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## Consultation on a Carbon Price Floor: support and certainty for low-carbon investment

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A response from the Combined Heat and  
Power Association

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# CHPA response to: The Consultation on a Carbon Price Floor

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## Executive Summary

The Government has committed to support the carbon price with the aim of increasing certainty for investors in low carbon electricity generation. It is proposed to provide this support through reform of the Climate Change Levy (CCL). This reform is particularly significant for combined heat and power (CHP) as it undermines the existing regime of exemptions from the CCL that offers the key support for CHP plant. These exemptions provide a sustaining level of subsidy that facilitates the continued operation of CHP plants and some limited growth in installed CHP capacity. The UK, however, missed its 2010 target for 10 GW<sub>e</sub> CHP by 4.4 GW<sub>e</sub> and it appears unlikely that projections of 12.7 GW CHP by 2020 will be met under this regime.

### The value of CHP

CHP is among the best available carbon abatement options for energy intensive users and is a highly cost effective solution for community and commercial scale energy schemes. **CHP operating in the UK saves between 9 and 13.5 MTCO<sub>2</sub> per annum.** These benefits have been recognised explicitly by Government, as noted by HM Revenue and Customs:

*'CHP provides one of the most cost-effective approaches for reducing CO<sub>2</sub> emissions and plays a crucial role in the UK Climate Change Programme.'*  
HMRC Notice CCL1/2 (July 2010)

### Impact of the Government's proposals

The Government's proposals introduce a new carbon price support (CPS) CCL liability for power generators, based upon the fossil fuel consumed for power generation. A CHP plant, which consumes fuel for the production of both power and heat, will similarly face a CPS liability on the total fuel consumed. This approach takes no account of the additional costs facing a CHP plant or of the efficiency and carbon-saving benefits it delivers. As a consequence it presents a punitive and disproportionate impact on such plant:

1. CHP plant will face an 'effective' CPS rate of up twice the rate of an equivalent power station
2. Existing CHP plant will increasingly cease operating in CHP mode
3. New investment in CHP will be halted
4. CHP plant will declassify from the CHP Quality Assurance Programme (CHPQA).

The consequence would be an increase in actual and reported CO<sub>2</sub> emissions from CHP sectors across the UK.

### A simple solution

To ensure that CHP operations and investment are not harmed by the reform of the CCL, there are two possible options:

1. In **recognition of the value of CHP and the need to increase uptake** in line with the Government's climate change and energy security agenda, **CHP could be fully exempted from the CPS tax**. This would provide additional material benefit and accelerate progress towards realising the full national potential for CHP
2. As a minimum, the **input fuel used to generate heat in CHP should be exempted** from the CPS tax. This would retain the status quo for operators and investors.

It is vital the any exemption is simple and does not create administrative burdens for Government. The CHPQA programme is used to verify that CHP plant save fuel and emissions. A very **simple no-cost modification to CHPQA procedures** could be made to calculate either a full or limited exemption from the CPS tax for CHP plants.

## Introduction

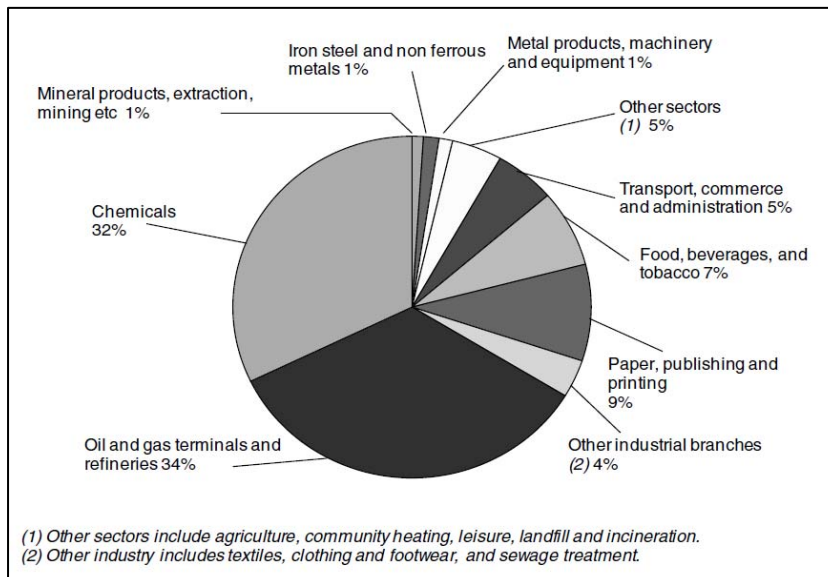
The Government has committed to introducing support for the carbon price and has indicated that it intends to achieve this through reform of the Climate Change Levy (CCL). The stated aim of CCL reform is to provide a stable carbon price signal on electricity generation to increase support and certainty for investors in low carbon electricity generation. The intention is that the carbon support price will be introduced from 2013 and the development work has been strongly based on the polluter pays principle.

