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Environmental Audit Committee

Energy subsidies

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Volume II

Written evidence

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Environmental Audit Committee

The Environmental Audit Committee is appointed by the House of Commons to consider to what extent the policies and programmes of government departments and non-departmental public bodies contribute to environmental protection and sustainable development; to audit their performance against such targets as may be set for them by Her Majesty's Ministers; and to report thereon to the House.

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The following members were also members of the committee during the parliament:
Richard Benyon MP (*Conservative, Newbury*) *[ex-officio]*
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Powers

The constitution and powers are set out in House of Commons Standing Orders, principally in SO No 152A. These are available on the internet via www.parliament.uk.

Publications

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the internet at www.parliament.uk/eacom. A list of Reports of the Committee in the present Parliament is at the back of this volume.

The Reports of the Committee, the formal minutes relating to that report, oral evidence taken and some or all written evidence are available in a printed volume.

Committee staff

The current staff of the Committee are Simon Fiander (Clerk), Nicholas Beech (Second Clerk), Richard Clarke (Committee Specialist), Andrew Wallace (Senior Committee Assistant), Anna Browning (Committee Assistant), Sayeda Begum (Committee Support Assistant) and Nicholas Davies (Media Officer).

Contacts

All correspondence should be addressed to the Clerk of the Environmental Audit Committee, House of Commons, 14 Tothill Street, London SW1H 9NB. The telephone number for general enquiries is 020 7219 6150; the Committee's email address is eacom@parliament.uk

List of additional written evidence

(published in Volume II on the Committee's website www.parliament.uk/eacom)

Written evidence

Written evidence submitted by Bryan Norris

[LETTER RECEIVED BY BRYAN NORRIS FROM DECC]

Dear Mr Norris

FREEDOM OF INFORMATION REQUEST

Thank you for your email dated 11 May 2012 in which you requested information regarding decommissioning tax relief. We have now completed our search for the information you requested.

The information which can be disclosed is given below. The remainder of the information is exempt under section 35(1) of the Freedom of Information Act and is therefore withheld.

1. *How many oil and gas rigs will be decommissioned with taxpayers money?*

There are currently 291 oil and gas platforms in the UKCS. The total cost of decommissioning these plus pipelines, wells and other subsea infrastructure is currently estimated to be around £30 billion in today's money, spread over the next 40 years or more.

2. *How many oil rigs are involved*

Please refer to the answer for question 1.

3. *What is the total budget for this subsidy?*

The Government is not offering a subsidy to the Oil and Gas industry for decommissioning expenditure. Budget 2012 announced a consultation on new contracts to provide long term certainty on decommissioning tax relief; this consultation will be published this year. The Exchequer impact of this policy is beneficial to the taxpayer in receipts, driven by an increase in investment and production.

Companies are legally required to decommission their assets at the end of a field's life. The total cost of decommissioning upstream petroleum infrastructure is currently estimated to be about £30 billion in today's money. Tax relief at a rate of 50% (75% for older fields) is available on these costs of business, but uncertainty around the future availability of such relief has been deterring investment in older fields and making it difficult for new players to enter the market. At Budget 2011, the Government said that it would work with industry with the aim of announcing further, longer-term certainty on tax relief for decommissioning costs.

The Government has already committed to provide relief; greater certainty will generate additional investment and production.

The Government will legislate in 2013 giving it the power to sign contracts with oil and gas companies guaranteeing that they will receive a certain level of relief on the cost of decommissioning their assets. We will consult on the detail and form of the contracts in the coming months.

COSTINGS

The Office for Budget Responsibility ("OBR") scrutinised the assessment of the Exchequer impact. This can be found at:

http://cdn.hm-treasury.gov.uk/budget2012_policy_costings.pdf

The measure is expected to increase investment and production, and thus Exchequer revenues, by encouraging increased incremental activity and improving market efficiency in the UKCS, leading to asset trades, stimulated by certainty over the tax treatment of decommissioning costs. The size of this change in investment and production is estimated using HMRC modelling and the relevant determinants from the OBR's economic forecast. These estimates are consistent with consultation work to date.

EXCHEQUER IMPACT (£M)

The Exchequer impact has been projected as follows.

	2012–13	*2013–14*	*2014–15*	*2015–16*	*2016–17*
Exchequer impact (£m)	-115	+245	+385	+340	+290

(Positive figures denote Exchequer yield)

Appropriate oversight and analysis will continue with the NAO and OBR, following consultation.

4. *Has the National Audit Office been made aware of such new extended subsidy? If so what is their judgement?*

Please refer to the answer for question 3.

5. *What is the independent auditors' advice on value for money for UK taxpayers and Total exposure?*

Please refer to the answer for question 3.

6. *What checks have been enacted to prevent corruption?*

The decommissioning process is open and transparent, operators are required to submit decommissioning programmes which are subject to wide ranging scrutiny by DECC, other government departments and statutory consultation with public bodies before approval to decommission is granted. On completion of a decommissioning programme operators submit a "close out report" summarising the outcome of the decommissioning activity—these close out reports are also subject to scrutiny. Copies of draft and approved decommissioning programmes are published on DECC's website and can be found at:

http://og.decc.gov.uk/en/olgs/cms/explorationpro/decommissionin/decommissionin.aspx

7. *With the oil industry receiving extra large tax breaks for oil exploration, please identify total positive tax receipts minus subsidies and losses and "contractual arrangements"*

Please refer to the answer for question 3.

8. *Please supply details of ALL contracts concerning taxpayer decommissioning of North sea oil rigs*

Please refer to the answer for question 3.

11 June 2013

Written evidence submitted by Calor Gas Ltd

"The fact is, thousands and thousands of our customers have already taken advantage of this ***amazingly generous subsidy*** *and are enjoying the many benefits."*

Solar Fusion Ltd leaflet, distributed to homes, 2013.

EXECUTIVE SUMMARY

1. Subsidy to wind has been on a rising trend since 1991: the annual subsidy will reach £5 billion in 2020—this subsidy burden is ultimately borne by households. Subsidising an industry for 30 years leads to a dependent and vulnerable industry rather than a commercially viable industry. Denmark has found that subsidy to wind creates no net jobs, has depressed its GDP and has distorted its economy away from more profitable sectors.

2. Wind is an intermittent technology with an unfortunate tendency not to deliver during the coldest weather. It has to be backed up 80% by fossil fuel power, and thus embeds a significant need for fossil fuel generation for decades to come. The Government has made no calculation of the cost of installing this back-up power.

3. Wind-power from offshore is double the cost of cheaper, alternative means. Its subsidy costs the economy far more than the value of the carbon it saves. The Government recognises significant negative environmental negatives from wind, and these need to be added to the debit side of the balance sheet.

4. Subsidy to biomass is likely to surge as biomass capacity is likely to at least double from 2012 levels. 92% of RHI accredited installations are biomass boilers, and RHI installations with their accompanying subsidies are rapidly rising, too.

5. Biomass increases carbon emissions in the short to medium term—conditions are unlikely to be met for it ever to repay its own carbon debt, even after 90 years.

6. The demand for wood in UK biomass is met mainly by imports, increasing our reliance on third parties, worsening the trade balance, and causing enormous loss of habitat abroad.

7. RSPB, Friends of the Earth and Greenpeace calculate that Drax biomass power station alone will be getting a subsidy of £550 million a year by 2016 from the taxpayer. At that rate, it costs £225 to save one tonne of CO_2—three times the computed social cost of the carbon.

8. Government made the assumption that there are no net emissions from biomass production. In fact, the drying process alone causes high energy consumption with a high environmental impact. DECC has acknowledged, however, negative environmental effects, including on climate change and air quality, of increased transportation throughout the lifetime of a biomass facility. Government does not know how much black carbon—a potent global warming factor—is emitted by biomass combustion.

9. Particulates emitted to air cost an associated loss of total population life of 340,000 life-years, a greater burden than the mortality impacts of environmental tobacco smoke or road traffic accidents; under the previous Government's targets for biomass this loss of life would have been doubled. The social costs of early death and disease to be caused annually by biomass are now calculated at £1399 million. Householders are paying subsidy to have their lives significantly shortened. Other poisons are emitted to air, including tonnes of arsenic and hexavalent chromium (of Erin Brokovich fame). This will add to the external costs of biomass.

10. Subsidy to heat pumps is set to rise significantly when RHI payments for the technology begin in 2014 for domestic households.

11. Tests to date on installed heat pumps show most failing the test of sustainability. Failures would not count towards our renewables target and could either completely waste or forfeit subsidy. Most heat pumps when installed do not do what it says on the tin.

12. Heat pumps are highly consumptive of electricity. Large scale installation of pumps would mean having to reinforce the grid at great cost. For instance, by 2030, each heat pump in a rural area could cause extra reinforcement costs of up to £1,130—another cost to be heaped upon the shoulders of electricity consumers, and this for a technology that so far does not work in most cases.

13. DECC does not know the total of subsidy devoted to renewables so neither the Department nor the Public Accounts Committee can do a study to ascertain whether the subsidy is good value for money.

14. Total subsidy to renewables over the period to 2030 has been calculated by a third party at £130 billion—this cost will be paid through fuel bills. Is this supportable in an age of austerity, where some 4.5 million families are already in fuel poverty?

15. The total cost of renewable energy policies (subsidy plus extra network costs) is about £175 billion by 2030. Will the value of carbon saved by 2030 be worth over £175 billion because if not the policy is fatally flawed?

1. *The subsidy to wind is rising to insupportable levels*

1.1 The original intent was that subsidy would be degressive as wind approached commercial viability. The opposite has been the case—subsidy has been on a rapidly rising trajectory. In 1990–2000 total subsidy to wind was £7.3 million (WA, 28.2.11, col. 244W). £2.2 billion was spent in subsidy to wind between April 2002 and March 2010 (WA, 11.2.2011, col. 457W). Subsidy to wind will rise to £5 billion in 2020 (WA, 4.7.2011, col. 1072W). If after thirty years of rising subsidy the industry remains commercially unviable it is never likely to be commercially viable.

1.2 The day-ahead wholesale electricity price averaged approximately £50/MWh in June 2011, according to the London Energy Brokers Association. The level of renewables obligation support available to onshore wind farms is one renewables obligation certificate (ROC) per MWh of electricity generated, and that available to offshore wind farms is two ROCs per MWh. The expected value of a ROC is constant over time at around £43 in 2011–12 prices (WA. 4.7.2011, col. 1073W). Thus, for offshore wind the total level of subsidy is 172% of what it costs to generate electricity on a commercial basis.

1.3 The cost of wind power from the consumer's perspective is not simply the basic cost of generation, plus the subsidy (paid by the consumer) but also the cost of integrating wind into the grid (also ultimately paid by the consumer). The cost of integrating wind comprises three elements—system operation costs of £16/MWh caused by errors in wind forecasting; transmission upgrade costs of £20–23/MWh to move the energy from wind farms to load centres; and, a planning reserve costing some £24–28/MWh to keep conventional plant running at a reduced load factor ready to pick up on wind's incapacity to deliver on windless days (Source: Colin Gibson, "A Probabilistic Approach to Levelised Cost Calculations" 2011). So, the system cost from the consumer's perspective totals £190/MWh for onshore wind and £270/MWh for offshore wind. In contrast, a combined cycle gas plant generates at £66/MWh.

1.4 Households pay approximately 40% of the Renewable Obligation costs. The remaining 60% of the RO cost imposed on industry, commerce and the public sector is ultimately paid for by households in terms of increased costs of goods, services and taxes.

2. *The cost of subsidising wind is far more than the cost of the carbon it saves*

2.1 What is the cost-benefit analysis of subsidising wind? Its supporters say that it reduces carbon emissions. In 2002, the UK Government Economic Service recommended an estimate for the social cost of carbon at £70/tonne of carbon for use in policy appraisal across Government. The Renewable Energy Foundation (REF) has found that onshore wind costs £93/MWh to remove a tonne of carbon from emissions and offshore wind £185 per tonne. On this basis, wind costs more to society than the carbon it displaces—and in economic terms, offshore wind costs our economy far more than double the carbon it is meant to displace.

3. *DECC knows full well about the "severe negative" environmental effects of wind*

3.1 DECC itself has enumerated the environmental negatives of wind. Paras. 3.24ff of the "Appraisal of Sustainability for the revised draft NPS for Renewable Energy Infrastructure: Non-Technical Summary" (DECC, October 2010) can be summarised -the construction of wind farms has a negative environmental effect; this impact could be severely negative when wind farms are close together; offshore wind farms could have a severely negative impact on international navigation routes; noise disturbance can be a hazard for humans and fauna and the disturbance lasts for 25 years; the visual effects could be significant and would last 25 years; where wind farms are clustered the impact will be cumulative; and, clustered wind farms offshore may result in increased flooding of the coast.

4. *Wind, far from creating jobs, may have a negative effect on GDP*

4.1 UK Government support is posited on the kit lasting 25 years. But, "Wind Energy—the Case of Denmark" CEPOS, September, 2009 found that, "Many 10 to 15 year-old turbines are past their useful life". This puts into question the strategic, economic and environmental benefits of a power plant that may have to be scrapped, replaced and resubsidized every ten to fifteen years. On the plus side, then, the negative environmental effects listed by DECC may last 10 to 15 years less than expected, but conversely subsidised plant which lasts half as long as expected will produce a lot less electricity, a lot more expensively over its lifespan.

4.2 The Danes have subsidised wind power since 1988, and in 2007 generated 19% of their demand by wind turbines. They are further along the curve than we are. CEPOS concluded:

> *"The Danish Wind industry counts 28,400 employees. This does not, however, constitute the net employment effect of the wind mill subsidy. In the long run, creating additional employment in one sector through subsidies will detract labor from other sectors, resulting in* ***no increase in net employment*** *but only in a shift from the non-subsidized sectors to the subsidized sector… The subsidy per job created is 600,000–900,000 DKK per year ($90,000–140,000). This subsidy constitutes around 175–250% of the average pay per worker in the Danish manufacturing industry.*
>
> *In terms of value added per employee, the energy technology sector over the period 1999–2006 underperformed by as much as 13% compared with the industrial average. This implies that the effect of the government subsidy has been to shift employment from more productive employment in other sectors to less productive employment in the wind industry. As a consequence,* ***Danish GDP is approximately 1.8 billion DKK ($270 million) lower than it would have been if the wind sector work force was employed elsewhere****."*

4.3 Evidence from the UK so far strengthens these concerns. In the period 2002–10 the UK spent £5 billion subsidising dedicated renewable electricity generators, at a cost of £230,000 per wind industry worker over that period. Subsidy per wind industry worker in the year 2009–10 amounted to £54,000—greatly in excess of the median earnings in either the public (£29,000) or the private sectors (£25,000) (Source: "The Green Mirage" by John Constable, August 2011). While it is not yet possible to estimate the net employment impacts of such costs, they are unlikely to be positive.

5. *Wind is intermittent and inherently unreliable especially in the depth of Winter*

5.1 The UK Renewables Strategy 2008 was frank about wind:

> "3.9.4 Analysis of wind patterns suggests that, at high penetration levels in the UK, wind generation offers a capacity credit of about 10–20%. This is an indicator as to how much of the capacity can be statistically relied on to be available to meet peak demand and compares to about 86% for conventional generation. This means that controllable capacity (for example fossil fuel and other thermal or hydro power) still has to be available for back-up at times of high demand and low wind output, if security of supply is to be maintained. New conventional capacity will, therefore, still be needed to replace the conventional and nuclear plant which is expected to close over the next decade or so, even if large amounts of renewable capacity are deployed…

> 3.9.6 In the British market electricity generating capacity does not earn money simply for being available; it earns money only when it actually generates. This is consistent with striking the optimal balance between costs and benefits of spare capacity on the system. It also means that wholesale electricity prices are likely to rise to very high levels at times when high demand and low wind speeds coincide. This is necessary in order to cover the costs of plant which does not get to generate very often, and so ensure that generators are incentivised to provide back-up capacity.
>
> 3.9.7 It is nevertheless possible that uncertainty over returns on investment, because of the difficulty of knowing how often plant will get the opportunity to run, will discourage or delay investment in new conventional capacity—or speed up the closure of existing capacity—and hence increase the risk of occasional capacity shortfalls."

5.2 The Revised Draft NPS on Energy accepts this argument: "An increase in renewables will therefore require additional back-up capacity and mean that we will need more total electricity capacity than we have now" (Para.3.3.11).

5.3 Put more plainly, every 10 new units worth of wind power installation has to be backed up by what are likely to be eight new units worth of fossil fuel generation, because fossil fuel can and will have to power up suddenly to meet the deficiencies of wind. **Wind does not provide an escape route from fossil fuel but embeds the need for it**. Nuclear runs at base load and cannot power up to cover the absence of wind. If fossil fuel plant has to be constructed and stand by waiting for wind to default then its power will have to be more expensive in order for the plant to "wash its face". So, the effect of having a large investment in wind is to drive up the price of power generally. Surprisingly, Government has not worked out the costs: "The Department has not provided estimates of the cost of constructing fossil fuel power stations to compensate for intermittency in the period out to 2030" (WA 9.2.2011, col. 356W).

5.4 *The Daily Telegraph* reported on 11 January 2010 that out of a UK capacity of 5% wind was delivering 0.2% during the January cold spell. The wind was not blowing when most needed. Andrew Horstead, a risk analyst for energy consultant Utilyx, commented: "This week's surge in demand for energy in response to the cold weather raises serious concerns about the UK's increased reliance on wind power… Failure to address these concerns could mean further rationing of energy in future years and could even lead to black-outs, so it is vital that the UK Government takes action now to avoid the lights going off," (ibid). The poor performance of wind in January 2010 was echoed in the cold snap of December 2010: *The Times* of 3 January 2011 reported that since the beginning of December turbines had been operating at only 20% of their capacity—on 2 January wind was contributing but 0.5% of the country's power. At the coldest times of year then, wind power has an unfortunate tendency to make itself unavailable.

5.5 Low wind conditions can prevail at times of peak load over very large areas and that low wind load factors in other European countries can coincide at exactly the same time—a European Supergrid may not be able to solve such problems. Wind power can be highly variable year on and back-up conventional generators will not only have uncertain income over shorter timescales, but will face significant year on year variations—all this forces up energy costs for the hard-pressed consumer.

Subsidy and Biomass

6. *Subsidies to biomass are rising fast*

6.1 The value of subsidy given to biomass generation in 2010–11 was £370 million (WA, 29.6.11, col. 850). This subsidy is on a rising trend as well. 92% of Renewable Heat Incentive payments are for solid biomass boilers. RHI applications and installations are rising rapidly. For large scale electricity generation by biomass dedicated regular biomass generation receives 1.5 ROCs/MWh, while "advanced conversion technologies" (gasification, pyrolysis and anaerobic digestion), dedicated biomass burning energy crops, and dedicated regular (non-energy crop) biomass with CHP all receive 2 ROCs/MWh. Installed capacity of plant biomass and co-firing in 2012 was 1,399MW but this figure—and the pertinent subsidy—is due to rise significantly (3,812MW of biomass capacity have been approved in the planning system).

7. *Biomass emits more GHGs than fossil fuels; its carbon debt is unlikely to be repaid*

7.1 The purported benefit from subsidising biomass is reducing carbon emissions. The UK regards biomass as "zero carbon" yet defines it as sustainable if it makes GHG savings of 60% over fossil fuels: "These sustainability criteria include a minimum greenhouse gas emissions saving of 60% compared to fossil fuel" (WA, 20.1.11). It does not need an advanced arithmetical or logical mind to recognise that a 60% reduction in emissions from fossil fuel levels is not and cannot be regarded as "zero-carbon". This is a logical somersault too far, conveniently—for the sake of cherry picking this technology—equating 40% to 0%! However, doubts about the true sustainability of biomass go much further.

7.2 In 2010, a Manomet report for the Commonwealth of Massachusetts ("Biomass Sustainability and Carbon Policy", June 2010) acknowledged, "Growing concerns about greenhouse gas impacts of forest biomass policies" and quoted the IEA report "Bioenergy" (2009): "Conversion of land with large carbon stocks in soils and vegetation can completely negate the climate benefit of the sink/bioenergy establishment". The UK Environment Agency is alert to this danger: using biomass for generating electricity and heat could help meet

the UK's renewable targets but "only if good practice is followed…worst practice can result in more greenhouse gas emissions overall than using gas ('Biomass—carbon sink or carbon sinner?' April 2009)."

7.3 Manomet discussses the varying rates by which regrowing forests repay the carbon debt incurred by their removal and combustion: burning biomass emits more greenhouse gases than fossil fuels: "Forest biomass generally emits more greenhouse gases than fossil fuels per unit of energy produced. We define these excess emissions as the biomass *carbon debt*. Over time, however, re-growth of the harvested forest removes this carbon from the atmosphere, reducing the carbon debt…Over a long period of time, biomass harvests have an opportunity to recover a large portion of the carbon volume removed during the harvest. However, this assumes no future harvests in the stand as well as an absence of any significant disturbance event. **Both are unlikely**." Recovering the carbon debt is a gamble, and it seems strange to be cracking open these cheap and natural stores of carbon while at the same time investing billions of pounds in trying to create as yet unproven carbon capture and storage technologies.

7.4 A report supported by the DG Development and DG Environment of the European Commission ("Flows of biomass to and from the EU", July 2011) concluded: "Analysis of the data and trade statistics looked at in this report shows that the quantity of wood required to satisfy the 2020 targets is likely to be too large to be met by increased production within the EU…Most of the increase in imports will therefore most likely come from Canada, the USA, and perhaps also Russia (if the risks associated with imports from Russia do not become prohibitive when the EU's Illegal Timber Regulation is fully implemented in 2013). **This risks not only damaging ecosystems in other parts of the world, but will also increase the EU's own carbon footprint**".

7.5 DECC admits that, "The UK is expected to be increasingly reliant on biomass imports in the future"—this for a commodity that was once vaunted as decreasing our reliance on third parties. Unfortunately, HMG does not know how much wood is being imported for biomass combustion (WA, 1.12.2010, col.801W). We do know, however, that imports are increasing very fast: imports of wood pellets into the EU rose by 50% in 2010 alone (The Economist 6 April, 2013) and that DECC itself expects that approximately 80% of feedstock to come from imports. The RSPB, Friends of the Earth and Greenpeace conclude: "Demand for wood, for electricity generation, will therefore add to the existing trade imbalance" ("Dirtier than Coal?" by RSPB, Friends of the Earth and Greenpeace 12 November 2012).

7.6 The EEA Scientific Committee on Greenhouse Gas Accounting states that the assumption that burning biomass is carbon neutral is incorrect: "Using land to produce plants for energy typically means that this land is not producing plants for other purposes, including carbon otherwise sequestered." If biomass production replaces forests, reduces forest stocks or forest growth, which would otherwise sequester more carbon, it can increase carbon concentrations net. If biomass displaces food crops—as biofuels did—this leads to hunger if crops are not replaced, and to emissions from land use change if they are. To reduce carbon in the air, the Committee concludes, bioenergy production must increase the net total of plant growth, or it must be derived from biomass wastes that would otherwise decompose. The Committee warns that the danger of this error is "immense". It states, "Current harvests…have already caused enormous loss of habitat by affecting perhaps 75% of the world's ice and desert free land, depleting water supplies and releasing large amounts of carbon into the air" ("Opinion of the EEA Scientific Committee on Greenhouse Gas accounting in Relation to Bioenergy", 15 September, 2011).

8. *As with wind, biomass subsidy costs more than the carbon it purports to displace*

8.1 The RSPB, Friends of the Earth and Greenpeace comment that DECC's flawed emission accounting on biomass has led to a situation where, "Burning whole trees in power stations would make global warming worse, undermining goals of reducing our greenhouse gases by 2050". On that basis they call for the withdrawal of public subsidies for generating electricity from feedstocks derived from tree trunks and to refocus support for bioenergy on the use of wastes and other feedstocks that are harvested sustainably. We agree. At a subsidy of £45 per MWh, it has been calculated that Drax, just one power station in the UK will be getting a subsidy of £550 million a year by 2016 from the taxpayer. At that rate, it costs £225 to save one tonne of CO_2 ("Dirtier than Coal", op.cit.). Even DECC has admitted: "Compared to offshore wind dedicated biomass electricity is a costly way of saving carbon," ("Renewables Obligation: Consultation on a notification process for new build dedicated biomass projects", May 2013). This is saying something because as already pointed out in para. 2.1 offshore wind costs our economy far more than double the carbon it is meant to displace.

9. *Biomass emissions during production are underestimated*

9.1 The "UK Biomass Strategy" (2007, p.41) made a blasé and dangerous—assumption: "For all biomass resources no net emissions during production assumed". All the emissions produced during planting, harvesting, sawing up, drying and delivery of these bulky and heavy items are ignored. E4Tech's study on biomass prices for DECC ("Prices in the heat and electricity sectors in the UK", January 2010) makes the assumption that for the wood pellet imports there would be 50km of road transport necessary for production purposes, 200km of road transport necessary in the country of origin, sea transport of 1500km and 50km of road transport necessary in the UK. This cannot be written off as equating to "no net emissions". The Environment Agency pointed out ("Biomass—carbon sink or carbon sinner?" op.cit.): "How a fuel is produced has a *major* impact on emissions:

transporting fuels over long distances and excessive use of nitrogen fertilisers can reduce the emissions savings made by the same fuel by between 15 and 50% compared to best practice".

9.2 Besides, and probably more importantly, biomass has to be dried before combustion can take place. Environmental emissions result from both the drying process and combustion in the boiler. These emissions typically include particulates, VOCs, and NOx to the extent that a common problem around biomass drying plant is so called noxious "blue haze". "Biomass and Bioenergy" confirms that, "Forest residues require a drying stage, which involves **high energy consumption and high environmental impact**" (Volume 34, Issue 10, October 2010, pp. 1457–1465). The pollution caused by these emissions should be calculated and factored into policy.

10. *DECC knows full well about negative environmental effects of biomass "in the short, medium and long term"*

10.1 The revised Draft NPS for Renewable Energy documents (December 2011) also revealed the damage to the environment likely from "considerable" transport movements: "Depending on the location of the facilities, air emissions and dust, which could impact sensitive flora, may also be increased through the high number of heavy goods vehicles transporting fuel and combustion residues" (p25). "There are potential negative environmental effects, including on climate change and air quality, of increased transportation throughout the lifetime of the facility…The overall effect of implementation on traffic and transport of biomass/waste combustion through the implementation of EN-3 is considered to be **negative in the short, medium and long term.** These effects are primarily from the movement of fuel and residue during the operational phase of the facility, although some significant, short term, local negative effects may result from the movement of component parts to the facility during construction" (p.39/40). The Revised Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) admits some of this environmental damage: "Biomass or EfW plants are likely to generate considerable transport movements. For example, a biomass or EfW plant that uses 500,000 tonnes of fuel per annum might require a minimum of 200 heavy goods vehicles (HGVs) movements per day to import the fuel. There will also be residues which will need to be regularly transported off site" (para.2.5.22).

11. *We should measure and control emissions of black carbon and isoprene from biomass before we deem it sustainable*

11.1 We need to adopt a precautionary principle in relation to the emissions of black carbon (BC) from biomass. BC is part of the particulate emissions caused by combustion. BC is the second largest contributor to global warming after CO_2. The UN's Economic Commission for Europe found that, "Urgent action to decrease (black carbon) concentrations in the atmosphere would provide opportunities, not only for significant air pollution benefits (eg health and crop-yield benefits), but also for rapid climate benefits, by helping to slow global warming and avoid crossing critical temperature and environmental thresholds" (UNECE's Executive Body for the Convention on long-range transboundary air pollution, meeting in Geneva, 15–18 December 2008: Item 13 of provisional agenda). The possibility that biomass could potentially contribute significantly to global warming by emissions of BC would be perverse indeed.

11.2 The Government does not know how much black carbon is emitted, or potentially emitted specifically by burning biomass in the UK, nor has it assessed how international control measures in the pipeline on black carbon might undermine the principle of subsidizing biomass combustion (WA, 4.5.2011: Col. 782W) . It should remedy these black holes of knowledge.

12. *Biomass combustion leads to early death and illness on a significant scale*

12.1 Biomass combustion can kill people. The particulates it emits damage human health by attacking lungs, hearts and brains. The latest Public Health Observatory data puts the percentage of total mortality attributable to particulates in England at 5.6%. What part of that can be attributed to biomass? We can work out the damage in terms of lives shortened and lost from an Impact Assessment published by DECC on new standards designed to cut down on the current level of mortality from biomass combustion. The quantum of mortality caused by biomass boilers currently being sold can be calculated from the assessment at £4343 million. The new limits will, if implemented, cut this reduction in life years to an equivalent of £1399 million. However, the new limits apply only to the larger particulates, and evidence is growing that the smaller particulates are more harmful than the large. No sum of the mortality caused by smaller particulates from biomass has been given. One must assume nonetheless that the impact from these smaller particulates in reducing human life-spans will be considerable.

12.2 The Committee on the Medical Effects of Air Pollution estimated that the 2008 burden level of particulates cost an "associated loss of total population life of 340,000 life-years…a greater burden than the mortality impacts of environmental tobacco smoke or road traffic accidents" ("The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom" 21 December 2010). Remarkably, this figure is exactly the level of extra burden of mortality to have been inflicted on the UK atmosphere by 2020 under the previous Government's policy on biomass, with its target of 38TWh by that date. No wonder Government has resiled from a specific target. The last Labour Government was aware biomass boilers

deteriorate as they age so proposed an annual MOT test on domestic biomass boilers—all mention of such an annual MOT test on boilers has since been dropped.

