when the CfDs were launched in early 2014, not 2017. As shown below, auctioning CfDs would have reduced the support costs considerably.

### Supports to zero-carbon electricity



**Figure 1 Past and projected expenditure on zero-carbon electricity support**

Sources: past FiTs and ROCs from Ofgem annual reports, projections: DECC (2015b)

The second less important reason is that the fall in gas coal and carbon prices has reduced the price of electricity and increased the gap between the CfD strike price and the wholesale price, although Figure 1 shows that this only becomes significant after 2017/18. The fall in fuel prices was outside the Government's control but the Treasury's Carbon Price Support (CPS) set in the 2011 Budget was frozen in the 2014 Budget, contributing to a lower future wholesale electricity price set by fossil fuels. A higher CPS would have generated more tax revenue and reduced support costs.

Finally, the 2014 capacity auction procured too much domestic capacity for 2018/19 through a failure to include the contribution that interconnectors make to security of supply (a mistake since rectified under pressure from DG COMP). More future capacity means lower future wholesale prices and higher CfD payments. The cost of the capacity procured of about £1 billion per year is not covered by the LCF, as it is intended to be a lower cost means of securing capacity adequacy for electricity consumers.

Running the RO scheme in parallel with CfDs had several adverse effects. The administrative strike prices that DECC proposed had to make the new scheme as attractive as the RO scheme to demonstrate its success, but assumed that developers would require almost as high a return on capital as the RO scheme. DECC (2013b) estimated that the weighted average cost of capital (WACC) for on-shore wind might fall from 8.3% under the RO scheme to 7.9% with a CfD, or by 0.4% (all real). These strike prices were used in the transitional (FIDeR) contracts, strongly criticized as too generous by the National Audit Office (NAO, 2014).

DG COMP was critical of the failure to market test the state aids offered through the CfDs. In response the Government announced an auction for CfDs (DECC, 2014a) with three separate pots for technologies of varying degrees of maturity.<sup>5</sup> Developers submit sealed bids chosen in order of increasing strike price regardless of the delivery date. If there are inadequate bids for any pot then the developers receive the administratively set and published strike prices. The first CfD auction was held in February 2015, and results are presented in Table 1.

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<sup>5</sup> [https://lowcarboncontracts.uk/system/files/round\\_2\\_operational\\_plan\\_v2.pdf](https://lowcarboncontracts.uk/system/files/round_2_operational_plan_v2.pdf)

The 27 successful projects will receive subsidies of £315 million per year by 2020/21. The solar bid of £50/MWh for 2015/16 was an incompetent bid and has not been registered, so it fails to receive a CfD.

Table 1 CfD Auction Allocation: Round 1

Technology		admin price	lowest clearing price	2015/16	2016/17	2017/18	2018/19	Total Capacity (MW)
Advanced Conversion Technologies	£/MWh MW	£140	£114.39			£119.89 36	£114.39 26	62
Energy from Waste with Combined Heat and Power	£/MWh MW	£80	£80				£80.00 94.75	94.75
Offshore wind	£/MWh MW	£140	£114.39			£119.89 714	£114.39 448	1162
Onshore wind	£/MWh MW	£95	£79.23		£79.23 45	£79.99 77.5	£82.50 626.05	748.55
Solar PV	£/MWh MW	£120	£50.00	£50.00 32.88	£79.23 36.67			69.55

Source: DECC (2015b)

Table 1 shows the clearing prices were often substantially below the administered prices (now price caps). The excess level of the WACC can be computed from Table 1 using cost estimates (DECC, 2013a) and price forecasts (DECC, 2014b). The internal rates of return (IRRs) for on-shore wind for varying values of the capacity factor (CF), capital cost (capex), and opex are shown in table 2. The column “IRR admin” gives the IRR using these cost assumptions but taking the administered price to determine revenues, while that labelled “IRR auction” uses the auction strike price, and “IRR difference”, shows the reduction in the IRR from moving from the administered to the auction prices. Changes in assumptions are in red, emboldened and italicized.

