Waters Wye Associates

The Cumulative Impact of Climate Change Policies on UK Energy Intensive Industries – Update Against New Government Policy

A summary report for
The Energy Intensive Users Group
Prepared by Waters Wye Associates

March 2011

Executive Summary

In July 2010 Waters Wye Associates (WWA) undertook an assessment of the costs of climate change policies for a variety of energy intensive companies, for the Energy Intensive Users Group (EIUG) and the Trades Unions Council[1] (TUC). The Government's recent announcements on electricity and climate change policies have resulted in proposals that will add new costs to the energy bills of the energy intensive businesses, as well as other customers. EIUG has asked WWA to update the analysis that was undertaken last year in light of the changes in policy.

WWA have updated our simple model of customers' tax exposure based on the analysis done by Redpoint[2] for DECC. WWA is grateful for the time Redpoint gave us in helping to understand how their modelling works.

The report again highlights that the cumulative impact of all climate change policies is significant; especially on energy intensive sectors (see Graph 1). The previous report illustrated that if the Government continues to simply add one energy or carbon reduction levy after another on to the energy intensive sectors then the risk is that these industries will no longer be able to compete internationally and will simply cease to operate in the UK. WWA can see nothing in the revised energy policies that seeks to address this impact.

The updated analysis is based on the concept of a "representative" energy intensive company using a stable level of gas and electricity demand and adding the projected tax increases to the bills. Based on the company data provided for the original report, this approach was adopted within the original report to prevent difficulties over confidentiality.

The representative customer was defined as follows:

- Electricity consumption was set at 100,000 MWh a year
- Baseline electricity price was £70/MWh, with transmission, balancing and distribution costing £9/MWh
- Gas consumption was set at 20,000,000 therms a year
- Baseline gas price was 50p/therm, with transportation costing 5p/therm
  Purchased emissions in 2013 was set at 100,000 tonnes
  The customer was subject to a Climate Change Agreement, which we assumed to remain as a 65% discount from 2011

The impacts on any individual customer will depend on their specific energy use, own generation and EU ETS allocation. For the purposes of illustration, we have assumed that in 2010, energy costs represented 25% of the operating costs of the representative customer. We have assumed that the company has revenues of £100m, with earnings of around 10% - £10m in this case. For our representative customer, this shows energy costs representing around twice the margin of the

[1] The Cumulative Impact of Climate Change Policies on UK Energy Intensive Industries – Are Policies Effectively Focussed? A summary report for The Energy Intensive Users Group and the Trades Union Congress by Waters Wye Associates
[2] Electricity Market Reform analysis of policy options, Redpoint, December 2010

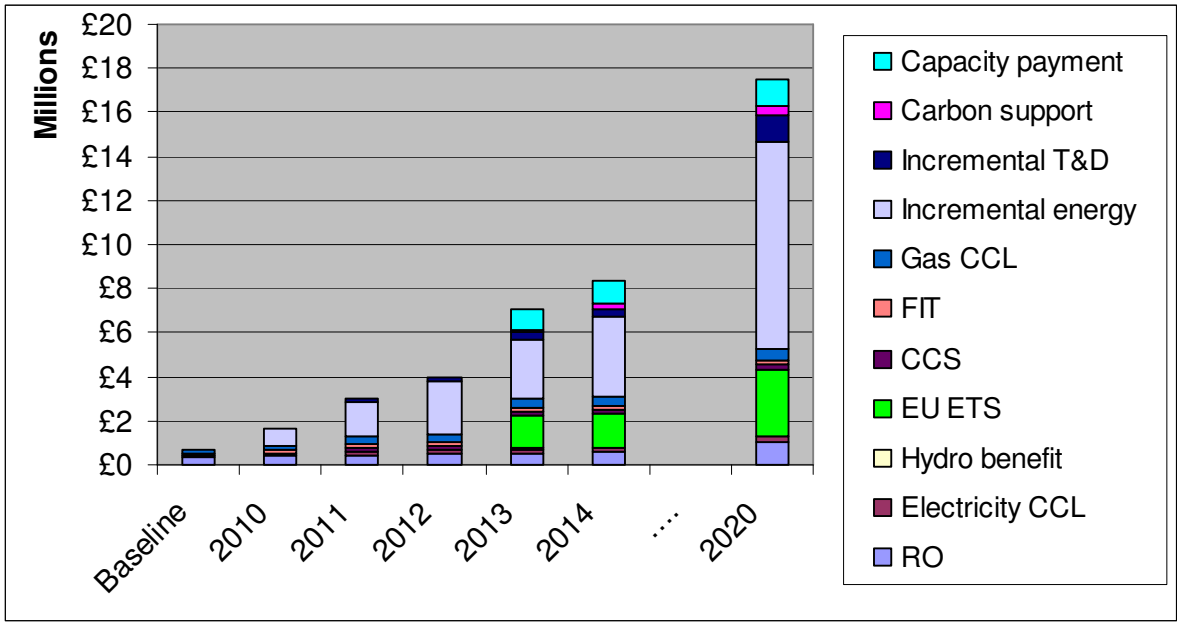
company. From an analysis of the returns of the energy intensive customers who participated in this study, WWA considers that this is plausible.

The costs from the new policy proposals will be passed through from generators in an opaque manner. This makes it much more difficult for energy intensive industry to quantify and harder to provide relief from, should Government be so minded to rebalance the burden faced by industry.

The new policies are focussed solely on the electricity market, but the Government has also announced the Renewable Heat Incentive (RHI) will no longer be financed via a levy on gas bills. WWA has therefore updated both the levies on electricity bills and the reduction in forecast gas costs. As with the original report, the analysis only goes out to 2020 as the EIUG members told us that this is the timeframe that will affect their immediate business investments. The tax burden was of such a magnitude by 2020 that there was little point looking any further ahead than this.

Graph 1 summarises the cumulative tax burden, without the cost of delivered energy, from the levies/taxes identified as relating to climate change policy in the UK. The increase in EU ETS costs is driven by an assumed increase in the price of EU emissions allowances between 2013 and 2020, but the majority of the tax burden is directly from UK Government designed policies. The summary of the assumptions used is outlined in Section 4.

Graph 1: Cumulative impact of climate change policies on an energy intensive user's costs



Source: Waters Wye Associates

The report itself has used assumptions that WWA consider to be relatively conservative, but the impacts still remain significant and it is easy for Government to model a wider range of scenarios to assess the impacts for themselves.

The tax burden on these sectors remains likely to result in two outcomes:

- Some sectors are already proving unable to reinvest in their infrastructure due to the increased energy tax burden in the UK and are consequently "withering on the vine" through an inability to produce cutting edge products or compete with foreign producers.
- No new plant will be built that can supply the materials required for a low carbon economy, such as steel and ceramics for wind farms, cells for photovoltaics, chemicals for building insulation to name but a few. The UK will also lose sectors such as paper and glass, along with the jobs and value they provide.

Many UK businesses if faced with a tax bill rising from £1m to £7m would simply go out of business. Even if they could stay in business, they may no longer have the profitability that encourages investment. They would certainly have to try and put up their prices. The energy intensive sectors are simply hit harder by these climate change taxes as they cannot pass the costs through, their owners are likely to abandon UK plant as they are often multi-national business, and job losses will result. The lack of analysis of the impacts of these taxes on this sector of the economy is extremely surprising.

The energy intensive sectors operate in a global market but not on a level playing field. International competitors are generally not exposed to these tax burdens, either because they are insulated from the impact of the enabling regulation or, outside the EU, the regulation does not apply. As a consequence of historically high energy prices and the active role that has been taken by UK government in this area, emissions from UK industry are generally materially lower than those of their international competitors.

The outcome of implementing policies as they are currently conceived will, therefore, be poor both economically and environmentally. Global greenhouse gas emissions may well increase as well as hitting both investment and jobs. Moving manufacturing offshore removes the processes emissions from the UK's emissions inventory, but it may not reduce global emissions and the UK simply imports the products it used to make.

This report has used assumptions that WWA consider to be relatively conservative, but the impacts still remain significant. WWA recognise that there are different underlying assumptions that others may make, the point however is simply to highlight the scale of the tax burden whichever forecasting assumptions are made.

Contents

Introduction

In July 2010 Waters Wye Associates (WWA) undertook an assessment of the costs of climate change policies for a variety of energy intensive companies, for the Energy Intensive Users Group (EIUG) and the Trades Unions Congress[3] (TUC). The Government's recent announcements on electricity[4] and climate change[5] policies have resulted in proposals that will add new costs to the energy intensive businesses, as well as other customers. This initial analysis suggested that the policy costs were likely to put a number of the businesses out of business. EIUG asked WWA to update the analysis that was undertaken last year in light of the changes in policy.

The purpose of the original report was to open an evidence-based and informed discussion on the effects of climate change policies on the UK's energy intensive sectors, such as paper, steelmaking, chemicals and ceramics. However, recent Government documents have still not explicitly looked at policy impacts on this sector of the economy. Instead the focus remains on the impact on domestic energy bills and smaller business bills. Such an approach totally avoids the impact on energy intensive customers. As noted in the original report, a 50% increase in energy bills for a supermarket – while significant – might represent a small increase in overall costs. For an energy intensive user, such an increase could easily represent a 25% increase in total costs.