The wealth of future energy scenarios that have been published all indicate that fossil fuels will continue to form a central plank of energy provision in a decarbonised economy both through carbon capture and providing flexible output in a generation mix that is increasingly unresponsive to demand. Good quality CHP represents the most optimal use of thermally derived power generation and might, therefore, expect to feature strongly in future development of the generation mix. The practical effect of the carbon price floor is, however, to penalise CHP operations; more broadly the Electricity Market Reform consultation contains no clear proposals to support growth of either fossil or renewable CHP.

### The value of CHP

CHP represents the most optimal use of any input fuel when creating thermally derived electricity and heat. The carbon savings it provides are due to this high fuel use efficiency. As a result CHP also addresses energy security and affordability issues. Many of the benefits of CHP do not accrue to the user of the plant and, therefore, without Government support the installation of a far cheaper heat-only boiler combined with the purchase of grid electricity is the more attractive option for potential users of CHP.

In 2009, CHP saved the UK economy between 9 and 13.5 MTCO<sub>2</sub>. Much of these savings accrued in industrial sectors at risk of carbon leakage<sup>1</sup> (Fig. 1)



**Figure 1:** CHP uptake across sectors of the UK economy. Over 50% comes from the refining and chemical sectors which are at risk of carbon leakage.

### The current exemptions regime for CHP

Currently, electricity generators and oil refineries are exempt from paying CCL on their input fuels. Good quality CHP operators are also exempt from CCL on both input fuel and exported electricity (LECs). The effect of the current exemptions regime has been to:

1. Ensure that many existing CHP plants continue to operate as CHP, through a variable output incentive that encourages CHP to operate at high load factors.

<sup>1</sup> Digest of UK Energy Statistics, *Department for Energy and Climate Change*, 2010

2. Improve the investment case for an important, if limited, increase in CHP installed capacity
3. Contribute a saving of 14 MTCO<sub>2</sub> at a cost to government of only £40/tonne CO<sub>2</sub> abated.

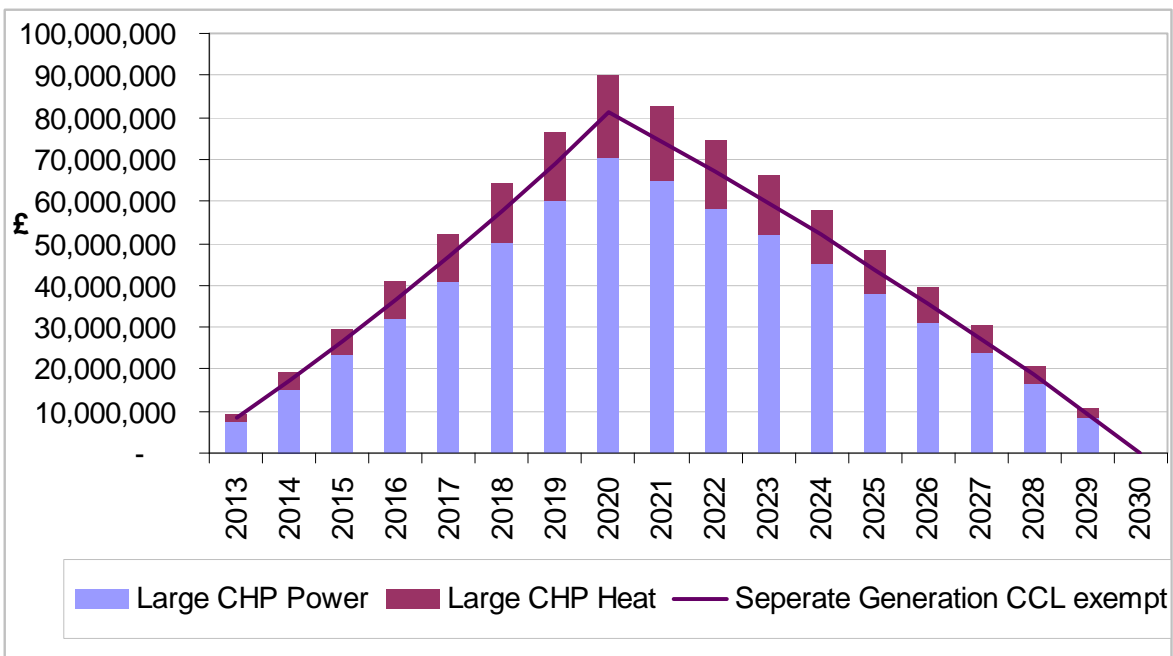
It is important to note that the current CCL exemption regime (along with other existing support for CHP) has been to provide a sustaining level of subsidy; it has proved insufficient to support the level of CHP investment and operation needed to meet the UK government's 2010 target for 10 GW of CHP by about 4.4 GW. DECC currently project installed capacity of 12.7 GW<sub>e</sub> by 2020 – compared to 5.6 GW<sub>e</sub> in 2009 and under the current support scheme, this would appear unlikely to be achieved.