12.3 A rising output of particulates from biomass will add to our problem in complying with the EU air quality limits. Current UK emissions of particulates are acknowledged by the Government to be "relatively high" and could cause rack up fines for the UK's infringements. The Government calculates that over 3,500t of larger particulates will be emitted to air in 2020 from biomass—a self-inflicted injury subsidised by the taxpayer, because without deliberate policy cherry picking of this technology and without significant subsidy mass generation of electricity from biomass would not be viable.

12.4 Biomass combustion also releases a wide variety of other pollutants into the air that we breathe. Non domestic burning of biomass emitted in 2010 160t of chromium, 130t of arsenic, and 16t of hexavalent chromium (WA, 23.5.2012.). Arsenic is poison: chromium and hexavalent chromium are carcinogenic (the latter being of Erin Brockovich fame). These figures will rise as more biomass capacity comes on stream, and the related morbidity and mortality toll will rise. We suspect that a location near a biomass plant will reduce the value of the housing concerned.

Subsidy and Heat Pumps

13. *Subsidy to heat pumps is set to rise*

13.1 Subsidy is currently provided to householders who install an air source heat pump (ASHP) at the rate of £850 per installation; and at a rate of £1,250 for householders who install a ground source heat pump (GSHP). Renewable Heat Incentive payments for operating these systems are scheduled for introduction in domestic premises from next year at an indicative rate of 6.9–11.5p/KWh for ASHPs and of 12.5–17.3p/KWh for GSHPs.

14. *Too often, heat pumps when installed fail to deliver value for money*

14.1 The key to whether heat pumps deliver value for money or not is the Coefficient of Performance (CoP) of the heat pumps in the field. Heat pumps extract heat from the ground or air and redirect the heat for space heating and hot water. CoPs represent the ratio of heat produced per unit of electricity consumed in generating that heat. A CoP of 3 means that 3kWh of heat are output for 1kWh of electricity used to run the pump. Higher CoP values represent relatively more efficient heat delivery. Heat pumps must achieve a CoP of 2.9 before their energy can contribute to the renewable energy target. Note that even with CoPs of 2.9 the carbon footprint of heat pumps will be higher than the fossil fuel, natural gas, so the UK taxpayer will be paying to incentivise the expensive and disruptive installation of a technology that is more polluting than a widely used fossil fuel.

14.2 A study of installed heat pump performance published by the Energy Saving Trust on 8 September 2010—"Getting Warmer: a field trial of heat pumps" revealed that the actual performance of heat pumps installed in the UK was surprisingly poor. The study was financed by the heat pump industry and based on a sample of sites where pumps had been installed pre-selected by the industry. The pumps were installed and accredited through the Microgeneration Certification Scheme's immediate predecessor, the Clear Skies programme. The study showed that only one of the 22 properties with Ground Source Heat Pumps (GSHPs) achieved the implicit minimum EU Directive CoP, and only nine of the 47 sites with ASHPs achieved the standard. REF commented on this report: "The risk of premature adoption and consumer disenchantment is clearly real, thus raising the spectre of a UK heat pump tragedy… On the basis of this study, there seems a distinct risk that some heat pumps will be subsidised even though they fail to meet the minimum standard for being considered a renewable energy source. If, on the other hand, government withdraws subsidies from such installations, well-meaning householders may discover after investing heavily in a heat pump that their installations fail to come up to the required EU standard, and thus forfeit entitlement to RHI payments" ("Renewable Heat Initiative", September 2010).

14.3 Something similar occurred during the Joseph Rowntree Foundation study in Elm Tree Mews in York where a communal ground source heat pump was installed with a nominal design CoP efficiency of 3.2–3.5. Despite a number of interventions, throughout the year of monitoring the delivered CoP efficiency was 2.15—that is, it failed the renewable test of reaching a CoP of 2.9, and would not be good value for the householder, nor contribute towards national renewable targets. Potentially, expensive technology will have been installed under a false premise.

14.4 A report by the Association for the Conservation of Energy, "Improving the energy efficiency of off-grid properties—the role of different heating technologies", (March, 2011) made assumptions about the CoPs of heat pumps based on international data: "For GSHPs we assume a lower end CoP of 2.3 and a higher end CoP of 3.5. For ASHPs we assume a CoPs of 2.15 and 2.7 respectively". On this basis all ASHPs would fail the test of being renewable since the qualifying bar for this is set by DECC at 2.9, and would not deliver savings towards the EU targets; some GSHPs would also fail.

14.5 The Building Services Research and Information Association (BSRIA) is the leading independent UK laboratory for testing, certification and performance verification of a wide range of building services products. Its website discusses the pros and cons of heat pumps: "Test conditions (and hence manufacturers' quoted CoP data) can therefore differ significantly from actual design and operating conditions". This confirms the essential

point that it is not enough to accept pre-installation manufacturers' quoted CoP data. BSRIA avert to manufacturers claiming impressive CoPs but say BSRIA, "This data should be treated with caution".

14.6 The BSRIA website proceeds to make the point that heat pumps can struggle at the coldest times of year, and their CoPs can fall below the acceptable: "The relevant test standard for most packaged heat pumps is BS EN 14511. For an air-to-water heat pump the standard specifies test conditions of 7ºC outdoor air temperature (source temperature). At external air temperatures lower than this, the COP will fall, as will the heating output of the heat pump. Depending on the application this reduction may be *significant*, such as during a cold winter morning when building pre-heat is needed".

14.7 In England the average daily temperature is below 7°C in January and February; in Scotland, the average daily temperature is below 7°C in December, January, February and March. The risk is, then, that for substantial parts of the year, varying by location heat pumps will struggle to deliver heat when it is cold outside. Recent experience of cold Winters emphasises this point. Met Office statistics for December 2010 show mean temperatures for the UK of -1°C, -0.5°C for England, -0.4°C for Wales and -1.9°C for Scotland. Indeed, in 2010, Met Office statistics show the mean temperature for the year to be 8°C in England and 6.5°C in Scotland—note below the 7°C reference point on average for the whole year. Perhaps it should come as no surprise that ASHPs should not prove so efficient when installed in the UK as their comparative systems in warmer continental countries.

14.8 DECC is well aware of the problem: "We are aware that systems installed in the past have not always worked as well as they should" (Para. 199, DECC Consultation on the RHI, 20 September 2012) and again: "It is a common feature in field trials and assessments that there is a significant gap between expected and actual performance" (para. 1.23, Microgeneration Strategy Consultation, DECC, 22 December 2010).

14.9 DECC is currently monitoring 150 heat pumps and preliminary results show that most heat pumps operating on a *mild* Spring day were achieving below the required performance levels—some significantly below. Far from backing a winning horse, DECC is backing a flop but it has been coy in admitting it, confining itself so far to admit: "We think it is likely that on average the results will still be a long way off the high-performing systems that are consistently being measured in Germany". Time after time heat pumps simply do not do what is says on the tin.

15. *Wide deployment of heat pumps would put a very expensive strain on the grid network*

15.1 The Revised NPS (October 2010) revealed the full implications of a pure electricity play including the electrification of heat: "Generation capacity will need **at least to double** to meet this demand and, if a significant proportion of our electricity is supplied from intermittent sources, such as wind, solar, or tidal, then the total installed capacity might need to **triple**" (para.1.66). This is a major driving factor behind the rising cost of energy to householders.

15.2 A key culprit technology pushing up prices so astronomically is fingered by DECC itself: "In the case of heat pumps the challenge to be managed is in the form of significant new electricity demand. Relative to a conventional household, installation of a heat pump could mean a doubling of annual electricity demand. Given heat demand coincides with peak electricity demand, this is likely to put additional load on the network when it is most strained. Clearly, roll out of heat pumps at scale will have significant impacts on our electricity network, (Microgeneration Strategy Consultation Briefing, 23 December 2010)".

15.3 Network costs of a high heat pump deployment scenario are estimated to be £290 per heat pump on a GB-wide basis in 2030 (£390 in 2050). This compares to £1,130 per heat pump in rural areas in 2030 (£1,490 by 2050) ("Assessing the Impact of Large-Scale Deployment of Heat Pumps on Electricity Distribution Network Costs", by Ernst and Young, 2013). These large extra costs will fall on the already hard-pressed consumer.

Subsidy in an Age of Austerity

16. *Subsidy to renewables is projected to rise to staggering levels*

16.1 The Public Accounts Committee has not undertaken a specific study of the value for money from subsidy to renewables since the Coalition came to power—DECC does not have the key information: "We found that the Department did not know the total level of direct government funding that had been allocated to developing renewable energy technologies by the various organisations involved. The absence of a coherent approach to delivering direct government funding for renewable energy technologies or framework for evaluating its impact meant the Department could not therefore demonstrate that funding had delivered value for money" (Funding the development of renewable energy technologies, PAC, October 2010).

16.2 Levy-funded spending (ie increases to consumer energy bills to pay for low carbon energy sources) is currently at £2.35 billion for this year. Forward projections by REF show total subsidy rising to £8 billion a year by 2020. The total of subsidy would be some £130 billion over the period 2002–30. If system integration costs are added in the total cost of the renewables policy will be £13 billion a year by 2020, and the total cost over the period 2002–30 would be £175 billion. Are these costs affordable and sustainable on any reasonable projection of our economic future?

17. *Fuel poverty is problematic, and could worsen*

17.1 The latest figures (issued 2013) show 4.5 million households living in fuel poverty in the UK (cf. 1.2 million in 1994). The going is likely to get tougher. OFGEM predicted a rise of up to 60% domestic fuel bills (Evidence to Energy and Climate Change Committee 2.12.09). The Renewable Energy Strategy admitted: "Poorer households are likely to spend a higher proportion of their income on energy and so increases in bills will impact more on them".

17.2 Professor Hills in his recent Fuel Poverty Review has proposed a new definition of fuel poverty to reduce this embarrassing figure, but redefining it will not lessen the eventual quantum of misery inflicted by a Government beggaring sections of its electorate. As Hills states, "In our central projections, the key fuel poverty gap indicator will rise by more than 50% between 2009 and 2016". Such policies risk social unrest, and run against the Prime Minister's pledge that green energy "must be affordable" (25 April, 2012). Redefinitions may ease political pain, but not the practical experience of people struggling with their energy bills.

17.3 DECC's own estimates for the impact on electricity prices in 2010 arising from its energy and climate change policies is +27%. The sticking plaster on this otherwise crippling blow to family finances was the claim by Mr Huhne in 2011 that by 2020 on average households would be paying on average 7% less to heat and power their homes because of policies taken in the round. Unfortunately, this average hides a big variation between households, and using DECC's own questionably optimistic figures REF calculated that 65% of households would be net losers from the policies ie **the few will be gainers at the expense of the many** ("Shortfall, Rebound, Backfire", op.cit.).

17.4 In its January 2012 Research Note, Policy Exchange came to the same conclusions—two thirds of households will be worse off because of DECC policies. Policy Exchange estimated the full impact of renewable energy subsidies on an average household by 2020 (through bills, tax and costs of products and services) to be £400 per year—equivalent to 2.5p on VAT. This implies that by 2020 the total net cost (not just through energy bills) to the average household of carbon and renewable policies will be *equivalent* to around 15% of the (without policies) energy bill.

17.5 Calor has urged OFGEM to undertake a study of how far Government subsidies are anti-competitive and drive up fuel prices; and, a parallel study to assess how far Government cherry picking certain technologies and in effect excluding otherwise viable technologies from the market are having an inflationary effect on fuel pricing. Indeed, if the policy cost is £175 billion to 2030 does the policy cost more than the problem it is purporting to address?

17 May 2013

Written evidence submitted by Energy Fair

Submission from the Coordinator of Energy Fair, a think-tank and campaigning group set up in February 2009, with a main focus on subsidies for nuclear power. We have produced three detailed reports and submitted a formal complaint to the European Commission, as described below.[1]

Executive Summary

For many years, nuclear power in the UK has been benefitting from seven main kinds of subsidy, several of which are substantial. Withdrawal of just one of those subsidies would raise the price of nuclear power to at least £200 per MWh, much more than the unsubsidised cost of offshore wind power (about £140 per MWh).

The Finance Act 2011 introduced a subsidy for nuclear power by exempting uranium from a tax on fuels used for the generation of electricity.

Three other subsidies have been proposed in the Energy Bill, most notably the "contracts for difference", as applied to nuclear power.

There are five major types of risk for any investor considering putting money into new nuclear plants. It appears from news reports about ongoing negotiations between EDF and the Government about the proposed new nuclear plant at Hinkley Point that the Government may be prepared to allow most of the financial risks to be transferred from EDF to consumers or taxpayers. That would be a large subsidy for EDF.

Energy Fair, with several other environmental groups and environmentalists, has submitted a formal complaint to the European Commission (DG Competition) about state aid for nuclear power in the UK.

There is no valid justification for subsidising nuclear power. It is a mature technology that should be commercially viable without support. Renewables have clear advantages in cost, speed of construction, security of energy supplies, and effectiveness in cutting emissions of CO_2. There are more than enough to meet our

[1] The reports may be downloaded via links from www.energyfair.org.uk. Our (second) formal complaint to the European Commission is described on www.energyfair.org.uk/actions.

needs now and for the foreseeable future, they provide diversity in energy supplies, and they have none of the headaches of nuclear power.

Subsidies for nuclear power have the effect of diverting resources away from techniques and technologies which are cheaper than nuclear power and altogether more effective as a means of meeting our energy needs. Existing subsidies should be withdrawn and no new ones should be introduced.

1. *Introduction*

This memorandum presents evidence that relates to the issues listed in the Environmental Audit Committee's notice.

2. *Existing subsidies for nuclear power*

Our report, *Nuclear Subsidies* (PDF, bit.ly/wPVERU), describes seven existing subsidies for nuclear power:

- *Limitations on liabilities:* The operators of nuclear plants pay much less than the full cost of insuring against a Chernobyl-style accident or worse.
- *Underwriting of commercial risks:* The Government necessarily underwrites the commercial risks of nuclear power because, for political reasons, the operators of nuclear plants cannot be allowed to fail.
- *Subsidies in protection against terrorist attacks:* Because protection against terrorist attacks can only ever be partial, the Government and the public are exposed to risk and corresponding costs.
- *Subsidies for the short-to-medium-term cost of disposing of nuclear waste:* In UK government proposals, the Government is likely to bear much of the risk of cost overruns in the disposal of nuclear waste.
- *Subsidies in the long-term cost of disposing of nuclear waste:* With categories of nuclear waste that will remain dangerous for thousands of years, there will be costs arising from the dangers of the waste and the need to manage it. These costs will be borne by future generations, but they will receive no compensating benefit.
- *Underwriting the cost of decommissioning nuclear plants:* In UK government proposals, the Government is likely to bear much the risk of cost overruns in decommissioning nuclear plants.
- *Institutional support for nuclear power:* the UK government is providing various forms of institutional support for the nuclear industry.

Sizes of the Subsidies

Of those seven subsidies, the largest is probably the cost of managing nuclear waste for thousands of years, although it is difficult to quantify. The next largest are probably the considerable risk of cost overruns in both the decommissioning of nuclear plants and the disposal of nuclear waste on short-to-medium timescales—but again these subsidies are difficult to quantify.

With regard to the cap on liabilities for nuclear disasters, Versicherungsforen Leipzig GmbH, a company that specialises in actuarial calculations, has shown that full insurance against nuclear disasters would increase the price of nuclear electricity by a range of values—€ 0.14 per kWh up to € 2.36 per kWh—depending on assumptions made.

If those insurance costs were to be paid, even at the lowest level (€ 0.14 per kWh), the cost of nuclear power would rise to at least £200 per MWh, substantially more than the unsubsidised cost of offshore wind power (about £140 per MWh). Details of the calculations may be found on www.energyfair.org.uk/oppcost.

3. *Other existing or proposed subsidies for nuclear power*

Our report, *Subsidies for nuclear power in the UK government's proposals for electricity market reform* (PDF, bit.ly/wZqBDH), describes four other subsidies for nuclear power, the first one, below, in the Finance Act 2011 and the other three proposed in the current Energy Bill:

- *Exemption from tax*. The "carbon price floor", introduce in the Finance Act 2011, is, in effect, a subsidy for nuclear power because it is a *de facto* tax on fuels used for the generation of electricity, and uranium is exempted from that tax.
- *Contracts for difference*. Although it is a mature technology that should not need subsidies, nuclear power would be eligible for the same system of subsidies as is proposed for renewable sources of power.
- *Capacity mechanism*. The UK government's proposals for a "capacity mechanism" as a backstop for the power supply system are not yet finalised. However, there is potential for the proposed mechanism to be used to provide unjustified support for nuclear power.

— *Emissions Performance Standard*. Although peer-reviewed research shows that nuclear power emits substantially more fossil carbon than wind power, it appears that the effect of the proposed new standard would, for the foreseeable future, be to lump them together as if they were equivalent in their carbon emissions.

The "contracts for difference" could be very substantial. For example, it has been reported that, for the proposed new nuclear plant at Hinkley Point, EDF has been holding out for a 40-year deal with a guaranteed price for nuclear electricity at around £95–£100 for each megawatt hour generated, close to twice the current market price for electricity.[2]

4. *The financial risks of investing in new nuclear plants and what that can mean in terms of subsidies*

Our report, *The financial risks of investing in new nuclear power plants* (PDF, bit.ly/JhdNtL) describes five major types of risk for any investor considering putting money into new nuclear plants:

— *Market risk*. By the time any new nuclear plant could be built in the UK (2020 or later), the market for its electricity will be disappearing, regardless of any possible increase in the overall demand for electricity. The rapidly-declining cost of photovoltaics (PV) with the falling costs of other renewables, and the likely completion of the European internal market for electricity with the strengthening of the European transmission grid, will be transforming the market for electricity in the UK, and throughout the rest of Europe and beyond. Consumers, large and small, will be empowered to generate much of their own electricity (on their own sites or elsewhere) or to buy it from anywhere in Europe, and this without the need for subsidies. Explosive growth of PV is likely to take much of the profitable peak-time market for electricity. And there will be stiff competition to fill in the gaps left by PV, from a range of renewable sources, many of which are better suited to the gap-filling roll than is nuclear power.

— *Cost risk*. There is good evidence that, contrary to the often-repeated claims that nuclear power is cheap, it is one of the most expensive ways of generating electricity. The inflation-adjusted cost of building new nuclear power stations has been on a rising trend for many years. The introduction of new safety measures after the Fukushima disaster will push up prices further. Meanwhile, the cost of most renewable sources of power is falling.

— *Subsidy risk*. Although nuclear power is a long-established industry which should be commercially viable without support, it depends heavily on subsidies. This is a clear breach of the principle of fair competition. At any stage, some or all of the subsidies may be withdrawn, either via formal complaints to the European Commission, or via the European Court of Justice, or via decisions made by politicians. All state aid which is deemed to be illegal must be repaid. Consumers may refuse to pay surcharges on electricity bills. There is additional subsidy-related risk arising from the great complexity of government proposals in this area, with its potential for unexpected and unintended consequences.

— *Political risk*. Apart from the risk that politicians may decide to withdraw some or all of the subsidies for nuclear power, it is vulnerable to political action arising from events like the nuclear meltdowns in Fukushima. That disaster led to a sharp global shift in public opinion against nuclear power and it led to decisions by politicians in several countries to close down nuclear power stations and to accelerate the roll-out of alternative sources of power. The next nuclear disaster—and the world has been averaging one such disaster every 11 years—is likely to lead to even more decisive actions by politicians, perhaps including the closing down of nuclear plants that are still under construction or are relatively new.

— *Construction risk.* The delays and cost overruns in the Olkiluoto and Flamanville nuclear projects are just recent examples of nuclear projects where actual build times and actual costs greatly exceed what was estimated at the outset. But the extraordinary complexity of nuclear power stations—which is likely to increase, after Fukushima, with the added complexity of new safety systems—means that construction risk will remain a major hazard for investors for the foreseeable future.

The connection between these risks and possible subsidies for the nuclear industry is that risk equates with cost, so if some or all of the risk is transferred from a nuclear operator to consumers or taxpayers, that is a subsidy for the nuclear operator.

As we have seen (Section 3), EDF is seeking a guaranteed price for electricity from the proposed Hinkley Point nuclear plant of £95–£100 for each megawatt hour generated (close to twice the current market price for electricity) for a period of 40 years.

Any such contract would mean that most of the financial risks outlined above would be transferred from EDF to consumers or taxpayers. This subsidy would be worth many billions of pounds.

Any such contract would be extremely wasteful and very unfair, as described in *A subsidy for nuclear power and its unintended consequences* (bit.ly/16sbLEm).

[2] "EDF staff cuts raise fresh fears over Hinkley Point C", *The Telegraph*, 2013–04–23, bit.ly/XUwVWJ.

5. *There is no valid justification for subsidising nuclear power*

The Government has suggested repeatedly that nuclear power is needed because it is cheap, because it is a low-carbon source of power, and because it provides security in energy supplies. But:

- *Cost:*
  - As we have seen (Section 3), EDF is seeking a guaranteed price for electricity from the proposed Hinkley Point nuclear plant that is nearly double the current market price.
  - As noted in Section 1.1, removing just one of the several existing subsidies for nuclear power would raise the price to at least £200 per MWh, substantially more than the unsubsidised cost of offshore wind power (about £140 per MWh).
  - The cost of nuclear power has been on a rising trend for many years, while the cost of renewables is falling.
- *Emissions*. Peer-reviewed research shows that the nuclear cycle emits between nine and 25 times more CO_2 than wind power (Jacobson, M Z, "Review of solutions to global warming, air pollution, and energy security". *Energy and Environmental Science* 2,148–173, 2009. doi:10.1039/b809990c.).
- *Security*:
  - Nuclear power is a hindrance, not a help, in ensuring security of energy supplies:
    - Like all kinds of equipment, nuclear power stations can and do fail. Failure of a nuclear power station is very disruptive on the grid because a relatively large amount of electricity is lost, often quite suddenly and with little warning. For that reason, special provision is need, the Large Loss Response, to cope with the failure of a nuclear plant.[3]
    - By contrast, variations in the output of renewables are much easier to manage because they are gradual and predictable.
  - There is a range of techniques for ensuring reliability of electricity supplies with 100% renewable sources of power (see www.desertec-uk.org.uk/elec_eng/supply_demand.html).
  - There are now many reports showing how to decarbonise the world's economies without nuclear power. Details, with download links, may be found via www.mng.org.uk/gh/scenarios.htm.
  - Nuclear power is not a home grown source of power in the UK. All uranium is imported.

In addition, there is abundant evidence from reputable sources that, in general, renewables, with conservation of energy:

- Can be built much faster than nuclear power stations.
- Can easily meet all our needs for energy, now and for the foreseeable future.
- Provide more flexibility than nuclear power.
- Provide diversity in energy supplies.
- Are largely free of the several problems with nuclear power.

Detailed evidence may be found on www.energyfair.org.uk/oppcost and via links from there.

Nuclear power is a mature technology that has been established for many years. It should be commercially viable without subsidies.

Subsidies for nuclear power have the effect of diverting resources away from techniques and technologies which are cheaper than nuclear power and altogether more effective as a means of meeting our energy needs.

6. *Formal complaint to the European Commission*

In December 2011, Energy Fair, with several other environmental groups and environmentalists, submitted a formal complaint to the European Commission (DG Competition) about state aid for nuclear power in the UK. Our press release about this submission may be seen in Legal bid to halt nuclear construction (bit.ly/Mp9Bfy). We understand that the Commission has passed the complaint to the UK government for its response but we have not yet heard a ruling on the submission.

In summary, the "grounds for complaint" in our submission is:

- That the so-called "carbon price floor", introduced in the Finance Act 2011, is a *de facto* tax on fuels used for the generation of electricity and that the exemption of uranium from that tax is incompatible with EU state aid rules, Articles 107 and 108 of the Treaty on the Functioning of the European Union (TFEU).

[3] See "Exclusive: Will wind farms pick up the tab for new nuclear?" (Business Green, 2010–08–24, bit.ly/czZCRx) and "Renewable energy providers to help bear cost of new UK nuclear reactors" (*The Guardian*, 2013–03–27, bit.ly/15Uz44N).

— That the cap on liabilities for nuclear accidents of the Paris/Brussels Conventions constitutes state aid in the sense of Article 107 of the TFEU. Since Article 351 of the TFEU requires EU Member States to adapt and align their pre-existing Treaty obligations to be compliant with EU law, since relevant UK laws have not been amended in the light of that requirement, and since the cap on liabilities has not been notified to the European Commission, it is, technically, illegal under EU law.

— That the proposed cap on liabilities of nuclear operators for the disposal of nuclear waste falls under the definition of state aid in Article 107(1) of the TFEU; that, unless or until it is notified to the Commission, it is illegal under EU law; and that, since the measure cannot be justified (Article 107(3) of the TFEU), it should not be approved by the Commission and should not enter into force.

— That the proposed "feed-in tariff with contracts for difference", as applied to nuclear power, is, under Article 34 of the TFEU, a measure having an effect that is equivalent to "quantitative restrictions on imports" and is thus contrary to EU law.

7. *Conclusion and recommendation*

For many years, nuclear power has been enjoying seven main types of subsidy, several of which are substantial. Another subsidy was introduced in the Finance Act 2011, and three more are proposed in the Energy Bill.

In connection with the current negotiations between EDG and the Government about the proposed new nuclear plant at Hinkley Point, it appears from news reports that EDF would like UK consumers and taxpayers to take on most of the financial risks of the project. Since the risks are large, the transfer of those risks would be a correspondingly large subsidy for EDF.

1.1 Recommendation

There is no valid justification for subsidising nuclear power. Renewable sources of power, with conservation of energy: Are cheaper than nuclear power (taking account of all subsidies); Can provide greater security in energy supplies than nuclear power; Are substantially more effective than nuclear power in cutting emissions of CO_2; Can be built much faster than nuclear power stations; Can easily meet all our needs for energy, now and for the foreseeable future; Provide more flexibility than nuclear power; Provide diversity in energy supplies; and Are largely free of the several problems with nuclear power.

Subsidies for nuclear power have the effect of diverting resources away from techniques and technologies which are cheaper than nuclear power and altogether more effective as a means of meeting our energy needs.

Existing subsidies, as described in this memorandum, should be withdrawn and no new ones should be introduced.

23 May 2013

Written evidence submitted by Dr David Toke

Dr David Toke is Reader in Energy Politics at the Department of Politics and International Relations, University of Aberdeen.

SUMMARY

1. The Government's claims that similar support is being made available to all electricity generators under Electricity Market Reform is false since better terms are likely to be offered to nuclear developers compared to developers of renewable energy. In particular the Government is likely to award contracts giving nuclear power developers premium price support (subsidies) for much longer periods compared to contracts to be offered to renewable energy developers. Indeed if the demands posed by EDF are met not only will nuclear power developers be given premium price (subsidy) support for more than twice as long as renewable energy developers, but they will also be paid considerably more in "headline" strike prices than onshore wind and they will also be offered loan guarantees which will not be available to renewable energy developers. A Government offer of loan guarantees, whether initially agreed as "partial" or complete, as suggested by the DECC Select Committee, will lead to a blank cheque for nuclear which will crowd out funds for renewables which are much more cost-competitive in practice.

2. The Government appears to be gearing up to justify giving preferential treatment to nuclear power compared to renewable by pointing to a distinction between "baseload" and "intermittent" low carbon generators. This distinction is irrelevant and arbitrary for the purposes of giving subsidies, and moreover represents an about turn in the policy compared to that given when EMR was introduced at the end of 2010. Then it was argued that novel technologies like offshore wind could receive higher support, not nuclear power which is not a novel technology. This policy change seems to have no other plausible explanation other than

nuclear power turning out to be more expensive in reality than was expected according to hopeful projects by nuclear advocates.

3. Any policy of giving preferential support to nuclear power compared to renewable sources such as wind power is contrary not only to the principles underlying competitive energy markets but is in flagrant breach of EU state aid rules. The EAC should warn against this and urge that the best disposition of low carbon support to achieve good value for the consumer is towards renewable energy rather than nuclear power.

Introduction

4. The aim of this submission is to discuss the balance of support (or subsidies) between renewable and nuclear power proposed by the Government's in its "Electricity Market Reform" (EMR). Will this policy fulfil its stated central purpose of offering a pathway for "decarbonisation" that is competitive and cost-effective?

5. The issue of whether support (whether called subsidies or not) which the government is offering to generators from these technologies are indeed being made available on equally competitive terms to these technologies is of central importance to the debate being held by the EAC. Indeed the Government has repeated claimed that the support for low carbon energy sources, that is the proposed contracts for difference (CfD) mechanisms, are equally available to all generators. For example Ed Davey told the House of Commons on 7th February this year that:

6. "Under EMR, as set out to Parliament in October 2010, new nuclear will receive no levy, direct payment or market support for electricity supplied or capacity provided, unless similar support is also made available more widely to other types of generation." (Gov UK 2013)

7. There are two key aspects of the question considered here. First, does the Government's approach actually meet up to this specification, and second, can this specification be achieved if EDF's demands for support for the Hinkley C development are approved by the Government? The answers to these questions will help us understand the extent to which Government policies are genuinely competitive, the extent to which they favour particular interests over others, the extent to which the policies are consistent and, in a practical sense, the extent to which they may pass the "state aid" test that will be set by the European Commission. The discussion is put into five sections: first the intentions set out in the EMR proposals set out in 2010 and the extent to which the current government discussions are consistent with that. Second the issue of the lengths of the contracts for difference (CfD) that are likely to be offered. Third is the issue of the "strike prices" that are to be offered. Fourth is the issue of "construction risk". Finally there is the issue of EU "state aid" rules.