The Government policies are highly interlinked, but are designed around a desire to reach a low carbon generation market in a relatively short period of time. WWA's update makes relatively simple assumptions about the policy impacts, drawing on the Government's consultation documents and the associated modelling work undertaken by Redpoint Energy.

This report updates the original analysis in light of the change in policy direction in relation to both the GB gas and power markets.

[3] The Cumulative Impact of Climate Change Policies on UK Energy Intensive Industries – Are Policies Effectively Focussed? A summary report for The Energy Intensive Users Group and the Trades Union Congress by Waters Wye Associates
[4] Electricity Market Reform – DECC December 2010
http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx
[5] Carbon Price Support – HMT December 2010
http://www.hm-treasury.gov.uk/consult_carbon_price_support.htm

1. What are the old and new policies?

1.1 Previously modelled policies

The policies WWA originally classed as being "climate change policies" were:

- the Renewables Obligation (RO);
- the Climate Change Levy (CCL);
- the Assistance for Areas with High Electricity Distribution Costs (formerly known as "Hydro Benefit")
- the EU emissions trading scheme (EU ETS);
- the Renewable Heat Incentive (RHI);
- the Carbon Capture and Storage (CCS) levy;
- the Carbon Reduction Commitment (CRC); and
- the feed in tariff (FIT).

A full explanation of these policies and the assumptions that WWA made in relation to their impact on bills is available in the original report. The only material change has been the announcement that the RHI will no longer be funded via a levy on gas bills, but from general taxation (see Annex B).

1.2 New Policy Proposals

There are now 4 new policies to consider:

- The RO being replaced by feed-in-tariffs (FITs) for all renewables[6]
- Emissions Performance Standards (EPS) for fossil fuel generators
- Capacity Payments
- Floor price for carbon

These policies are described in more detail in Annex 1. The important factor for EIUG members is that two of the policies, capacity payments and a carbon floor price, will directly add to customers' bills in addition to the policies previously examined, by 2020.

It can be seen, and the Government argues this, that the overall framework creates an energy market that is more favourable to renewable generation and nuclear power which are relatively more expensive than the coal and gas plant that make up the majority of the generation capacity today. This suggests that not only will the policies impact the wholesale prices, but that the underlying price curve will also increase.

The Government's documents suggest that in the long term, say 2030, the electricity prices in the new lower carbon world will be below the current forecast prices. Even if this were the case, there is little prospect of energy intensive industry being able to produce internationally competitive products while they wait for lower prices to appear in 20 years time.

[6] Note that this FIT scheme is not the same as the FIT that applies to small embedded plant that took effect from April 2010.

2. Policy Costs for an Energy Intensive Company

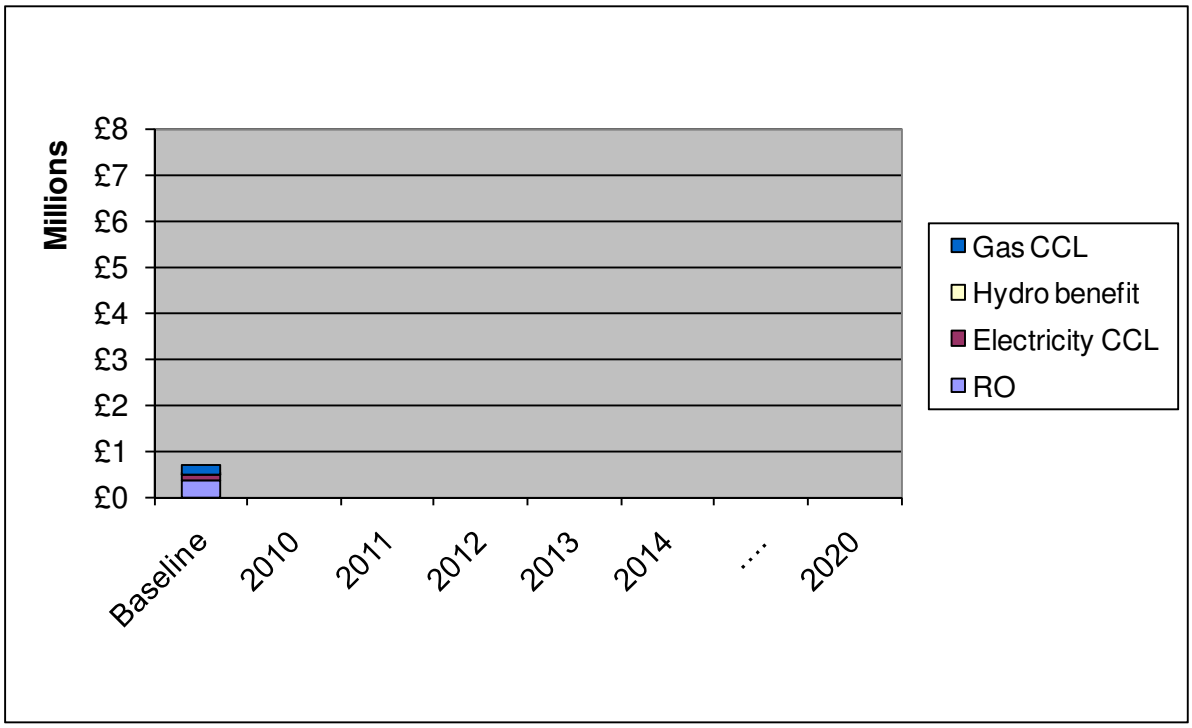
Using the assumptions outlined in this report, WWA has constructed a number of graphs to illustrate the impacts of the policies on a representative customer. All of the graphs below have had the renewable heat incentive (RHI) removed as a starting point. The data has then had added the remaining policies as well as the new policies to the representative customer's data. This builds up a picture of the costs that the climate change policies are imposing on this sector of the UK economy.

Where the graphs have changed compared to the original report we have noted the old graph numbers to try and make a comparison of the two papers easier. It should be noted that the feed in tariff (FIT) cost is the cost of the existing FIT scheme that supports small scale renewables. The renewables obligations (RO) costs represent the RO to 2017 and then the cost of the remaining RO and FIT with CfD policies out to 2020. The EU ETS cost is the direct cost to the customer as an EU ETS participant, not the cost of EU ETS the customer experiences through generators passing their EU ETS costs into higher electricity prices.

2.1 Baseline UK Policies the RO & CCL

Graph 2 shows how much tax the representative customer paid in climate change policies in 2009, in the form of the CCL on both its gas and power bills and as a result of the RO. Hydro benefit costs are also included, but are too low to see.

Graph 2: Current Costs for a representative customer of the RO and CCL

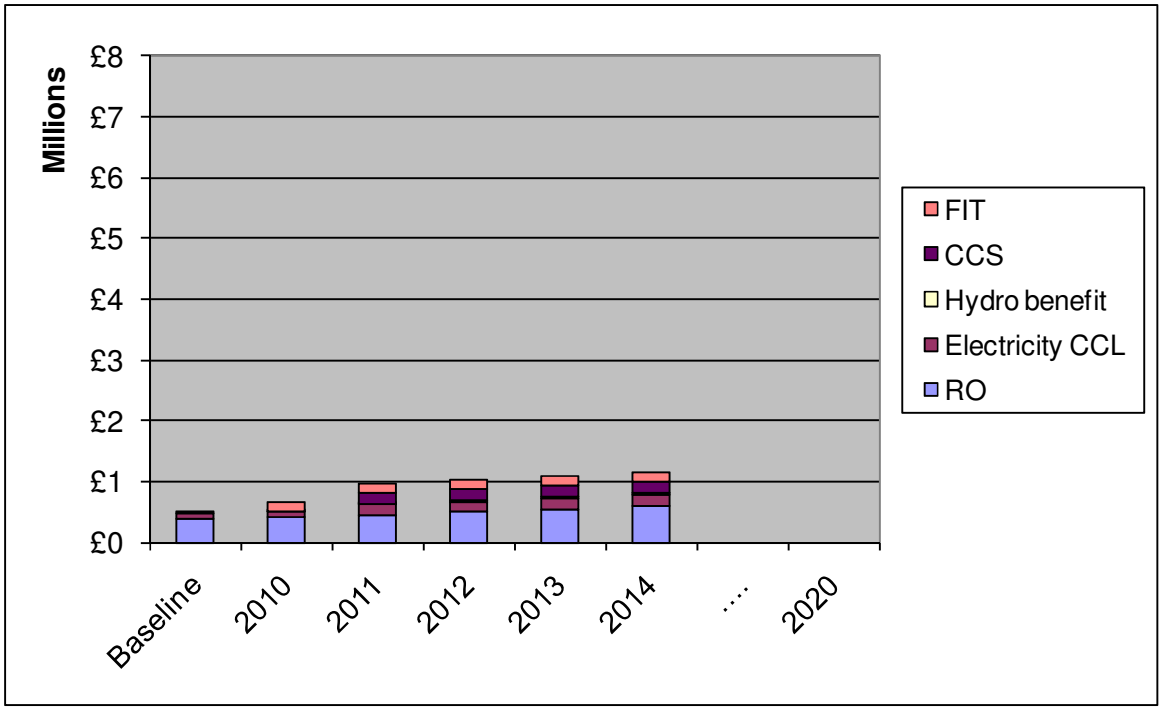


Source: Waters Wye Associates

2.2 UK Electricity Market Policies to 2014

In graph 3, WWA has added in the CCS levy and the FITs for small scale generators to the 2009 baseline. In fact no CCS levy has yet been levied on electricity bills, but it is reasonable to assume an announcement this year or next year is probable unless the Government decides to finance the CCS demonstration projects from general taxation.