Table 2 Differences in the internal rate of return for on-shore wind

CF	capex £/kW	fixed opex £kWyr	var opex £/MWh	IRR admin	IRR auction	IRR difference
25%	£1,600	£30	£5	6.8%	3.5%	3.3%
25%	<b>£1,800</b>	£30	£5	5.1%	2.0%	3.1%
<b>28%</b>	£1,600	£30	£5	8.9%	5.4%	3.5%
25%	£1,600	<b>£45</b>	£5	5.4%	2.0%	3.4%
25%	£1,600	<b>£20</b>	£5	7.7%	4.5%	3.2%
25%	£1,600	£30	<b>£2</b>	7.4%	4.2%	3.2%

Source: own calculations



Although there are considerable differences in the IRRs from varying the technology assumptions (particularly the CF), the variations in the reduction in the IRRs are small, suggesting that the lowering of the WACC of some 3% real per year is robust. If the implied WACC is reduced by 3.3% through auctions then the saving on generation investment of £75 billion up to 2020 (DECC, 2011) would be £2.5 billion per year by 2020, continuing for 15 years. This may underestimate the potential savings, as unsuccessful auction bidders for the first two years expected to be able to fall back on the RO Scheme that runs until 2017. If the RO scheme had been ended at the date of introducing the CfDs, then there would have been no fall-back, no need to ensure equality of returns for the CfDs and ROCs, and hence lower prices in the CfD auction and even larger savings.

On 17<sup>th</sup> June 2015 the Secretary of State for Energy and Climate Change announced that the RO Scheme for on-shore wind would be ended early, with no future support for on-shore wind, the cheapest large-scale renewable option. If the early closure of the RO scheme implied relying solely on CfD auctions for all technologies, then it would be a sensible, if over-due, policy change. If the aim was to end any support for on-shore wind to pacify local opposition, it was unnecessary, given that powers to rule against local schemes was devolved to local authorities in this announcement. If the reason was concern that the Levy Control Framework would be breached, then closing the cheapest option but not the far more expensive off-shore wind and tidal lagoons makes no sense.

At the heart of a well-functioning government, the Treasury should be ensuring that we get *value for money* from our investments and policies. Mature renewables are supported as part of our climate change objective, and Table 1 demonstrates that some are now competitive with nuclear power, although intermittent renewables like wind and solar PV impose additional balancing costs and reserve requirements on the system. All zero-carbon generation needs long-term contracts at above current market prices as carbon is under-priced, contracts lower the WACC and to allay concerns over policy instability. The social cost of carbon (SCC) is much higher than the EU Allowance price and also higher than the current Carbon Price Floor (the earlier CPF projected £70/tonne by 2030 that was then considered the required level for new nuclear power and may be a better estimate of the medium term SCC).

Less mature renewables should be additionally supported for the value of their learning spill-overs. Increased deployment drives down costs and lowers future investment costs for us and makes them more attractive for other countries, further reducing global carbon emissions which impact on us. That was the primary logic behind the EU *Renewables Directive*, which was an intelligent way to ensure that each country contributed to the total EU ambition. Unfortunately, the *Directive* fails to distinguish between renewables with high spill-overs from those with no spill-overs at all (tidal lagoons, which is a mature technology – we have been building dams for centuries – and required to compete with similarly mature options).

As a further contribution to reducing expenditure, phasing out FiTs makes sense for several reasons. First, expensive small-scale schemes are less efficient than utility-scale renewables for electricity generation (MIT, 2015). Now that there is a global market for domestic scale solar PV, much of the initial learning has already taken place and needs little further support. Utility scale renewables should be auctioned under the CfD scheme. Second, the kinds of households that install solar PV are primarily attracted by the high real rates of return that they can earn compared to indexed bonds or other secure financial products. The returns to these have declined and so too should the returns offered to households, providing the prices they pay for the electricity they displace or sell properly reflects its value (including the social cost of carbon). If FiTs are retained, then announcing aggressive degressions encourages a more competitive early market and can always be adjusted upwards if necessary without alarming investors in the way revising them down does. Taxing their income as dividends also makes sense.

Phasing out the RO Scheme as soon as possible and replacing it with, if necessary, a more restricted set of pots for CfD auctions should deliver the most cost-effective way of meeting our renewables targets. In addition, the CfD strike prices set by the auction should be nominal, not indexed, as that (slightly) front-loads the payments, which is more attractive to investors, and also nominal bonds are more liquid than indexed bonds. There is a case for only offering the auctioned strike price for, say, the first 2,000 MWh/MW capacity each year, to avoid over-paying for high wind locations, on the German model (or paying for a certain number of cumulative MWh/MW over a 10-15 year period). That

should give roughly equal payments per MW capacity installed. Location decisions will then be more efficiently guided by the current locational transmission charges.