Change since 2010?

8. There can be no doubt that there have been some highly significant changes in the framing of the debate about Government support for low carbon sources since the Government published their proposals at the end of 2010. Some key paragraphs are reproduced in the annex to this submission to illustrate this. Summarised here, it can be said that the original proposals give an impression that there would be a competitive auction of contracts to supply low carbon electricity, with the cheapest sources winning the contracts. The only major caveat to this seemed to be that some allowance could be made for "early stage, high cost technologies such as renewables" (DECC 2010, 117). In other words the clear impression that was left was that it was anticipated that nuclear power would be the cheapest.

9. Many of us were sceptical of this. Speaking for myself I found it very challengeable to expect that, for example, onshore wind, would be more expensive than nuclear power. I was unconvinced by the widely agreed assumption that the latest models of nuclear power plant (eg the EPR) was going to be cheaper than previous incarnations of nuclear sets, such as Sizewell B. It could not even be assumed that, in practice, the new nuclear plant could be financed to be at a lower cost than offshore wind plant.

10. My assumption was a somewhat cynical one in that the Government policy would not be implemented as it appeared, and that some policy "fix" would be applied to ensure that nuclear power was given much superior terms compared to renewable energy. In the past, hopeful over-optimistic projections about the cheapness of nuclear power have always been proved wrong by reality. The recent period has followed this trend, with studies of nuclear power costs prepared by the pro-nuclear engineering establishment proving to be gross underestimates compared to the realities of building EPRs as evidenced by the reactors being built in Finland and France. However, in the past nuclear power was given an effective blank cheque by the state. Perhaps nuclear advocates had been hoping that the Government's claims to support competition in provision of low carbon energy would be abandoned in fact and that there would be a return to the nuclear "blank cheque" practices of the past.

11. Indeed, proposals now appear to be emerging that will offer nuclear power a superior set of terms compared to renewable energy. The only point of debate is whether the terms offered by the Government will be sufficiently weighted in favour of nuclear power to give them the very wide advantage that they need over renewables in order to be deployed.

12. What is clear is that the reality of relative support given under EMR to nuclear compared to renewable is somewhat different to that which was presented in the original EMR proposals. It is nuclear power, not renewables, that will be given special treatment of much more generous and amounts of support (subsidy).

Contract Length

13. The Government's own proposals, and my own informal feedback on the contract negotiations, indicate that renewable energy generators such as onshore and offshore wind developers will be offered contracts of 15 year length, and no longer. On the other hand it appears that the Government is prepared to offer nuclear power developers contract lengths of at least 25 years. Certainly the implication from Ed Davey's statements is that nuclear developers will be offered longer contracts than those offered to renewable energy developers (Davey 2013). This gives a clear competitive advantage to nuclear developers. If, for example, nuclear developers are given 25 years and are given the same "strike price" as renewable operators then the nuclear developers will receive premium price support that is two thirds more in total compared to renewable energy developers.

14. This appears to be justified by assertions that renewable energy plant lasts for a shorter period compared to nuclear plant (Davey 2013). This will indeed usually be the case, but such an assertion ignores the fact that, in the case of wind plant, the existing infrastructure can be re-used following refurbishments, perhaps with new blades. This is especially significant in the case of offshore wind where a successor scheme could financed much more cheaply than the initial project given that the foundations and electricity distribution infrastructure has already been installed. Perhaps this second project, consisting perhaps of no more than new blades, may require a guaranteed contract price of no more than the wholesale electricity price. A further factor is that wind power plant costs could well have declined after the first fifteen years. By comparison consumers become "locked in" to paying much higher premium price levels of support to nuclear power plant. Locking in consumers to paying premium prices for longer than is necessary does not represent good value to consumers, but it does represent a policy bias in favour of nuclear power and against their main low carbon competitors such as wind power and solar power whose prices have tended to fall in the past.

15. In fact EDF has been lobbying for a contract length of 40 years (Utility Week 2013), sometimes described in the press as a demand for a 35 year contract. This contract length would therefore commit the energy consumer, for a given strike price and given amount of energy production, to paying more than twice the amount of total support to nuclear power compared to wind power. If, as discussed below, nuclear power were given higher than onshore wind's expected strike price of £80 per MWh, this disparity would increase to even higher multiples.

Strike Price

16. Under EMR the strike price is the payment, per MWh, for low carbon electricity production, that developers will be assured of being paid over periods specified in a long term contract. Such long term contracts are referred to as "feed-in tariffs". However, not all low carbon technologies will be paid the same. For example, it seems likely that onshore wind power developers will be offered around £80 per MWh (2013 prices) as a strike price. This is less than the income theoretically available under the Renewables Obligation (RO). However under a feed-in tariff system there should be more certainty about future income levels compared to the RO, and making the cost of investment capital cheaper and thus requiring the required power purchase price per unity generated lower.

17. It seems that nuclear power developers will be offered at least £80 per MWh, and certainly it is the case that EDF have lobbied for a lot more—just under £100 per MWh according to the press. Indeed DECC itself appeared to suggest that nuclear "First of a Kind" would cost £98 per MWh (DECC 2010, 28), although the ascription "First of a Kind" is a curious formulation since nuclear power plant have been operating for 60 years.

18. Coincidentally or not, the "strike price" suggested by EDF is also around this level,—£98 per MWh—although as mentioned earlier, involving a much longer contract compared to wind power. As commented previously this level of support would mean that the consumer would be committed to giving several multiples of higher support for a unit of nuclear energy compared to onshore wind power, and much higher quantities of subsidy compared to offshore wind power schemes.

19. The Government have outlined a vision to bring down the cost of offshore wind to £100 per MWh (Renewable Energy Roadmap 2011). Yet it seems that this is in a policy context of offering 15 year contracts to offshore wind and offering at least 25 year contracts to nuclear power (with EDF wanting 35–40 years). This means, in effect, that if the Government did acceded to EDF's demands for a £98 per MWh strike price it would be giving much more support to nuclear power than it would prefer to give to offshore wind. This contrasts with an originally dominant discourse has often been that offshore wind is a less mature technology. Is the logic about to be turned around and nuclear power now to be regarded as an immature technology and offshore wind to be regarded as a being an "old" technology relatively less deserving of support compared to nuclear power?

20. However, the contrast between the initial impression given by Government policy and the possible outturn of policy is made even sharper by the fact that EDF's demands for a high strike price and very long contract do not end there. They also want (at least some) underwriting of construction risk.

Construction Risk

21. Underwriting of construction risk means that whatever happens, then some agent (in this case HM Government) will agree to pay the cost of construction of the plant, or an agreed portion of that grant. Currently EDF is requesting only (to my knowledge) an unspecified part of the construction risk, although some nuclear advocates, including the Select Committee on Energy and Climate Change itself (DECC Select Committee 2013a), appear to be recommending that the entire nuclear construction risk be underwritten by government. This would help nuclear projects because banks may be more likely to lend that amount of money at relatively low interest rates compared to the much higher rate of return required by equity investors. However, three issues are raised by this.

22. The first issue is that analysis of the history of nuclear power construction might question the assumption that this was a "risk-free" action by the Government. Nuclear power plant have been subject to cost overruns and often take longer to complete than planned meaning that the loan guarantees would have to be called in if this experience repeated itself. A nuclear constructor could spend some or all of the money that was underwritten and, having suffered unplanned reverses, announce that they would ask the government to repay the loans the pay for "part" of the project. However they would quite probably also say that they would be unable to complete construction unless the state guaranteed the rest of the power station costs. "Partial" underwriting would thus collapse into full underwriting. The nuclear constructor would suffer no financial penalty, but the state would be faced with the dilemma of having a part completed nuclear power station.

23. This scenario effectively happened in the case of Sizewell B when the electricity industry was privatised part way through its construction. The Government agreed to guarantee the costs of completing the project. The electricity consumer ended up picking up all of the costs guaranteed under a mechanism called the "fossil fuel levy". History could quite easily repeat itself if the state agreed to any form "underwriting" of construction costs. Despite this the DECC Select Committee has actually recommended such a strategy (DECC Select Committee 2013a). **By offering what may be initially sold as "partial" underwriting of construction risk, the Government will be signing a blank cheque for nuclear power in all but name. For nuclear power there is no such thing as "partial underwriting", any more than there is such a thing as being "partially pregnant".**

24. The Government's reply to the DECC Select Committee has been interpreted as a response which did not completely rule out this possibility of nuclear underwriting. Indeed the letter from DECC actually suggested that "baseload" and "intermittent" plant could be treated differently. This may be referring to offering longer contracts to nuclear constructors compared to renewable developers, but this is unclear.

25. A second issue is how the claims for "competitiveness" can survive if one party (nuclear power) is given preferential terms through "underwriting" risk. I have already discussed how it seems that nuclear is going to be given preferential terms through a longer contracts, and also, perhaps (if EDF's demands are met), through a higher strike price compared to onshore wind. Now there is also a possibility of nuclear power being afforded a third type of preferential term through having their construction costs underwritten.

26. A third issue is whether such "underwriting construction risk" support could possibly be reconciled with the EU's state aid rules (see below). The Government would have, at the very least, to offer comparable support for construction risk to offshore wind, as well as offer equivalent terms to renewable on other matters. Given that a MW of nuclear power generates a much larger amount of electricity than a MW of offshore wind this means that if the Government underwrites Hinkley C at 3.6 GW worth of capacity it would have to offer similar underwriting to something around 10 GW of offshore wind. Underwriting would be of significant benefit to offshore wind and would lead to major cost reductions because of the reductions in interest charges on debt portions of the investment. Certainly, if any technologies should be offered underwriting, the newest, most innovative technologies, such as tidal lagoons, tidal stream and wave power technologies should be given priority. It is difficult to see how, some 60 years after their genesis, nuclear power might claim to require a market preference policy.

27. Nevertheless, as mentioned earlier, the Government through its distinction between baseload and intermittent plant seems to be preparing the ground for giving preferential terms to nuclear power compared to renewable. Yet it is difficult to see the basis for this. Contrary to frequently made assumptions, wind power and other renewable developers have to pay for the balancing of their output through their own income stream from sales of electricity. When their electricity is traded on the wholesale markets the value of this electricity is discounted to pay for the balancing services consequential upon the "intermittent" (or variable) source of electricity. Indeed the very choice of language (intermittent as opposed to variable) implies a bias in the Government approach towards seeing variable renewable output as being less valuable than "baseload" nuclear production. It is the case that if large proportions of electricity are sourced from renewable then more transmission interconnector capacity will have to be built. But not only is this facility open to other electricity trading uses but also such costs will be offset (in the comparison with nuclear subsidies) by in-kind or actual subsidies to nuclear power. These include the sharing of costs for extra back-up capacity required to guard against sudden breakdowns by nuclear power stations (Carrington 2013), and other subsidies discussed by other submissions to the EAC.

EU State Aid Rules

28. EU state aid rules exist for a very good purpose—to ensure that the Government does not give state aid that would distort the efficient allocation of resources through market mechanisms (Europa 2013a). The Government insists that its low carbon support policies do not discriminate between different technologies. However, as covered in the arguments above, the proposals to support nuclear power clearly do discriminate in favour of nuclear power. This will be at the very least through offering nuclear developers longer contracts than will be awarded to wind power developers, and, if EDF's terms are accepted, a lot more than this.

29. In fact, as can be seen by reference to the state aid rules renewable energy has an exemption on the grounds that it is an environmental measure. In contrast, nuclear power has no such exemption (Europa 2013b). Yet the Government proposes to do the exact opposite of the these rules, that is offer better terms to nuclear investments compared to renewable energy. It is extremely difficult to see how this can be reconciled with the state aid rules.

Conclusion and Recommendations

30. It can be seen through this argument that the Government has shifted from an ostensible policy of saying (initially) that it would allow some concessions to be made for some newer renewable generation in its low carbon support towards now building a case to justify why better terms should be given to nuclear power. It has been the contention of many that the process of presenting nuclear power as somehow cheaper than renewable has been flawed from the start. It does seem that public policy has been dragged along on the basis of a process of what Tom Burke has called "salami slicing"—that is presenting nuclear costs as being smaller than they are, but bit by bit gaining policy acceptance of an ever increasing set of subsidies. The strategy has been of gaining policy commitment for a steady incremental rise in the level of subsidies offered to nuclear power. It would have been politically unacceptable for the policy process to have become by an open declaration that nuclear power would receive better terms than renewable energy sources. However now we see these better terms emerging through this process of "salami slicing". The Government have already it seems, committed to offering nuclear developers longer contracts to received low carbon premium support compared to renewable energy developers. The exact scale of the preferential treatment is yet to be seen. However if the Government does accede to the demands set by EDF the difference between the terms will be very large indeed. Given that renewable and nuclear are competing for a limited set of resources under the "levy controlled framework" it is difficult to avoid the conclusion that Government's policy will achieve poor value for consumers in that the cheaper resources of renewable energy will be sidelined by Government policies to give better terms to more expensive resources associated with new nuclear power stations.

Recommendations

31. It is therefore recommended that:

(a) the EAC should warn against the possibility that the Government may give better terms to nuclear power compared to renewable energy technologies, that is by giving longer contracts, a higher strike price (compared to onshore wind) and/or loan guarantees to nuclear power; and

(b) the EAC should reconsider the basic policy premise that nuclear power should be offered low carbon support. It is clear that the Government's own strategy implies that there are limits on funds (subsidies) available to support low-carbon energy and that if these are to be most cost-effectively disposed they need to be reserved for low carbon technologies other than nuclear power. Maintaining a belief that nuclear power is economically competitive with renewable energy leaves Government policy in a state of unreality leading to a failure to plan a consistent, workable, energy strategy for the future.

Annex

EXCERPTS FROM GOVERNMENT'S INTRODUCTORY PAPER ON ELECTRICITY MARKET REFORM ISSUED IN DECEMBER 2010 (DECC 2010), PAGES 116–117

9. The Government is attracted to a greater use of auctioning as a mechanism to set the level of feed-in tariff support, regardless of the specific model for FIT chosen in the White Paper next year. The price discovery characteristics of an auction should enable financial support to be set at a level just high enough to lead to deployment but not high enough to lead to excessive profits, with bids driven down by competition.

10. However, adopting an auction-based approach would require Government to determine what share of the electricity mix should be low-carbon and may require Government to have a view on the breakdown of technologies within the low-carbon mix. Leaving decisions on technology choice to individual investors—who are directly exposed to the risk of making poor decisions, could lead to a lower-cost and lower-risk technology mix. (page 115 DECC 2010)

14. Having one auction for all low-carbon technologies would maximise competition between technologies, allowing investors (who are driven by maximising the return on their investments) to determine the most costeffective low-carbon technologies. However, this could on the other hand lead to a "winner takes all"

outcome where the current lowest cost technology would win all the bids and dominate the technology mix. This would not be good for encouraging early stage, high cost technologies such as renewables.

15. Having technology-specific auctions would enable different tariffs to be set for different technologies but could lead to insufficient competition (not enough bidders) and would probably entail the Government having to specify how much capacity from each technology was wanted (ie how many GW of onshore wind, offshore wind, nuclear etc).

16. One way to provide differentiation in support for individual low-carbon technologies within an auction approach, and replicate the benefits of allowing investors to choose the technology mix, could be to have a technology neutral auction for a single tariff level for all low-carbon generation and then to offer technology specific premiums on top to early stage technologies with higher costs such as offshore wind. This would give additional revenue certainty to the lower cost and more mature low-carbon technologies but would allow Government to recognise that innovation in earlier stage, higher-cost technologies is a legitimate objective in its own right. (p116–117)

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11 June 2013

Written evidence submitted by the Renewable Energy Association

The Renewable Energy Association (REA) is pleased to submit this response to the Environmental Audit Committee's Inquiry on Energy Subsidies. The REA represents a wide variety of organisations involved in renewable energy in the UK, across the power, heat and transport sectors, with members ranging in size from major multinationals to sole traders. With over 1,100 corporate members, the REA is the largest renewable energy trade body in the UK. The REA's main objective is to secure the best legislative and regulatory framework for expanding renewable energy in the UK.

Executive Summary

— There is nothing new about energy subsidies—they are a reflection of the pivotal role that energy plays in the economy. It is reasonable for governments to apply subsidies in line with clearly stated policy objectives, such as encouraging promising new and emerging technologies into the marketplace, reducing reliance on imported fuels, controlling greenhouse gas emissions and stimulating economic growth. However there is an issue in that subsidies often lack transparency, though this is not generally the case for renewable energy.

— Government's aim should be to create a competitive energy marketplace based on a transparently level playing field. It is crucial that external costs of energy sources be fully taken into account; when that is done the costs of many renewable energy technologies compare very favourably. Until external costs are fully internalised, support for renewables may be required to compensate, however the costs of many renewable technologies are falling whilst the costs of conventional energy sources are rising. Support for renewables is therefore fully justified as a stopgap measure, especially as they fulfil all of the previously identified objectives.

— The Government must therefore do more to ensure transparency and a level playing field. Subsidies should be tied to clearly defined objectives. More work is needed to quantify and account for the externalities of conventional sources. The UK Government must heed the conclusions from the most recent European Council meeting on 22 May 2013, reiterating the "priority that should be attached to ensuring a level energy playing field" and "phasing out environmentally or economically harmful subsidies, including for fossil fuels".

Introduction

There is no clear definition of energy subsidies and the subject is inherently political. Subsidies are any form of support that reduces the price paid by the final consumer, and therefore encourages consumption of that particular energy form. For more expensive energy forms like renewable energy or nuclear, that might be to help them compete with the fossil fuel benchmark. For fossil fuels the support might be to encourage indigenous production in the face of cheaper international competition or, as is the case in the less developed countries, to make energy more accessible to consumers.

Subsidies for renewable energies are more transparent than those to fossil fuels and nuclear. The REA therefore welcomes this inquiry and the Oxford Energy Associates (OEA) work. It is extremely important to set out a framework enabling comparison across the different energies and therefore work on this topic should be continued and updated on a regular basis.

Responses to Inquiry Questions

1. *Has the Government identified and measured energy subsidies?*

1.1 In 2004 the European Environment Agency (EEA) produced a report, "Energy subsidies in the European Union, a brief overview",[4] for the International Renewables Conference in Bonn. The executive summary's opening paragraph is worth repeating here:

> *"There is no agreed definition of energy subsidies among European Union (EU) Member States. The term may include cash transfers paid directly to producers, consumers and related bodies, as well as less transparent support mechanisms, such as tax exemptions and rebates, price controls, trade restrictions, planning consent and limits on market access. It may also cover government failure to correct market imperfections, such as external costs arising from energy production or consumption. This results in a wide range of economic estimates and confusing policy arguments."*

1.2 The OEA report documents how subsidies are often hidden and are therefore hard to quantify. This is exacerbated by the lack of clarity over the precise meaning of "subsidy". The majority of studies focus on consumer subsidies with less attention paid to producer subsidies. These are detailed in paragraph 2.3.

1.3 The annual subsidy for renewables in the OEA report totals £3,052 million. This is far lower than the total for oil (£539 million), gas (£3,631 million), coal (£85 million), and nuclear (£2,300 million), which total £6,555 (Figure 1). Furthermore, some of the costs, eg "Additional exemptions from charges and accelerated tax allowances" for oil and gas and the costs of dealing with the legacy nuclear waste, are not quantified meaning their totals are underestimated.

2. *The Government's treatment of subsidies compared to best practice*

2.1 As described by Oxford Energy Associates, there are different ways to define and scope energy subsidies and there appears no formal clarification by the Government as to which is the correct methodology.

2.2 Section 1 of the OEA report details and explains the background to subsidies and how they work. Having explained the economics involved, the report identifies a number of types of subsidies and how they are calculated in the different reports. Despite noting such differences and limitations, the report does not specifically specify which method is best practice.

2.3 In a recent report by the International Monetary Fund (IMF),[5] subsidies are defined under two headings: consumer and producer. Consumer prices are those which arise when the prices paid by consumers are below a benchmark price, generally calculated as the cost minus the recovery price for the domestic producer. On the other hand, producer subsidies are those which arise when prices received by suppliers are above this benchmark. The report notes that one key difference between the two is that, unlike consumer subsidies, producer subsidies do not lead to excessive consumption of energy. Whilst distinguishing between the two types of subsidies, the report chooses to focus on consumer subsidies and the producer subsidies remain rather unclear.

[4] http://www.eea.europa.eu/publications/technical_report_2004_1
[5] http://www.imf.org/external/np/pp/eng/2013/012813.pdf

Figure 1

SUMMARY OF UK ENERGY SUBSIDIES (WRITTEN EVIDENCE COMMISSIONED BY THE COMMITTEE FROM DR WILLIAM BLYTH, OXFORD ENERGY ASSOCIATES, PAGE 34). [*not reproduced here*]

2.4. A recent report by the Overseas Development Institute[6] presented a number of subsidy categories, types and definitions. Based on their identification of subsidies they estimated that globally developing country governments spent more than $396 billion subsidising fossil fuels in 2011, whilst only $5 billion was spent on combating the effects of climate change.

2.5. Rarely mentioned are the hidden subsidies associated with providing the British Armed Forces to protect offshore oil and gas companies: http://www.amsslimited.com/?page_id=111, and http://platformlondon.org/wp-content/uploads/2012/10/A-Secret-Subsidy-piracy.pdf

3. *The scale of subsidies in the UK and comparison with other countries*

3.1 As noted in the OEA report, the most comprehensive assessment and comparison of international subsidies is the OECD report "Inventory of estimated budgetary support and tax expenditures for fossil fuels".[7] This report notes that it is extremely hard to directly compare countries as "[t]ax-expenditure accounting was not designed with international comparability in mind". A fundamental limitation being the differences in the definition of the benchmark tax system. Therefore national tax expenditure estimates can only be considered in the context of the specific tax system for that country. For this reason the report focuses on accounts of individual countries rather than making direct comparisons.

3.2 The OECD is working on expanding its work to include such country-specific backgrounds when estimating tax expenditures. However it also notes the need for countries to be open and transparent in their reporting of tax-system features which support the production or consumption of fossil fuels.

3.3 In line with paragraph 2.5, the EEA report compared energy subsidies in the EU-15. The report, however, has not been repeated since this 2004 edition. At the time of the report however, it was found that whilst on-budget support for the coal industry continued in the UK, Germany and Spain, it had more or less ceased in other countries like Belgium and France. It was further noted that the UK, along with Italy and the Netherlands provide the highest level of support to the oil and gas sector through reduced VAT rates.

3.4 Additional conclusions drawn from the EEA report were that, across the EU-15, support for fossil fuels was high whilst support for renewable energy "represents a much less mature industry with arguably greater need for technological and market support to enable full commercial development." Furthermore, in historical terms, renewable energy subsidies in the EU-15 have been "relatively low in comparison with other forms of energy during periods of fuel transition and technology development".

3.5 Whilst both the OECD and the EU reports aim to assess the scales of subsidies in the UK and internationally, there appears to be a lack of national reports which assess the size of energy subsidies solely in the UK. Furthermore, as noted in paragraph 1.2, all reports which have attempted to do so tend to focus on one type of subsidy or note a number of limitations to the study.

3.6 Based on the information in paragraphs 3.1–3.5, the scale of subsidies in the UK and in comparison with other countries have not yet been reliably reported. The future work of the OECD appears promising but it remains essential that countries are transparent in their reporting.

4. *Whether the Government has any plans or targets to reduce or eliminate "harmful" subsidies*

4.1 In 2009 the G20 committed to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption." This statement is however rather flexible, for example, there is no specific deadline, only a pledge to do it in the "medium term".

4.2 A progress update[8] published in June 2012, noted the limitations of the text. The "vague definition [of] fossil fuel subsidies in the G20 commitment has allowed many countries to 'opt-out' even reporting on their fossil fuel supports". It is suggested that there has been divergence over the terms: "subsidy", "inefficient subsidy" and a subsidy which "encourage[s] wasteful consumption". This led to six countries opting out of reporting in 2011 and the number is expected to have risen since.

4.3 As further noted in the progress report discussed in paragraph 4.2, for any further analysis or reform, transparency on support policies to fossil fuels is essential. Allowing policies to be visible to others will mean that assumptions made by national governments can be seen and in turn potentially challenged.

[6] http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8335.pdf
[7] http://www.oecd.org/site/tadffss/48805150.pdf
[8] http://priceofoil.org/content/uploads/2012/06/FIN.OCI_Phasing_out_fossil-fuel_g20.pdf

4.4 Most recently David Cameron attended a European Council meeting on 23 May 2013 whose conclusions[9] included the following: "Priority will be given to:

(c) the revision by the Commission of state aid rules to allow for targeted interventions to facilitate energy and environmental investment, ensuring a level playing-field and respecting the integrity of the single market; and

(d) phasing out environmentally or economically harmful subsidies, including for fossil fuels."

5. *Progress in reducing such harmful subsidies, and how current energy policies and DECC's "Energy Pathways" for the mix of energy sources will influence the magnitude of any subsidies*

5.1 Despite the agreement discussed in paragraph 4.1, it was reported[10] that worldwide fossil fuel subsidies rose to at least $470 billion in 2010, about $100 billion on 2009 figures. It was further reported that whilst fossil fuels receive subsidies of this scale (admittedly the total was reported at $409 billion in this report), renewable energy technologies obtained a smaller $66 billion in the same year.[11]

5.2 Furthermore, the G20 progress report (paragraphs 4.2 and 4.3) found that nations are just changing their definitions of subsidies. The report concluded that no subsidies have (at the time of the report) been eliminated as a result of the G20 commitment. It is suggested that there has been a lack of growth in identified policy interventions since the first progress report which was submitted by members in June 2010.

5.3 It is widely reported, for example in the IMF report,[12] that the removal of subsidies would encourage reductions in consumption and waste and therefore lead to reduced CO_2 emissions. This positive effect would be furthered still by strengthening incentives for "research and development in energy-saving and alternative technologies". Ie energy efficiency and renewable energy sectors would benefit from the removal of these harmful subsidies and in turn so would the environment.

5.4 Current policies are working well to incentivise renewables and energy efficiency measures, however to truly make a fair playing field, there needs to be greater transparency across all energy sources. The Government therefore needs to make a concerted effort to fulfil the G20 commitment made in 2009.

6. *REA recommendations*

6.1 In forming this response we recognise that the available data are limited and the topic of defining and quantifying subsidies is complex. We therefore suggest that an alternative approach may prove most useful.

6.2 In 2011 the Committee on Climate Change produced "The Renewable Energy Review".[13] The document partly focused on estimating the cost of low-carbon technologies up to 2040. These were presented as shown in Figure 2, though we hasten to add that we do not agree with many of the costs shown (for example the costs of solar PV have fallen dramatically since this report was written).

Figure 2

ESTIMATED COST OF LOW-CARBON TECHNOLOGIES (2011, 2020, 2030, AND 2040). [FROM "THE RENEWABLE ENERGY REVIEW", CCC, FIGURE 1.10 *[not reproduced here]*]

6.3 Presenting the costs in this manner, ie basing estimations entirely on the costs and free of subsidies allows a simple comparison across technologies and internationally.

6.4 As an addition to a graph such as this, it would be useful to indicate the impact that subsidies and taxes could have on these costs, for example by adding vertical arrows. By changing the lengths of these it would allow the user to see what options are available in order to bring all technologies to the same benchmark level. This could be done in a similar way as the DECC 2050 calculator whereby you change the scenarios used.

6.5 Having a framework such as this will help consumers to see how the costs have changed and are changing over time, therefore adding to the transparency in the market

6.6 It is a perennial frustration for the REA that while the costs of renewable energy are routinely quantified, the benefits are not subject to systematic quantification. Aside from the environmental benefits, additional advantages include balance of trade benefits, employment, exports, security (including defence), price stability and HMT tax revenues. We believe that the wider advantages need to be taken into account and make for a compelling case in favour of renewable energy.

12 June 2013

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[9] http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/137197.pdf

[10] http://www.guardian.co.uk/environment/2011/oct/11/g20-curb-fossil-fuel-subsidies

[11] http://www.guardian.co.uk/environment/2012/jan/19/fossil-fuel-subsidies-carbon-target

[12] http://www.imf.org/external/np/pp/eng/2013/012813.pdf

[13] http://archive.theccc.org.uk/aws/Renewables%20Review/The%20renewable%20energy%20review_Printout.pdfhttp://archive.theccc.org.uk/aws/Renewables%20Review/The%20renewable%20energy%20review_Printout.pdf

Written evidence submitted by the Association for the Conservation of Energy

Introduction

1. The Association for the Conservation of Energy was formed in 1981 by major companies active within the energy conservation industry, in order to encourage a positive national awareness of the needs for and benefits of energy conservation; to help establish a sensible and consistent national policy and programme and to increase investment in all appropriate energy-saving measures.

We welcome this opportunity to respond to the Environmental Audit Committee's inquiry into energy subsidies.

The Nature of this Submission

2. This submission mainly concerns paragraph (v) of this inquiry by the Committee—"how current energy policies and DECC's 'Energy Pathways' for the mix of energy sources will influence the magnitude of any subsidies."

3. We will be arguing that "current energy policies" as specified in The Carbon Plan and explained in detail in "DECC's Energy Pathways" "will most certainly 'influence the magnitude of any subsidies' to the extent that **they will require an unnecessary spending of the between £19 and £396 per year for 40 years by every single person in the UK. That amounts to a total of between £1.19 billion and £24.97 billion per year and between £47.6 billion and £998.8 billion over the 40 year period."**

4. That unnecessary spending that will be dictated by "current energy policy", while not necessarily taxation is never-the-less is the public's money. And so constitutes a subsidy.