Graph 3 Forecast electricity based taxes for a representative customer to 2014



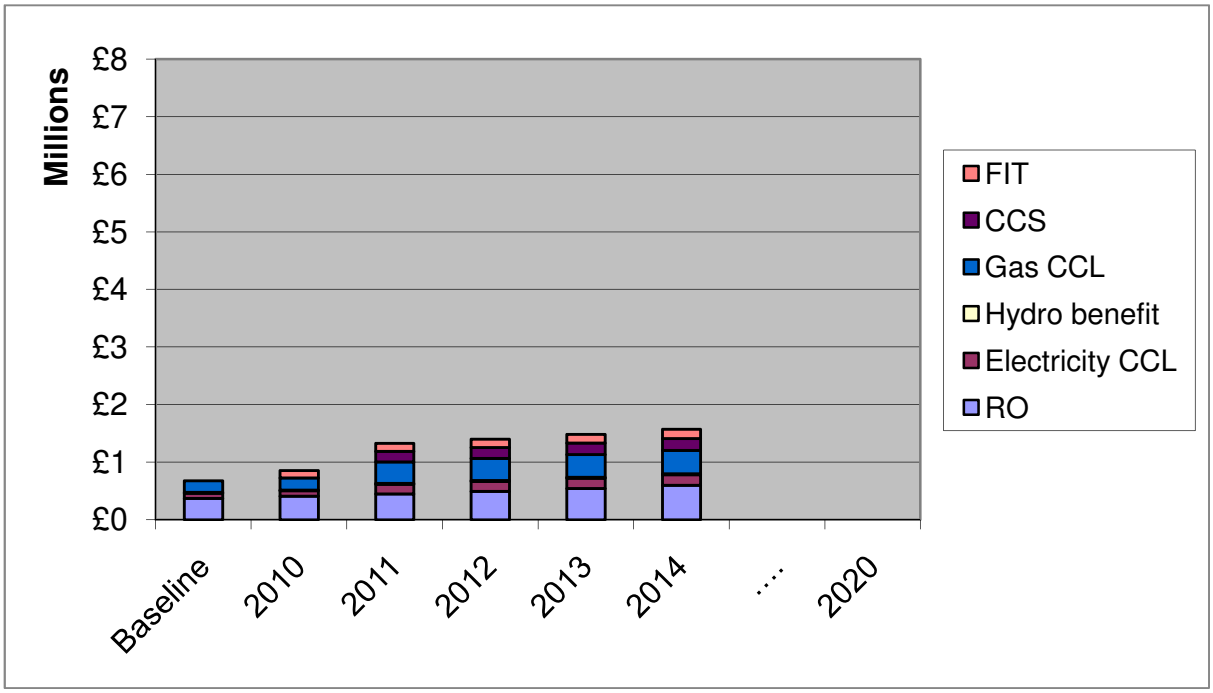
Source: Waters Wye Associates

2.3 UK Gas & Electricity Taxes to 2014

Graph 4 shows the tax exposure of the representative customer arising in both the electricity and gas markets to 2014.

It is one of the features of the representative customer baseline that it consumes gas and electricity in similar proportions. WWA and the EIUG recognise that generally industrial processes that are energy intensive will tend to use more of one type of fuel than the other. However, this graph allows us to see the costs arising on an energy intensive customer just from the climate change related policies that the Government already has in place or, in the case of the CCS levy, had previously been announced and have not been publicly cancelled.

Graph 4: Forecast electricity and gas based taxes for a representative customer to 2014



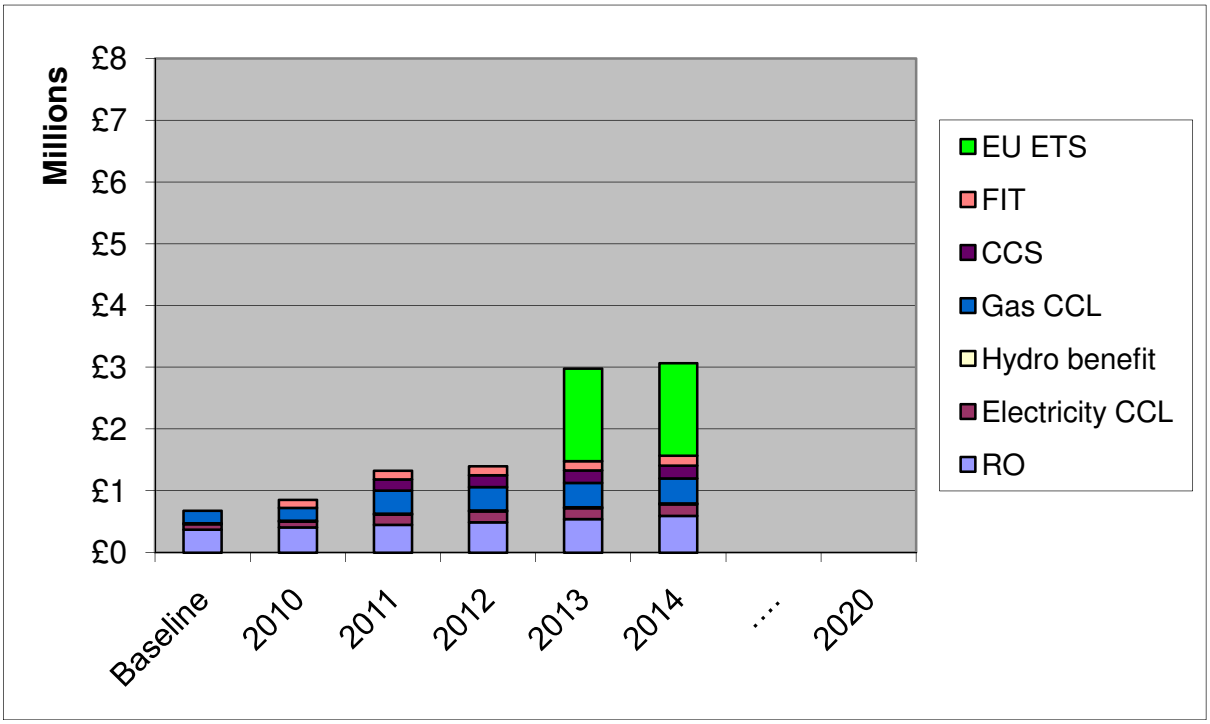
Source: Waters Wye Associates

2.4 All Existing Climate Change Policies to 2014

As well as UK climate change policies the intensive user is subject to European policies, mainly in the form of the emissions trading scheme (EU ETS). The additional cost in graph 5, compared to graph 4, is the EU ETS cost that the customer is directly exposed to.

The cost of the EU ETS regime increases for industrial participants because the customers stop receiving all the required carbon allocation for free under EU ETS III. The amount the customer is purchasing is based on the assumptions WWA made about the benchmark allocations. We reviewed the assumptions with EIUG now that the benchmarks are agreed, but their exposures to EU ETS costs had not altered significantly. This graph therefore has the same EU ETS cost for the representative customers as WWA previously used.

Graph 5: Forecast cost of all climate change policies for a representative customer to 2014 (update of Graph 6)