### The Governments proposals for reforming the CCL and impact on CHP operation

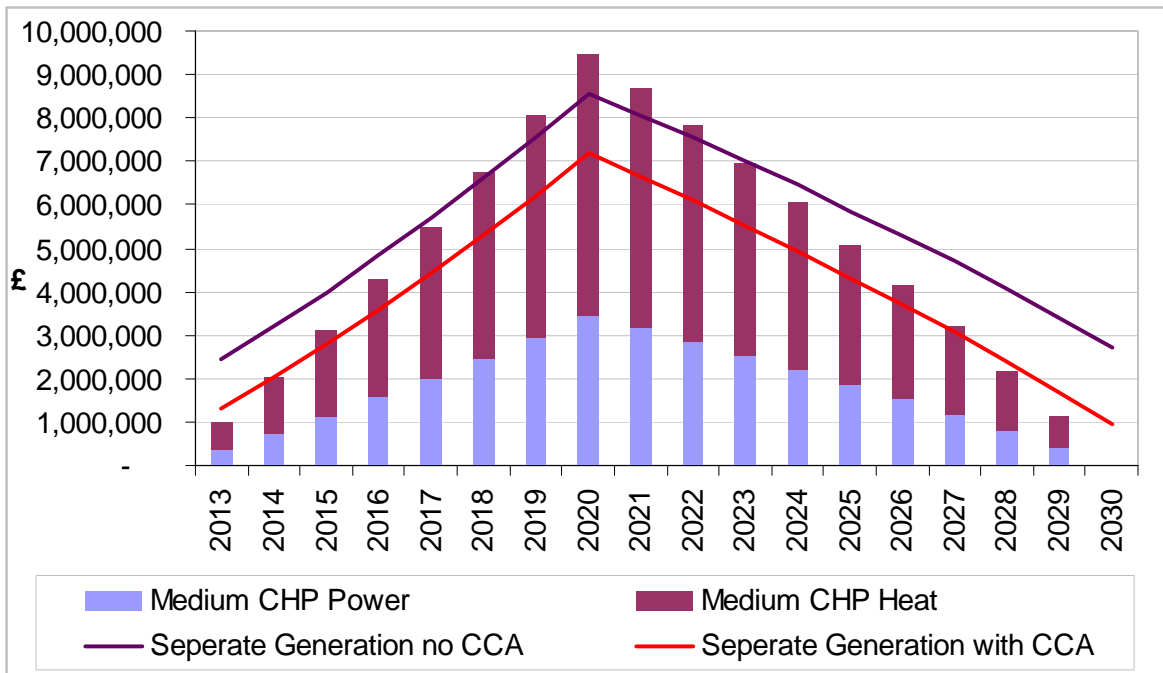
The Government's consultation proposes the removal of the existing exemption from CCL on input fuels for electricity generators. For CHP plant, the proposal is that all the input fuel for CHP (including that used to generate heat) will be subject to the new tax: the Carbon Price Support (CPS) Tax. By placing the CPS tax on all input fuels, CHP plant will pay up to twice as much tax per kWh of electricity produced than a typical gas power station.