There is also a good case for paying for capacity availability rather than output, if the aim is to encourage deployment, as this would better meet the underlying objectives of the *Renewables Directive*, but as the target is set in MWh in 2020 that may be a step too far without reforming the *Renewables Directive*.

### **3. Reforming renewables support and the Levy Control Framework**

The *Energy Act 2013* aimed to replace the RO scheme in 2017 but meanwhile offer CfDs with FiTs that would reduce the risk of volatile wholesale prices. The *Energy Union Package* was launched on 25 Feb (COM(2015) 80) with the statement that:

“... renewable production needs to be supported through market-based schemes that address market failures, ensure cost-effectiveness and avoid overcompensation or distortion. Low-cost financing for capital intensive renewables depends on having a stable investment framework that reduces regulatory risk.” (EC, 2015)

Action Point 5 reiterated the aim of “integrating renewables in the market ...” and proposing “a new European electricity market design in 2015, which will be followed by legislative proposals in 2016.” This Commission proposal would seem to reverse the logic, painfully learned in the UK, of moving from Premium FiTs like the RO Scheme to FiTs with their revenue guarantee and hence reduced risk and WACC. German, Spanish and Italian evidence all demonstrates that a well-designed FiT can be cost-effective (with suitable degression tracking falling costs), lead to rapid deployment, and encourage the cost reductions that are the logic behind the *Renewables Directive*. Does that mean that we should abandon what seems to be an effective instrument in the CfD with FiT (to give it its proper EMR name)?

There are two good reasons for linking payments to wholesale prices and requiring Renewable Energy Supply from Electricity (RES-E) to pay for balancing services. As the volume of a specific type of RES-E increases in a local market area (South German PV is an excellent example) so the output in favourable conditions (sun in this case) will massively increase, depressing

wholesale prices in those hours. If this fall in prices is signalled back to the developers, then they will adjust their supply and reallocate to better locations (in terms of revenue, which may be higher in less sunny locations). If the price they receive is independent of the spot price, this efficient signal will be suppressed, raising the cost of deploying renewables. In addition, PV has a rapid fall-off as evening approaches, requiring rapid replacement, which puts stress on the ramp rates of back-up plant. Paying for the new ancillary services (ramping, frequency response, inertia) that high RES-E requires is a cost caused by that RES-E and needs to be reflected in their support costs, most logically by requiring the operators to purchase these services.

The counter argument is that exposing RES-E to uncertain market conditions undermines the risk and cost reducing properties of the classic FiT. Instead, it merely raises the delayed question of how RES-E should be supported. The logic of the *Renewables Directive* is solving the club good problem of financing deployment to reap the dynamic economies of scale (learning-by-doing), which is primarily about the design, location and installation of the RES-E plant, and less about its operation (which, if it is mature enough to warrant mass deployment, should primarily depend on the resource, wind or sun). This would suggest paying for availability rather than output, or per MW rather than per MWh. This would make renewables just like capacity in the capacity auction, as the aim would be to identify the “missing money” needed to justify deployment, while providing a long-term contract for availability that addresses the “missing (futures) market” problem (Newbery, 1989; 2015).

To reduce risk further, balancing and other ancillary services could be procured competitively by the System Operator and the RES-E developer offered a cost-reflective contract, whose cost would be factored into the auction for capacity availability. Other aggregators or supply companies could offer Power Purchase Agreements (PPAs) for the metered output, based on a prediction of the local wholesale price, further reducing transaction costs and risks.

### 3.1. *The Levy Control Framework*

The problem with the current system of funding CfDs is that the Government is underwriting an unknown level of support, as the subsidy depends on the difference between a known strike price and an unknown wholesale price.

Various imperfections in the current zero-carbon subsidy regime could be simultaneously addressed by a capacity auction for competitively supplied zero-carbon mature generation (PV, on-shore wind, and perhaps later, off-shore wind). This would provide an fixed nominal annual payment for available capacity that could be used immediately to back a debt instrument used to build the plant. As noted above, there are good reasons for not indexing payments as in the current CfDs, as this back-end loads payments, reduces their value to the market, and goes in the opposite direction of liquid financial markets, which issue nominal debt.

Each technology would attract a standard de-rating factor (as in the current capacity auction), such that their de-rated capacity would be comparable across technologies in terms of value for money. The amount of funding available would be pre-determined and hence known, avoiding the uncertainties of the LCF. The support would be targeted to achieve its purpose of driving down costs, and not unnecessarily over-rewarding favoured locations (wind in Scotland or Shetland), as the output is electricity which ought to be considered as equal to all other electrons.<sup>6</sup> Failure to treat electrons equally leads to such distortions as negative prices, and an apparent willingness to pay for lengthy transmission reinforcements (such as the Bootstraps connecting Scotland by sub-sea links to England) at twice what they are really worth.