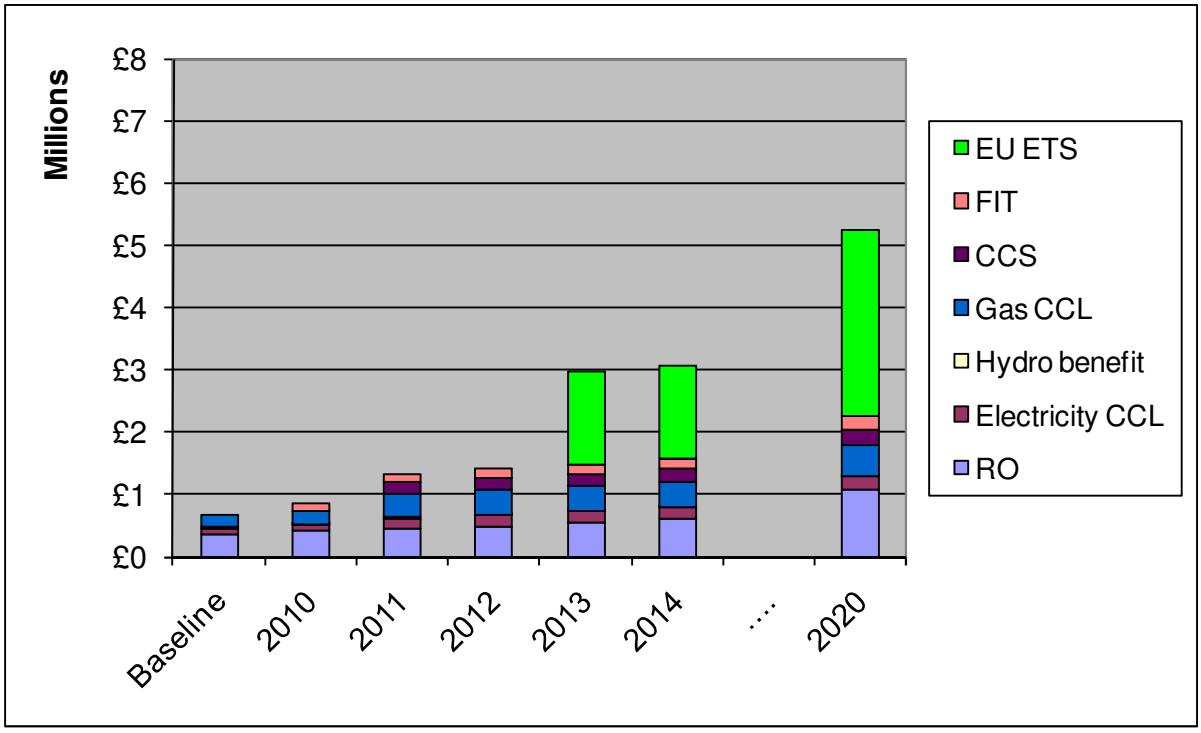
Source: Waters Wye Associates

2.5 All Previously Announced Policies in 2020

For a 2020 tax liability, WWA kept the energy usage and price stable, but increased the costs of the policies in line with the agreed projected policy costs. For EU ETS we had increased the EUA price from £15 to £30.

This graph represents the baseline forecast increase in a customer's energy bills before the new policies are taken into consideration. The increase in costs would be on top of increases in wholesale energy prices and transportation charges. WWA have noted the reasons why these costs are probably on the low side, but a rise in business costs of £5m in a decade just based on Government policy remains a considerable burden on a business.

Graph 6: Forecast cost of all existing climate change policies for a representative customer to 2020 (Updated Graph 8)



Source: Waters Wye Associates

2.6 Total Energy Bills

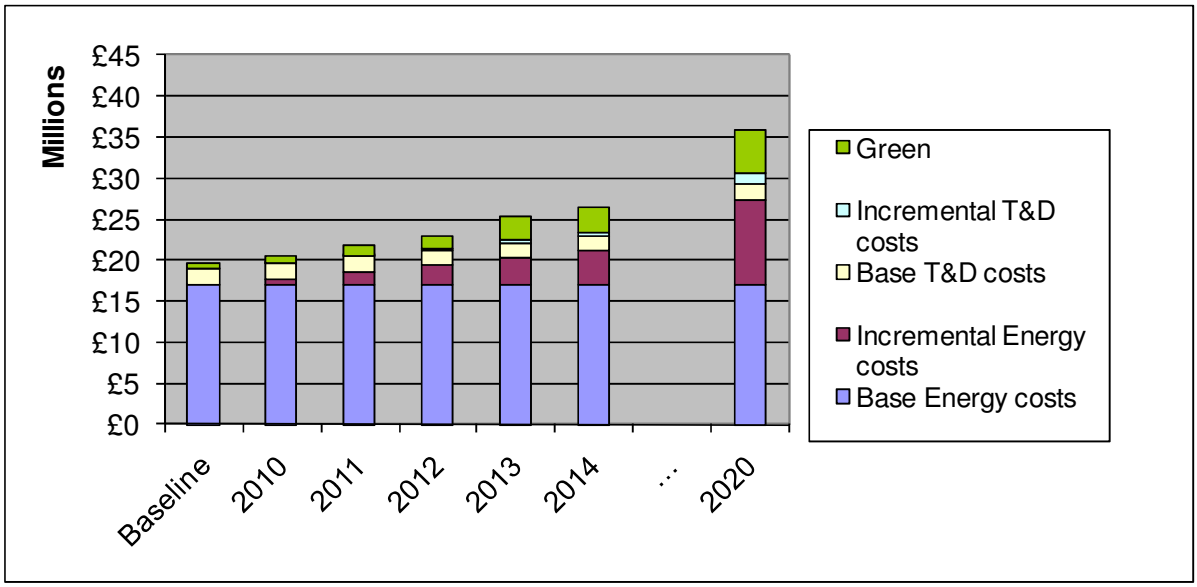
WWA believes that there will be increases in the energy bills of customers without any of the new climate change policies. To illustrate the total bill we assumed, as previously, that wholesale energy prices increased by 3.6% each year between 2010 to 2020. This reflects earlier estimates of the impact on energy prices of previously announced renewable strategies. We then assumed an annual 8% increase in electricity transmission and distribution (T&D) costs, which are themselves related to energy policies.

Graph 7 shows the baseline energy costs, with just the incremental increase in energy prices and T&D costs, with the costs of the climate change policies on top. For our representative customers this shows his total energy related bills almost doubling in a decade.

The assumptions around the price rises made are outlined in more detail in Section 10 of WWA's original report. In light of the proposed changes to high voltage distribution charges[7] some customers will now expect to see their distribution charges rise by significantly more that the 8% assumed here.

[7] EDCM indicative charges were published in December 2010.

Graph 7: Impact on the total bill of a representative customer of: costs of existing climate change policies; higher energy prices and higher transmission and distribution prices. (Updated graph 11)



Source: Waters Wye Associates

2.7 Impact of Old & New Policies

The graphs below show the costs of the existing, previously announced and new policies on the representative customer. In Graph 8 we have also shown the changes to the representative customer's total bill, with the baseline energy costs, additional energy and T&D costs, and the climate change policies. While the graph does not show the same marked change in the costs, this is really because the energy intensive companies have such significant exposure to energy prices already. So what looks like a small relative increase is actually nearly £20m in additional costs.

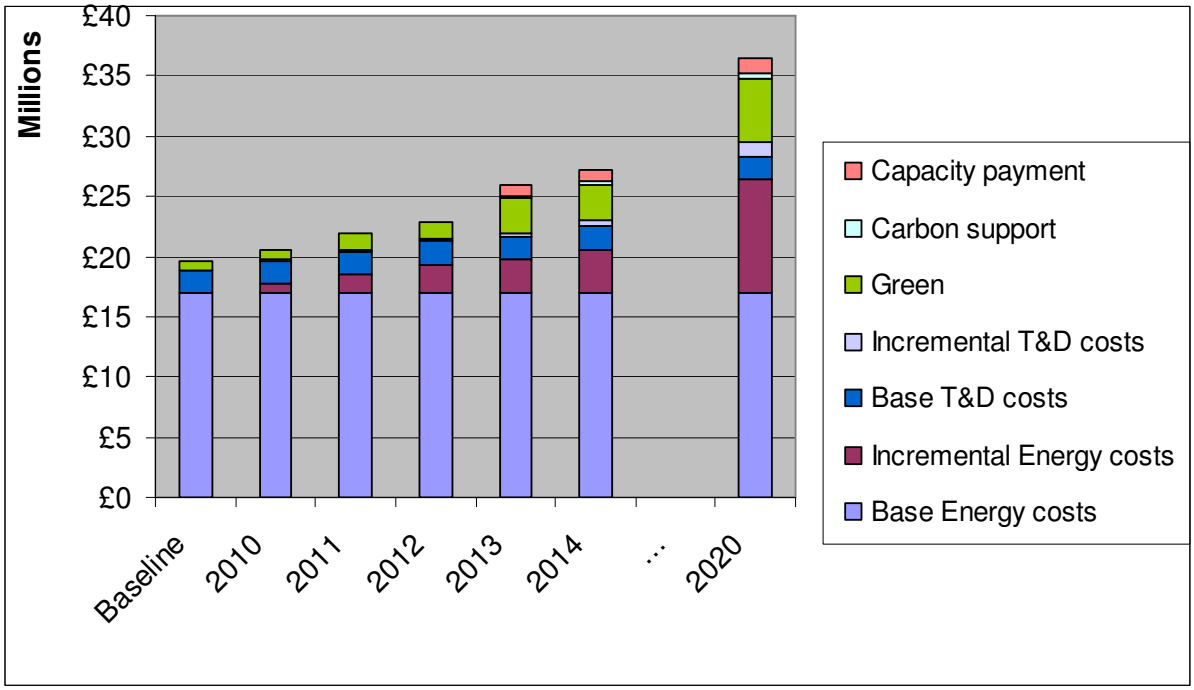
WWA's EU ETS assumptions only impact the direct cost of EU ETS to the customers. The base electricity prices, taken from DECC for the original report, would have had some EU ETS price assumption included in them (though we do not know what DECC modelled). However, the carbon floor price policy, modelled by Redpoint, shows that the policy increases prices further, as would be expected. WWA therefore took the incremental electricity price increase from the Redpoint model under the "trajectory price" for carbon[8] of £30/tCO_2 scenario. The graphs below show this incremental increase in prices as it would impact a customer's bill, though it would not be a discrete cost, but part of the power price.