What is a Subsidy?

5. This definition of a subsidy as including "the public's money" and so being far wider than simply "public money" (ie taxation) definition is not new. For instance:

(i) The government itself defines the feed in tariff, which is paid by the public as consumers and not as taxpayers (and so is "the public's money"), as a subsidy.

(ii) The amount of money available for, and paid out as, ROCs is also collected from the public as consumers rather than taxpayers yet it is listed in the Blue Book as a tax (table 11.1).

6. In his Report for the Committee Dr William Blyth of Oxford Energy Associates explains (on page 9) that a subsidy can include "transfers between consumers and producers as a result of policy...".

"Current energy policies" in the DECC Pathways involve:

(i) Massive extra (ie more than other alternatives that deliver the same—or better- results) use of "the public's money" that will result from those pathways; and

(ii) Massive transfers of money as a result of policy,

in a wholly unjustifiable way because all the benefits of those "current energy policies" can be achieved by cheaper policies. Indeed, we go further—a major benefit of current energy policies, energy security ("keeping the lights on") can be more reliably achieved by cheaper policies.

7. So as we said above the public is being required by current energy policies in the pathways to subsidise polices that are both more expensive and less reliable than the alternatives that are **available and known** to government and based on evidence and "robust" analysis by DECC and included in DECC's own pathways—but ignored by DECC.

Subsidies for New Nuclear Power

8. The subsidy we will now explain is to the "current energy policy", as detailed in the "DECC pathways", that is dependent on new nuclear power stations to keep the lights on and achieve our legally binding 80% CO_2 reduction target by 2050.

It is a hidden subsidy—but never-the-less it is still a subsidy in the sense we described above: it involves requiring the public's money to be spent on a policy that is both more expensive than an alternative policy that achieves exactly the same objectives far more cheaply and **also more reliably**. How does this work?

9. On the Pathways calculator DECC's four main pathways specified in the Carbon Plan called:

— Analogous to MARKAL;

— Higher Renewables more energy efficiency;

— Higher nuclear less energy efficiency; and

— Higher CCS more biofuels,

are explained in full. These are the main ways forward for government policy. In the DECC Review of April 2013 DECC's Head of Strategy Ravi Gurumurthy, wrote that the Analogous to MARKAL pathway was considered to be the most cost effective pathway.

10. So let us explain how the subsidy occurs. First we list the cost of the four main government pathways, from the DECC pathways calculator. Table 1 DECCs estimated cost of current policy.

Table 1

COSTS £ PER PERSON PER YEAR 2010–50

	Fossil	*Bioenergy*	*Electricity*	*Buildings*	*Transport*	*Industry*	*Finance*	*Other*	*Total*
Higher renewables more energy efficiency	537	225	314	762	2,292	146	835	7	**5,118**
Higher nuclear less energy efficiency	544	393	244	806	2,469	15	856	2	**5,329**
Higher CCS, more bioenergy	608	319	190	1,028	2,157	146	801	16	**5,265**
Analogous to MARKAL 3.26	550	305	231	733	2,011	146	747	13	**4,736**

11. **The calculator explains that this is not an energy bill it is "the absolute cost to society of the whole energy system" (mean undiscounted real pounds per person per year 2010–50) and "includes only the physical costs of constructing, operating and fuelling equipment."**

All of these government pathways achieve 80% CO_2 reduction and keep the lights on by passing the stress test and by importing energy.

12. Secondly we investigated whether this was the most cost effective way of achieving those two objectives; and we did this by removing the new nuclear power element from the government pathways and substituting other levels of activity for the various policy measures listed in the pathways (exactly what changes we made for each comparison pathway is contained in Appendix 1).

We emphasize that we did not change the government's robust evidence and analysis: all we changed was the activity level (listed as 1–4 or A-D) on the pathways calculator for various possible demand side and supply side measures. And here is the result in Table 2.

Table 2

COSTS (£)

	Fossil	*Bioenergy*	*Electricity*	*Building*	*Transport*	*Industry*	*Finance*	*Other*	*TOTAL*
Higher renewables more energy efficiency	537	225	314	762	2,292	146	835	7	**5,118**
Comparison v 1	*547*	*287*	*295*	*762*	*2,118*	*146*	*801*	*8*	***4,964***
Higher nuclear less energy efficiency	544	393	244	806	2,469	15	856	2	**5,329**
Higher CCS, more bio energy	608	319	190	1,028	2,157	146	801	16	**5,265**
Comparison v.1	*627*	*319*	*180*	*1,007*	*2,157*	*146*	*785*	*16*	***5,237***
Comparison v 2	*629*	*319*	*187*	*1,007*	*2,157*	*146*	*785*	*16*	***5,246***
Comparison v.3	*615*	*319*	*182*	*1,007*	*2,165*	*146*	*785*	*20*	***5,239***
Comparison v 4	*597*	*283*	*172*	*1,028*	*2,213*	*106*	*817*	*16*	***5,232***
Analogous to MARKAL	550	305	231	733	2,011	146	747	13	**4,736**
Comparison example 1	*579*	*283*	*167*	*638*	*2,039*	*146*	*601*	*20*	***4,473***
Comparison example 2	*596*	*289*	*200*	*723*	*1,861*	*146*	*675*	*23*	***4,513***
Comparison example 3	*585*	*289*	*206*	*723*	*1,861*	*146*	*695*	*24*	***4,529***
Comparison example 4	*620*	*289*	*178*	*723*	*1,861*	*146*	*658*	*23*	***4,498***
Comparison example 5	*617*	*289*	*202*	*723*	*1,861*	*146*	*659*	*23*	***4,520***
Comparison example 6	*611*	*289*	*236*	*723*	*1,861*	*146*	*668*	*23*	***4,557***
Comparison example 7	*585*	*304*	*235*	*439*	*2,039*	*146*	*576*	*16*	***4,340***
Comparison example 8	*601*	*283*	*232*	*721*	*1,980*	*146*	*723*	*24*	***4,710***
Comparison example 9	*590*	*283*	*238*	*721*	*1,980*	*146*	*720*	*16*	***4,694***
Comparison example 10	*580*	*319*	*232*	*721*	*1,869*	*146*	*683*	*16*	***4,566***

13. What this shows is that ALL the comparison pathways involving no more nuclear power stations cost less than the equivalent government pathways—ie less of the public's money will be required as a result of them. Table 3 summarises this information.

Table 3

	Cost of government pathway per person per year 2010–50 stated on the DECC calculator (£)	*Cost of our comparison(s) per person per year calculated by the DECC calculator (£)*	*Annual subsidy of government pathway per person as compared to our pathways (£)*	*Total annual subsidy of government pathway (Based on population figure of 63,075,914 from ONS) (£)*	*Total subsidy of government pathway over 40 year period (£)*
Higher renewables more energy efficiency	5,118	4,964	154	9.71 billion	388.4 billion
Higher CCS more bio	5,265	5,232–5,246	19–33	1.19 billion–2.08 billion	47.6 billion–83.2 billion
Analogous to MARKAL	4,736	4,340–4,694	42–396	2.64 billion–24.97 billion	98.4 billion–998.8 billion

14. Of course it may be argued that the government pathways are necessary to achieve our joint objectives of 80% CO_2 reduction and keeping the lights on, and so these policies that involve spending of the public's money are not subsidies but are needed to achieve vital policy objectives.

15. This argument is **factually incorrect**. As Appendix 2 shows ALL of our alterative pathways achieve the 80% and keep the lights on. Indeed the evidence regarding the latter point is that the alternative pathways are more reliable than the equivalent government pathways because, as Appendix 3 shows, not only do they require either the same or less security back up than the government pathways, but they **all rely on less imported energy than the government pathways.**

And in an uncertain world who knows what conflicts, wars and upheaval and political allegiances there will be in 2025 let alone 2035 or 2045? The more we rely on imported energy the less will be the certainty of keeping the lights on.

16. So the government is pursuing a course requiring massive extra spending of the public's money "as a result of policy" (to use Dr Blyth's words) because it is blindly adhering to a policy decided some years ago (the building of new nuclear power stations)—**despite evidence that it holds** that this policy is neither the cheapest nor the most reliable way of achieving energy policy objectives.

The Public's Money and the Government's Promises

17. All of this is totally contrary to repeated ministerial promises, as well as the Conservative Election Manifesto and Coalition Agreement. The latter says (at page 17) new nuclear power stations will be allowed "**provided that they receive no public subsidy**".

The Conservative Election Manifesto of April 2010 used almost identical words and saying that new nuclear power stations would be "encouraged"—"providing they receive no public subsidy."

And Ministers have repeatedly given similar assurances repeatedly. For instance:

> **Charles Hendry:** Government's position on new nuclear power is clear. It is for the private sector energy companies to construct, operate and decommission new nuclear power plants, as long as they are subject to the normal planning process for major projects and that they receive no public subsidy.—Hansard, 24 June 2010: Columns 465–6.

There are numerous similar pronouncements by, for instance, Mr Hendry,[14] Chris Huhne MP,[15] Baroness Wilcox,[16] and Lord Marland.[17]

18. Indeed, quite apart from the case argued herein, Dr Blyth in his written report for the Committee stated unequivocally (at page 25): "despite ministerial announcements ... that there would be no public subsidies for new nuclear plant, it is apparent that several subsidies will in fact be in place" and he goes on to explain them.

19. And the nuclear industry itself accepts that it will now be receiving subsidies. Writing in Energy World May 2013 Peter Haslam, the Public Policy Advisor with the Nuclear Industry Association said that "new nuclear will be delivered without any **direct** public subsidy." But not without **any** public subsidy!

[14] Hansard 24.6.10 cols 465–6; www.decc.gov.uk/en/content/cms/news/NIF10/NIF10.aspx
[15] The Times 15.5.10; Independent on Sunday 13.6.10
[16] Hansard 2.6.10 col 271
[17] Hansard 3.6.10

APPENDIX 1

ENTRIES ON THE DECC PATHWAYS CALCULATOR FOR OUR COMPARISON PATHWAYS

POLICY	*HR1*	*CCS1*	*CCS2*	*CCS3*	*CCS4*
DEMAND SIDE					
Domestic transport behaviour	**4**	3	3	3	3
Shift to zero emission transport	3	2	2	2	3
Choice of fuel cells or batteries	2	2	2	2	1
Domestic freight	3	3	3	3	3
International aviation	2	2	2	3	2
International shipping	2	2	2	2	2
Average temperature of homes	**4**	**4**	**4**	**4**	3
Home insulation	**4**	3	3	3	3
Home heating electrification	**D**	C	C	C	C
Home heating that isn't electric	**D**	B	B	B	B
Home lighting and appliances	**4**	**4**	3	3	3
Electrification of home cooking	B	A	A	A	A
Growth in industry	B	B	B	B	C
Energy intensity of industry	3	3	3	3	3
Commercial demand for heating and cooling	**4**	3	3	3	3
Commercial heating electrification	**D**	**D**	C	C	C
Commercial heating that isn't electric	**D**	C	C	C	C
Commercial lighting and appliances	**4**	3	3	3	3
Electrification of commercial cooking	B	A	A	A	A
SUPPLY SIDE					
Nuclear power stations	1	1	1	1	1
CCS power stations	1.3	2	2	2	2
CCS power station fuel mix	B	C	C	B	C
Offshore wind	1.9	1.3	1.3	1.3	1.3
Onshore wind	2.7	1.5	1.5	1.5	1.4
Wave	1.6	1	1.3	1.3	1.3
Tidal Stream	2	1	1	1	1
Tidal Range	2	1	1	1	1
Biomass power stations	1	1	1	1	1
Solar panels for electricity	1.2	1	1	1	1
Solar panels for hot water	1.8	1	1	1	1
Geothermal electricity	1	1	1	1	1
Hydroelectric power stations	2	1	1	1	1
Small-scale wind	1	1	1	1	1
Electricity imports	1	1.5	1.5	1.5	1.5
Land dedicated to bioenergy	3	3	3	3	3
Livestock and their management	2	2	2	2	2
Volume of waste and recycling	B	B	B	B	B
Marine algae	1	1	1	1	1
Types of fuels from biomass	A	B	B	B	B

POLICY	*HR1*	*CCS1*	*CCS2*	*CCS3*	*CCS4*
SUPPLY SIDE					
Bioenergy imports	2	3	3	3	2
Geosequestration	1	2	2	2	2
Storage, demand shifting and interconnection	**4**	2	2	2	2

POLICY	*MP1*	*MP2*	*MP3*	*MP4*	*MP5*	*MP6*	*MP7*	*MP8*	*MP9*	*MP10*
DEMAND SIDE										
Domestic transport behaviour	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
Shift to zero emission transport	3	1	1	1	1	1	3	2	2	1
Choice of fuel cells or batteries	1	1	1	1	1	1	1	1	1	1
Domestic freight	3	3	3	3	3	3	3	2	2	3
International aviation	3	2	2	2	2	2	3	3	3	3
International shipping	3	3	3	3	3	3	3	3	3	3
Average temperature of homes	**4**	**4**	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**4**

POLICY	*MP1*	*MP2*	*MP3*	*MP4*	*MP5*	*MP6*	*MP7*	*MP8*	*MP9*	*MP10*
Home insulation	1	3	3	3	3	3	1	3	3	3
Home heating electrification	C	A	A	A	A	A	A	A	A	A
Home heating that isn't electric	A	A	A	A	A	A	A	A	A	A
Home lighting and appliances	**4**	**4**	**4**	**4**	**4**	**4**	3	3	3	3
Electrification of home cooking	B	B	B	B	B	B	A	A	A	A
Growth in industry	B	B	B	B	B	B	B	B	B	B
Energy instensity of industry	3	3	3	3	3	3	3	3	3	3
Commercial demand for heating and cooling	**4**	3	3	3	3	3	3	3	3	3
Commercial heating electrification	C	C	C	C	C	C	C	C	C	C
Commercial heating that isn't electric	C	C	C	C	C	C	B	B	B	B
Commercial lighting and appliances	**4**	**4**	**4**	**4**	**4**	**4**	3	3	3	3
Electrification of commercial cooking	A	B	B	A	A	A	A	B	B	B
SUPPLY										
Nuclear power stations	1	1	1	1	1	1	1	1	1	1
CCS power stations	2	2	2.1	2	2	2	2	2.5	1.9	1.9
CCS power station fuel mix	B	A	A	A	A	A	C	B	B	B
Offshore wind	2	2	2.7	1.5	1.5	1.5	2.5	2.5	2.5	2.5
Onshore wind	1	1	1.3	1	1	1	1	1	1	1
Wave	1	1	1	1	2	3	1	2	2	2
Tidal Stream	1	1	1	1	2	3	1	1	1	1
Tidal Range	1	1	1	1	2	3	1	1	1	1
Biomass power stations	1	1	1	1	1	1	1	1	1	1
Solar panels for electricity	1	1	1	1	1	1	1	1	1	1
Solar panels for hot water	3	3	3	3	3	3	3	3	3	3
Geothermal electricity	1	1	1	1	1	1	1	1	1	1
Hydroelectric power stations	1	1	1	1	1	1	1	1	1	1
Small-scale wind	1	1	1	1	1	1	1	1	1	1
Electricity imports	1	2	2	2	2	2	1	1	2.1	1.8
Land dedicated to bioenergy	3	3	3	3	3	3	3	3	3	3
Livestock and their management	2	1	1	1	1	1	2	2	2	2

POLICY	*MP1*	*MP2*	*MP3*	*MP4*	*MP5*	*MP6*	*MP7*	*MP8*	*MP9*	*MP10*
SUPPLY SIDE										
Volume of waste and recycling	B	B	B	B	B	B	B	B	B	B
Marine algae	1	1	1	1	1	1	1	1	1	1
Types of fuels from biomass	B	B	B	B	B	B	B	B	B	B
Bioenergy imports	2	2	2	2	2	2	3	2	2	3
Geosequestration	2	2	2	2	2	2	1	1	1	1
Storage, demand shifting and interconnection	3	3	3	3	3	3	3	1	2	2

Key:

HR1—*Government higher renewables, more energy efficiency pathway (our comparable)*

CCS1/4—*Government higher carbon capture and storage, more bio-energy pathway (our comparables)*

MP1/10—*Government analogous to Markal pathway (our comparables)*

APPENDIX 2

CALCULATIONS DONE BY THE DECC PATHWAYS CALCULATOR SHOWING THAT OUR COMPARISON PATHWAYS ALL ACHIEVE ENERGY SECURITY WITH THE SAME OR LESS "BACK-UP" THAN THE GOVERNMENT EQUIVALENT PATHWAY

	CO_2	*Security back up*	*Nuclear*	*Onshore Wind*	*Level 4*
Higher renewables more energy efficiency	**80%**	**24**	**1.4 (5–6)**	**2.7 (11500)**	**12**
Our comparison with above	*80%*	*24*	*1*	*2.7 (11500)*	*11*
Higher nuclear less energy efficiency	**80%**	**11**	**2.7 (25)**	**1.4 (5840)**	**1**
Higher CCS, more bioenergy	**81%**	**0**	**1.5 (6–7)**	**1.5 (6200)**	**1**
Comp to Higher CCS, more bio v. 1	*80%*	*0*	*1*	*1.5 (6200)*	*3*
Comp to Higher CCS, more bio v. 2	*80%*	*0*	*1*	*1.5 (6200)*	*1*
Comp to Higher CCS, more bio v. 3	*80%*	*0*	*1*	*1.5 (6200)*	*1*
Comp to Higher CCS, more bio v. 4	*81%*	*0*	*1*	*1.4 (5840)*	*0*
Low cost pathway	**80%**	**0**	**2.6 (23/4)**	**1 (4,400)**	**10**
Compare to above v 2	*82%*	*0*	*1 (0)*	*1 (4,400)*	*10*
Analogous to MARKAL 3.26	**82%**	**7**	**1.8 (10/11)**	**1.3 (5480)**	**6**
Comparison to MARKAL example 1	*83%*	*0*	*1 (0)*	*1 (4,400)*	*5 **
Comparison to MARKAL example 2	*82%*	*5*	*1 (0)*	*1 (4,400)*	*4 **
Comparison to MARKAL example 3	*82%*	*1*	*1 (0)*	*1.3 (5480)*	*4 **
Comparison to MARKAL example 4	*82%*	*2*	*1(0)*	*1 (4,400)*	*4 **
Comparison to MARKAL example 5	*82%*	*4*	*1 (0)*	*1 (4,400)*	*4 **
Comparison to MARKAL example 6	*82%*	*0*	*1 (0)*	*1 (4,400)*	*4 **
Comparison to MARKAL example 7	*82%*	*7*	*1 (0)*	*1 (4,400)*	*1 **
Comparison to MARKAL example 8	*80%*	*7*	*1 (0)*	*2 (8000)*	*2 **
Comparison to MARKAL example 9	*81%*	*7*	*1 (0)*	*1 (4,400)*	*2 **
Comparison to MARKAL example 10	*83%*	*7*	*1 (0)*	*1 (4,400)*	*2 **

APPENDIX 3

CALCULATIONS DONE BY THE DECC PATHWAYS CALCULATOR SHOWING THAT OUR COMPARISON PATHWAYS ALL RELY LESS ON IMPORTED ENERGY THAN THE GOVERNMENT EQUIVALENT PATHWAY

	IMPORTS TWh/year						
	Coal	*Oil*	*Gas*	*Bioenergy*	*Uranium*	*Electricity*	*Total*
Higher renewables more energy efficiency	**0**	**290**	**18**	**70**	**336**	**0**	**714**
Our comparison with above	*0*	*278*	*135*	*70*	*0*	*0*	*483*
Higher nuclear less energy efficiency	**0**	**118**	**107**	**201**	**1,605**	**0**	**2,031**
Higher CCS, more bioenergy	**23**	**368**	**214**	**140**	**420**	**15**	**1,180**
Compare to Higher, more bio v.1	*0*	*368*	*320*	*140*	*0*	*15*	*843*
Compare to Higher, more bio v.2	*0*	*368*	*324*	*140*	*0*	*15*	*847*
Compare to Higher, more bio v.3	*177*	*351*	*182*	*140*	*0*	*15*	*865*
Compare to Higher, more bio v.4	*45*	*345*	*204*	*70*	*0*	*15*	*679*
Low cost pathway	**0**	**233**	**55**	**77**	**1496**	**0**	**1,861**
Compare to above v 2	*540*	*110*	*170*	*70*	*0*	*0*	*890*
Analogous to MARKAL 3.26	**96**	**296**	**0**	**105**	**672**	**24**	**1,193**
Comparison to MARKAL example 1	*37*	*310*	*331*	*70*	*0*	*0*	*748*
Comparison to MARKAL example 2	*228*	*419*	*41*	*70*	*0*	*30*	*788*
Comparison to MARKAL example 3	*253*	*419*	*40*	*70*	*0*	*30*	*812*
Comparison to MARKAL example 4	*228*	*419*	*48*	*70*	*0*	*30*	*795*
Comparison to MARKAL example 5	*228*	*419*	*47*	*70*	*0*	*30*	*794*

	IMPORTS TWh/year						
	Coal	*Oil*	*Gas*	*Bioenergy*	*Uranium*	*Electricity*	*Total*
Comparison to MARKAL example 6	*228*	*419*	*46*	*70*	*0*	*30*	*793*
Comparison to MARKAL example 7	*0*	*275*	*471*	*105*	*0*	*0*	*851*
Comparison to MARKAL example 8	*194*	*383*	*239*	*70*	*0*	*0*	*886*
Comparison to MARKAL example 9	*74*	*383*	*193*	*70*	*0*	*0*	*720*
Comparison to MARKAL example 10	*39*	*367*	*192*	*140*	*0*	*24*	*762*

12 June 2013

Written evidence submitted by the Wood Panel Industries Federation (WPIF)

About WPIF

The Wood Panel Industries Federation (WPIF) represents all UK manufacturers of wood based panels, including OSB, particleboard and MDF. The industry annually consumes around 4.1 million green tonnes of wood (around 0.9 million of which is post-consumer wood waste). WPIF's members supply 60% of the UK demand for wood panels.

There are six wood panel plants in the UK—three in Scotland, two in England and one in Wales. These are in areas of high rural unemployment, and provide valuable employment opportunities, as well as contributing to the local and national economies.

The Impact of Energy Subsidies

The wood panel industry relies on domestic wood to produce its products. As well as post-consumer waste wood, over two thirds of the industries wood requirements comes from the sawmilling and forestry industries. This includes small roundwood and sawmill products (sawdust and chips), the very types of wood which are now being targeted by biomass burning power companies. Historically such wood was considered to be a waste, but the introduction of the wood panel industry and other product manufacturers has resulted in a strong market demand for all of these sources.

WPIF is extremely concerned about the unintended consequences of the Government's subsidy regime which supports energy companies in burning wood which has an alternative use, and could be processed into furniture or construction materials. The unintended consequence of this policy is that the wood market is being distorted, prices are rising, and if left uncontrolled, existing users of the wood will be priced out of the market and displaced.

Biomass is unique amongst renewables, as the only technology which requires a fuel for which there are existing and competing users. This means that part of the subsidy paid to energy companies goes towards their purchase of the fuel (in this case wood), and consequently has an impact on the wider market for that material. WPIF does not believe that the uniqueness of biomass in this regard has been adequately considered in the design of the subsidy regime. The Renewables Obligation, and the proposed Contracts for Difference, are too blunt an instrument, and urgently need to be reassessed.

The scale of biomass required to meet the UK's forecasts for deployment of this technology is around six to ten times the domestic wood harvest (a harvest which is already consumed in full by existing wood processors). As a result, it is inevitable that many tens of millions of tonnes of biomass will have to be imported to satisfy demand. The Government has long been aware of this, and has set the subsidy level at a rate which supports those importing wood. There is currently only one level of subsidy support (per technology band). No differentiation is made between domestic and imported wood, despite the fact that importing wood costs twice as much as using domestic wood. As a result, energy companies can buy domestic wood at higher than the normal market rate, and pass the additional subsidy benefit on to their shareholders. This will distort the wood market, and price traditional users, who operate in low margin businesses, out of the market completely. WPIF has, on very many occasions, proposed to DECC that support should be differentiated for imported and domestic wood, and that only imported wood should receive a subsidy. WPIF has received a Legal Opinion from a top QC which states there would be no trade barriers to such a move, and we are happy to share this with the Committee if it would be helpful for your inquiry.

Given their commitment to ensure best returns for their shareholders, and the vast difference in price between domestic and imported wood, energy generators will use the subsidy to buy domestic wood. Despite most biomass installations still being in the planning process, Ofgem's Annual Sustainability Report Dataset 2011–12 reports that around 1,621,393 tonnes of UK wood biomass was burnt during 2011–12, around 16% of the UK's annual wood harvest. This includes reporting that "virgin wood", "small round wood", "wood chip", "forestry residues", "pellets" and "waste wood" were all burnt. The wood panel industry's wood take is around one third roundwood, one third sawmill co-products, and one third waste wood. These feedstocks are particularly attractive to generators as they are traditionally of lower value than sawlogs. This leaves the wood panel industry particularly vulnerable to the growth in biomass burning.

Industry reports show that since 2008 the wood price paid by our sector has increased by 57%. However, the sales prices of our panels has only increased by 31%. In real terms sale prices are now at 52% of the 1995 price (when records began). This rate of divergence has increased since 2010 and, although we understand that in any market prices can fluctuate, it is this divergence between feedstock and product sales price that is particularly concerning for our industry.

As well as an economic impact, and a potential loss of jobs, the risk of displacement also has environmental consequences. Wood panel production produces only 378kg (with CHP) or 458kg (without CHP) per tonne of wood used, whereas burning wood for electricity generation produces 1,950kg of CO_2. An independently produced report by Carbon River report states that over the lifecycle of a tree 1,370kg CO_2 is sequestered per tonne of timber processed in the wood panel industry. Over the lifecycle of a tree the net emission is 157kg CO_2 per tonne of timber processed in the biomass industry. Carbon River's report also states that displacement of the wood panel industry would increase net emissions by six million tonnes per annum (more than 1% of the UK's reported emissions in 2008).

We believe that the Government needs to act urgently to address the unintended, but very real, consequence of current subsidies to biomass power stations. The Scottish Government has accepted the risk, to existing wood users, of large new entrants into the market for this finite resource, and has capped at 15MW the size of dedicated biomass plant which is eligible for subsidy support. WPIF supports this measure, however this does not address the impact of the largest entrants into the field (converted coal plants, and co-firing coal plants). WPIF urges the UK Government to look at means of reducing the impact of these plants, and ensuring that wood processors have a future in the UK.

12 June 2013

Written evidence submitted by Friends of the Earth England, Wales and Northern Ireland

1. Friends of the Earth is pleased to submit evidence to this extremely important inquiry, and would like to thank the Committee for initiating it.

2. **The Government is increasing, not decreasing, financial support for fossil fuels.** The Committee is interested in whether the Government appears to have plans to phase out environmentally harmful energy subsidies, and what progress they are making. The Government is in a headlong rush to issue tax discounts for new fossil fuel exploration (from the North Sea and, looking forward, shale gas). Rather than winding down fossil fuel subsidies the Treasury is in active behind-the-scenes discussions with the shale gas industry about which new ones to introduce, and it has delivered a package of North Sea tax support which has been heartily welcomed by Oil and Gas UK.

3. **Some things need subsidy, like renewable energy**. As stated by the very helpful scoping study produced by Oxford Energy Associates (OEA)[18] for the Committee, discussions about energy subsidies are characterised by more heat than light. It is right to subsidise critically needed new industries like solar and wind power; even if domestic decarbonisation was not urgently required (which it is) we must seize the opportunity for the UK to build supply chain capacity and manufacturing prowess in the technologies that are being fast adopted across the developed and developing world. There is a market failure. Incumbent dirty energy has benefitted—and still does—from generations of financial and institutional support. As Rob Gross at Imperial College argues, targeted support for new technologies "*have what economists call dynamic effects: they foster innovation, yield increasing returns to adoption and help low carbon technologies move along their learning curve. Thus, targeted subsidies bring down the cost of low carbon technologies, creating options which can be deployed cost-effectively in the future*".[19]

4. **Fossil fuel subsidies cannot be justified economically or environmentally.** The corollary, as the EU, G20 and International Energy Agency stress, is that we must end implicit and explicit support for the extremely well establish and infrastructurally embedded use of fossil fuels. The Chief Economist of the IEA has called dirty energy subsidies the "*appendicitis*" of the global energy system, which must "*be removed for a healthy energy economy*".[20] We agree. We also welcome that the OEA study draws attention to the biggest energy subsidy of all: the failure to require fossil fuel producers to pay the full social, environmental and long-term economic impact of climate change. The IMF points out that this is the single largest global energy subsidy once properly accounted for.[21]

5. There can be no room for dogma or artificially narrowly and politically expedient definitions of subsidy. What matters is that the balance of support in all its forms must be rapidly tilted towards the clean industries of the 21st century.