The next question is what to do if the current LCF risks being breached. This will depend on the policy question of whether we intend to meet our RES target, which under all current Future Energy Scenarios except *Gone Green*, we are likely to miss (National Grid, 2015). If the Government is serious about these targets, and concerned at affordability, then it needs to replace the RO Scheme as soon as legal with CfD (or preferably, RES capacity) auctions, as it has done for on-shore wind and roof-top PV. It then needs to make an estimate of the cost of reaching the targets and budget accordingly, with the advantage of the extra revenue streams arising from increasing the VAT rates on energy to the standard rate. To the extent that falling energy prices are one reason for rising levy claims,

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<sup>6</sup> “ought” here means that the RES Directive, which encourages output not investment, is flawed and thus encourages the UK and others to support the wrong aspect of the technologies. It would be desirable to start making that case when the EU comes to benchmarking Member State performance.

the need to protect consumers that was the reason for the LCF, that reason for the breach is unimportant.

This should also mean having a single pot for all near-mature technologies, and deciding whether and how much innovation funding of immature technologies is justified. It is a nonsense to set large sums of money aside for tidal lagoons which are a mature technology with no learning spill-overs. Some of the more expensive (e.g. deeper water round 3) off-shore wind might benefit from awaiting further cost reductions. If off-shore wind is pursued to avoid disturbing local communities with on-shore wind, there is a case for compensating local communities for accepting on-shore wind. Some fraction of the extra cost that avoiding off-shore wind would save, given that off-shore wind is costing up to £114.39/MWh (table 1) would be the natural approach. It may then be worth considering whether some part of the off-shore excess cost is a larger learning spill-over than for on-shore wind, in which case that might be separately identified and paid as an addition to the revenue from competing against on-shore wind in the auction.

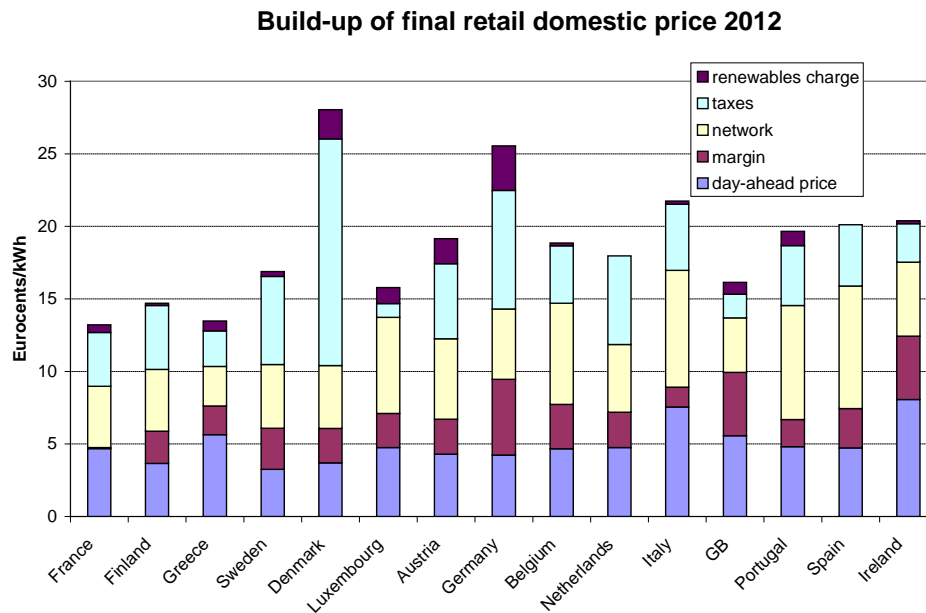
#### **4. Taxes, subsidies and State Aid**

Setting taxes and subsidies on fuels and various energy-related activities lies within the full control of the Treasury, but is, surprisingly, the least studied part of energy policy. This is doubly surprising as there are clear principles from public economics to guide the setting of such instruments (Diamond and Mirrlees, 1971; Newbery, 2005). It is worth revisiting these principles given the growing weight of taxes and levies intended to fund the increasingly costly subsidies to renewable energy and energy efficiency programmes (such as the alphabet soup of CERT, FiTs, ROCs, CfDs and ECO shown in figure 3).