WWA notes that Redpoint actually use a trajectory cost of carbon of £50 for the majority of their analysis as it is the figure their model required to deliver the level of carbon intensity the Government wanted.

[8] The trajectory price is the total cost of carbon that the Government wants the generators to pay. So where Redpoint modelled a trajectory price of £30 it uplifted prices by £9MWh by 2020.

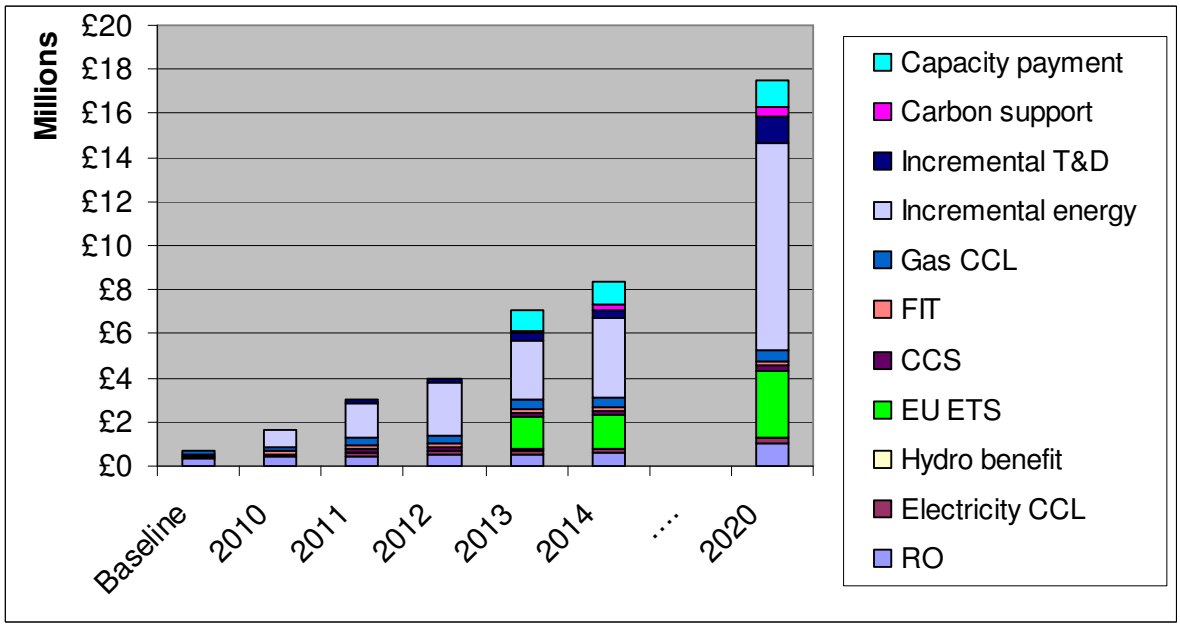
Finally Graph 9 strips out the base line energy, but leaves in the incremental increase in the energy costs and the T&D costs. This gives a better feel for the sort of volatility in the energy cost background that the intensive users have to plan their own businesses around.

Graph 8: Impact on the total bill of a representative customer of: costs of all climate change policies; higher energy prices and higher transmission and distribution prices. (Updated Graph 11)



Source: Waters Wye Associates

Graph 9: Incremental impact on a representative customer of: costs of all climate change policies, higher energy prices and higher transmission and distribution prices (Updated graph 12)



Source: Waters Wye Associates

3. New Graphs on Electricity Costs Attributed to Carbon Policies

EIUG members pointed out that they will pay for "carbon" a number of times. Currently the cost of electricity has been inflated by the costs of the EU ETS scheme. Under EU ETS II generators have had to buy some of their permits to emit carbon. Going forward, under EU ETS III, the generators will buy all of the emissions permits via an auction.

With the Government's proposed carbon floor price the cost of carbon for fossil fuel generators goes up. The graph below aims to illustrate that there is an element of the power price that is actually just the carbon price being paid by the generators. WWA has not modelled the energy mix in the years of analysis. We have made a simple assumption that £5/MWh of the electricity price that we project could be the cost to the generators of the EU ETS III scheme. It has been widely acknowledged that the generation sector can, and does, pass their EU ETS costs through in prices. They have no international competition so are free to do this.

It could be argued that £5 is too low a number. If we were to assume that gas was the marginal fuel in the majority of periods then their carbon costs would be in the region of £12/MWh at a carbon price of around £30/tCO_2. If it was argued that the coal is sometimes marginal it would be reasonable to assume the past through cost from the marginal plant is higher, but with more renewables or new nuclear plants the pass through cost would be lower. WWA does not know what the plant mix is in the Redpoint model, so as with all of the assumptions we chose a conservative number that simply illustrates the scale of the impact of the industrial customers from these very opaque pieces of tax policy.

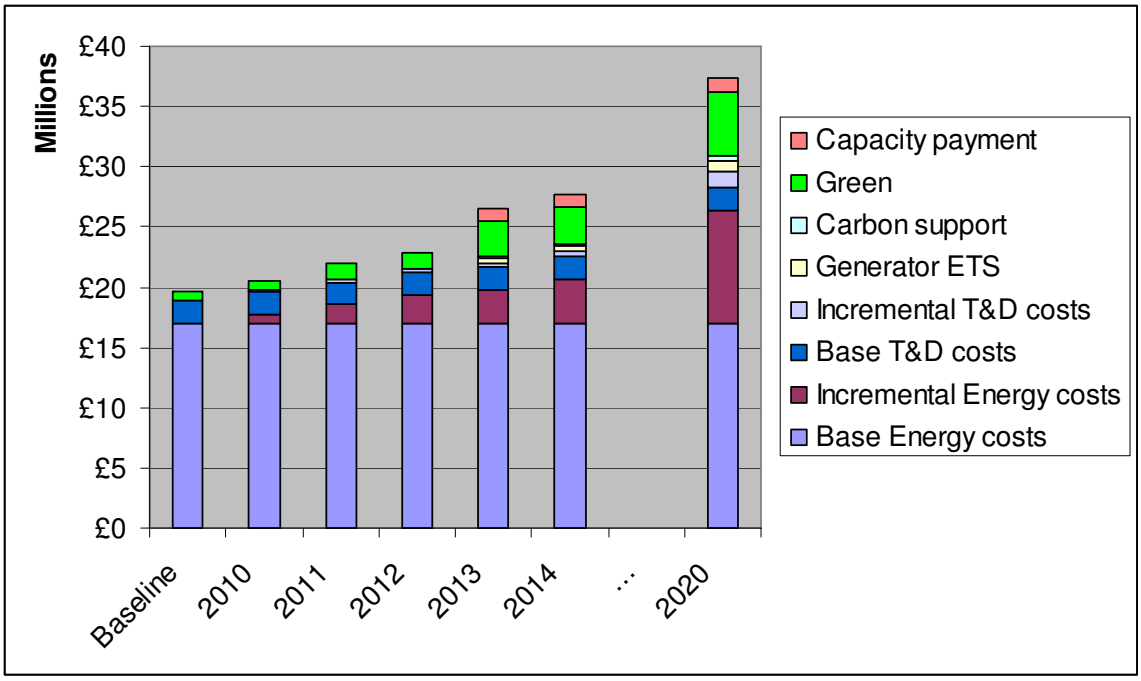
These indirect EU ETS costs have been deducted from the incremental energy prices and highlighted separately in graph 10 below. These should be seen as yet more costs associated with the Government's lower carbon energy strategy.

While the value used could be questioned, the analysis could also be done of the electricity cost that relates to increasing transmission costs for generators as more wind connects, or increasing balancing costs from more intermittent generation. The issue is that these indirect costs, as well as the direct taxation, will impact intensive energy users more than other sectors.

WWA would note that this graph also shows the carbon floor price policy cost as a separate item in the stack. However, that cost will appear via the customers' electricity bills and is therefore an indirect carbon tax. WWA discusses in Annex A the potential wider impacts of these carbon based policies on the level of electricity prices.

The graph highlights that the industrial customers pay the carbon price in the electricity price (EU ETS and Carbon Floor), then it pays its own EU ETS carbon costs and the CCL. On top of these taxes they pay for policies like the RO to deliver a low carbon market for customers, such as domestic customers, who currently do not pay any direct carbon related costs.

Graph 10: Highlighting the impact of EU ETS in the electricity price



4. Policy Cost Assumptions

The table below gives the key assumptions used to arrive at the representative customer's tax bill as a result of climate change policies. A more detailed explanation is given in Annex 1.