The CHPA has modelled the proposed impacts of the new CPS tax by comparing it with the tax liability for an equivalent combination of a power-only combined cycle gas turbine (CCGT) power station and a stand alone boiler delivering the same amount of heat and power. The modeling does not include the cost of the European Union Emissions Trading Scheme (EUETS). The modeling presented below represents only the new tax regime under the CPS as it affects CHP and separate generation technologies. Wherever possible, Government data or projections have been used (e.g. EUA price, gas and electricity price etc).

The modeling indicates that CHP operators will suffer a significant additional cost burden as a result of the proposed changes which could result in generators paying Government for CHP derived emissions savings. The impact on CHP operations is more pronounced with a greater CPS price (Figs 2 and 3).



**Fig 2:** CPS tax cost impact on CHP (bars) versus the cumulative impact on CCGT and boilers for large scale (refinery based) CHP plant. Where the bars are higher than the line CHP plant would be paying a premium to Government for each tonne of carbon saved.



**Fig 3:** CPS tax cost impact on CHP (bars) versus the cumulative impact on CCGT and boilers for medium scale CHP plant where the heat customer has a Climate Change Agreement (CCA; red line) or no CCA.

#### Under Carbon Price Support Scenario 1 (the lowest carbon price proposal)

- For a small scale CHP plant, the total impact of the CPS tax in 2013 would be £5,339 of which £3,528 is attributable to the heat. In 2020 the liability would rise to £25,330, £16,738 would be applied to the heat portion.
- For a medium scale CHP plant, the total impact of the CPS tax in 2013 would be £331,666 of which £210,936 is attributable to the heat. In 2020 the liability would rise to £1,573,402, £1,000,667 would be applied to the heat portion.
- For a large scale CHP plant, the total impact of the CPS tax in 2013 would be £3,151,386 of which £680,439 is attributable to the heat. In 2020 the liability would rise to £14,949,960, £3,227,957 would be applied to the heat portion.

#### Impact on investment in CHP plant

As long as new gas fired power stations and boilers continue to be consented and installed, investment in new gas-fired CHP plant will yield emissions savings over its entire life compared to those boilers and power stations. **Investment in new CHP plant is, therefore, a valuable tool for government in reducing UK emissions.**

The projected impact on investment in new CHP plant (expressed as the Internal Rate of Return {IRR}) was modelled using Government projections and included additional benefits that CHP plant receives such as CCL Levy Exemption certificates (until 2023) and Enhanced Capital Allowances (not available to all CHP investors but included anyway).

For an investment to be made in a CHP plant, that investment will need to demonstrate that:

- a) the investment delivers an IRR better than, or commensurate with, other calls on the capital of that investor; and
- b) the investment delivers a superior IRR than the alternative investment in a boiler plant and CCGT. Typically an investor will seek a 3 to 4 percentage points premium in the IRR of a CHP plant to reflect the greater risk profile and transaction costs of the CHP plant

when compared to the alternative investment. For smaller plant this risk premium will tend to be greater to reflect poor economies of scale and a weaker ability for the investor or host site to manage their energy market risk.

The results of the modeling are illustrated in Table 1.

This analysis indicates that under the baseline conditions:

- For medium and large plant the baseline conditions indicate that the case for investment in CHP plant is already marginal today. These conditions will not preclude CHP investment but suggest that CHP investment will only occur where site-specific circumstances, such as regulatory pressures or wider investments on the site, impact upon commercial decision.
- For smaller plant there is a positive case for investment.

These modeling outputs reflect the empirical evidence of the marketplace, with a low general level of activity in the medium and large sector and more buoyant conditions for smaller plant.