Figure 2 shows the wide variation across countries in both the rates of tax and of charges for renewable energy, transforming Denmark from one of the cheapest countries before taxes and charges to the most expensive after these imposts. The high cost of renewables in Germany is also noteworthy, as is the low rate of tax in the UK, which levies a reduced rate of VAT at 5% on energy instead of the standard rate of 20%.

The varying treatment of levies and taxes was drawn into sharp relief in the European Commission consultation on the draft *Environmental and Energy Aid*

*Guidelines* issued in December, 2013.<sup>7</sup> DG COMP is particularly hostile to the selective (i.e. discriminatory) remission of such levies that some member states (notably Germany) provide to energy-intensive trade-exposed industries.



**Figure 2 Taxes and charges on domestic electricity in EU15, 2012**

Sources: DECC *Quarterly Energy Prices* 2013 at

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/244580/qep\\_sep\\_13.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244580/qep_sep_13.pdf) with breakdown from ACER (2013) applied to tax inclusive price

This consultation raised a number of important issues – whether these levies and charges are taxes, whether industry should be exempt from such charges, how revenue for supporting low-carbon energy should be raised, and more generally, how to define a subsidy. More recently, DG ENER commissioned Ecofys (2014) to define and collect data on energy taxes and subsidies across the EU, and these fortunately (for the most part) have been guided by the well-established principles of modern public finance.<sup>8</sup>

<sup>7</sup> Available at:

[http://ec.europa.eu/competition/consultations/2013\\_state\\_aid\\_environment/index\\_en.html](http://ec.europa.eu/competition/consultations/2013_state_aid_environment/index_en.html).

<sup>8</sup> One notable exception is the notion of the external cost of the depletion of natural resources, which they estimate accounts for 22% of total external costs. Such costs are pecuniary not physical externalities and therefore should not be included.

## 5. Principles of good public finance

Diamond and Mirrlees (1971) argued that revenue-raising taxes should not distort production, but should fall on final consumers. The only taxes and subsidies that should be targeted on production are those that correct otherwise inefficient prices for various externalities. Pollution taxes (including carbon taxes) are the standard example, while a Value Added Tax has the desirable property of falling on final consumption while exempting production.

Logically, while DG COMP is correct to criticize the *selective* exemption of these purely revenue-raising levies and charges, the correct solution is to make the exemption universal for all production activities, not just for energy-intensive industries. Politically this may appear at first sight unattractive as it would seem to increase taxes on voting taxpayers, but this is primarily a problem of perception, as these levies and charges on industry fall even more heavily on final consumers as they add additional costs and distortions to the final products (not to mention that some industries may exit and impose further costs in the form of unemployment). The fact that the former coalition Government, under pressure from the opposition to reduce rapidly rising electricity prices, felt the need to transfer some charges on electricity to general taxation in late 2013 demonstrates that attempts to disguise taxes as levies are not necessarily politically successful strategies, even if they seemed appealing at the time of first introduction. This becomes particularly unappealing when the charges fall disproportionately on poorer households and are in part used to provide generous subsidies to richer households who install PV panels (Chawla and Pollitt, 2013, figure 5).