Green Charges	Background	New Assumptions	Basis of Increase
Electricity			
Assistance for Areas with High Electricity Distribution Costs (known as 'Hydro Benefit')	To subsidise distribution to the far north of Scotland	Assumptions unchanged. 17p per MWh	WWA have included a 3% increase per annum to reflect inflation.
Renewables Obligation, subsequently FITs	Payment scheme to stimulate renewable electricity generation to be replaced by FITs.	Assumed the support rate between FITs and RO will not change. The 2009 buy-out price of £3.719 / MWh continued to be used as a starting point.	10% increase assumed within the original report per annum has been left unchanged.
Original Climate Change Levy	A tax to encourage industrial and commercial energy users to reduce energy use.	Unchanged. The reduction in the benefit from having negotiated a climate change agreement from 80% relief to 65% from April 2011 had already been taken into account.	WWA also include a 3% increase per annum to reflect inflation
Additional Climate Change Levy known as Carbon Price Support (CPS)	Levied on generators it works with the EU ETS carbon price to provide carbon price certainty for generators in order to stimulate investment in low carbon generation, particularly new nuclear build.	Full pass through of the incremental cost increase under a £30 carbon trajectory (2020 target) as modelled in the HMT consultation.	Figures provided by HMT have been used. These are predicated on an underlying assumption that the generation mix will be less carbon intensive by 2020. Given that gas will remain the marginal fuel for the foreseeable future, WWA would question whether these assumptions are realistic.
Carbon Capture and Storage Levy and EPS	In the original report this was framed as a CCS Levy. Government has now proposed an emission performance standard.	The same figure of 2% increase on electricity bills projected for CCS has been used to quantify the impact of EPS from 2011.	WWA have included a 3% increase per annum to reflect inflation.
EU Emission Trading Scheme (Indirect)	The increased costs passed on by power generators in the bills themselves have not quantified in this report.	Full pass through assumed. DECC Medium carbon price values used.	DECC medium carbon price projections used.

Capacity Payments	To ensure that there is sufficient plant margin to meet demand in real time	A low (£.0.30 per MWh) and high scenario (£9.00 per MWh) have been used based on the Redpoint analysis.	WWA have included a 3% increase per annum to reflect inflation.
Existing Feed In Tariff	Designed to encourage the growth of renewable electricity generation	Removed and replace by new FIT scheme (see above)	n/a
Gas			
Climate Change Levy	A tax to encourage industrial and commercial energy users to reduce energy use.		Intensive energy users currently have 80% reduction if they have CC Agreement. The relief available will reduce to 65% from April 2011 and thus the associated charge will increase accordingly. WWA also include a 3% increase per annum to reflect inflation.
Renewable Heat Incentive	An incentive to encourage the development of small scale renewable heat schemes	No-longer relevant. Announcements made in the October 2010 spending review suggested that this will be funded by general taxation, rather than a levy.	n/a
Other Processes			
EU Emission Trading Scheme	Although a limited amount of industrial emissions are already covered by EU ETS, this will become far more comprehensive for large intensive industry by the beginning of Phase III when industry emissions will be subject to benchmarks pitched at top decile levels of performance.	This volume of emissions has not been changed from the last assessment. WWA has retained the £15 to 30 range of the original report	Original range. However, we note that DECC Medium carbon price projections could be used.

Annex A. The New Policies & Updated Assumptions

A1.1 Feed In Tariffs

The Government proposes to shut down the Renewables Obligation to new projects from 2017 and move renewables support to a system of feed in tariffs (FITs). The consultation document suggests four different FIT regimes are possible:

1. Premium FIT – static payment on top of achieved power
2. Fixed FIT – get fixed payment (power plus uplift)
3. FIT with CfD – long term price fixed, support floats around the strike price. Means sometimes a generator is paid while other times they may pay.
4. RAB – extend price controls to renewable generation – and apply a regulated rate of return

The Government preference is for a CfD FIT, which raises a number of questions about what the strike price is, who the CfD is with, what the impact on market liquidity is, etc... The administration of such a scheme looks onerous on renewable developers, who are often smaller companies. It also possibly slows development if the allocation is based on a tender, as developers will not want to spend money until they are successful in a tender. There must also be questions about the cost of administration and the benefits of keeping the RO going while starting a new scheme.

WWA recognises the arguments that such a scheme should be economic and it is similar to other FIT regimes used around the world. We would note that the unintended consequences of such schemes have been the increasing costs associated with balancing a market with a lot of often intermittent generation, that is incentivised to always run and does not offer flexibility and "shape" to help the system operator (SO) to meet demand in real time. However, WWA has not attempted to account for any increasing costs across the system from a substantial change in the generation mix.

It is unclear if the FIT with CfD scheme would result in more or less take up of renewables, shift investment patterns (so renewables' developers hold off development until FITs come in), be cheaper to administer, etc... It is also unclear if the Government will actually push ahead with a policy that looks difficult to implement and administer, as well as potentially creating barriers to entry. WWA expect that developers will want a premium FIT scheme as it looks far more like the current RO, but with many of the downsides of the RO removed.

WWA therefore decided on balance to assume that the cost of the FITs scheme will be in line with the assumptions we originally made about the costs of the RO. For the purposes of this update, WWA left the increase in the cost of the RO on electricity bills at 10%[9] a year. The report starts with the 2009 buy-out price of

[9] See original report, Annex 1, for explanation of 10%

£3.719/MWh[10]. The FITs referred to later are the FIT that are currently in place to pay small renewable generators.

A1.2 Emissions Performance Standards

Emissions Performance Standards (EPS) gives a cap on the amount of carbon a generator can produce with every MW of power. The policy is designed to stop new coal build unless it has carbon capture on at least part of the plant. The EPS levels the Government are consulting on are:

- 600g CO_2/kWh – fits level of post combustion on supercritical coal – requires demonstration covers ¼ of capacity (400MW on 1600MW plant - gross)
- 450g CO_2/kWh – exempt demonstration projects – others need CCS on 700MW of a 1600MW plant (40%)

Under the second option, the Government points out a plant could run part loaded only using the plant capacity that the CCS can operate with. However, the prospect of a plant running part loaded in this manner being economic makes such an outcome unlikely. The Government says that it does prefer option 1 as it provides less disincentive for new build generation and this is the rate used in the Redpoint modelling, which also assumes the new plant will retrofit CCS on all capacity after 2025.

Redpoint assumed that the EPS proposed by the Government would come into force in 2018. The Government has said that it will grandfather the EPS of the plants given planning approval before the point the EPS comes into force. It therefore seems unlikely the cost of a CCS fitted plant will feed into power prices by 2020. However, the costs associated with financing the demonstration projects may appear before then.

For the purposes of this update, WWA has continued to assume a 2% increase in industrial electricity bills, effective from 2011[11]. A legislative framework for a new levy on energy prices, to fund the carbon capture and storage (CCS) demonstration projects, was introduced in the Energy Act 2010. The Act allows for a levy on electricity suppliers that could support up to four industrial scale CCS demonstration projects in the UK. The CCS levy was due to be administered by Ofgem, but though the coalition committed to the CCS programme, it remains unclear what this levy will be on, how large it will be, when it will be introduced. The lack of clarity adds to investment uncertainty. We understand Redpoint's baseline prices do not assume any CCS levy as the levy would apply to customer bills and therefore not impact wholesale prices.

[10] http://www.ofgem.gov.uk/Media/PressRel/Documents1/RO%20Buy-Out%20price%202010%2011%20FINAL%20FINAL.pdf
Note WWA used the 2009/10 buy-out price as 2009 is our base year, but we note that that the RO auctions clear at a price above the buy-out price, around £40/ROC.

[11] This 2% is on an estimate energy bill before "new" green charges are added but including projected increases in the RO and CCL.

A1.3 Capacity Payments

Capacity payments are designed to ensure that there is enough plant margin on the system to meet demand in real time. The idea being that an electricity system needs excess capacity to cover for unavailable plant (due to outages, lack of wind, etc.) and that this marginal plant will run at low load factors and therefore may be uneconomic without some additional payment above the power price. The alternative to a capacity payment is to simply let plant that runs infrequently cover all of its costs by charging very high prices. However, relying on limited operations at very high prices does not make an attractive investment prospect.

The Government's proposed options for capacity payments are:

- *Capacity payment* – one payment to all available generators.
- *Capacity Obligation* – suppliers must contract with generators for set amount or face a buy-out price.
- *Capacity auction* – volume set centrally (say 3 years in advance) and purchased via a cleared auction, where all successful plants (new and old) are paid a capacity price.
- *Reliability option* – auction for call options requiring generators to be available to the SO at the strike price.
- *Tender for Targeted Resource (TTR)* – capacity payments to sources needed to meet margin shortfall, with the payment set by tender.

Of these options the Government prefers the TTR approach. The consultation document mentions a figure of 5GW, but it is unclear how much of that capacity may be accounted for already in the reserve, or STOR[12], market. Redpoint's model assumes that capacity is bought to create a plant margin on 10-11%, so the quantity would alter as different assumptions about plant retirements and new build are used.

In 2009/10 National Grid reported that it procured on average 2623 megawatts (MW) of STOR and utilised STOR for 961.5 hours, the equivalent of 104.7GWh, at a cost of £68.3m in availability payments. The Redpoint modelling would appear to assume that some old and some new OCGTs would provide the new capacity service, but it is not clear if the "old" plant is existing STOR plant, or CCGTs running more flexibly. National Grid has forecast[13] an increasing need for STOR to around 7GW in 2020 under a "gone green" scenario.