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[18] Oxford Energy Associates, Written evidence commissioned by the Environmental Audit Committee, May 2013, http://data.parliament.uk/writtenevidence/WrittenEvidence.svc/EvidencePdf/700

[19] Imperial College London, On Picking Winners: the need for targeted support for renewable energy, 2012, https://workspace.imperial.ac.uk/icept/Public/On%20Picking%20Winners%20low%20res.pdf

[20] *Guardian*, "Phasing out fossil fuels could provide half of global carbon target", 2012, http://www.guardian.co.uk/environment/2012/jan/19/fossil-fuel-subsidies-carbon-target

[21] IMF, "Reforming Energy Subsidies", March 2013, retrieved from http://www.imf.org/external/np/fad/subsidies/index.htm

6. This submission focuses on dirty energy subsidies in the UK. We believe the balance of attention and controversy has unjustly settled upon the relatively minor balance of subsidy to immature renewable energy technologies, rather than the outrage of explicit and implicit subsidies for fossil fuels. We start by reiterating the case made by the IMF, OECD and International Energy Agency for a broad definition of a subsidy—into which the Government's recent tax breaks for oil and gas exploration would fall. We then examine:

- the rapid expansion over the last financial year of "field allowances" to encourage the production of oil and gas from the UK Continental Shelf;
- the prospects for a similar future favourable tax regime for unconventional fossil fuels, including shale gas, and its implications; and
- The flawed Capacity Mechanism, which looks likely to create an unnecessary and avoidable subsidy for fossil fuels.

Definition of a Subsidy

7. The International Monetary Fund (IMF) defines an energy subsidy as anything that affects what the price for energy would otherwise have been in a perfectly competitive market—the "price gap" approach. The IMF bypasses semantics to point out that in practice *"although energy subsidies do not always appear on the budget, they must ultimately be paid by someone."*[22] The IMF includes within this definition the implicit subsidy given to fossil fuel energy by not incorporating within its price the full cost of the social and environmental damage caused by climate change. It is not possible to accurately price this subsidy, and indeed many of the attempts to do so miss entire categories of impact—but it is indeed likely to be very large.

8. The OECD define a subsidy similarly broadly: "*Governments support energy production in a number of ways, including by: intervening in markets in a way that affects costs or prices; transferring funds to recipients directly; assuming part of their risk; selectively reducing, rebating or removing the taxes they would otherwise have to pay; and undercharging for the use of government-supplied goods or assets… the scope of 'support' is deliberately … broader than some conceptions of subsidy*".[23] The International Energy Agency provides the most straightforward definition: "*an energy subsidy is defined as any government action that lowers the cost of energy production, raises the revenues of energy producers or lowers the price paid by energy consumers*."[24]

9. Under any of the definitions of energy subsidies listed above—a far more nuanced and sensible discussion of subsides in practice than is often allowed for in public debate—it is clear that the UK fossil fuel industry is heavily subsidised. Subsidies come directly through field allowances and other supportive tax measures, and indirectly via the failure of the Government to reflect the real social and environmental cost of the damage caused by climate change.

10. For Europe, the EU's State Aid rules are clear there are two main conditions for subsidies: environmental protection and helping infant technologies[25]. Two main actions follow from this: First, helping infant technologies is a good justification for providing subsidy. There is a follow-up—clearly, technologies are not infant for long. Mature technologies should not receive subsidy, and infant technologies' subsidies should fall as their costs fall and incumbent's unfair advantages diminish. Second, don't subsidise environmentally damaging industries, whether they're infant or not. Indeed, environmentally damaging, mature technologies should be the absolute priority for having subsidies removed.

UK Fossil Fuel Tax Breaks: "Field Allowances" and Tax Certainty

11. This central section of our response focuses on **"field allowances"**—Government reductions on the headline rate of tax payable from profits from certain designated oil and gas fields. We focus on this area for two reasons. First, because it represents a significant increase in subsidy to the fossil fuel industry consciously driven forward by this Government, in particular over the last financial year. Second, we note the OEA scoping study lacks the latest data in this area, which our research is able to provide.

12. Field allowances are a relatively new phenomena and their expansion over the last 12 months has been significant.

- Field allowances were first introduced by Alistair Darling in Budget 2009 and have been rapidly expanded by George Osborne, in particular over the last financial year (see below).
- Of the 34 licences awarded in 2012–13, 28 qualified for one of the Chancellor's expanded suite of field allowances.

[22] IMF, Energy Subsidy Reform: Lessons and Implications, January 2013, http://www.imf.org/external/np/pp/eng/2013/012813.pdf

[23] OECD, An OECD-wide inventory of support to fossil-fuel production or use, 2012, http://www.oecd.org/site/tadffss/PolicyBrief2013.pdf

[24] IEA, OECD, World Bank, "The Scope of Fossil Fuel Subsidies in 2009 and a roadmap for phasing out fossil-fuel subsidies", 2010, http://www.worldenergyoutlook.org/media/weowebsite/energysubsidies/second_joint_report.pdf

[25] Directive 2009/72/EC of the European Parliament and of the Council, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0072:EN:NOT

— Oil and gas fields that qualify for a field allowance pay less tax on the profits from production from those fields than they otherwise would; in addition to the 30% corporation tax rate levied on profits from oil and gas production, an extra "supplementary charge" of 32% is generally levied, taking the headline tax rate to 62%.[26]

— However field allowances waive this additional supplementary charge for up to five years. As an example of how field allowances work, consider the £3 billion "large deep water oil field" allowance created in Budget 2012, designed specifically to encourage investment off the coast of Shetland. Over five years the allowance allows £3 billion in profits from that field to not be subject to the 32% supplementary charge, reducing total tax payment over that period by £960 million (£3 billion x 0.32).

13. **The oil and gas industry should pay high taxes.** It is worth reflecting here that the high tax rate supposedly levied on oil and gas is entirely appropriate. Fossil fuel production remains highly profitable even after tax, and it is right that the Exchequer benefits from the exploitation of a national resource. Of most relevance to the terms of this inquiry, even after these high rates of tax the fossil fuel industry evades having to pay the full social and environmental cost of its activity; the Stern report estimated that climate change caused by fossil fuels could reduce global GDP by 20%, to say nothing of the impact of oil spills and air pollution.

14. **New research by Friends of the Earth[27] shows that the total value to the industry over five years of the 28 field allowances awarded in 2012–13 is £1.952 billion:**

— 17 "Small Field Allowances", each worth up to £48 million over five years = £816 million.

— Nine "Brown Field Allowances", each worth up to £160 million over five years = £720 million.

— One "Shallow-Water Gas Field Allowance", worth up to £160 million over five years.

— One "Ultra-Heavy Oil Field Allowance", worth up to £256 million over five years.

15. **Field allowances are clearly subsidies**. They are a reduction in the headline rate of tax payable on non-qualifying oil and gas fields. HMRC notes that the field allowances are explicitly designed to "*increase investment and production in fields that are economic but—for tax reasons—are considered to be commercially marginal*":[28] they lower the cost of energy production by reducing the overall tax rate payable on those fields. Under any of the sufficiently broad definitions of a subsidy outlined above, it is not credible for Oil and Gas UK CEO Malcolm Webb to claim that "*the oil and gas industry enjoys no subsidy from Government… field allowances are not subsidies*".[29]

16. **Either the allowances stimulate new dirty energy, or they are a tax give away in a time of public spending restraint.** What is not clear to the external observer is the extent to which the economics of the 28 fields licensed with qualifying allowances since Budget 2012 were sufficiently marginal that the allowances "tipped the balance" to allow new investment to take place. As the field allowances apply uniformly to qualifying fields regardless of need, it is possible that by expanding the availability of allowances the Treasury is merely foregoing tax revenue it would otherwise have received for activity that would have happened anyway. Illustratively, even if only a quarter of the new licenses did not economically depend on the allowances, it amounts to half a billion pounds of tax revenue foregone over five years. At the individual field level therefore field allowances are doing one of two things: either improving otherwise marginal economics to the point that an investment now becomes viable, meaning oil and gas that would otherwise have stayed in the ground now gets extracted; or merely foregoing tax revenue at a time of immense pressure on the public purse. Friends of the Earth believes either is unjustifiable.

17. **Government expects that the allowances will stimulate oil and gas production.** The Treasury states that it is indeed encouraging oil and gas drilling that would otherwise not happen. For example, the Treasury considers that the long term tax revenues from the "Brown Field Allowance" introduced in September 2012 will "*significantly outweigh the initial cost of the allowance*".[30] For as long as oil and gas extraction is taking place, it is right to tax it heavily. But there is a world of difference between that and actively increasing fossil fuel production in order to get more tax revenue into the Exchequer. It is the very opposite of a green economy.

[26] *Some older fields (pre-1993) also pay the Petroleum Revenue Tax of an additional 50%, which can be deducted from their corporation tax rate, meaning profits from about 30 such fields are taxed at a marginal rate of 81%.*

[27] Friends of the Earth, UK fossil fuel tax breaks 2012–13, May 2013, http://www.foe.co.uk/resource/briefings/uk_fossil_fuel_tax_breaks.pdf

[28] HMRC, Tax Information and Impact Note: Field Allowances, 2012, http://www.hmrc.gov.uk/tiin/field-allowances.pdf

[29] Platform London, "The Battle of Definitions: no subsidies for the oil industry", May 2013, retrieved from http://platformlondon.org/2013/05/13/the-battle-of-definitions-no-subsidies-for-the-oil-industry/

[30] HM Treasury, "Chancellor announces further action to stimulate investment in North Sea", 2012, retrieved from https://www.gov.uk/government/news/chancellor-announces-further-action-to-stimulate-investment-in-north-sea

18. **The industry is delighted with the tax breaks.** The environmental impact of the Chancellor's approach can be surmised through the reaction of oil and gas producers themselves.

- The package of measures announced on oil taxation in Budget 2012—including some of the new field allowances, together with a commitment from the Chancellor to legislate for a fixed rate of tax on decommissioning oil rigs and other assets—was greeted rapturously by the industry. Oil and Gas UK described the package as a *"turning point for the industry"*.[31]
- Mr Osborne's pledge to introduce a fixed rate of tax for decommissioning was claimed by OGUK to lead to £40 billion of new investment, producing 1.7 billion barrel equivalents of oil and gas. Friends of the Earth calculates that this much oil and gas, when burned, would produce as much carbon dioxide as the UK currently emits in a year.[32]
- In February 2013 OGUK declared that *"after two disappointing years brought about by tax uncertainty and consequent low investment, the UK continental shelf is now benefitting from record investment in new developments and in existing assets and infrastructure, the strongest for more than three decades... The recent introduction of targeted tax allowances to promote the development of a range of difficult projects, coupled with the government's ground-breaking commitment to provide certainty on decommissioning tax relief, has prompted global companies and independent businesses alike to take another look at the UK as an investment destination."*[33]

19. **The Government is to conduct a review of how else to attract the oil and gas industry—the diametric opposite of the review it should be conducting**. The Government has decided that will send out a clear message to the oil and gas industry that its business is wanted; tax breaks play a symbolic, not just economic, role in creating this message. In June 2013 the Government announced a review, to be led by Sir Ian Wood, into how maximise "economic" extraction of oil and gas from the North Sea.[34] As HMRC note above, lowering tax rates is evidently seen as a viable mechanism to as part of maximizing the economic viability of fossil fuel production. The review that the Government should be conducting is how to strategically, fairly but urgently wind down high carbon industries like oil and gas production and wean the UK's tax receipts off the revenues it provides—not how to actively keep our economics and revenues hooked on unsustainable dirty energy production.

20. **Only 20% of global fossil fuel reserves can be burned**. The short term temptation of ramping up domestic production of oil and gas is the UK's role in a global race to the bottom. Only one fifth of already proven fossil fuel reserves can be burned if we are to keep global temperature rise to be low two degrees[35]—the stated aim of UK, EU and G20 climate policy. Investors risk responding to the Chancellor's green light by ploughing money into fossil fuel production that risks being stranded assets if global climate policy tightens as it should—or which hcontributes to potentially runaway climate change if it doesn't.

21. **The UK's impact on climate change extends far beyond how it accounts for its own carbon budgets**. The Government states that there is no need to worry about the climate implications of increased domestic supply because it doesn't affect our domestic carbon accounting: *"what the emissions in the UK will be is the thing that is targeted by the Climate Change Act, and other countries are responsible for all the emissions in their territories… the level of activity in the North Sea in such a highly globalised market, as is the case for oil, would be likely to have an impact on **UK territorial** emissions"* (our emphasis).[36] Satisfying carbon accountants is one thing, but can ignore the basic physics: if field allowances work, oil and gas that would otherwise have stayed in the ground will be dug up and, presumably, burned as a result of the chancellor's tax breaks. Any international oil displaced from UK markets by increased domestic consumption will be used elsewhere instead.

22. **Where is the similar emphasis on renewable energy?** This rhetorical support does not stand in isolation from his position on other forms of energy: compare the Chancellor's enthusiasm for fossil fuels (Budget 2012: "*gas is cheap… I also want to that ensure we extract the greatest possible amount of oil and gas from our reserves in the North Sea.*"[37]) with his rhetorical downplaying of the "costs" of renewable subsidies (also Budget 2012: "*Renewable energy will play a crucial part in Britain's energy mix—but I will always be alert to the costs we are asking families and businesses to bear. Environmentally sustainable has to be fiscally sustainable too*"). In practice, renewable energy support extends little beyond the £7.6 billion allocated within the levy control framework to 2020, an amount sufficient to pay for little more than the amount of renewable energy required under the EU Renewables Directive. What the Chancellor gives with one hand he takes away

[31] Energy Voice, "2012 Budget a turning point, says O&GUK", 2012, retrieved from http://www.energyvoice.com/2012/03/2012-budget-a-turning-point-says-oguk/

[32] Friends of the Earth, "Oil and gas tax breaks", 2012, http://www.foe.co.uk/resource/media_briefing/tax_breaks.pdf

[33] BBC News, "North Sea oil investment at 30-year high, industry says", February 2013, http://www.bbc.co.uk/news/business-21564947

[34] DECC, "Economic benefits of offshore oil and gas to be maximized", June 2013, https://www.gov.uk/government/news/economic-benefits-of-offshore-oil-and-gas-to-be-maximised

[35] Carbon Tracker, Unburnable Carbon 2013: wasted capital and stranded assets, 2013, http://www.carbontracker.org/wastedcapital

[36] House of Commons, Corrected Transcript of Oral Evidence taken before the EAC on Budget 2012, retrieved from http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenvaud/c1931i/1931i.htm

[37] Friends of the Earth, "Budget 2012 reaction", http://www.foe.co.uk/resource/briefings/budget_2012_reaction.pdf

with the other: support for renewable energy counts for much less than it ought if rhetorical, explicit and implicit subsidies for fossil fuels are still so high on the Government's agenda.

Shale and other Unconventional Gas

23. The Chancellor's determination to support the UK fossil fuel industry has led him to pledge a consultation on "new tax incentives"[38] for the nascent UK shale gas industry. As the Economist notes, "*Nurturing Britain's oil industry has other advantages too. Convincing investors of the stability of its tax regime will help as the government tries to lure investors onshore to drill for shale gas*".[39] Tax breaks for offshore oil and gas have created a precedent for onshore: Francis Egan, Chief Executive Officer of Cuadrilla Resources, told the Energy and Climate Change Committee in December 2012 that "*we are not asking for a special regime. The Treasury is deciding whether the existing offshore regime should be applied to the onshore*".[40]

24. In June 2013 the energy minister, Michael Fallon, gave an update on progress: "*the Chancellor has announced the fiscal incentives that will apply, they are being discussed in detail with the industry and they will be firmed up by the summer and they will be in the Autumn Statement and they'll take effect from next April*".[41] In actual fact, however, at the time of writing the Chancellor had *not* announced details on the tax regime that would apply. The promised "consultation" has been conducted opaquely behind Treasury doors.

25. **The Chancellor appears to have decided to publicly offer "generous" tax incentives for shale prior to analyzing whether they are needed.** Friends of the Earth submitted Freedom of Information requests to HM Treasury to attempt to understand the extent to which favourable tax treatment is required by the industry. We learned that although the Chancellor first announced his intention to bring in a "*generous*" new tax regime for shale in early October 2012,[42] the first "*introductory meeting*" for the shale gas industry to discuss the "*economics of the UK shale gas industry; how tax is currently affecting companies' investment assumptions; [and] the commercial framework within which companies are considering shale gas investments*" was only held on 5 November 2012.[43]

26. **Tax may be only a marginal consideration for shale investors.** We also learned that industry representatives advised the Government in November that "*[although] it was positive that the Government was talking about oil and gas so publicly… the market for gas would probably drive exploration* ***more than tax or technology in the short term***" (our emphasis).[44] This tallies with Francis Egan's (op cit) suggestion to the ECC Committee, in response to a question asking how the existing tax regime is affecting Cuadrilla, that "*we are not impeded by the tax regime*".[45] As discussed earlier in this submission, any tax reductions that do not have a material impact on investment decisions are little more than giveaways.

27. **Enough is enough.** Friends of the Earth opposes shale gas production on environmental and economic grounds. For the same reason as for oil and gas from the North Sea, we do not consider it prudent to be actively pursuing new sources of fossil fuels from unconventional sources, nor building our national tax strategies and the long term health of the public finances upon them. Even if a case could be made for making the most of existing investment in the North Sea as stocks inevitably decline—which we do not believe it can, given the urgent need to turn attention elsewhere—it most certainly could not be made for breaking out into a new frontier of fossil fuel exploration, extraction, and consumption. As an absolute first step, there should be no subsidies for shale gas exploration.

The Capacity Market

28. The current Energy Bill introduces a new policy—the Capacity Market—which is designed to ensure security of power supply as the amount of variable generation capacity increases over time and older coal fired plant is removed from the system due to European air pollution legislation. Auctions run by the National Grid would procure a volume of generation capacity judged necessary to meet projected demand. The cost would be recovered though charges, ultimately feeding through to consumer and business power bills.

29. **The Capacity Market was not the best option.** Friends of the Earth has made clear its concern that the Capacity Market may not be the best mechanism to achieve its stated objective. If support is needed for any fossil fuel power stations, potentially needed to help meet underpin future demand but no longer otherwise profitable due to lower wholesale prices caused by cheaper renewable energy, then a Strategic Reserve option

[38] HM Treasury, "Autumn Statement 2012: Chancellor's statement", retrieved from https://www.gov.uk/government/speeches/autumn-statement-2012-chancellors-statement

[39] *The Economist*, "Drill, maybe, drill", May 2013, retrieved from http://www.economist.com/news/britain/21577105-spurt-oilfield-decline-could-keep-economy-above-water-drill-maybe-drill

[40] House of Commons, Corrected Transcript of Oral Evidence taken before the Energy and Climate Change Committee on "the impact of shale gas on energy markets", 11 December 2012, retrieved from http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenergy/c785-ii/c78501.htm

[41] The House Magazine, "Energy Booster", June 2013, retrieved from http://www.politicshome.com/uk/article/79643/energy_booster.html

[42] George Osborne's speech to Conservative Party Conference 2012.

[43] Information released by HM Treasury in response to Freedom of Information request, see http://www.foe.co.uk/resource/briefing_notes/foi_on_hm_treasury_engagem.pdf

[44] Information released by HM Treasury in response to Freedom of Information request, see http://www.foe.co.uk/resource/briefing_notes/foi_minutes_ogff_2012.pdf

[45] Evidence to ECCC, op cit.

would provide better value for money. This option has been rejected by DECC. We believe the preparations for the Capacity Market were premature[46] and have created the circumstances where its use is now essential as power companies have sat on their hands. In addition alternative mechanisms to generation capacity—such as demand side response and reduction, interconnectors, and storage—have been given insufficient priority in the Capacity Market plans or in Government policy more generally.

30. **Unnecessary subsidy for fossil fuels will be created by the Capacity Market.** According to DECC's Impact Assessment gross revenues to capacity providers are modelled to be up to £2.5 billion per annum, or £10 billion in total between 2024 and 2030[47]—assuming no payments are made before 2024. Evidence from one existing capacity auction in the United States[48] (the PJM market), cited by DECC as a model for its Capacity Market, is that existing fossil-fuel resources (gas, oil and coal-fired) have received 70% of the $42 billion in capacity payment revenues under those auctions, with only 3% going to demand side resources.

12 June 2013

Written evidence submitted by BSW Timber

BSW Timber

BSW Timber is the UK's largest domestic sawmilling group, processing around 15% of the UK's annual timber harvest. The company has six mills across the UK (and one in Latvia). The group has an annual turnover in excess of £180 million, employing over 900 people; indirect employment accounts for another 2,500 jobs. It is one of the largest timber buyers in the UK, annually consuming around 15% of the UK wood harvest.

Impact of Energy Subsidies

BSW Timber is extremely concerned about the impact that subsidies for biomass will have on the UK wood market, and the possible distortion it will lead to.

The UK has a very limited wood supply; around 10.2 million tonnes annually. This is almost all used by wood processors. There simply is not enough domestic wood to service a new entrant (biomass) without displacing existing users. Better management of forests will not help to meet this demand; the Forestry Commission estimates that potential increase in production will only be two to three million green tonnes.

Whilst sawlogs are the most expensive part of the tree, and energy generators currently say they do not intend to burn them, we believe that companies like ours are still at risk from biomass subsidy policies. The price premium of saw-logs will not dissuade energy generators from using them for biomass, as it will increasingly become easier and cheaper to purchase whole trees instead of splitting them into premium and "lower value" parts. Generators will start to purchase saw-log timber, diverting this wood from the timber industry and undermining the Waste Hierarchy. Whole trees have already been used for pellets in North America.

The entrance of subsidised biomass energy companies into the wood market does not only increase demand for a finite and valuable resource, it will also increase the cost for domestic wood processors. The large subsidises available to energy companies will allow them to purchase wood at a higher rate than those in the wood processing industry, distorting the market. In the 10 years since the introduction of the Renewables Obligation the price of standing timber has increased 72.4% in real terms.

The UK will require many millions of tonnes more wood than it can supply domestically. As a result, this wood will have to be imported. The current subsidies have been set at a level which allows energy companies to pay the higher cost of imported wood, regardless of whether they source that wood from 50 or 5000 miles away. This will give those energy companies a financial incentive to purchase cheaper domestic wood, putting further pressure on domestic wood processors who (for financial and phytosanitary reasons) can only source UK wood.

We believe that subsidising biomass in the same way as other renewable technologies, rather than taking into account its unique characteristics (namely the existing fuel source for which there are competing and existing users) is potentially extremely damaging for UK businesses and jobs, and the environment.

The Committee on Climate Change has recognised that wood has a valuable role to play in green construction, and that this should be prioritised ahead of burning wood for electricity. BSW Timber is a major producer of sustainable and low-carbon building materials. Wood is the least carbon intensive building material; every cubic metre of wood that is used in place of alternative materials saves between 0.7 and 1.1 tonnes of carbon dioxide. By using a timber frame, it is possible to reduce the carbon footprint of a typical three bedroom house by approximately three tonnes. 4.2 tonnes of CO_2 can be saved per 50 square metre of wall element, by

[46] Friends of the Earth, "Don't panic—why even Ofgem are relaxed about a blackout scare", October 2012, retrieved from http://www.foe.co.uk/news/ofgem_37741.html

[47] DECC, Impact Assessment: Electricity Market Reform—Capacity Market, November 2012, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66039/7103-energy-bill-capacity-market-impact-assessment.pdf

[48] M Gottstien, RAP, "Beyond Capacity Markets—Delivering Capability Resources to Europe's Decarbonised Power System", March 2012, www.raponline.org/document/download/id/4854

substituting timber frame and softwood weather boarding for brick and block. 13.85 tonnes of CO_2 can be saved when softwood weatherboarding is substituted for PVCU weather boarding.

BSW believes the Government must urgently reassess the unintended consequences of its biomass subsidy regime, particularly taking into account the more environmentally friendly uses of wood which are at risk of being displaced.

14 June 2013

Written evidence submitted by EDF Energy

Executive Summary

- The UK's energy system is in a state of flux. The existing electricity market framework has served consumers well by delivering high levels of reliability but is now being stretched in an attempt to deliver outcomes that reflect a different set of policy objectives and a different economic climate.
- The UK needs infrastructure fit for the 21st century and the urgent challenge now is to secure the vital investment required to ensure there is adequate capacity to meet future electricity needs while reducing emissions at least cost to consumers. The Government has taken a clear leadership position in setting the framework for reducing greenhouse gas emissions, and we need to ensure that we maintain the momentum needed to make the transition to a low carbon economy.
- EDF Energy believes that the Electricity Market Reform (EMR) proposals as laid out in the Energy Bill are capable of providing the right framework for the low carbon investment that the country needs, while keeping costs down for consumers.
- Reform of the existing electricity market arrangements is necessary to ensure that investment comes forward to deliver the reliable diverse energy mix required to achieve the UK's energy policy objectives. The transition to a low carbon economy will mean moving away from a market based on the short run marginal cost of fossil fuel plant to one that is likely to be based on the long run average costs of electricity production.
- The EMR proposals are consistent with the history of the development of UK energy markets, where changes to the objectives of energy policy have necessitated Government action to develop the market.
- We have reviewed the report by Oxford Energy Associates but do not consider that the various definitions of the types of subsidy available could be applied to market redesign and EMR. The EMR package does not confer an economic advantage to market operators and does not represent a subsidy.
- The report demonstrates the difficulty of establishing a universally agreed definition of the term "subsidies". A wide definition of the term "subsidy" makes it difficult to both identify and measure its impact on the economy. Narrow definitions are able to identify precisely transfers between the Government and other parties, and are able to quantify the impact of a particular measure. EDF Energy notes that the Government's implied definition of "subsidy" (in the context of nuclear new build) has followed this approach by defining it as a "levy, direct payment or market support for electricity supplied or capacity provided" only available to specific technologies. We welcome the clarity that the Government's definition provides to investors.
- We would also highlight that the report contains some inaccuracies with respect to the role of the Nuclear Decommissioning Authority and also the restructuring of British Energy in 2005.
- EDF Energy notes that the scope of the inquiry has primarily focussed on the upstream section of the energy system but consider that as much attention needs to paid to the funding of downstream initiatives and their impact on customers' bills.

About EDF Energy

1. EDF Energy is one of the UK's largest energy companies with activities throughout the energy chain. We provide 50% of the UK's low carbon generation. Our interests include nuclear, coal and gas-fired electricity generation, renewables, and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including both residential and business users.

Assessing Subsidies

2. EDF Energy welcomes the literature review of subsidies contained within the report by Oxford Energy Associates. However, we believe that the work highlights the fact that much of the debate over the concept of subsidies remains inconclusive, and that an accepted definition of the term is unlikely to achieve universal agreement outside of a technical economics description. We do not agree with the implied assertion that any form of Government guarantee or spending relating to the private sector is a "subsidy" given that there are a number of public policy objectives and imperatives behind such support. In fact, it is normal for Governments to try and attract private sector investment through a number of policy measures, including tax allowances and relief, and yet these are rarely considered "subsidies".

3. Narrow definitions have the advantage of precisely identifying transfers between the Government and other parties, and we favour such an approach to ensure that like is always being compared with like. Wider definitions are likely to be more subjective in scope and face inherent difficulties in being adequately measured for policy purposes. In addition, a vague definition will face problems in trying to assess overall consumer benefit or detriment.

4. The assessment of the benefits of subsidies has to consider some fundamental properties of the energy market. Electricity supply, for example, has a systemic importance to the economy. Its overall contribution to economic welfare is not related to the profits obtained by generators. In the event of sustained power cuts there would be vast disruptions for downstream industries and consumers, and this would be socially and politically unacceptable.

Role of Taxes and Subsidies in the Context of Market Reform

5. EDF Energy notes that environmental taxes are generally considered to be an acceptable means by which to penalise harmful environmental impacts. Such taxes work on the basis of restricting market activities that generate negative externalities. As HM Treasury notes, the objective is to help "shift the burden of tax" from "goods" to "bads".[49] Subsidies should be considered as part of this same framework where the objective instead is to support "goods" in contrast to "bads", and should not have pejorative connotations.

6. It is widely agreed that carbon pricing is a key element of climate change mitigation policy, as it ensures that the environmental and social cost of carbon emissions are internalised and reflected in the price of goods and services. Industry consensus is that greater certainty in the future long-term price of carbon will form an important and significant part of the electricity market framework required to increase investment in low carbon generation.

7. However, the current EU ETS price is not providing the long-term signal to make the relevant investments in low carbon generation. EDF Energy therefore welcomed the Government's introduction of a carbon price floor from 1 April 2013 as part of its reforms to drive low carbon investment. This will ensure that all generators pay a minimum price for their carbon emissions and is consistent with the Government's commitment to operate a "polluter pays principle". A more transparent and level playing field will prevent distortions to the wholesale electricity price from developing.

8. We agree with the Government that a strong carbon price signal should sit alongside supporting policy frameworks, such as the Electricity Market Reform (EMR) package, that can together help to reduce the costs of decarbonising the electricity sector. If the issue of negative externalities is not adequately addressed (eg through a robust carbon price) then this can cause further difficulties for the assessment of any support in the energy sector.

9. Having reviewed the report by Oxford Energy Associates, we do not consider that the various definitions of the types of subsidy available could be applied to market redesign and EMR. This is because the current proposals for energy reform are just that—market reform. They are consistent with the history of the development of the Electricity Pool, New Electricity Trading Arrangements (NETA) and British Electricity Trading Transmission Arrangements (BETTA). In each case, changes to the objectives of energy policy necessitated Government action to develop the market.

10. The existing electricity market framework has served consumers well by delivering high levels of reliability but is now being stretched in an attempt to deliver outcomes that reflect a different set of policy objectives and a different economic climate. As our existing power stations start to close, we are also seeing more fundamental changes in the composition of the industry. The past decade alone has seen the UK become a net importer of gas as its North Sea reserves begin to decline.

11. The Government has stated the direction of travel it wishes to take in terms of its energy policy objectives, and the reality is that this will require a different market solution than the system we currently have. The current "energy only" market is based on a system where generators are only paid when they actually produce and sell electricity, and do not obtain any payments for the economic service of being available to produce energy. Our analysis shows that continuing with an "energy only" market will progressively reduce plant margins and will fail to ensure security of supply.