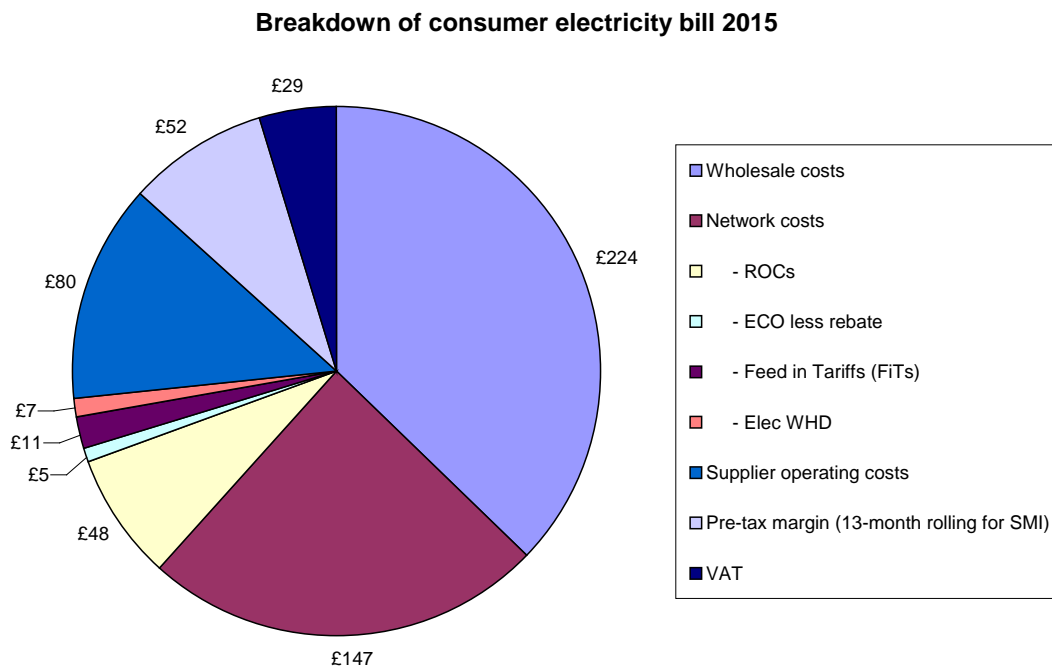
The second insight of public economics is that broad-based taxes are less distorting than narrowly based taxes, and that it is difficult to find good arguments against a uniform rate of VAT as the best form of indirect taxes for raising revenue (Deaton and Stern, 1986). The argument that electricity should be subject to a lower rate of VAT because it is income inelastic – that is its use rises less quickly across households than income and so accounts for a larger share of low income than high income households – is fallacious, as it would be more equitable to charge at the standard rate and make uniform lump sum payments (e.g. universal access to education and health, which is the form in which lump sum transfers are primarily made), than to give subsidies (the difference between the standard and lower VAT rate) that increase with income.



It thus follows that the revenue needed to finance renewables and other public goods should come from general taxation raised in the least distorting ways consistent with distributional objectives – either through income taxes or a uniform rate of VAT, and not by selectively charging single products like electricity.

## 6. Restructuring charges and taxes

Figure 3 shows that environmental charges made up 12% of the total electricity bill of £603 in 2015, while figure 1 (above) showed that this is set to rise rapidly under current policies as CfDs start falling on consumer bills. Note that the carbon price (through the EU Emissions Trading System, ETS and CPS) are included in the wholesale electricity price and do not appear as environmental charges, nor does the levy on consumers to pay for Ofgem’s Network Innovation Competitions (which is designed to lower future consumer bills and so may better be considered as an investment).



**Figure 3 Breakdown of average household electricity bill (3,200 kWh costing £603) at March 2015**

Source: Ofgem at <https://www.ofgem.gov.uk/publications-and-updates/charts-outlook-costs-make-energy-bills> accessed 28.7.15

The *Guardian* noted on 2<sup>nd</sup> April 2015<sup>9</sup> that “The carbon floor price went up from £9.54 to £18.08 per tonne of CO<sub>2</sub>, raising the cost of a tonne of carbon (sic) for British power plants to £23, when allowances on the EU’s emissions trading system (ETS) are factored in.” The social cost<sup>10</sup> of CO<sub>2</sub> is the external cost of all future damage discounted to the present, and as DECC points out, is conceptually different from the market price shown in the ETS. Its value is problematic, and the Government distinguishes between the price for the sectors covered by the ETS and the non-covered sectors, for which the price is much higher - £(2015)63/tonne.<sup>11</sup> If the social cost of carbon were set at £30/tonne (the 2020 original target for the CPF), given that the average emissions intensity of electricity is 500 kg/MWh, the shortfall is £22/tonne CO<sub>2</sub> or £11/MWh. On a bill of 3.2 MWh that would add £35 to the bill. If we deduct the inappropriately levied net (after the Government financed rebate) environmental charges of £70 and add back the £35 the pre-tax bill (before the £29 VAT) would be £526. Adding VAT at 20% of £105 gives the final bill as £631, only 5% higher than the current bill, an almost unnoticeable impact of this desirable tax change.

Similarly, the same source gives the 2015 domestic gas bill as £709 for 13.5 MWh<sub>t</sub>, which currently includes no carbon price, although at £30/t CO<sub>2</sub> and 184kg/MWh<sub>t</sub> the missing carbon cost is £6/MWh<sub>t</sub> and the shortfall on VAT (20% not 5%), currently £62, is £186, which, with the carbon cost, would add £193 to the bill, a rise of 27%. Fortunately, gas prices are falling, so this is the ideal time to make the tax change for both fuels.