Two of the proposed capacity mechanisms are examined by Redpoint. The first "capacity payment for all" would pay all plant for being available, which would be similar to the system that existed under the Electricity Pool. The second option is a "targeted capacity tender" where the SO buys up to the capacity that is needed to create the desired plant margin. The second option aligns with the Government's TTR approach.

Redpoint's modelling suggests that the capacity for all option adds around £7-9/MWh to electricity prices, but without the breakdown of their data it is unclear how this

[12] STOR – short term operating reserve, purchased under tender by the SO for quick response.
[13] Future Balancing Services Requirements: Reserve – National Grid http://www.nationalgrid.com/NR/rdonlyres/55610D9A-C53A-4E28-88C6-29AE5DF72EF2/42697/Future_Balancing_Services_Requirements_Reserve1.pdf

range is arrived at. The targeted capacity tender is forecast to add £0.3/MWh to prices, which seems very low. The reason the second price may seem low is it does not assume a utilisation charge (covering fuel price) to be paid when the plant runs. It would seem to us that the capacity fee would have to be very high if fuel costs were not added when plant runs to allow for financing of plants based on a 20 year contract. It may be possible for a generator to get a 20 year fuel deal, but the fuel supplier would probably assume consumption only on peak demand days and therefore offer only a very high price.

WWA would also be concerned that the tender option may be assuming that some existing gas plant will tender at similar costs to those now seen. We believe that if gas is running very flexibly, say starting at least once a day, this will have significant impacts on its operation and maintenance costs. As noted above the operation of more gas plant flexibly may also increase gas price volatility and gas network charges. So the price of power from an existing gas plant operating as reserve would go up, as well as the cost being spread over fewer hours.

To take account of the uncertainty over the capacity mechanism, WWA decided to model a high cost and low cost scenario, but based on Redpoint's analysis to keep the outcome on the representative customer in the same range as used by the Government. For the low cost scenario we assumed a "targeted capacity tender" mechanism with the real cost being £0.3/MWh from 2013 to 2020 (adjusted for inflation). In the high cost scenario, WWA have assumed a cost of £9/MWh, which is the higher Redpoint figure based on "capacity payments for all" analysis.

A1.4 Carbon Price Support

The Government has said that it wants to ensure that generators face the full price of carbon when they generate, meaning that all fossil fuel fired generation would pay more for carbon than they do under the EU ETS regime, though how much more is yet to be decided. The mechanism that the Treasury (HMT) proposes to use is the Climate Change Levy (CCL); an energy tax already added to business energy customers' bills at the point of consumption.

The proposal is to "top-up" the EUA price via a CCL rate on fuel going into generation. The new CCL rate, *"carbon price support rates"*, will be linked to the average carbon content of the fuel, so a coal plant will pay more than a gas plant. The carbon price CCL rates will be set to achieve an overall price of carbon set by the Government to increase over time. For example, if target price is £30/tCO_2 and the EUA price is £15/tCO_2, they would set the tax in the region of £15/tCO_2.

To also tax the generators using oil the Government will alter the fuel duty rules to ensure all fossil fuels used in generation are taxed. The result of taxing all fossil fuel inputs into power stations will clearly be to increase the prices from these generators. As the fossil plant is the price setting plant on the system it therefore drives the power curve, as no generator is incentivised to sell under the price of the marginal plants. It also increases the prices of the reserve plant that the SO books for covering rapid system changes such as a drop in the wind or a TV pick-up in demand. These plants are generally small scale, fast responding fossil fuel fired OCGTs. As there are no exemptions for small plant proposed the cost of the system support plants will also increase.

The Government has proposed to set the initial carbon support CCL rates for each fuel and then apply an escalator from 2013 to meet a "target price trajectory". The Government's consultation suggests that the target rates (CCL + EU ETS) would be in the region of £20-£40/tCO_2 in 2020 and £70 in 2030. With the EUA price capable of fluctuating it is probable that the unless the carbon support CCL rates are set in the short term they are likely to slightly under or over charge against the target price.

WWA was interested to see that the majority of the modelling done by Redpoint used a target carbon price of £50/tCO_2 as they needed that level to reduce the carbon intensity. However, for the HMT consultation the highest priced scenario is £40/tCO_2 in 2020. All the scenarios raise the target to £70/tCO_2 in 2030.

To take account of the effect of the carbon floor price in this update, WWA has taken the incremental price increase from the Redpoint analysis outlined in the HMT document[14], based on the £30/tCO_2 target carbon price. As the target price at £30 increases the electricity price, the analysis must be assuming a lower EU ETS price than WWA has used to look at the impact of EU ETS on the representative customer. WWA believes that irrelevant of the EU ETS price, the policy itself will be used to uplift fossil fuel generator costs, i.e. if EUAs are trading at £30 in 2020 the trajectory price will be increased to say £40. Using the incremental increase in prices established by Redpoint gives an uplift of £0.58/MWh in 2013 rising to £3.14/MWh with higher uplifts in the intervening years.

WWA's original price data was in nominal terms, so we have simply increased the baseline prices in line with our inflation assumption of 3%, and then added the incremental cost of the £30 floor price policy from the HMT data (which was real not nominal, so includes inflation). This clearly has several weaknesses, in terms of using different underlying price assumptions and possibly different EU ETS assumptions. However, the incremental cost again gives a feel for the impact on prices that the policy is expected to result in. As our original base price data was selected prior to the new policies being put in place it is highly unlikely prices would outturn lower than our original price assumptions by 2020 so assuming a price increase seems robust.

WWA would note that the HMT data shows an increment in 2020 that is somewhat lower than in previous years. WWA understands that this is because the Redpoint model generates prices based on capacity, so a new plant comes on, competition increases and prices reduce. If the new build is low or no carbon that would reduce the impact of the carbon floor price in the final price. WWA does not know what the EUA price is that Repoint used, nor did the DECC price data in our original report explicitly state the EUA price assumption. However, the Government clearly expects the EUA price to be below £30/tCO_2 for the carbon floor policy to create a price uplift. WWA therefore does not believe there is double counting by adding the increment to the original price data, but appreciate this could be questioned.

[14] Chart 5.E p36 – scenario 2 uses £30 for target in 2020.

Annex B. Change to Remove One Proposed Tax

B1.1 Renewable Heat Incentive

The Chancellor, George Osborne, presented the Government's Spending Review on 20 October 2010[15], in which he announced that the Renewable Heat Incentive (RHI) would no longer be financed by a levy on gas prices. Instead the support would come from general taxation. For the EIUG members who are gas intensive this is a very welcome move.

However, there have as yet been no formal policy announcements despite the scheme being due to start this year.

WWA has therefore taken the RHI costs out of the original analysis. For the original study WWA had assumed 1% a year increase in industrial gas bills, starting in 2011, from the RHI. This then reached 4% in 2015. As the Government had said that the target increase in bills would be around 20%, WWA used the 20% figure in 2020. WWA has now assumed that there is no direct levy on gas bills apart from the climate change levy (CCL). The removal of the proposed RHI will have a significant impact on the forecast costs for the gas intensive users, reducing the price increases somewhat.

It is intended that the CCL increases in line with inflation. WWA had therefore assumed a 3% a year increase in companies' exposure to the CCL. Companies have discounts on these rates, as well as some energy being treated as "feedstock" and therefore levy exempt. WWA has not changed this assumed tax exposure.

It would be possible for the Government to reverse the change in CCL discounts – e.g. to reinstate the 80% discount originally offered to energy intensive users. The calculations show that this would be a relatively trivial concession to energy intensive users.

WWA believes that the proposed changes to the power market will have knock on impacts to the price of gas for several reasons. Firstly, the increasing use of intermittent generation will need to be supported by back-up, flexible generation. If we assume this is gas fired generation that moves to mid-merit for power dispatch, flexing far more within day than is currently the case, this daily change in gas demand is likely to cause gas price volatility to increase and system balance costs may also go up.

Secondly, more flexible gas may also mean additional investment in gas transportation capacity is required to allow a larger volume of gas off-takes to operate at higher ramp rates. This could require larger pipes, more compression, flexible storage, etc., all of which will feed into delivered gas prices.

WWA originally assumed gas prices increased by 5.24% annually (including inflation)[16] and we have not changed this assumption. We understand that Redpoint's model does not consider impacts on gas prices resulting from the change

[15] http://www.hm-treasury.gov.uk/spend_index.htm
[16] This was based on DECC's central price forecast of July 2009 in the UK low carbon transition plan

in the use of the gas network either. However, we would suggest that the Government may wish to consider these impacts in greater detail to fully understand the effects of the changes in the power market on the gas market and thus the gas prices faces by all classes of consumers.

Annex C. Other Forecasting Issues

The analysis done for DECC by Redpoint[17] to assess the impacts of the new policy proposals is a considerably more complex model than that used by WWA in looking at the policy impacts. Redpoint is focussed on looking at the wholesale market, but WWA was looking at the final bills for customers. There are therefore a number of points that need to be noted.