Under the various scenarios following the introduction of the CPS element of the CCL:

- For all CHP there is a major deterioration of the absolute IRR from the baseline conditions. The impact is greatest under Scenario 3, where the deterioration ranges from 4.5 percentage points for the large CHP to 6.2 percentage points for the medium CHP.
- For all CHP there is a significant deterioration in the relative IRR as compared to the alternative investment in CCGT and boilers. Impacts are again greatest under Scenario 3, where for a large CHP the CHP investment is weaker than the alternative by 1.7 percentage points, this differential rising to 2.5 percentage points for the medium-sized plant. Whilst the small plant continues to show a positive differential under Scenario 3, this has fallen by 2.1 percentage points from the baseline case.

For all CHP, under all circumstances, the analysis demonstrates a major deterioration of the investment conditions for CHP as a result of the introduction of the CPS tax. It is recognised that the equivalent investment in CCGT and boilers is also impacted by the changes, as would be expected from a tax of this nature. However the relative impact on CHP is much greater, with the consequences that:

- a) the tax has a greater negative impact upon the lower-carbon CHP investment; and
- b) CCGT and boilers will become relatively more attractive as an investment option.

### Summary of Impacts

The result of the proposals will undermine the case for both new investment in, and continued operation of, CHP plant across the UK.

The impact for the CHP industry would be:

1. A halt in new CHP investment. Manufacturers and installers of CHP plant would lose orders for new CHP plant with associated economic impacts
2. Existing CHP plant (possibly not written down) becoming uneconomic. Plant not written down would become a cost burden to the owner
3. Supply of heat to customers may become uneconomic; CHP plant may switch to operating as a power plant losing revenue from heat sales.

The impacts for the UK may include:

1. Economic harm to the CHP manufacturing industry
2. A loss of inward investment in new CHP
3. An increase in CO<sub>2</sub> emissions from CHP plant as a result of declassification of CHP

4. A reduction in the recording of emissions savings (irrespective of whether they exist) through declassification from the CHPQA programme
5. Carbon leakage as a result of business moving away from the UK
6. Direct harm to the competitiveness of UK manufacturing sectors that utilise CHP, through increased costs.

**Table 1:** Effects on CHP plant and separate generation IRRs under the three proposed carbon price scenarios and the current (baseline) case.

Comparative IRR Plant Type	CPS on all fuel inputs			
	Baseline	Scenario 1	Scenario 2	Scenario 3
Large CHP	15.6%	14.8%	12.9%	11.1%
Large CCGT + Boiler (CCL exempt)	16.0%	15.4%	14.1%	12.8%
Delta (Positive = CHP Advantage)	-0.4%	-0.7%	-1.2%	-1.7%
Medium CHP	14.9%	13.8%	11.2%	8.7%
Medium CCGT + Boiler (with CCA)	14.1%	13.6%	12.4%	11.2%
Delta (Positive = CHP Advantage)	0.7%	0.2%	-1.2%	-2.5%
Small CHP	20.7%	19.9%	17.8%	15.8%
Small CCGT + Boiler	13.9%	13.4%	12.2%	11.0%
Delta (Positive = CHP Advantage)	6.8%	6.5%	5.6%	4.7%

### A simple effective solution

The CHPA considers that fossil CHP merits additional support above that which it currently receives for as long as new investment can be expected to deliver emissions reductions. The UK Government missed its 2010 target, for 10 GWe of CHP, by 4.4 GW and installed capacity is not growing significantly. The Government's own projections for CHP of 12.7 GW by 2020 do not look like they will be achieved without an increase in support for CHP plant. A failure to secure additional savings from CHP plant will require additional savings to be sought from other, higher cost, CO<sub>2</sub> abatement options.

If the Government wishes to meet its own projections for CHP installations, the **CPS mechanism could be used to support 'good quality' gas-fired CHP through a complete exemption on all input fuel**. A complete exemption from the CPS tax would provide a material benefit to good quality CHP and drive industry growth by a) maintaining existing absolute levels of IRRs for CHP and, crucially, b) improving the level of IRR relative to the competing investment in CCGT and boiler plant (Table 2). The effect of the limited exemption applying the CPS tax liability to the fuel used for power generation only will be to leave the position of CHP broadly unchanged: a) absolute levels of IRR will fall but b) IRR levels relative to the competing investment will remain in line with current differentials (table 3).