12. There is general industry agreement that a well designed capacity market will have a key role in ensuring security of supply. As the Government has stated, a capacity market "will provide an insurance policy against the possibility of future blackouts by providing financial incentives to ensure we have enough reliable electricity capacity to meet demand".[50] The early introduction of the capacity market will reduce uncertainty for existing plant and will avoid the need for new replacement capacity before it is really needed. This will be a more a cost-effective option for consumers.

[49] HM Treasury, Statement of Intent. Available at: http://www.hm-treasury.gov.uk/tax_environment_statement_of_intent.htm

[50] DECC, Annex C: Electricity Market Reform: Capacity Market—Design and Implementation Update, May 2012, p3

13. The analysis informing the EMR process has indicated that the existing "energy only" market framework will not provide a satisfactory solution for the Government's stated objectives of decarbonisation, security of supply and affordability. Due to the change in the generation mix, the electricity system will be required to move away from competing on marginal costs set by fossil fuel input costs, to a system that is likely to be based on long run average costs. In addition, there will a greater focus on the need for capital investment and repayment. It will not be possible to make this transition without interim arrangements to accommodate a system using a single price reference. This is especially important if conventional plant is not penalised for the true costs of its emissions due to shortcomings in the carbon price.

14. Investors should be allowed to make a reasonable return with an acceptable sharing of risk so that the final outcome represents a fair deal for both consumers and investors. Achieving an efficient allocation of risk is particularly relevant for low carbon generation projects as they tend to require very large upfront investments. In addition, under the existing market arrangements, such plant are largely price takers with volatile revenue streams that are influenced by fluctuating fossil fuel prices and which do not have any direct link to their actual generation costs. By contrast, fossil fuel plants such as CCGTs involve lower sunk costs and their revenue is highly correlated with variable costs. This means that the gas price amounts to a natural hedge for the electricity price, and costs can be passed through to consumers. Since the issue of efficient risk allocation affects both overall investment incentives (which affects security of supply) and also relative incentives of low carbon versus other generation capacity (which affects decarbonisation) not addressing it explicitly could undermine the effectiveness of the measures that are primarily aimed at delivering secure, affordable and low carbon energy supplies.

Contracts for Difference

15. With specific reference to EMR, EDF Energy agrees with the Government that Feed-in tariffs with Contracts for Difference (CfDs), in conjunction with the carbon price floor, are capable of working for all low carbon technologies (including renewables, nuclear and fossil fuels with carbon capture and storage) and, indeed, are designed to do so. They will give all such projects access to the long-term, stable and reliable revenue they need to justify the large upfront investment required. The mechanism will therefore provide a vital underpin to enable financing of low carbon projects.

16. The CfDs will be a key component of ensuring value for money for customers by shielding them from the damaging impacts of high and volatile fossil fuel prices. Offering a fixed price (via the "strike price") will ensure that consumers pay no more than is necessary when the underlying power price is high. This is because the CfD is designed to be two-way. When the market price is above the agreed strike price, the generator will be required to pay back the difference to electricity suppliers (via the counterparty body). If the reverse is true then generators will receive the price they achieve in the electricity market (the market reference price) plus a "top up" to the agreed strike price from the reference price. This will ensure value for money and price stability for consumers. In this respect the mechanism is a major improvement for customers over the Renewables Obligation.

17. It is important to highlight that, while the strike price will be a fixed price, it is not a guaranteed return or risk-free, as the operators of CfD plant will still be required to (a) construct the plant to budget (b) generate to receive the strike price (and hence will continue to face operational risk) and (c) participate in the wholesale market to achieve the market reference price (and not just the "top up"). Therefore under the CfD mechanism, the generator will still be exposed to wholesale market price signals and will be required to efficiently schedule and maintain its plant accordingly.

18. The strike prices for all low carbon technologies will initially be set administratively (or through negotiation) while the new market framework develops, and will be based on the "most up-to-date cost and deployment data available".[51] However, the Government has made it clear that it will move to a competitive price discovery process for all low carbon technologies "as soon as practicable"[52] (potentially as soon as 2017 for technology-specific auctions and the 2020s for technology-neutral competitions). Either way, the strike prices will be established in an objective and transparent manner. This will provide benefits to consumers by ensuring the effective delivery of a secure diverse mix of low carbon generation plan at the least cost.

19. The CfD mechanism will expose the relative cost positions of generation technologies so it creates an incentive for least cost low carbon generation.

Nuclear New Build

20. EDF Energy is committed to delivering affordable, secure, and low carbon supplies based on a diverse energy mix, including nuclear and renewables. We would clarify that we have never sought a subsidy for nuclear new build and believe that the Government has made clear its position on the matter.

[51] DECC, Annex B: Feed-in tariff with Contracts for Difference: Draft Operational Framework, May 2012, p14
[52] Ibid., p9

21. Clarification of what was meant by "no public subsidy" for nuclear new build was confirmed in a Written Ministerial Statement on energy policy by Chris Huhne MP, the then Secretary of State for Energy and Climate Change on 18 October 2010. He wrote:

> *"To be clear, this means that there will be no levy, direct payment or market support for electricity supplied or capacity provided by a private sector new nuclear operator, unless similar support is also made available more widely to other types of generation."*

22. The CfD mechanism, for which nuclear new build is eligible, is therefore consistent with the Secretary of State's definition of "no public subsidy" for new nuclear operators. We firmly believe that the strike price should be based on delivering a fair deal for both investors and customers, be affordable and provide value for money.

23. In addition, we would highlight that it is the Government's policy that the operators of new nuclear power stations must set aside funds over the operating life of the power station to cover the full costs of decommissioning and their full share of waste costs. This is a requirement that EDF Energy would fully comply with in the development of its nuclear new build plans.

Existing UK Nuclear Assets

24. EDF Energy would highlight that liabilities remaining from the early research and nuclear power development programmes are, and always have been, public liabilities. The costs of dealing with them are therefore the Government's responsibility and not a subsidy. It is therefore not clear why Oxford Energy Associates report describes these activities in the section headed "Nuclear Subsidies". The Nuclear Decommissioning Authority (NDA) is the public body responsible for the decommissioning and cleaning up of the civil nuclear facilities previously under the control of British Nuclear Fuels Limited (BNFL) and the United Kingdom Atomic Energy Authority (UKAEA). These include the first generation Magnox power stations and associated fuel reprocessing facilities.

25. There is one particular area of Oxford Energy Associates' evidence that we feel needs to be corrected. Reference is made to the financial intervention by the Government in British Energy and the resulting waste liabilities. It is suggested that the Government had provided a £5 billion "bail out" but this is not accurate. The Government provided a credit facility of up to £650 million but not all of this was used and, in fact, was paid back with interest by British Energy during its restructuring.

26. Finally, we would point the Committee to two separate analyses by the National Audit Office (NAO) of the British Energy restructuring and sale to EDF Energy. In its report of March 2006 titled "The Restructuring of British Energy", the NAO has a table that shows that, as of 28 February 2006, the "total net benefit to the taxpayer of rescuing British Energy" was positive and worth £2.7 billion.

27. A follow-up NAO report, titled "The sale of the Government's interest in British Energy", published in January 2010 noted that "the Government sold its stake in British Energy when energy prices were at a peak, and got a good price". As a result of the sale, the proceeds were transferred to the Nuclear Liabilities Fund, which was set up to meet the cost of future decommissioning of British Energy's nuclear power stations. As of March 2009, the Fund was valued at £8.3 billion—significantly higher than the estimated decommissioning costs of £3.6 billion.

28. The restructuring of British Energy was ultimately a profitable deal for the taxpayer. Equally, it was strategically important in that it secured a significant proportion of the UK's electricity generation, which may have been jeopardised had the company been allowed to go into administration.

29. We would highlight that the existing eight nuclear power stations, now part of EDF Energy, continue to make a key contribution to the UK's low carbon generation mix and the wider economy. For example, in 2012 the plant generated 60TWh of electricity. This was almost 50% higher than the last year before the stations were acquired by EDF Group in 2009. This performance is a result of the £300 million annual investment in the power stations and this is in addition to £350 million spent on plant operations every year (with 90% of the total being spent in the UK).

30. In February 2012, EDF Energy announced that it would continue to seek life extensions for all its nuclear power stations where it is safe and commercially viable to do so. We are expecting an average life extension of seven years across our Advanced Gas-cooled Reactor (AGR) fleet, and have a strategic target of 20 years for Sizewell B. This will avoid the emission of almost 340 million tonnes of CO2 if the same amount of electricity is generated by fossil fuels—equivalent to removing all the cars from UK roads for nearly five years. In addition extending the plants' lives will also bring significant training and employment opportunities for a new generation of nuclear engineers and operators as we seek to develop the UK's position as a primary source for skills and expertise in the industry.

31. Our decision in December 2012 to extend the lives of Hinkley Point B and Hunterston B power stations, which in total employ more than 1500 employees and contractors, by seven years to 2023 will help maintain vital skills in the UK nuclear industry. Above all, the recent performance of the plant, and the planned plant life extensions, demonstrate the key role that the UK's existing nuclear fleet has in providing the reliable, low carbon electricity that the country needs.

Downstream Impacts

32. EDF Energy notes that the scope of the inquiry has primarily focussed on the upstream section of the energy system but consider that as much attention needs to paid to the funding of downstream initiatives. We support the principle behind Government schemes, such as the Green Deal and Energy Company Obligation (ECO), to increase the installation of energy efficiency and other measures. However, it is vital that the cost implication of these initiatives, in terms of affordability and impact on customers' bills, is fully evaluated. It is also important that a distinction between energy and social policy objectives is made as there is a risk that conflating the two will lead to more costly outcomes for customers as more expensive solutions are inadvertently prioritised over those that more cost-effective. Customers need to be fully aware of, and understand, the objectives and implications of energy policy (in terms of cost) if we are to build support for market reform and the benefits of the transition to a low carbon economy.

14 June 2013

Written evidence submitted by Vestas Wind Systems

Summary of Vestas Key Points

- Implicit subsidies for fossil fuelled power stations in the UK are significant. Health and carbon costs of fossil fuelled power stations in the UK amounted to between €6.8 billion and €10.4 billion in 2009. This is a huge implicit subsidy. Such subsidies distort the electricity market, making it unnecessarily difficult for technologies not in receipt of such subsidies, such as wind, to compete.
- Once the electricity market is a truly level playing field it would be reasonable to expect that subsidies for mature renewable energy technologies such as onshore wind can be phased out. A truly level playing field requires an end to implicit subsidies for fossil stations and a robust and meaningful carbon price to be established.
- Direct, policy based subsidies tend to receive more attention than implicit subsidies, including in the Oxford Economics report used as the basis for the Committee's inquiry. This tends to distort the impression of politicians, the public and the media of the level of subsidies received by wind generators in the UK.

About Vestas

1. Vestas is the world's largest supplier of wind turbines, having supplied over 46,000 turbines in more than 70 countries, more turbines in more countries than any other supplier. Vestas designs, manufactures, constructs and maintains wind turbines, both onshore and offshore. We are a pure wind player; we believe in wind and do not have interests in any other technology.

2. Vestas employs around 500 people across the UK, from R+D, construction and operations. We are currently manufacturing and testing the 80 metre blade for our dedicated offshore turbine at our world leading Technology Centre on the Isle of Wight.

3. Vestas has experience across a wide range of markets, most in which wind is subsidised to some extent, others where the dynamics of the market mean that wind is economically viable without support. We would be happy to share our experience with the Committee.

(i) *Has the Government identified the extent of energy subsidies and measured them?*

4. It is important that this inquiry takes account of the extent to which energy sources do not incur costs which reflect their impact on both society and the environment. Any shortfall between the full societal cost and the costs borne by an electricity generator is an implicit subsidy. For example there are significant health costs as well as environmental costs associated with fossil fuel use which are not borne by fossil generators.

5. The European Environment Agency[i] calculated that in 2009 the health costs (*excluding* carbon costs) of the UK's thermal power stations were between €2 billion and €5.4 billion per year. These estimates exclude the cost of heavy metals and organic pollutants. These health costs are not borne by the thermal stations that create them but by society and the health service more widely. This creates an implicit subsidy for those thermal stations. The benefit of avoiding such health costs delivered by non-polluting forms of power generation such as wind deliver are similarly not reflected in the market prices.

	Health costs of UK thermal power stations (excluding carbon)	***Health costs of UK thermal power stations (including carbon)***
All thermal	€2bn–€5.4bn	€6.8bn–€10bn
Coal	€1.8bn–€5bn	€4.9bn–€8bn
Gas	€144m–€400m	€1.8bn–€2bn

Source: European Environment Agency report "Costs of Air Pollution from Industrial Facilities" 2011

6. The EEA estimated that in addition to the €2 billion to €5.4 billion for non-carbon costs, the carbon related health costs of thermal plants amounted to EUR4.8 billion. Based on these cost figures and reported electricity generation in 2009, the total implicit subsidies for coal is *very approximately* €45 to €75/MWh[ii] and for gas *very approximately* €11/MWh to €12/MWh.[iii] Regardless of the rudimentary calculation, this represents a significant implicit subsidy.

7. The Government does take into account the health costs of its policies in its impact assessments to some extent (see example from the EMR impact assessment below). The monetised health benefit of renewable energy often, however, fails to gain the same attention as the cost of direct, policy based, subsidy cost. This appears to have been the case in the Oxford Economics report for the Committee, which does not mention health costs and the implicit subsidy given to thermal plants by them not being borne in the market. This is a considerable oversight and one which the Committee should ensure is not reinforced in its final report.

Table 32

MONETISED BENEFITS OF THE EMR SCENARIOS RELATIVE TO THE UPDATED BASELINE FOR IMPACTS IN 2025 (NPV 2010–30, REAL 2009)[iv]

	FiT CfD		*Premium FiT*	
Relative to updated baseline	*Range*	*Central*	*Range*	*Central*
NPV	£505–£732m	£643m	£347–£503m	£442m

8. There are also impacts on ecosystems and the natural environment, which are not included in the impact assessment for the Electricity Market Reform.

(ii) *How well does the identification match up to best practice?*

9. Vestas is not in a position to comment on this question.

(iii) *How does the scale of subsidies compare with other countries?*

10. It is very difficult to do a fair comparison of subsidy costs between the UK and other markets, as the treatment of renewable energy projects is very different. For example in the UK a renewable plant is treated as any other type of plant connected to the system. It pays the same transmission costs, incurs the same balancing costs and is constrained as any other plant is. In many other markets renewable projects are given treated differently. This means they incur more implicit subsidies which means they incur less market costs, so require less subsidy.

(iv) *Does the Government have plans to reduce or eliminate subsidies?*

11. Removing implicit and direct subsidies for fossil fuels and nuclear is the first step to creating a truly level playing field. Under a truly level playing field most mature forms of renewable energy such as onshore wind would be able to operate without subsidy. Onshore wind has been receiving subsidy in the UK for around 20 years. This pales into insignificance given that 50 year old coal stations currently receive implicit subsidies for their continued operation. Offshore wind which is globally a much less mature technology than even onshore wind, has been receiving subsidy for less than 15 years.

12. A long term policy that gives investors the certainty to invest in high capital cost technologies such as wind is needed. Investors must be confident that the market environment will remain stable, that the carbon price will be maintained throughout the life of the project, that they will have access to the market through the grid and interconnections with other market. Government plans to develop new interconnections and transmissions lines within the UK will also help remove the implicit subsidies given to existing capacity. The electricity network was built to reflect the location of the UK's fossil fuel resources. The fact that thermal

stations have convenient access to the existing grid should not mean they do not have to pay towards the cost of building lines to locations where new forms of energy resources, such as wind, are located. Socialising the cost of building new transmission lines is no different to socialising the cost of the cost of building the national grid in the 1950s.

(v) *Government progress in reducing harmful subsidies*

13. Some measures in the Government's Electricity Market Reform will help reduce subsidies; others are likely to increase the level of subsidies. It should be expected that as the Carbon Price Floor increases the implicit subsidy to thermal plant will reduce. Similarly as the Emissions Performance Standard prevents new coal stations being built and the Industrial Emissions Directive closes some coal stations, the implicit health cost subsidy should fall.

14. The amount of new capacity likely to be covered by a Contract For Difference is likely to lead to a considerable increase in the amount of direct subsidy in the market, at least in until 2020. The actual level of subsidy will depend on the electricity price, as the subsidy in the contracts is the difference between the electricity price and the contract price. If the electricity price increases above the level of the contract price generators have to pay back the difference, so they would represent a negative subsidy.

References

[i] EEA Report "Costs of Air Pollution from Industrial Facilities" 2011 see http://www.eea.europa.eu/pressroom/publications/cost-of-air-pollution

[ii] Health costs of UK coal stations listed in the European Environment Agency report, divided by UK coal station power generation in 2009 as stated in Digest of UK Energy Statistics

[iii] Health costs of UK gas stations listed in the European Environment Agency report, divided by UK gas station power generation in 2009 as stated in Digest of UK Energy Statistics

[iv] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48133/2180-emr-impact-assessment.pdf

17 June 2013

Written evidence submitted by the Fuel Poverty Advisory Group

The Fuel Poverty Advisory Group is a non-departmental advisory body, which consists of a chairman and senior representatives from the energy industry, charities and consumer bodies. Each member represents their organisation, but is expected to take an impartial view. The role of the Group is to:

- Consider and report on the effectiveness of current policies aiming to reduce fuel poverty;
- Consider and report on the case for greater co-ordination;
- Identify barriers to reducing fuel poverty and to developing effective partnerships and to propose solutions;
- Consider and report on any additional policies needed to achieve the Government's targets; and
- Encourage key organisations to tackle fuel poverty, and to consider and report on the results of work to monitor fuel poverty.

Note:

The diverse nature of the Group's membership may, on some occasions, prevent unanimity on some of the following points.

The Fuel Poverty Context

Escalating energy prices are the biggest cause of more households going into fuel poverty. The long term trend is for prices to continue rising. With every 1% increase in energy prices, another 50–60,000 households are added to the numbers in fuel poverty. The average domestic dual fuel bill is now at a record high of £1,365 per annum[53] creating severe additional hardship for some six million UK fuel poor households.[54] The problem is even more acute for many living off the gas grid using Oil or LPG, where average fuel bills are circa £2,100 per annum.[55] The Government's Energy Market Reform (EMR) has no beneficial impact on bills between now and 2016 and adds costs from 2016 onwards.

[53] Ofgem: Electricity and Gas Supply Market Indicators updated 22 November 2012
[54] Consumer Focus 2012
[55] DECC, Fuel Poverty Detailed Tables 2010

The recession, unemployment plus the industries overall and longer term investment plans estimated at c. £200 billion to 2020[56] and uncertainty over new generating capacity and energy prices will exacerbate the problem. FPAG remains deeply concerned that the costs and implication of the UK's transition to a low carbon economy, has yet to be sufficiently explored. Meanwhile, the regressive means of collecting costs added to fuel bills to fund a range of related environmental and energy costs creates consumer inequity.

Professor John Hills, at the request of Government, undertook an independent review of the fuel poverty definition and measurement which completed in April 2012. Professor Hills' "interim findings" and conclusion that fuel poverty is a: "distinct and serious problem; that it deserves and requires attention as recognised by Parliament in adopting the Warm Homes and Energy Conservation Act, were welcomed by FPAG. We also noted and strongly endorsed Professor Hills" emphasis on the detrimental physical and mental health consequences of living in a cold home.

As part of the Review's conclusions, they established a "Fuel Poverty Gap" which measures the average and aggregate depth of fuel poverty expressed as the difference between costs faced by the fuel poor and typical costs of achieving a warm home. The Review found that fuel poor households are paying £1.1 billion more for their fuel compared to typical households across England. The fuel poverty gap clearly demonstrates the enormous scale of the problem. In his final report Professor John Hills stated: "It is essential that we improve the energy efficiency of the whole housing stock. But those on low incomes and in the worst housing can neither afford the immediate investment needed nor afford later repayments without additional help." FPAG unequivocally agrees with Professor Hills.

It remains very clear that irrespective of how fuel poverty is to be eventually defined and measured, the number of households and occupants will still remain in the millions. Consequently, a robust strategy delivering serious measures will be required if the Government is to meet the legally binding target to eradicate fuel poverty by 2016.

Under the current definition of fuel poverty nearly 50% of households are pensioners (10% contain a person over the age of 75 or over), 34% contain someone with a disability or long-term illness, 20% have a child aged 5 or under.[57] Hence the plight of the ever increasing numbers of fuel poor households has never been more serious than it is today. High energy bills cause stress and misery for many and often ill health as well for those living in a damp and poorly insulated property.

At the same time as the energy Industry sets course for a low carbon transformation and EMR, the future of fuel poverty, its measurement, definition, mitigation schemes and the welfare benefits system will **all** change. For the first time since 1978 there will no longer be a government funded fuel poverty programme in England. The devolved assemblies of Scotland and Wales, however, will keep their funded schemes which will be in **addition** to a GB wide new energy supplier obligation.

The Green Deal and ECO could offer a new opportunity to assist both those households off the gas grid. However, most FPAG members believe that the Energy Company Obligation (ECO) must be dedicated to the alleviation of fuel poverty and not used to subsidise expensive measures on behalf of "Able-to-Pay" households whilst so many fuel poor household still require measures to be fully funded upfront.

Consultation Questions

(i) *Whether the Government has identified the extent of energy subsidies, and measured them;*
(ii) *How well any identification of subsidies by the Government matches up to best practice methodologies in how energy subsidies are defined and scoped;*
(iii) *The scale of subsidies in the UK, including comparison with other countries;*
(iv) *Whether the Government has any plans or targets to reduce or eliminate "harmful" subsidies;*
(v) *Progress in reducing such harmful subsidies, and how current energy policies and DECC's "Energy Pathways" for the mix of energy sources will influence the magnitude of any subsidies*

Consultation Response

FPAG will limit it response to the issue of harmful energy subsidies and their distributional impacts and progress in reducing such harmful subsidies.

The UK's transition to a low carbon economy has profound implications for all consumers, but particularly so for the fuel poor. Many stakeholders, including FPAG, argue for major intergenerational policy change such as this, for it to be funded by the Treasury and not by costs directly added to consumer's energy bills. Adding costs to energy bills in this way is inherently regressive.

Fuel Poverty and Household Income

Fuel price rises have far outstripped increases in household income and have hit the poorest hardest; many low-income households therefore need urgent and immediate help with rising energy costs.

[56] Ofgem Project Discovery
[57] Hills Review 2011–12

Those with the lowest incomes are the least able to absorb price rises, as fuel makes up a much more significant proportion of their incomes than is the case for those on higher incomes. The mean annual income of fuel poor households in the UK in 2010 was £11,000 compared to an average income of £32,000 for non-fuel poor households.[58] In addition, those on the lowest incomes typically pay more for their energy with households with an average income of £6,500 paying £1,954 for their energy, compared to those earning around £42,000 paying £1,244 per annum.[59]

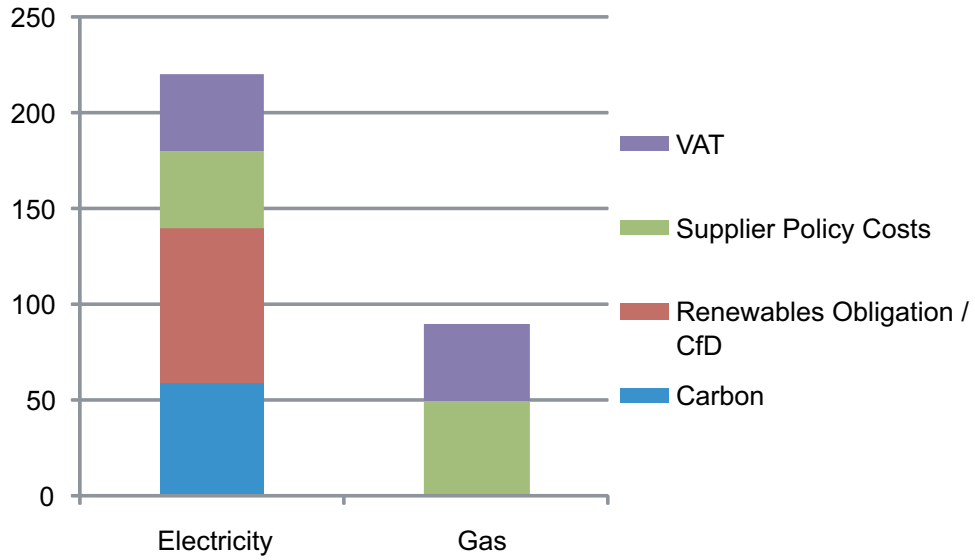
The table below illustrates the fundamental difficulties faced by fuel-poor households. Not only are they economically disadvantaged, they also need to spend more on fuel, in absolute terms, to achieve a warm and healthy living environment *ie* those who need to spend most on fuel are least able to do so and live in the most thermally inefficient properties.

Fuel expenditure as a % of income	*Number of households (thousands)*	*% of whole stock*	*Average full income (£)*	*Average fuel costs (£)*	*Average SAP*
<5%	9,900	45.8%	41,963	1,244	59.1
5–10%	8,164	37.8%	19,832	1,338	54.0
10–15%	2,275	10.5%	12,549	1,497	47.0
15–20%	641	3.0%	9,649	1,644	42.0
>20%	620	2.9%	6,567	1,954	36.0
Total	**21,600**	**100.0%**	**28,526**	**1,338**	**54.7**

Source: Detailed Tables published by DECC in 2012

Social and Energy Policy Cost Recovery is Disproportionally Loaded onto Electricity Bills

The sums collected by the Big 6 suppliers to fund some aspects of Government social and energy policy are predominantly loaded onto electricity and not gas bills. The view of the Government's own Fuel Poverty Advisory Group is that the loading and its disparity of these policy costs by 2020 will, on a £per customer basis, look something like £220 vs £90 per annum (all big suppliers support this view).



The inequity of costs added to bills is compounded when the market intervention is effectively a "tax" to facilitate low carbon generation to coexist with fossil fuel generation in the competitive energy market and the sums raised subsumed into Treasury coffers.

The introduction of the Carbon Price Floor, subject to the Annual Budget debate is such an example. This intervention will see the cost of carbon steadily rise in GB to £30 per ton by 2020, compared to circa £3.50 per ton at present. Together with the auctioning of EU emissions trading scheme permits to fossil fuel generators, this will raise around £2 billion in 2013 rising to nearly £7 billion by 2027 an average of £4 billion per year.[60] Both these measures will lift the market price for energy and hence the consumer will pay more.

[58] DECC (2012) *Annual Report on Fuel Poverty Statistics 2012*
[59] DECC Fuel Poverty Detailed Tables 2010
[60] "Jobs, growth and warmer homes: Evaluating the Economic Stimulus of Investing in Energy Efficiency Measures in Fuel Poor Homes" Cambridge Econometrics & Verco for Consumer Focus, October 2012

Over the next 15 years c. £63 billion will be added to consumer energy bills through the Carbon Price Floor and EU Emissions Trading System (ETS). Meanwhile, FPAG notes the Chancellor's recent decision to recycle some £300 million of the sums to be received from the carbon price floor (c. £1.4 billion to be paid by all consumers) to only industrial energy users of electricity to soften its impact, yet will not do something similar to protect the most financially disadvantaged fuel poor consumer in this context. FPAG further notes that consultation will now take place to explore the extension of compensation to cover Contracts for Differences.

Meanwhile, the French,[61] Estonian[62] and Australian[63] Governments are recycling some on their carbon revenues back to consumers through insulation measures and in Australia, welfare benefit improvements as well.

The long term and sustainable solution to UK fuel poverty is to radically improve the thermal efficiency of its housing stock and, where required, install an efficient heating system. FPAG robustly challenges any assumption that Government cannot afford to aggressively tackle fuel poverty. It argues that the use of carbon tax revenue to fund fuel poor households in particular would have multiple benefits from having warmer homes including improved health, greater energy efficiency, carbon reduction and economic growth.

In order to give greater perspective of distributional impacts and "underline its importance", FPAG wishes to cite the following research[64] and conclusions drawn, commissioned by Consumer Focus as part of its commitment to support the work of FPAG on the distributional impacts of energy tariffs. The study was designed to first assess the impact of the Energy Bill and other social and environmental policies on household energy bills, with particular attention to **those not likely to benefit from ameliorative measures funded through costs added to bills**; and second explore potential solutions to off-set those worst affected.

The Hardest Hit

A core objective of this research was the identification of households "hardest hit" by the energy policies.

Electricity, as previously mentioned above, is subject to the majority of policy costs. Households reliant on electricity for heating are likely to have higher than average levels of electricity consumption, compared to the rest of the population, and therefore bear a disproportionate share of policy costs. These households might expect to receive measures to offset the particularly high costs they face, but this does not appear to be the case. The research found that a lower proportion of electrically-heated households (27%) benefit directly from policies when compared to all households (40%). Consumers that use electricity to heat their homes see an average increase in their bill relative to the "no policy" bill, while all other consumers see a decrease on average. Furthermore, the difference between electrically-heated "winners" (defined as households that "get support" and benefit from policy) and electrically-heated "losers" (households that do not get any support) is stark, at over £500.