Both of these principles need to recognize constraints in setting other taxes, of which the most relevant is a proper carbon tax. Ideally the EU should reform the ETS to given an adequate carbon price, as part of a global deal to internalize the climate change externality of releasing greenhouse gases. That would remove the case for the rather distorting UK Carbon Price Support. Further illustrations of the illogicality of levying lower rates of VAT on energy while levying charges for production subsidies (mostly to renewables, some to

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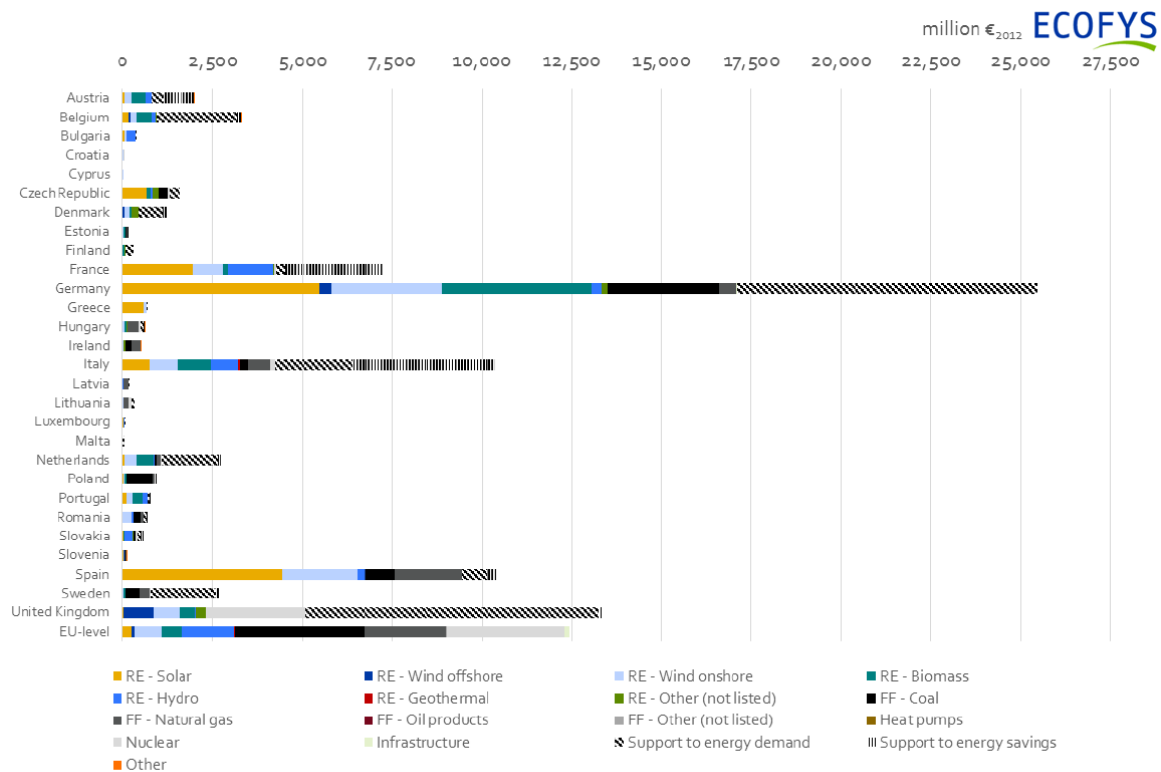
<sup>9</sup> At <http://www.theguardian.com/environment/2015/apr/02/carbon-floor-price-hike-will-trigger-uk-coal-slowdown-say-analysts>

<sup>10</sup> See <https://www.gov.uk/government/collections/carbon-valuation--2#social-cost-of-carbon>

<sup>11</sup> See <http://www.forestry.gov.uk/fr/infd-7wtdju>

nuclear power) comes from the recent Ecofys (2014) report which examines the subsidies and costs of EU energy.

Figure 4, taken from Ecofys (2014), shows the high level of UK “support to energy demand” (i.e. the shortfall between the taxes and charges actually levied on energy and the standard rate of VAT). This support is almost exactly equal to all the other supports in the UK and a higher proportion of the total than in almost all other major EU Member States (except for Belgium, Denmark and Sweden).



**Figure S - 3 Interventions per Member State in 2012 (in million €<sub>2012</sub>)**  
 Note: The EU-level intervention refers to interventions financed by the EU and not by individual Member States.