Should Government not wish to use the CPS mechanism to provide additional support for CHP, CHP should, as a minimum, be treated as other power generators i.e. be liable to pay CPS only on that portion of the fuel used for power generation. Fuel consumed for the production of heat, which is not subsequently used for power generation, should not be subject to the CPS tax. Charging an electricity tax on fuel used to generate heat will lead to a disproportionate penalty on CHP plant compared to separate heat and power generation and significantly impair both the case for continued operation in CHP mode for existing plant and for investment in new CHP (see appendix I; Table 3).

**Table 2:** Impact on the investment case for CHP (IRR) versus separate generation if all input fuel were to be exempted from the CPS tax

Comparative IRR		CPS on fuel inputs (CHP exempted)		
Plant Type	Baseline	Scenario 1	Scenario 2	Scenario 3
Large CHP	15.6%	15.6%	15.6%	15.6%
Large CCGT + Boiler (CCL exempt)	16.0%	15.4%	14.1%	12.8%
Delta (Positive = CHP Advantage)	-0.4%	0.2%	1.5%	2.8%
Medium CHP	14.9%	14.9%	14.9%	14.9%
Medium CCGT + Boiler (with CCA)	14.1%	13.6%	12.4%	11.2%
Delta (Positive = CHP Advantage)	0.7%	1.3%	2.4%	3.6%
Small CHP	20.7%	20.7%	20.7%	20.7%
Small CCGT + Boiler	13.9%	13.4%	12.2%	11.0%
Delta (Positive = CHP Advantage)	6.8%	7.4%	8.5%	9.7%

**Table 3:** Impact on the investment case for CHP (IRR) versus separate generation if all input fuel used to generate heat were to be exempted from the CPS tax

Comparative IRR		CPS on fuel inputs (heat exempted)		
Plant Type	Baseline	Scenario 1	Scenario 2	Scenario 3
Large CHP	15.6%	14.9%	13.5%	12.0%
Large CCGT + Boiler (CCL exempt)	16.0%	15.4%	14.1%	12.8%
Delta (Positive = CHP Advantage)	-0.4%	-0.5%	-0.6%	-0.8%
Medium CHP	14.9%	14.4%	13.5%	12.5%
Medium CCGT + Boiler (with CCA)	14.1%	13.6%	12.4%	11.2%
Delta (Positive = CHP Advantage)	0.7%	0.8%	1.0%	1.2%
Small CHP	20.7%	20.4%	19.7%	19.0%
Small CCGT + Boiler	13.9%	13.4%	12.2%	11.0%
Delta (Positive = CHP Advantage)	6.8%	7.1%	7.5%	7.9%

### Administrative simplicity

Implementing these changes needs to be achieved in the simplest possible way to minimize the burden for Government and industry. The CHP Quality Assurance (CHPQA) programme is a well established mechanism which could be easily adapted at no cost to Government to determine the amount of fuel used for electricity generation. This would easily facilitate either approach to exemption, a) for CPS for all fuel consumed by a CHP or b) an exemption from CPS for fuels used in heat generation, without creating an additional burden for either industry or Government. An example of how this could work is given in appendix II.

## Responses to Consultation Questions

### 3.A1: What are your expectations about the carbon price in 2020 and 2030?

Predicting the carbon price out to 2020 or 2030 is highly challenging particularly given the fundamental changes to the Emissions Trading Scheme that will commence in 2013. The Government's data indicates a price of £70 tonne in 2030 which does appear high compared to historical levels. If this were to be the case, the level of the carbon price floor (if it is operated in direct relation to the EUA price), may well be higher than indicated in the model proposed in the consultation.

In the context of this consultation, the CHPA is concerned that, once in place, there may be a tendency to raise the CPS tax rate under potential future administrations. Whilst the initial proposals are for a carbon price relative to the EUA price, there is no guarantee for the mechanism to continue in this way. This potential for change in the future will impact the risk analysis for investors. For CHP operators, both the absolute cost of the measure combined with the future CPS price risk will act as a powerful disincentive to invest.