[61] http://www.gouvernement.fr/gouvernement/systeme-d-echange-de-quotas-d-emission-de-gaz-a-effet-de-serre-periode-2013–2020–0

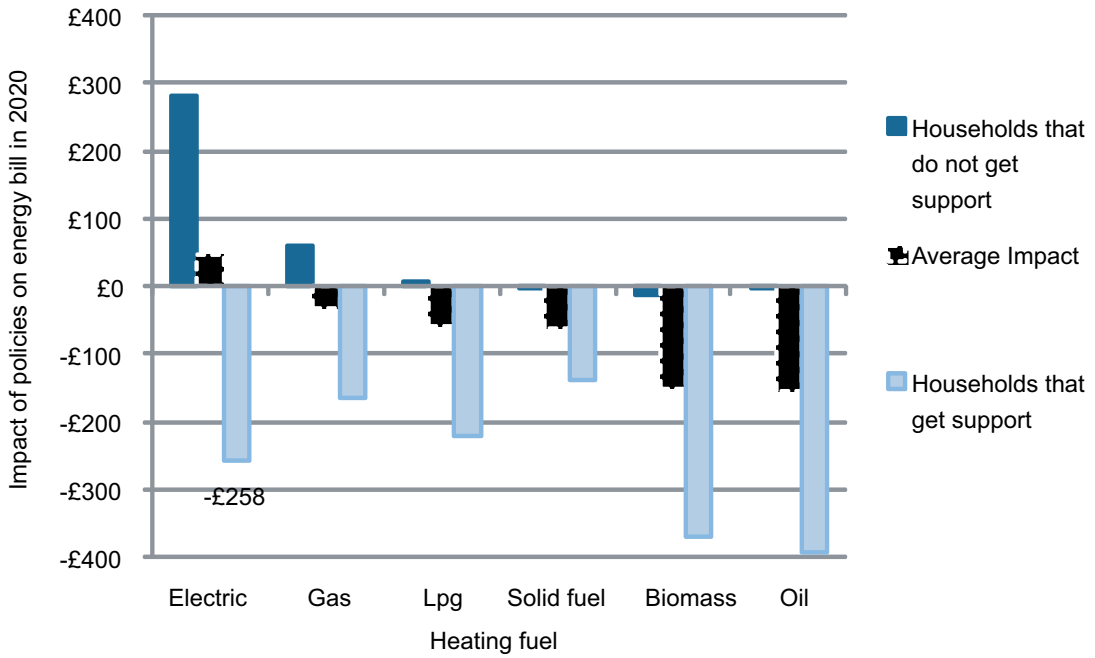
[62] http://www.urbenergy.eu/fileadmin/urb.energy/medias/Events/Piaseczno2011/ppts/WP5_Piaseczno2011_KredEx.pdf

[63] summary of the *australian* government's climate

[64] The hardest hit—Going beyond the mean. Centre for Sustainable Energy Bristol, April 2013

The graph below shows the impact of policies on 2020 household energy bills by household heating fuel for DECC's "central policy scenario".

IMPACT OF POLICIES ON ENERGY BILL BY HEATING FUEL AND THOSE WHO DO AND DO NOT RECEIVE SUPPORT



Across all households that do not benefit from energy policy, electrically-heated homes are subject to the largest increase of £282, whilst households using non-metered fuels experience a decrease (regardless of whether or not they benefit from policy). This is because the benefits of products policy outweigh the total policy costs for this group of consumers.

In 2020, electrically-heated households:

— represent 10.5% of the total share of heating fuel by type;
— pay 18.9% of the total cost of domestic energy policy; and
— receive 6.8% of all measures deployed.

Furthermore, these householders contribute a significant amount towards large scale infrastructure projects designed to deliver energy security and renewable energy. When combined, the EMR and historical legacy of the Renewables Obligation represent the largest share—some 35%—of total policy costs of £4.8 billion in 2020.

Identifying the Hardest Hit

The analysis of the impact of Government policies on domestic energy bills by different socio-demographic characteristics highlighted some important distributional issues, not least the implications for low-income households with electric heating.

Chi-squared Automatic Interaction Detector (CHAID) was used to further explore and identify the characteristics of those "hardest hit".

The analysis found that of the five groups "hardest hit" by policy costs, four use electricity to heat their home and hence have above average electricity consumption, compared to the population as a whole.

Reducing Harmful Subsidies and Compensating the Hardest Hit

The research explored a range of approaches for off-setting the impact of policies on those worst affected and produce a more progressive distributional impact—that is, ensure lower income households are proportionally better off compared to higher income households. The application of an "equity charge" in which a fixed credit is given to all consumers and the cost of this is recovered through raising the unit cost of energy above the median consumption threshold, provides a fairly effective form of compensation. However, the changes to tariff design under this approach do not protect the hardest hit as these are typically low-income households with above average electricity consumption.

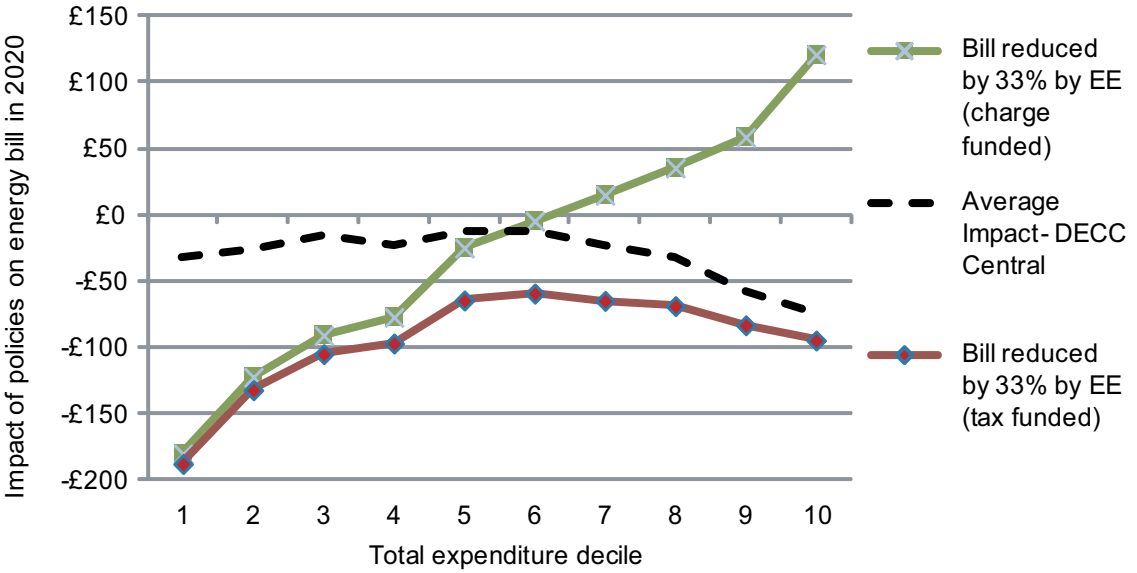
A different approach to compensating those worst affected involves targeting electrically-heated purpose-built flats and households with occupants who are over 65. There are 1.1 million households in electrically-heated purpose built flats. This group are worse off on average by over £100 as a result of policy costs, yet

they have lower than average income and expenditure. Similarly households with occupants that are over 65 are typically lower income, especially those that use electricity for heating.

One approach to compensating these households involves allocating them a lump sum payment. However, the scale of payments required to ensure these households become **better off on average** is considerable (ranging from £500 to £1,000). Therefore, an alternative approach involves reducing their energy costs by an average of 33% through energy efficiency measures. The distributional impact of this approach is shown in the graph below.

Figure A.1

AVERAGE BILL IMPACT IN 2020 BY EXPENDITURE DECILE FOR THE DEMAND REDUCTION PACKAGES



Further work is needed to quantify the cost of measures required to deliver the savings across the 1.68 million households identified for targeting. However, the "consumer credit" package investigated as part of this study generated revenue of £1.1 billion per year from consumer bills, which is similar in scale to the current Energy Company Obligation.

Policy Implications

The research explored a number of options for targeting the hardest hit households. It identified two groups that would benefit from targeting; households in purpose built flats with electric heating and all properties with electric heating containing at least one pensioner. The final stage of this research explored options for compensating these households. The research found that providing sustainable energy measures to reduce household energy costs provided the most successful approach to protecting these households and was the most progressive option in terms of distributional impact.

Further analysis reveals towards 30% of the off-peak typical electric heating tariff being required to cover the government's policy, and with further increases likely, that it is not unrealistic to foresee this increasing to some 50% of off peak unit costs. This is hardly in concert with the government's strategy to electrify heat and transport.

Conclusion

The review of harmful subsidies and their distributional impacts of the above have shown that there remains a significant gap for the hardest hit by energy policy. In FPAG's opinion amendments to the current Energy Bill to compensate these households should now be considered.

Options for Government to explore:

— The new Energy Company Obligation and Warm Home Discount levied more towards the gas bill.

— Make all off peak units unencumbered with policy costs. This would support Government's ambition to electrify heat and transport and also create a real price differential for customers to time shift energy appliance usage.

— Make the electricity consumption of homes without access to mains gas unencumbered with policy costs. In my opinion, it could be accommodated in Retail Market Reform proposals but it would require a firm government commitment to eliminate these volumes when allocating obligations between suppliers in the future. Liquid Propane Gas and Heating Oil are 50% more expensive that mains gas. It would be an equitable solution of a legacy issue that is fundamentally unfair.

— Promoting modern storage heaters to electrically heated flats as a mechanism to balance supply and demand in a future that will have a more system balance challenges eg wind, solar, electric vehicles etc.

— Make all demand side management units of electricity unencumbered with policy costs. This would facilitate a simple "level playing field" message to stimulate this market and also engage more consumers in smart meters and to seek cheaper prices.

— Ensure its forthcoming Fuel Poverty Strategy and Heat Strategy also considers policies for compensating these households by, for example, installing solid wall insulation, heat pumps and/or gas district heating as a priority.

— In terms of future funding for these measures further consideration of the use of existing carbon revenues or revenues from an EE FiT.

25 June 2013

Written evidence submitted by Malcolm Grimston

THE FULL COSTS OF GENERATING ELECTRICITY

EXECUTIVE SUMMARY

The recent debate about costs of low-carbon electricity has tended to be based on a rather crude "cost of a generating unit divided by number of units produced" approach. The potentially vast costs associated with managing the inherent intermittency of some renewables, notably wind and solar, are not at present fully reflected either in the stated costs of these energy sources nor in the quoted "subsidies" they are receiving. It is becoming increasingly clear that the full costs—both economic and environmental—of all sources of electricity, most notably variable sources such as renewables like wind and solar, should include not only the direct costs referred to above but also indirect costs caused by, for example, the intermittency of the output. These costs are potentially very large and include the need for grid strengthening ("grid-level system costs"); the effect on the economics of other generators, leading to higher prices (or threats to security of supply, in itself a huge potential cost to consumers); and the greenhouse gas emissions caused by the need vary the output of dispatchable fossil-fuelled power plants, thereby reducing their thermal efficiency. A rational approach to allocating limited resources to deliver maximum supply security and emission reduction would involve ascribing all costs and environmental effects, direct and indirect, to the source which has ultimately given rise to them. This would lead to a very different discussion re the way of achieving economic, security of supply and environmental goals—for example, arguably leading to a reclassification of variable renewables as "medium carbon".

THE UNIQUE CHALLENGES OF ELECTRICIY

Electricity is a unique commodity. Despite over a century of research, it still cannot be stored in significant amounts—pumped storage is feasible in some circumstances but requires appropriate geology and major capital investment and suffers from losses of some 15%–30% of the power input.[65]

For most commodities, of course, it is possible to manufacture them when it is convenient, then to stockpile them until they are needed. If it makes sense, for example, to manufacture shoes overnight (say to take advantage of low power prices), the shoes can be stored for a practically unlimited time until someone wants to buy them. But with electricity we have to be able to make exactly the right amount to fill requirements on a moment-by-moment basis. Generating too much puts great strain on the wires which carry electricity from the power station to the customer and can lead to their deforming and ultimately melting, with serious effects—eg "electrical arcing" or severe damage to transmission capacity. Generating too little puts us in danger of poor quality electricity supplies and, eventually, power cuts, which are extremely expensive. Among the effects of power cuts are failures in our transport systems, losses of a day's production in the workplace, loss of a freezer full of food, inability to pump water into our homes or power our hospitals, and severe social disruption, eg looting and vandalism if the power cut occurs overnight.

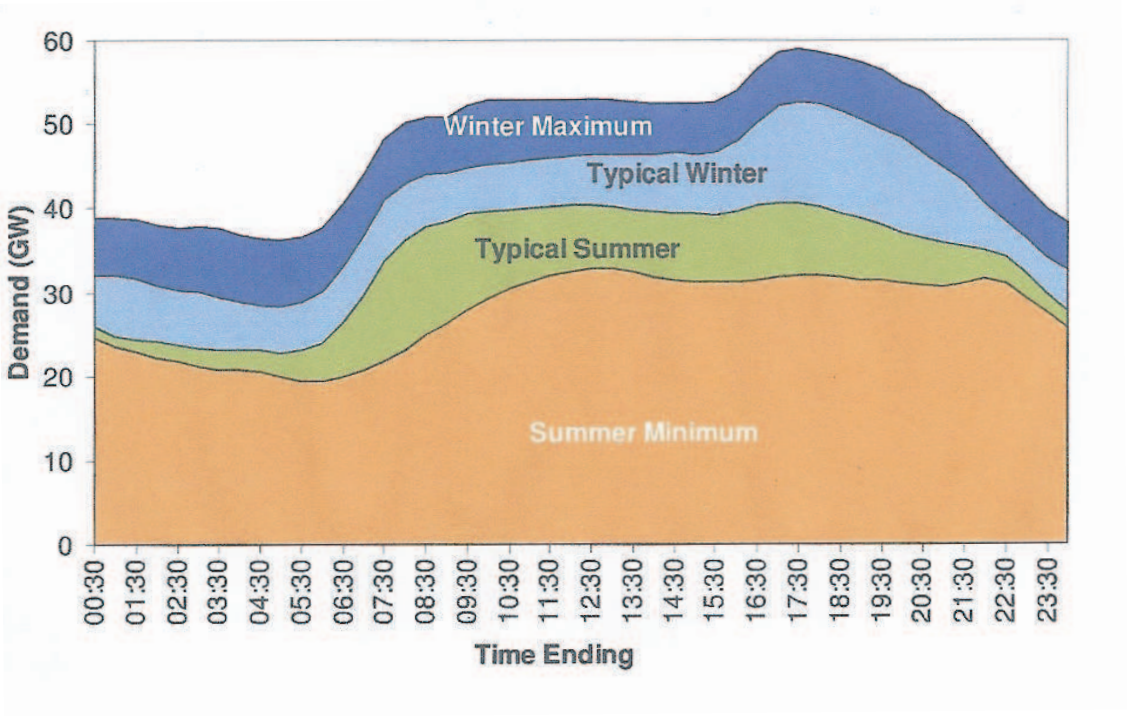
Even if the discrepancy between supply and demand is not sufficient to cause damage to the transmission network or power outages, an excess or shortage of power demand can result in an increase or decrease in frequency of the power supply. (In the UK the National Grid has a statutory duty to maintain the frequency in the range of 49.5 Hz to 50.5 Hz and usually upholds it at between 49.8 to 50.2 Hz.[66]) If the frequency should

[65] http://www.electricitystorage.org/technology/storage_technologies/pumped_hydro/, Electricity Storage Association (2012), *Electricity storage—pumped hydro.*

[66] http://www.nationalgrid.com/uk/Electricity/Data/Realtime/, National Grid (2013), "Electricity—real time operational data".

become too high this can cause direct damage to a variety of appliances and/or increase wear and tear. If the frequency is too low then equipment will tend to underperform. In turn this may lead operators to increase their demand where they can (eg the driver of an electric train opening the throttle to compensate for the lower speed), which may exacerbate the supply/demand discrepancy.

VARIATIONS IN UK POWER DEMAND, 2010–11[67]



Power demand varies considerably, both during the day and during the year. The difference between peak demand and lowest demand in the UK is roughly a factor of 3 (60,000 MW to 20,000 MW). Usually demand fluctuation is fairly predictable but variations can be very rapid. The biggest power surge to date in the UK was some 2,800 MW after the penalty shoot-out in the 1990 football World Cup semi-final between England and West Germany in 1990 (when supporters put the kettle on for a consolatory cup of tea). Electricity planners needed to be ready for the moment when coverage of the Royal Wedding in 2011 reverted to the TV studio, when demand surged by 2,400 MW.[68]

This balancing act creates considerable challenges, both technical and economic. In a functioning system, the grid operator, who is ultimately responsible for keeping supply and demand in balance, has to be able to order (or "dispatch") enough reliable electricity to fulfil demand, but no more. Furthermore, somebody has to keep power stations available to fill very high levels of demand, say on a cold, still, cloudless winter evening, while knowing that these plants will not be called upon for most of the rest of the year when demand is lower. The costs of failing to fulfil demand are very high—typically the "Value of Lost Load" (VOLL) is estimated at between 50 and 350 times the price of a delivered unit.[69]

The Importance of "Dispatchability"

Traditionally, most countries have overcome these problems by building, or encouraging the building of, large power stations whose power can be varied (or which can be turned on and off) in response to changes in demand. Nuclear power stations, which have very low variable costs—in other words, since they use very little fuel they cost very little more when they are operating compared to when they are not—tend to be used for "baseload", ie the power demand that never goes away (to keep water pumping systems operating, transport running and so on). The baseload is roughly 20 GW in the UK, considerably more than installed nuclear capacity of around 10 GW, meaning that when the system is being run rationally the nuclear stations will operate continuously whenever they are available. Fossil-fuelled power stations—particularly gas but also coal—are used to "load-follow", since a considerable proportion of their costs is saved when they are not running. However, the important thing is that all of this plant is "dispatchable"—ie it will be available to generate if the grid operator requires it to do so (unless it is closed down for maintenance or has broken down

[67] http://www.nationalgrid.com/NR/rdonlyres/D4D6B84C-7A9D-4E05-ACF6-D25BC8961915/47015/NETSSYS2011Chapter2.pdf, National Grid (2011), *2011 National Electricity Transmission System (NETS) seven year statement.*

[68] http://www.clickgreen.org.uk/analysis/general-analysis/122208-royal-wedding-triggered-record-energy-demand-on-uks-national-grid.html, *ClickGreen* (2011), "Royal Wedding triggered record energy demand on National Grid."

[69] Cramton P and Lien J (2000), *Value of lost load*, University of Maryland.

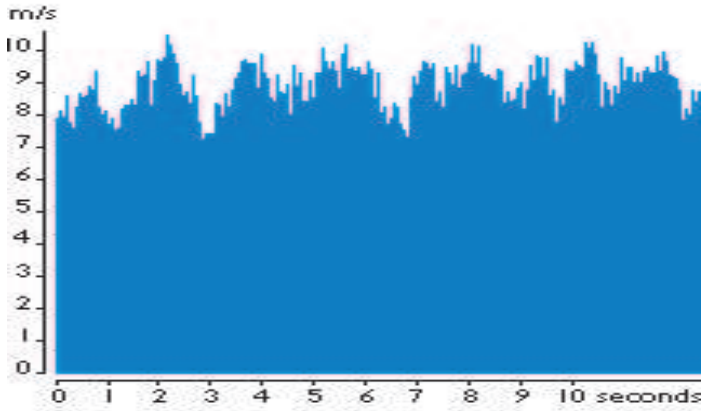
unexpectedly). At times of very high demand the real-time power price increases enormously to compensate those companies which do keep power stations ticking over to fulfil that very high demand.

In order to maintain the quality of supply and ultimately to keep the lights on in unforeseen circumstances—say a particularly cold snap or a time when two or three large power stations break down unexpectedly—the grid operator seeks to maintain what is called a "capacity margin" in the system as a whole. So if we expect the highest demand in a particular year to be about 60,000 MW, the ideal situation would be to keep about 72,000 MW of power capacity ready for use, in case the demand should happen to be say 65,000 MW and up to 7,000 MW of power plant was undergoing maintenance or had broken down unexpectedly. A capacity margin of about 20% is generally regarded as sufficient, though from time to time it has exceeded this (and indeed fallen below it).

The Challenge of Variability

However, recently things have begun to change significantly because of growing use of renewable sources of energy, many of which are "variable" (the opposite of "dispatchable") because they depend on unpredictable, or at least very variable, weather conditions. The output from, say, a windfarm will typically be about 25–30% of its "rated" capacity—in other words if the windfarm produces 100 MW of electricity when the wind is blowing at the best speed, the average output will be between 25 and 30 MW. (In 2010 the figure was 23.7% in the UK, in 2011 it was 29.8%.[70]) However, it is very difficult to predict with any great accuracy or much in advance when the wind will blow—indeed, wind speeds can vary over a few seconds or minutes on a "gusty" day.

SHORT-TERM VARIABILITY IN WIND SPEED[71]



Short-term variability in wind speed[7]

The output can vary very rapidly—sometimes within a matter of seconds or minutes—as weather conditions change. Although the most rapid variations are to some extent compensated for by the inertia of the wind turbine rotor, the phenomenon still creates technical, financial and economic problems. Technically, turbulence necessitates the provision of a great deal more wire capacity in order to accommodate all power being produced when the wind is blowing, but then very rapidly switch supply to another area of the country when the wind drops and other types of power plant are required. In China about half of the energy being produced in windfarms is wasted because the grid connections are not yet in place.[72] It also offers challenges to maintain system frequency and imposes more wear and tear on the wind turbines. Wind turbine towers are usually tall enough to avoid the greater wind turbulence encountered close to ground or sea level.

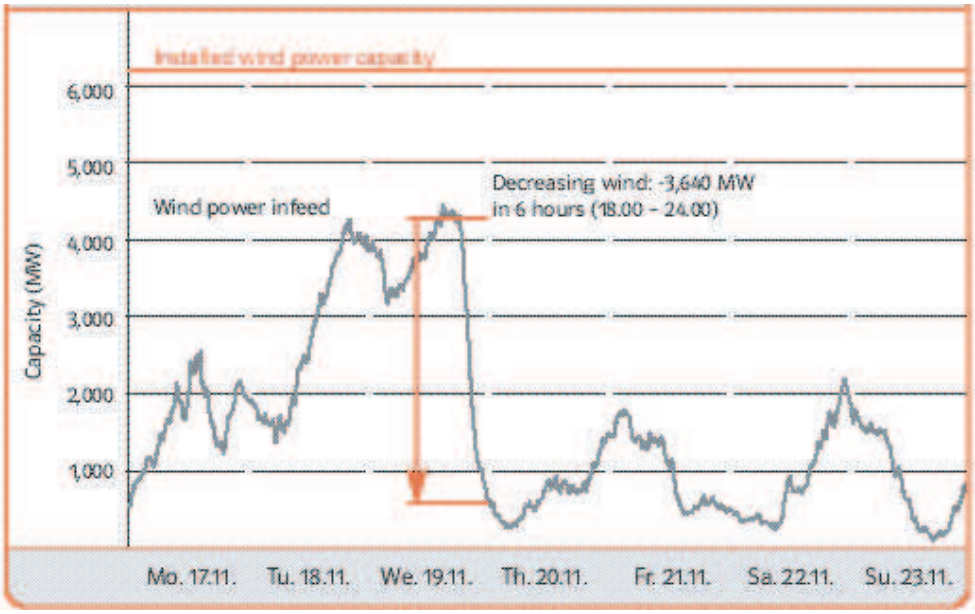
[70] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65850/5956-dukes-2012-chapter-6-renewable.pdf, DECC (2012), *Digest of UK Energy Statistics*, Chapter 6.

[71] University of Strathclyde (2013).

[72] http://www.chinadaily.com.cn/bizchina/2011–02/15/content_12019641.htm, *China Daily* (2011), "2.8 billion kWh of wind power wasted", February 15 2011.

Evidence suggests that low wind speed tends to be weakly correlated with high power demand (cold windless winter evenings and hot windless summer days), further exacerbating the challenges.[73] At other times wind or solar generators may be producing close to 100% of their rated output, risking overloading the system and obviating other power sources to close down.

VARIATION IN OUTPUT FROM WIND GENERATORS IN GERMANY, 2003[74]



It is not enough simply to have sufficient generating capacity available to meet demand. If the quality of the supply (especially its frequency) is to be maintained then the capacity available must be able to respond quickly to changes in demand on the system. With the exception of some renewables such as hydropower and biofuels, which are dispatchable, most renewables are unable to provide this responsiveness as the output is determined by wind speeds, tides or sunshine. The output of conventional power stations, by contrast, can be actively varied by increasing or decreasing the amount of steam being generated and fed to the turbines.

Managing a system which includes a lot of variable renewables presents a number of challenges, depending on whether the wind is blowing or is not.

When the wind is blowing (or the sun is out or the tide is in), in order to prevent excess supply and, for example, damage to the transmission wires or unacceptably high frequencies, quite a lot of that energy has to be wasted—in the UK in recent years wind generators have often been paid quite large sums of money to stop generating electricity when the wind is good[75]—and/or other companies have to cut their output to compensate.

The latter response undermines the profitability of the gas- or coal-fired plants that are having the market cut from under them. (The economics of nuclear power means that it would be the last to be withdrawn if there was an excess of variable output at any particular time.) But when the wind is not blowing we still need almost as many gas- and coal-fired power stations as we would have needed if we have never built the windfarms in the first place. So some way has to be found of compensating the fossil fuel power stations for the market they lose when the wind is blowing. If this is not done they might be closed down or mothballed, and so not be available for when the wind drops. This problem is already being seen in countries like Germany and Spain with a lot of wind energy[76] and is also at the heart of some of the contradictions in the UK Energy Bill which was published in draft form in December 2012.

On the one hand, the Energy Bill is responding to the likelihood that, left to a free market, investors would only fund new build combined cycle gas turbines (CCGT). CCGT is quick and cheap to build and maintain and the technology is particularly appropriate for load-following, it being relatively easy and economically worthwhile to vary its output depending on the system demand. Although it is expensive to run (fuel costs dominating overall costs) it is economically quite low risk, because if the gas price does soar (the key economic sensitivity for gas-generated electricity, since most of the cost of that electricity is the cost of gas), then the

[73] http://www.jmt.org/stuart-young-report.asp, Young S. (2011), *Analysis of UK Wind Power Generation November 2008 to December 2010,* John Muir Trust

[74] http://www.eonnetz.com/frameset_reloader_homepage.phtml?top=Ressources/frame_head_eng.jsp&bottom=frameset_english/energy_eng/ene_windenergy_eng/ene_win_windreport_eng/ene_win_windreport_eng.jsp, E.On Netz (2004), *Wind Report 2004.*

[75] http://www.bbc.co.uk/news/uk-scotland-13253876, "Scots windfarms paid cash to stop producing energy", *BBC website,* 1 May 2012.

[76] http://www.businessweek.com/news/2013–01–23/eon-rwe-may-have-to-close-down-unprofitable-gas-power-plants, Andresen T and Nicola S (2013), "EON, RWE may have to close down unprofitable gas power plants", *Bloomberg Business News.*

extra cost can very largely simply be passed on in higher power prices to customers who have nowhere else to go, at least in the short term.

Nuclear and renewables, by contrast, are much more capital intensive (ie they cost a lot more to build per unit of installed capacity), though they are cheaper to run. Unmitigated coal capacity lies between CCGT and low-carbon sources, while coal with Carbon Capture and Storage (CCS) also has high capital costs. The key economic sensitivity for these sources, then, is how the initial construction programme is managed. The costs associated with any time or cost overruns in the construction phase cannot be passed on to consumers in the same way. Consumers could simply commission a new CCGT to replace the output from the nuclear or renewable plant while it was being finished. So the Energy Bill proposes a "carbon price floor" (ie a guaranteed bonus for sources of electricity like nuclear and renewables that do not emit carbon dioxide) and contracts-for-difference (in effect a guaranteed long-term power price) to promote investment in renewables and nuclear.

On the other hand, however, if these measures work and more variable renewables are brought online, then as noted earlier the economic case for investing in new CCGT or other dispatchable technology is weakened, since these plants would be left without an income during those times when the wind was blowing at the right speed. (This is even more the case with more heavily capital intensive sources such as coal with CCS or nuclear, as their economics are more seriously harmed by being taken off line.[77]) But eventually we have to have new CCGTs (or other flexible dispatchable capacity) to provide power when the wind drops, or the lights go out. So the government is having to introduce other measures, notably capacity payments (paying companies to keep power capacity available even if it is not being used), to compensate CCGT for the effects of the measures it introduced to deter CCGT in the first place. The vast costs incurred by this need to manage the inherent intermittency of renewables are not at present taken into account when calculating the true costs of renewables and the full subsidies they receive. German energy and environment minister Peter Altmaier has estimated the cost of Germany's transition to renewables at up to €1 trillion. Feed-in tariffs account for more than half of the total, underpinned by a regime under which customers are forced to take all the renewable electricity being generated at any particular moment. This "must-take" regime represents a major subsidy to renewables alongside the upfront subsidies but is rarely described as such. Improvements to the German grid will cost an estimated €27.5 billion and €42.5 billion.[78] Over 8,000 km of new or upgraded transmission lines (with associated environmental impact) will be required and grid operators have said, "The investments required for expanding the transmission network only represent a fraction of the energy switchover's cost, but they are essential for its successful implementation".[79]

The point is emphasised by a table from the UK government's National Policy Statement on Energy (July 2011).[80] Already the UK is running a significant capacity margin (over 40%) because an increasing amount of that capacity is variable and cannot be relied upon to fulfil peak demand. The projected need for generating capacity in 2025 is no less than 113 GW, to cover peak demand unlikely to be more than about 65 GW in that year, even with good economic recovery. That would seem to represent a capacity margin of over 70%, vast by historical standards. It would be necessary purely to cope with the variability of the 33+ GW of new renewable capacity. Whether the cost of building and maintaining such enormous redundancy is borne by the renewables or, by distorting the market, is apportioned to other players (through "must take" contracts for renewable output), it is ultimately going to land on the backs of consumers (and/or the taxpayer).