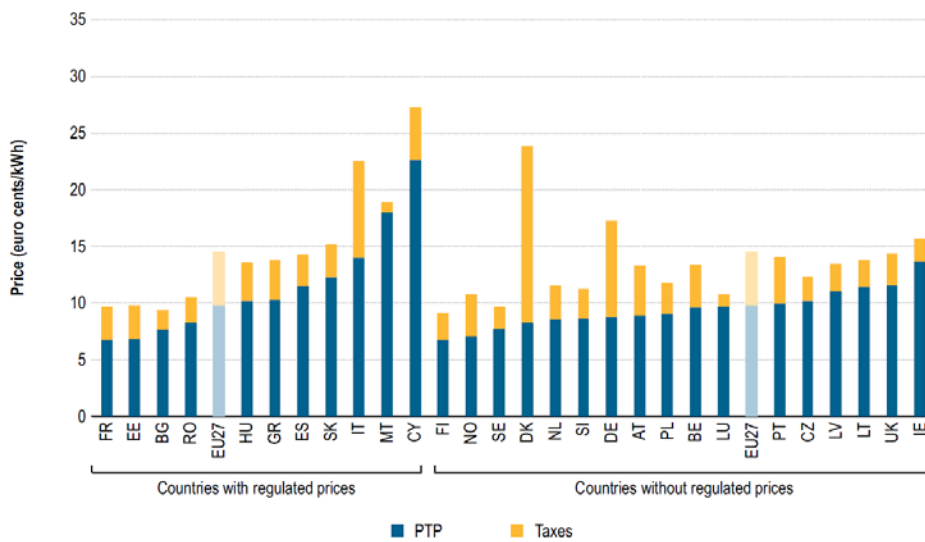
### Figure 4 Energy subsidies for EU member states in 2012

Source: Ecofys (2014).

That leaves the question whether the UK is taxing the industrial sector at the right level, given that electricity pays a carbon price (ETS plus the CPS) while gas pays neither, oil is heavily taxed, and coal is taxed through the Climate Change Levy at £0.81/GJ or £2.92/MWh. If we concentrate on electricity sold to the industrial sector, Figure 5 shows the UK is taxing somewhat less than the EU27 but this was before the CPS came into effect.

What is clear from figures 2 and 5 is that not all countries have the right answer, and therefore the internal EU market is distorted as taxes on producers differ widely, with Denmark, Italy and Germany well above the EU average. It also leaves the DG COMP question of whether exempting trade exposed sectors from green charges distorts competition when carbon is not properly priced in most EU countries. The latter would be avoided by border tax adjustments for carbon content, which would also pave the way for efficient EU carbon taxes, but the political plausibility of that policy combination is low.

Figure 4: Electricity POTP and PTP for industrial consumers – Europe – 2012 (euro cents/kWh)



Source: ACER, based on Eurostat (25/5/2013), DC: 2,500-5,000kWh

Figure 5 EU electricity prices pre- and post-tax for industry, 2012

Source: ACER (2013), PTP is pre-tax price, POTP is post-tax price

## 7. Conclusions

The Government passed the *Energy Act 2013* to reduce the cost of meeting our renewables target and changed to a support mechanism closer to the classic FiT. The move to auctions demonstrated both an appetite for this instrument and a considerable reduction in cost, compared to the previously announced administratively set strike prices. Large amounts of money were arguably poorly spent in the transitional arrangements paying these strike prices, confirming that although FiTs can be cheap, there must be some mechanism to link the support price to the actual cost – and auctions appear the best way.

The *Energy Union Package* now argues for market-based schemes. This has some logic but it needs to be reconciled with a sufficiently stable investment climate that allocates risk to those best placed to bear them while providing the incentives for efficiency. This briefing note argues that capacity contracts with suitable PPAs and contracts for ancillary and balancing services (with all contracts reflecting efficient market value) are a logical solution and allow progress to a zero subsidy regime for mature RES-E post 2020, provided the carbon price is set or supported at an adequate level. Adequately funding a state development bank on the German KfW model to leverage cheaper private capital would also help lower costs.

Finally, and fortunately under the direct control of the Treasury, energy taxes and subsidies need to be reformed in line with principles of sound public finance, and the support instruments directed to better achieve their objective at least cost. This requires raising the energy VAT rate to the standard rate, financing all environmental and development public goods from general tax revenue, and replacing the RO scheme with capacity auctions, funded in nominal terms and hence with a predictable impact on the Levy Control, which will possibly need to be reset if the UK is serious about its EU RES target.

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