### And how important a factor will it be when considering investment in low-carbon generation?

For gas-fired CHP plant the CPS tax will be a strong factor against investing in CHP plant as they will face an increased cost and risk compared separate generation of heat and power. For a power-only generator, the full costs can be passed through to the wholesale market mitigating the CPS tax price risk. A heat generator may be subject to all or part of the existing CCL tax whose increase over time is broadly predictable. For a CHP plant, the tax on the fuel used for heat generation cannot be passed on to the wholesale power market hence increasing the risks compared to a boiler.

The CPS tax may also become more expensive than the CCL boiler rate soon after the policy is implemented; the tax burden for heat delivered from CHP would become greater than the tax burden on heat delivered from a boiler. This cost increase will be exaggerated if the boiler operator has a Climate Change Agreement or were fully exempted from the CCL for boiler fuels.

For other low carbon generation (nuclear, renewables and CCS), generators are expected to operate under the proposed CfD FiT. Operators receiving the CfD FiT will be far less sensitive to price signals under the CPS as the CfD will guarantee the value of their power. Only if the CPS raised the power price above that under a CfD would it impact the operator but, given the costs of developing new low carbon generation and the proposed scenarios for the CPS price, such a situation appears unlikely to materialise. Furthermore, the CPS mechanism will only impact the wholesale price when fossil fuel generation operates at the margin. According to the Redpoint analysis, fossil fuelled plant will operate at the margin for less than 50% of the time by 2025<sup>2</sup>. For long term investment (such as low carbon generation plant) the impact of the carbon price support will be of diminishing significance over time. As much of the significant new plant investment is anticipated to occur post 2023, the impact of the CPS on these investments appears to be very limited.

The Carbon Price support may provide a very significant windfall to existing low carbon generators but such a windfall will not affect the investment case for new plant. The CHPA is concerned about the possibility for a windfall to plant which have already been written down or which are in current receipt of Government subsidies (both direct and indirect)

### 3.A2: If investors have greater certainty in the future long-term price of carbon, would this increase investment in low-carbon electricity generation in the UK? If so, please explain why.

<sup>2</sup> Electricity market reform: analysis of policy options. Redpoint Energy, December 2011

Whilst long-term certainty in the carbon price could facilitate new investment in low carbon generation, the price would need to be punitively high for such a mechanism to achieve such investment on its own<sup>3</sup>. The Government, through its Electricity Market Reform consultation, recognises this and proposes other mechanisms, principally the CfD FIT for supporting new renewables, CCS and nuclear plant. The combination of the reducing level of carbon pass through and the CfD mechanism causes the CHPA to question whether the CPS proposal will, on its own, bring forward new low carbon investment. Finally, the ability of future Governments to alter the CPS tax rate may cause investors to discount the value of the CPS for future low carbon investment.

**3.A3: How much certainty would investors attribute to a carbon price support mechanism if it were delivered through the tax system?**

As mentioned in Q3.A2, the ability of subsequent administrations to alter the CPS mechanism and rate may cause investors to discount significantly the value of the mechanism from the end of this Parliament.

**3.A4: In addition to carbon price support, is further reform of the electricity market necessary to decarbonise the power sector in the UK?**

Government analysis indicates that carbon price support is not the most cost effective mechanism for delivering a low carbon electricity system. There is wide acceptance that there is a need for reform of the market with the lack of liquidity being a key issue hampering new entrants.

There is a need for a clear narrative from Government as to the direction of the electricity market and its interaction with power demand including heat. In particular, the Government needs to determine a clear unified message on the future role for gas. Currently, there is a mix of messages from government with some arms and agencies indicating that there is almost no role for gas in the future whereas other areas of government have determined that new gas is vital for meeting energy security requirements. The CHPA would encourage Government to ensure that gas-fired CHP plant development is actively supported whilst new gas-fired power stations and gas-fired boilers continue to be approved and commissioned; CHP will emit fewer emissions than these forms of separate generation thus improving both security and affordability of energy supply.

The CHPA is concerned that the Governments proposals in the EMR and the Carbon Price Support consultation may not work in harmony and that their introduction in parallel will simply serve to add cost and administrative burden for no additional low carbon generation.

Whilst the EMR has a focus on power generation, the decarbonisation of industry, especially those with demand for high grade uninterrupted heat supplies, remains a difficult area to tackle. Currently gas-fired CHP represents the best compliance option delivering tangible emissions savings. Harming the viability of CHP may lead to an increase in emissions in those sectors where it is currently being used as a cost effective carbon abatement technology.