C1.1 Energy prices

In the original report WWA used what it considered to be a conservative forecast or energy prices. As part of its Renewable Energy Strategy, DECC projected future energy price changes. The methodology used by WWA was to set a baseline energy price, and calculate the various taxes against that baseline. The projections used started in 2010 and went forward annually to 2014. WWA then took a point estimate of the effect of these charges in 2020.

WWA had calculated the percentage annual increase in each of the projections over the period 2009 to 2020. This gave a central estimate, being an annual real increase of 0.68% a year in electricity prices. Assuming an inflation forecast of 3% a year gave an electricity price rise of 3.68% a year. To be conservative, WWA used only a 3.6% increase in energy prices per year. This percentage was used to increase the baseline electricity cost accordingly for the representative customer. A similar approach for gas prices produced an annual 5.24% increase in gas prices, including 3% for inflation.

The modelling done by Redpoint for the Government creates a price curve based on the assumptions in the model, so may end up with different base prices to those assumed by WWA. Redpoint's report acknowledged that their forward prices were also out of step with the forward curves at the time of publication. All models makes assumptions about plant closure and new build that could be debated, but the general move to a market dominated by renewables, with some new nuclear after 2027 is a reasonable outcome given the policy aims of Government, i.e. to decarbonise the electricity sector.

Redpoint show that of the policy options that they looked at, all increase prices in the wholesale electricity market. WWA wish to note that this report is focussed more on the levies/taxes added to bills as a direct result of Government policy and changes in the underlying forward energy price curves will have some impacts on these extra costs. However, the Government may want to look at the position of the energy intensive using sectors under a range of electricity price scenarios as well as differing tax rates and tax designs.

C1.2 Capacity Mechanism

The design of the capacity is mechanism is vital in determining how it will impact the operation of the electricity market and the prices. As noted above, the Government supports a targeted approach. As we understand it the "TTF" model would see the SO tender for the volume of capacity it agreed with Government/Ofgem was required. It would then contract (we assume long term to encourage new build) and

[17] Electricity Market Reform analysis of policy options, Redpoint, December 2010

dispatch the plant when it was economic to do so, i.e. at times when the cost of the generator was lower than that available through the balancing mechanism.

The amount of capacity purchased would depend on the assumptions made about the contribution of plant on the system to security, i.e. what the plant margin is forecast to be. For example the wind farms could be rated as providing some capacity or none. The type of capacity will also determine its costs, so a fast response plant such as OCGTs, which would help the SO manage reductions in generation quickly (for example from a fall in the wind), would be likely to be more expensive than say a CCGT plant.

WWA also notes that the capacity costs are assumed to be smeared over all customers. However, at times when the capacity is used we would expect at least some of the costs to be targeted back through the cash-out regime. It would seem logical to charge the energy from reserve plant to those who need energy when reserve has to be used. Thus the capacity mechanism in itself may well make imbalance prices more volatile and higher at peak times. Because the baseline is fixed in 2010 this increase in energy prices is not captured in underlying price rises.

The Government will also have to consider whether the action of having a capacity mechanism leads to a reduction in capacity as older plant wants to be available to the SO for a capacity fee, rather than operate in the market as a whole. Future investment in peaking/flexible plant may also be deterred if the capacity mechanism, or more importantly the use of plant held on capacity mechanism contracts, reduces the peak prices in the market. It would seem probable that if customers are going to pay capacity payments they will not unreasonably want to see that capacity operate, not sit idle to meet a demand on a few peak days.

WWA's use of two very different capacity costs reflects our concern that modelling the impact of a capacity mechanism is very difficult and the lower numbers look too low once the unintended consequences are considered.

C1.3 CHP & Embedded Plant

WWA has made no reference to the increasing costs to fossil fuel fired CHP of the carbon support proposals. It has long been Government policy to try and encourage the building of CHP and it has generally received preferential treatment to increase investment (for example, reserve allowances under EU ETS II). Many industrial customers will have CHP and the effect of the carbon levy on the CHP fuel input will add substantially more to their electricity costs as they are probably the main user of their own electricity output.

Redpoint's model does not look at the impacts on embedded plant of the proposals as it is netting embedded generation from demand. WWA would suggest that policy package could have a number of impacts on the way embedded plant operates. For example, the Government notes that the capacity mechanism may provide locations signals (say a tender for capacity in a region). With smaller renewables plant being embedded plant the distribution companies may need more of the capacity to be embedded. The costs from the embedded plants used for balancing will feed into cash-out and their costs will rise if fossil fuelled.

C1.4 Impacts of Ofgem Policy

While the two Government consultations have been hailed as being significant changes to the energy markets, they are not the only proposed changes currently facing the customers. There are a raft of policies being lead by Ofgem that may also drive up prices. Again WWA has made no assumptions about the impacts of these policies but the Government needs to consider the following proposed changes:

- Project TransmiT - potential to change all transmission charges and connection fees
- Significant Code Reviews - gas emergency arrangements already under review and electricity cash-out proposed for review
- EDCM charges in the distribution networks charges and the associated treatment of pre-2005 generators
- Measures to improve liquidity

Annex D. Method Applied to update the study

1. WWA checked with the companies that none had seen a significant change in the factors that had fed into the original data, such as a change in their forecast of allowances allocated under the EU ETS. They confirmed their base data was relatively stable. This meant that WWA held constant the assumptions about the representative customer (see Annex E).

2. WWA had previously set the representative customer's energy usage energy costs (£/MWh and p/therm) stable and applied the climate change policy costs to their bills. This gave the representative customer a projected **cumulative effect** of existing low carbon schemes, increases in existing low carbon policies (CCL, RO, etc.) and new low carbon schemes (RHI, FIT and CCS levy).

3. For a 2020 point projection, WWA again kept the energy usage and price stable, but increased the costs of the policies in line with the agreed policy costs. For EU ETS we had increased the EUA price from £15 to £30.

4. To account for the change in policies on the representative customer, WWA first removed the RHI, but left the CCL on gas unchanged. This reduces the tax liabilities associated with gas somewhat.

5. On electricity related taxes WWA assumed that the RO cost previously forecast is approximately equivalent to the cost of the proposed new FIT with CfD. We therefore left the cost of the RO representing the RO + FIT with CfD in 2020. The FITs referred to in the analysis are the existing FITs for small generators.

6. The carbon support and capacity mechanism will only be apparent via the wholesale electricity price, rather than as a discrete add on to customers' bills. WWA therefore looked at the impact on the wholesale electricity price of the policies before stripping out the increases to show their direct contribution to the representative customers' exposure to climate change policies.

    - For the capacity payment WWA has modelled a high and low scenario. In the low scenario, based on the "targeted capacity tender" mechanism used by Redpoint, the real cost is assumed to be £0.3/MWh from 2013 to 2020 (adjusting for inflation). In the high scenario WWA have assumed a cost of £9/MWh, which is the Redpoint figure based on "capacity payments for all" analysis.

    - For the carbon floor price WWA has taken the increments outlined in the Redpoint analysis in the HMT document[18], based on a £30/tCO_2 target carbon price by 2020, and added those increments (assuming inflation at 3% on the electricity base data to remain in line with the WWA base data). The underlying data was given to WWA by HMT.

[18] Chart 5.E p36

7. As WWA believes that it is probable that wholesale energy prices will themselves rise, using the typical customer data, we increased the base energy cost of wholesale electricity, transmission and distribution charges. We then imposed the same climate change policy costs on top of the higher energy bills. The assumptions for these rises have not been altered form the original report.

8. WWA have assumed that the representative company will still have a 65% rebate under a future Climate Change Agreement Scheme. Even though no formal consultation documents have emerged since the original WWA study in July 2010, there is concern among several companies in this study from plenary and sector discussions with DECC, that future Climate Change Agreements might be available for only a limited number of energy intensive sectors. If this were the case, such companies, and our representative customer, would have a significant increase in their "green taxes" above those modelled here.

Annex E. A "representative" company

WWA developed a "representative" company in the first study to overcome the issues of confidentiality. The company is not real, in so much as it is not based on specific bills, but its profile is based on the data provided to WWA. Like the study participants, the representative customer is assumed to have a CCA and thus receive a CCL discount.

WWA believes that the representative customer gives other energy intensive users a feel for the type of exposure that they will face from climate change policies by being representative of real customers.

The representative customer has the following profile:

- Electricity consumption was set at 100,000 MWh a year
- Baseline energy price was £70/MWh, with transmission, balancing and distribution costing £9/MWh
- Gas consumption was set at 20,000,000 therms a year
- Baseline gas price was 50p/therm, with transportation costing 5p/therm
- Purchased emissions in 2013 was set at 100,000 tonnes

The impacts on any individual customer will depend on their specific energy use, own generation and EU ETS allocation. For the purposes of illustration, we have assumed that in 2010, energy costs represented 25% of the operating costs of the representative customer. We have assumed that the company has revenues of £100m, with earnings of around 10% - £10m in this case. For our representative customer, this shows energy costs representing around twice the margin of the company. From an analysis of the returns of the energy intensive customers who participated in this study, WWA considers that this seems plausible.