Total current generating capacity	85 GW
Peak electricity demand now & 2020	60 GW
Average demand	43 GW
Closure of coal plants by 2015 owing to the Large Combustion Plant Directive	12 GW
Nuclear closures over next 20 years	10 GW
Generating capacity required in 2025	113 GW
Of which new build	59 GW
Of which renewable	33 GW
For industry to determine	26 GW
Non-nuclear already under construction	8 GW
Current proposals for new reactors	16 GW

So when it comes to looking at the costs of various sources of electricity, it is highly misleading simply to consider the cost of installing the wind generator or solar panel divided by the number of units of electricity it produces. Some sources of electricity, notably the variable renewables, impose huge costs on the system as a whole.

[77] http://www.oecd-nea.org/ndd/reports/2011/load-following-npp.pdf, OECD/NEA (2011), *Technical and economic aspects of load following with nuclear power plants.*

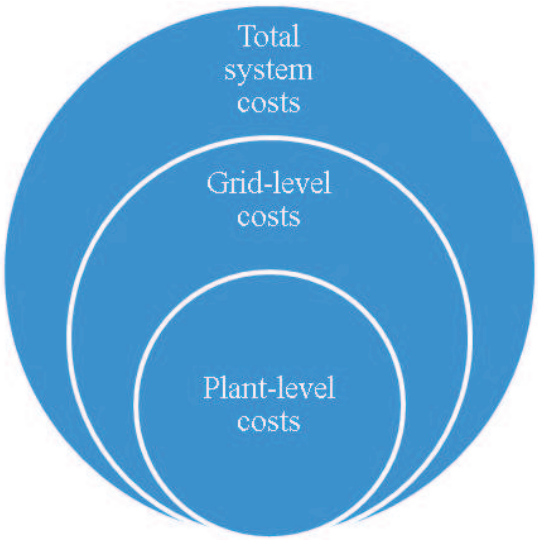
[78] http://www.faz.net/aktuell/wirtschaft/wirtschaftspolitik/energiepolitik/umweltminister-altmaier-energiewende-koennte-bis-zu-einer-billion-euro-kosten-12086525.html, *Frankfurter Allgemeine* (2013), "Umweltminister Altmaier, Energiewende könnte bis zu einer Billion Euro kosten", February 19 2013.

[79] http://bigstory.ap.org/content/grid-operators-say-germany-must-invest-25-billion, "Grid operators say Germany must invest $25 billion", *The Big Story*, 30 May 2012.

[80] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf, DECC (2011), *Overarching National Policy Statement on Energy* (EN-1).

Grid-Level System Costs

The issue is considered in depth in an OECD/NEA study published in November 2012.[81] The report looks at the way various methods of generating electricity interact with each other. Such external costs of particular sources, or "system costs", are defined as the total costs above plant level costs to supply electricity at a given load and given level of security of supply. They can take the form of intermittency, network congestion, greater instability (ie higher risk of interruption to supply) etc. The focus of the report is on system costs associated with nuclear power and renewables such as wind and solar photovoltaics. In particular, the report considers "grid-level system costs", a subset of overall system costs that consists of the costs of network connection, extension and reinforcement, short-term balancing and long-term adequacy in order to ensure continuous matching of supply and demand under all circumstances.



The report considers the complex issues arising from the integration of significant amounts of variable renewables, which profoundly affect the structure, financing and operation of electricity systems, thereby having economic and financial implications well above the "plant level" costs of these sources. It includes the first quantitative study of grid-level system costs in six countries (Finland, France, Germany, South Korea, UK and USA).

The most important effects of a large variable renewable component in a particular electricity system may be:

- lower and more volatile electricity prices in wholesale markets due to the influx of variable renewables with very low marginal costs (including zero fuel costs), leading to the closure or mothballing of existing plant need to maintain secure supplies;
- the reduction of load factors of dispatchable power generators (the "compression effect") as renewables with very marginal cost are given priority over dispatchable supply;
- the introduction of inefficiencies in existing plants coupled with an influx of renewables, implying an increasing gap between the costs of producing electricity and prices on electricity wholesale markets; and
- greater physical wear and tear to thermal power plants owing to the greater stress on (especially) metal components—as the metal expands and contracts alongside unnecessary increases and decreases in output and hence core operating temperature it is more likely to crack—thereby shortening the life and/or increasing the maintenance costs of these plants.

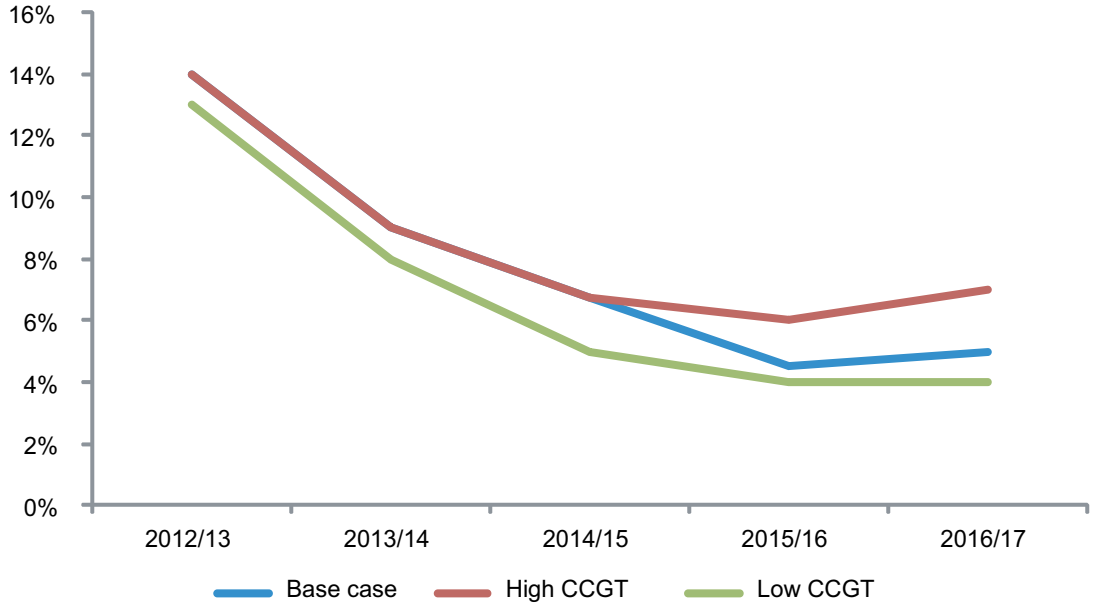
The financial implications of variable renewables are therefore potentially profound in both the short term and the long term.

In the short term, the dispatchable power technologies will suffer owing to the compression effect. The effect on nuclear may be less than on other dispatchable technologies, as nuclear has low variable costs. It is therefore likely to continue to run when large amounts of renewable electricity are available (eg because the wind is blowing at or near optimum speeds) as there is little economic advantage in taking them offline (while taking CCGT offline saves significant amounts of gas). As noted earlier, gas plants are already experiencing substantial declines in profitability in many countries with high shares of variable renewables.

[81] http://www.oecd-nea.org/ndd/reports/2012/system-effects-exec-sum.pdf, OECD/NEA (2012), *Nuclear energy and renewables: system effects in low-carbon electricity systems.*

The threat to security of supply represented by the encroachment of renewables into the market of dispatchable generators are amply demonstrated by recent developments in the UK. Some 4.5 GW of coal-fired capacity at Didcot, Kingsnorth and Cockenzie, and over 2 GW of oil-fired capacity at Fawley and Grain, was closed earlier than expected in 2012–13.[82] At the same time capacity margins are projected to fall dramatically in the near future, perhaps as low as 4% by 2015–16, well below the 20% generally regarded as being necessary to ensure secure power supplies.[83]

PROJECTED UK CAPACITY MARGINS 2012–17



The inescapable conclusion would seem to be that "energy-only" electricity markets will need to be supplemented with "capacity markets" (or markets with capacity obligations) if dispatchable technologies are to remain in the market to provide back-up for when the wind is not blowing at the right speeds.

In the long term, however, nuclear power is likely to be more seriously affected than gas or coal, owing to the higher capital investment costs and hence higher risks in volatile low-price environments.

Some of these effects are already being noticed. Nuclear power in Germany has in recent years moved away from the traditional and efficient role of operating at stable levels close to full capacity, as the introduction of large amounts of variable renewables has repeatedly led to prices below the marginal costs of nuclear, including several instances of negative prices. (Electricity becomes a good of negative value if so much is being generated that costly measures must be taken to prevent overloading the wire system—good news for customers in the short term but disastrous if it results in dispatchable plant being mothballed or not replaced.)

For different reasons (ie that there are times when the available nuclear output is greater than total demand) nuclear power also follows load in France to a considerable extent. Both the French and German experience shows that this can be done technically. Studies suggest that the short-term technological load-following capabilities of nuclear are comparable to coal-fired generation but not as good as CCGT and well behind open cycle gas turbines (OCGT).[84] (The overall economics of the last mean that it tends only to be used at times of very high demand.)

The study attempts to quantify the grid-level system costs of various electricity sources in the six countries named earlier. There is quite a degree of variation among these countries, reflecting such factors as the siting of plants with respect to demand, the overall mix, the quality eg of wind cover and the levels of security of supply demanded. Taking the UK as an example, the calculated grid-level system costs of various sources of electricity are as follows. (The figures are cited for a case where the technology in question provides 10% of total electricity and 30% of total electricity and are in US$ per MWh.)

[82] http://www.argusmedia.com/pages/NewsBody.aspx?id=841211&menu=yes, *Argus Media* (2013), "Coal-fired plant closures to increase UK gas burn".

[83] http://www.ofgem.gov.uk/Media/PressRel/Documents1/20121005_Capacity_press_release.pdf, Ofgem (2012), "Projected tightening of electricity supplies reinforces the need for energy reforms to encourage investment".

[84] http://www.templar.co.uk/downloads/0203_Pouret_Nuttall.pdf, Pouret L., Buttery N. and Nuttall W J (2009), "Is nuclear power inflexible?", *Nuclear Future* Vol. 5.

Technology	*Nuclear*		*Coal*		*Gas*		*Offshore wind*		*Onshore wind*		*Solar*	
Penetration level	10%	30%	10%	30%	10%	30%	10%	30%	10%	30%	10%	30%
Total grid-level system costs	3.10	2.76	1.34	1.34	0.56	0.56	34.0	45.4	18.6	30.2	57.9	71.7

This implies that introducing variable renewables up to 10% of the total electricity supply will increase per MWh costs, depending on the country, by between 5% and 50%, whereas if the penetration level is 30% this may increase per MWh costs by between 16% and 180% (the last figure referring to solar PV in Finland).

The study also looks at the effect on the profitability of dispatchable technology (and therefore the effect on the incentives for companies to invest in new plant) of having wind and solar at penetration levels of 10% or 30%. (Profitability of these plants is affected both by being taken off line, so losing direct income, and by the very low market price of electricity at times when significant amounts of renewables are available.) The results are striking.

Penetration level		*10%*		*30%*	
Technology		*Wind*	*Solar*	*Wind*	*Solar*
Load losses	CCGT	-34%	-26%	-71%	-43%
	Coal	-27%	-28%	-62%	-44%
	Nuclear	-4%	-5%	-20%	-23%
Profitability losses	CCGT	-42%	-31%	-79%	-46%
	Coal	-35%	-30%	-69%	-46%
	Nuclear	-24%	-23%	-55%	-39%
Electricity price variation		-14%	-13%	-33%	-23%

However the system is organised, these costs will need to be met. An economically rational system would place these costs on the renewable technologies themselves, by mandating variable renewables to compete in the market on equal grounds to dispatchable technologies. As noted earlier, in reality renewables are generally shielded by transferring the costs onto the system as a whole, eg through "must-take" contracts that mandate distributors to buy renewable electricity whenever it is available, whatever costs might be incurred on other generators as a result. These market arrangements are just as important, if not more so, as the direct subsidies which have been offered to renewable investors through Renewable Obligation Certificates.

"Smart grids", which can for example switch fridges or heating systems off for one or two hours when supply drops, may help to mitigate some of these issues to some extent. However, it is difficult to see how a similar approach could revolutionise practice in industry, where cutting power supply would potentially leave a workforce idle. There seem then to be three broad solutions to this challenge.

— Capacity payments or markets with capacity obligations, in which variable producers need to buy "adequacy services" from dispatchable providers, which would thus earn additional revenues.

— Long-term, fixed-price contract subscribed by governments for guaranteed portions of the output of dispatchable plants whether in the form of contracts for differences or feed-in tariffs.

— The gradual phase-out of subsidies to variable renewables, the discontinuation of grid priority and a more direct allocation of additional grid costs to the sources which cause them—this would slow down deployment of renewables (hence reduce costs very considerably) but would also force the internalisation of grid and balancing costs.

The Hidden Greenhouse Gas Emissions of Renewables

Clearly, the need in effect to double the amount of capacity—generating and transmission—to ensure secure supplies in a system with heavy use of variable renewables will result in much higher greenhouse gas emissions (and other resource and environmental impacts) simply from constructing the infrastructure itself. However, the greenhouse gas implications of variable renewables go further. The back-up spinning capacity required to cope with the variability of renewables emits significant amounts of carbon. The inefficiency introduced in fossil generators by having to vary their output to compensate for changes in the output of variable renewables means more emissions of carbon dioxide per unit of electricity generated in these plants. System emissions will therefore be higher than one would believe by simply assuming that when renewables are generating they replace an equivalent amount of carbon-producing capacity. In some cases, at least where coal is the main source of generation, the thermal inefficiency losses outweigh the displacement advantages, resulting in higher emissions than if the wind farms were simply shut down.[85] At present these carbon emissions are allocated not to the renewables whose presence causes them but to the back-up capacity itself. This again presents a skewed picture of the true implications of the various sources of electricity.

[85] http://docs.wind-watch.org/BENTEK-How-Less-Became-More.pdf, Bentek (2010), *How less became more—wind, power and unintended consequences in the Colorado energy market.*

Conclusions—A More Rational Approach

The NEA report makes four recommendations.

1. Increasing the transparency of power generation market costs at the system level, so it is clear to decision-makers the full economic costs of variable renewables.
2. Preparation of regulatory frameworks that minimise system costs and favour their internalisation—ie the costs fall where they are incurred. Four points need to be addressed here:
   - — the decrease in revenues for operators of dispatchable capacity owing to the compression effect;
   - — the need to internalise the system costs for balancing and maintain supply adequacy effectively;
   - — allocation of costs to the appropriate technology, insofar as it is possible; and
   - — the need for careful monitoring and internalisation of the carbon implications of the requirement for back-up, through a carbon tax again imposed on the causes of the emissions, not necessarily simply the plants that are producing them.
3. Better recognition of the value of dispatchable low-carbon technologies in complementing the introduction of variable renewables.
4. Development of flexibility resources for future low-carbon systems, eg working on increasing the extent to which nuclear plants can follow load, greater storage capacity and increasing international interconnection (a greater challenge for islands like the UK or Japan than it is for a continental nation like Germany or Switzerland).

Whether or not these recommendations are followed, it is vital that the full costs of use of various sources of electricity are taken into account when planning a system that needs to balance costs alongside system security and environmental implications if the best policies are to be followed. The claim that some variable renewable sources are close to "grid parity"—ie are becoming economically competitive with other sources of electricity—tend to be made on the basis that renewables are shielded from their economic and environmental implications. It is of course still a perfectly defensible stance for government to take to argue that certain non-financial advantages of renewables (whatever such advantages might be) merit a very steep increase in power bills or a doubling of the national debt (alongside the much greater land or water area required). But such statements must be made against a realistic assessment of what those costs are and what are the associated reductions, if any, in greenhouse gas emissions from the system as a whole rather than the wind turbine or solar panel taken in isolation. Otherwise we may find consumers paying vastly inflated bills on the basis of promises which cannot be delivered on technically.

30 May 2013

Written evidence submitted by Energy UK

1. Energy UK is the trade association for the energy industry. Energy UK has over 80 companies as members that together cover the broad range of energy providers and suppliers and include companies of all sizes working in all forms of gas and electricity supply and energy networks. Energy UK members generate more than 90% of UK electricity, provide light and heat to some 26 million homes and invested £10 billion in the British economy in 2011.

Summary

2. We welcome the work of the Environmental Audit Committee (EAC) to provide an overview of energy subsidies in the UK. We believe it is important to increase transparency on energy subsidies.

3. Both the benefits and the costs of subsidies should be considered. In the current UK context, it is important to remember that subsidies are designed to help achieve the transition to a low-carbon, secure and affordable energy mix. Subsidies are needed when the market alone cannot deliver the outcomes government is aiming for.

4. Subsidies can be paid for through general taxation or through levies on energy suppliers. In the latter case, an obligation is often placed on energy companies, who bear the costs and are responsible for delivering the objectives.

5. We believe subsidies should be addressed transparently, objectively—by comparing cost and benefits, consistently—by looking at tax in parallel to looking at subsidies—and should be designed as cost-effectively as possible.

6. We are engaging with the Government in order to achieve this objective.

7. Oxford Energy Associates report provides a useful contribution to the debate, but does not provide a full picture of the subsidies in the energy market (eg Energy Companies Obligation, Renewable Heat Incentive).

Comments on the Written Evidence Submitted by Oxford Energy Associates

8. We welcome the report by Oxford Energy Associates. It helps clarify certain issues in the debate about energy subsidies.

- 8.1 Only under perfect market assumptions are subsidies always a source of economic inefficiency. When perfect market assumptions do not hold, subsidies can be justified or even necessary to contribute to economic efficiency. This is particularly true in the case of asymmetric information or externalities—which, arguably, are both present in the energy sector.
- 8.2 There is no clear definition of what a subsidy exactly is and how to measure subsidies. The report identifies at least five definitions of what subsidies are and as many methodologies to identify them.
- 8.3 The effort to identify the extent of energy subsidies in the UK is helpful. As an industry that often has to support the cost of subsidies, we would welcome more transparency on the costs and benefits of subsidies.

9. However, there are limitations to the report that we would like to highlight:

- 9.1 We feel some elements should not be counted as subsidies. This is the case for the budget of the Nuclear Decommissioning Authority (NDA) which is in charge of the decommissioning and cleaning up of the civil nuclear facilities previously under the control of British Nuclear Fuels Limited (BNFL) and the United Kingdom Atomic Energy Authority (UKAEA). Liabilities remaining from the early research and nuclear power development programmes are, and always have been, public liabilities. The costs of dealing with them are therefore the Government's responsibility and not a subsidy.
- 9.2 The statement regarding the financial intervention by the Government in British Energy and the resulting waste liabilities is inaccurate. The Government provided a credit facility of up to £650 million but not all of this was used, and was paid back with interest by British Energy during its restructuring.
- 9.3 Some policies which meet the criteria used by the report to assess subsidies have been left out of the report summary table. These include the Winter Fuel Payment and the Cold Weather Payment and the Energy Companies Obligation (ECO), smart-meter roll-out and Renewable Heat Incentive. These should be taken into account in order to get a full picture of subsidies on the energy market from the beginning to the end of the value chain.

Our View on Energy Subsidies

Developing a more balanced view on subsidies

10. Subsidies can provide benefits. Energy subsidies in the UK support government's social, low carbon and security of supply objectives.

11. Under the current policy framework, about half of the total direct subsidies are targeted to support low-carbon generation. About a third of direct subsidies are designed to deliver energy efficiency improvements, the rest going to innovation and affordability.

12. The majority of direct subsidies are funded by levies on the industry—which means that they add on to the costs and eventually get passed through the bill. We feel this is an important point as it makes clear that in many cases, the industry has become the delivery body of subsidies.

Principles for designing subsidies that work

13. Subsidies should be designed to meet objectives in the most cost-effective way.

14. We believe there should be a transparent approach to subsidies. There should be a clear assessment of their costs as well as their benefits. It should be clear who benefits from subsidies and who pays for it.

15. We endorse the phasing out of subsidies for commercialised/mature technologies in the longer term. However, support mechanisms continue to have an important role as we transition to mature low-carbon technologies being fully competitive in the electricity market. It is also important that the principle of grandfathering for existing support mechanisms is maintained.

16. We are engaging with policy makers in order to support a more rigorous approach to subsidies.

- 16.1 We have regularly taken positions aiming at improving the cost-effectiveness of subsidies. For example, we have said that the design of consumer support subsidies including the 5% VAT rate and other cash transfers such as Winter Fuel Payment and Cold Weather Payment could be improved.
- 16.2 We have published reports analysing the cost of subsidies, such as ECO, where our estimates diverged from the Government's and which we believe warrant further consideration. As the Green Deal and ECO delivery goes along and actual data becomes available, we would welcome a review of the actual costs compared to the estimates by an independent body.

16.3 We are constantly engaging with the Government on the detailed design of its policy mechanisms, and will continue to do so in order to achieve a clear consensus on the estimated cost of its policies.

17 July 2013

Written evidence submitted by United Kingdom Without Incineration Network

1. Introduction

1.1 United Kingdom Without Incineration Network (UKWIN) was founded in March 2007 to support local groups in opposing waste incineration plans, promote sustainable waste management and inform environmental decision making. UKWIN currently has more than 100 member groups.

1.2 UKWIN welcomes this opportunity contribute evidence to the inquiry by the Environmental Audit Select Committee.

1.3 We note that the evidence so far put before the Committee focuses extensively on the efficiency of subsidies and that the scope of the Committee's examination will include:

(iv) whether the Government has any plans or targets to reduce or eliminate "harmful" subsidies; and

(v) progress in reducing such harmful subsidies, and how current energy policies and DECC's "Energy Pathways" for the mix of energy sources will influence the magnitude of any subsidies.

We focus our evidence on the aspect of harmful subsidies.

2. Summary

— In our response to the call for evidence by the House of Commons Environmental Audit Committee, we recognise the inherent need for Government to use financial instruments including subsidies in order to manage the development of the UK's electricity generation mix for economic, social and environmental ends.

— The evidence that we wish to put before the Committee relates to the subsidy of generating sources that are themselves inherently energy inefficient and both directly and indirectly harmful to the environment.

— Our evidence focuses on electricity generation from waste (ie via waste incineration) particularly via ACT (Advanced Conversion Technology) and the subsidies appertaining but the underlying issue is that of the ineffective use of non renewable resources when the Government is committed to a low carbon future.

— Waste incineration consumes not only renewable resources that are best dealt with by composting or anaerobic digestion, but also non renewable resources that should be recycled in line with the Waste Hierarchy. See appendix A1 and A2.

— Incineration produces large volumes of carbon dioxide and some toxic pollutants. Please see Appendix A5.

3. Waste Incineration

Waste incineration plants recover energy in the form of heat, a small proportion of which is converted to electricity. Most of the remaining heat is available for purposes such as community heating schemes but in almost every instance in the UK is dissipated into the atmosphere due to the absence of customers for it often in circumstances where the facilities are poorly located relative to potential heat users.

As a result the energy efficiency of these plants as measured by energy in the form of Energy passed to the National Grid ÷ Energy recovered from waste is extremely low, frequently of the order of 20% or less. Please see Appendix A3, A4 and A5.

This low efficiency level compares poorly with that achieved by fossil based generation sources and arises inevitably (and in line with the laws of thermodynamics) as the result of the relatively low level technology employed. A consequence is that in terms of CO_2/KWh (the emissions factor), these plants (with an expected 25 year life span) will actually, in future years, achieve a performance inferior to that set by DECC as the marginal emissions factor and some are already in this situation. In other words, they are, or will be, operating in opposition to the Governments carbon reduction strategies.

UKWIN believes that the technology involved is not such as to be worthy of subsidy, nor will it become so and that the biogenic element of the electricity produced (ie that deemed to derive from the renewable proportion within the waste) should not qualify for Renewable Obligation Certificates (ROCs).

4. Renewable Obligation Certificates (ROCs).

In fact, and as an outcome of the Government's consultation on proposals for the levels of banded support under the Renewables Obligation for the period 2013–17 and the Renewables Obligation Order 2012, the Government decided that:

> "In the light of the consultation responses, and additional evidence provided on costs and deployment potential, the Government has decided to introduce a single band for new ACT generating capacity. Support under the ACT band will be two ROCs/MWh for new accreditations and additional capacity added in 2013–14 and 2014–15, reducing to 1.9 ROCs/MWh for new accreditations and additional capacity added in 2015–16 and 1.8 ROCs/MWh for new accreditations and additional capacity added in 2016–17".

UKWIN argues that this decision was perverse and created a **harmful subsidy**, harmful because:

- It encourages the waste of resources and is harmful to the environment, the economy and local communities (please see Appendix A1).
- It is contrary to the principles of the Waste Hierarchy and the carbon reduction principles on which it is based.
- It fails to take account of the externalities associated with waste incineration.
- It is damaging to the Government's policy of increasing recycling and reuse as expressed in the 2011 Review of Waste Policy and elsewhere.
- It encourages, contrary to the Government's expressed policies on carbon, waste recycling and reuse, the overprovision of waste incineration capacity as forecast by Eunomia in its report "Residual Waste Infrastructure Review, Issue 4, May 2013". The forecast level of overprovision (please refer to Appendix A6 of this submission) would have a disastrous effect on recycling, recovery and progress in carbon reduction and/or saddle Local Authorities in particular and the nation as a whole with glut of poorly performing electricity generation capacity unable to meet the relevant carbon dioxide emissions factors.
- It is contrary to the Governments expressed policies for developing low carbon sources of electricity.

5. Other Subsidies

UKWIN has focussed this evidence on what we believe to be a particularly perverse decision relevant to ROCs on behalf of Government but we are equally opposed to the subsidy of waste incineration via the Renewable Heat Incentive, Feed in Tariffs, rate relief or Contract for Difference.

APPENDIX A

SUPPORTING EVIDENCE

1. Proposal for a New EU Environment Action Programme to 2020 (2013)

Impact Assessment accompanying the proposal for a new general Union Environment Action Programme to 2020, Annex 6: The underlying analysis of priority objectives

Concerning the application of market-based instruments aiming at creating the economic conditions to support the waste hierarchy, the main challenges are related to: In some MS [Member States], presence of harmful subsidies (eg to support incineration)…

2. Applying the Waste Hierarchy: Evidence Summary DEFRA 2011 and Guidance on Applying the Waste Hierarchy DEFRA 2011

Note particularly the chart on page 6 of the Guidance.

3. Incineration of Municipal Solid Waste, DEFRA 2007

A modern incinerator producing only electricity from the steam may therefore achieve a maximum electrical generating efficiency of 27%, with a typical efficiency range being from 14% to 24%.

Advanced Thermal Treatment of Municipal Solid Waste (DEFRA February 2013) endorses the above statement.

4. DEFRA: Incineration of Municipal Solid Waste February 2013

Table 1: Incineration Technologies

An Incinerator producing exclusively heat can have a thermal generating efficiency of around 80–90%. This heat may be used to raise steam for electrical generation at approximately 17–30% gross efficiency. Net electrical efficiencies (taking account of the parasitic load of the plant) are often cited up to ~27% for Incinerators recovering electricity only, although some facilities have reported exceeding this. The choice of a

steam turbine generator set to produce electricity (alone) will limit the upper efficiency based on acceptable boiler temperatures.

In contrast, the efficiency of an Incinerator for power generation is lower than a large coal or gas fired power station. Typically, a coal fired power station will have an efficiency of 33%–38% and a combined cycle gas turbine (CCGT) power station can have an electrical efficiency in excess of 50%.

5. Planning Applications for Waste Incinerators

DEFRA's statement is consistent with the information supplied in planning supporting statements by applicants for planning consent for waste incinerators. For example an incinerator with a planned annual throughput of 140,000 tonnes of waste, currently the subject of the planning processes (and described as Advanced Conversion Technology) will, of the potentially recoverable energy in the waste feedstock, and based on the applicants performance data, actually deliver only some 18.3% as electricity to the National Grid.

Resource Recovery Solutions (Derbyshire) Ltd: Planning Application Supporting Statement:

> Development of Waste Treatment Facility, comprising Reception and Recycling Hall;
> Mechanical Biological Treatment (MBT) Facility; Advanced Conversion Technology (ACT) Facility; Power Generation and Export Facility;
> Education and Office Accommodation; Landscaping and, Access. Sinfin Lane, Derby).

In the process, some 172,000 tonnes of carbon dioxide are to be emitted annually. (Environment Agency: Permit EA/EPR/WP3133KP: Decision document recording the decision making process.)

Of this some 59,000 tonnes derives from fossil elements in the waste and can be compared to the c.77,000 MWh which the plant will deliver to the Grid. The specific emission factor will therefore be around 0.77tonnes CO_2/MWh or more than twice DECC's currently published marginal emissions factor of 0.3356 tonnes CO_2/MWh.

6. Eunomia: Residual Waste Infrastructure Review, Issue 4, May 2013

(Section 1.2 Summary of Current Position for the UK)

- Based on our estimates of residual waste arisings in 2012–13 there is a "capacity gap" of around 9.3 million tonnes (per annum) between the quantity of residual waste and the amount of treatment infrastructure capacity currently either "operating" or "under construction";
- Without any change in residual waste quantities, however, there would be overcapacity of 12.0 million tonnes (per annum) if the 21.3 million tonnes of waste treatment capacity that has planning consent reaches financial close and subsequent operation;

9 September 2013

The Stationery Office Limited
12/2013 032496 19585