**Administration 4.B1: What changes would you need to make to your procedures and accounting systems to ensure you correctly account for CCL on supplies to electricity generators?**

The proposals may require significant changes to procedures for CHP operators. CHP plant are often part of a wider heat provision arrangement involving stand alone boilers. Due to the way the CHPQA programme operates, some or all stand-alone boilers may be included as part of the CHPQA compliance for a site. The tax changes may mean that CHP plant will need to re-register with the CHPQA programme based on the costs of the CCL for boiler input fuel and the CPS for generators. For many sites the gas fiscal meter is at the site boundary with sub (non-fiscal)

<sup>3</sup> Electricity market reform: analysis of policy options. Redpoint Energy, December 2011

meters at the CHP plant (which may be owned and operated by a third party). A requirement for a new fiscal meter at the CHP plant may create a significant administrative and cost burden for a CHP operator to comply with the CPS. By using the CHPQA system to levy the CPS tax only on fuel used for power, the need for such meters and complexity would be avoided.

For all sites which consume fossil fuels for a power generation (an potentially other uses), the introduction of the CPS will establish a requirement for administrative processes for determining the proportions of the fuel used in power generation (including the fuel requirement to generate electricity for the purpose of electricity generation) Some calculation will need to be devised for determining the proportion off generation used in power generation. In respect of this CHP plant are similar to power plant and it will be necessary to determine these proportions too. Such a mechanism will require the use of CHPQA as some of the fuel is not used for power generation at all. The CHPQA system is an extant audited and verified system for CHP plant and meets the requirements of the Cogeneration Directive. The ongoing use of the CHPQA and calculation of equitable treatment of CHP through this mechanism offers an administratively simple and cost effective option to Government whilst ensuring that the benefit of new and existing CHP continue to accrue to the UK economy.

**4.B2: How long would you need to make the necessary changes to your systems to account for CCL on supplies to electricity generators?**

If the CHPQA system is not to be used then it is difficult to quantify the impact of the CPS on systems for CHP plant operators but it is likely to be significant due to the administrative changes that will be required.

**4.B3: Please provide an estimate of how much the system changes would cost, both one-off and continuing?**

See answer to Q4.B2

**Types of generator**

**4.C1: Do you agree that all types of electricity generators should be treated equally under the proposed changes? If not, please explain why.**

The CHPA considers that fossil CHP merits additional support above that which it currently receives for as long as new investment can be expected to deliver emissions reductions. The UK Government missed its 2010 target, for 10 GW<sub>e</sub> of CHP, by 4.4 GW<sub>e</sub> and installed capacity is not growing significantly. The Government's own projections for CHP of 12.7 GW<sub>e</sub> by 2020 do not look like they will be achieved without an increase in support for CHP plant. CHP represents one of the lowest costs of carbon abatement to Government and is a well established technology. A failure to secure additional savings from CHP plant will require additional savings to be sought from other, higher cost, CO<sub>2</sub> abatement options and will eliminate one of the most practicable low-cost abatement options for industry.

If the Government wishes to meet its own projections for CHP installations, the CPS mechanism could be used to support 'good quality' gas-fired CHP through a complete exemption on all input fuel. **A complete exemption from the CPS tax would provide a material benefit to good quality CHP and drive industry growth.**

Should Government not wish to use the CPS mechanism to provide additional support for CHP, CHP should, as a minimum, be treated as other power generators i.e. all fossil fuelled electricity generators should be charged for fuel used for the generation of electricity. Fuel consumed for the production of heat, which is not for subsequently used for power generation, should not be subject to the CPS tax. Charging an electricity tax on fuel used to generate heat will lead to a disproportionate penalty on CHP plant compared to separate heat and power generation and significantly impair both the case for continued operation in CHP mode for existing plant and for investment in new CHP (see appendix I).

### **Commercial Analysis of CHP**

For an investment to be made in a CHP plant, that investment will need to demonstrate that:

- a) the investment delivers an IRR better than, or commensurate with, other calls on the capital of that investor; and
- b) the investment delivers a superior IRR than the alternative investment in a boiler plant and CCGT. Typically an investor will seek a 3 to 4 percentage points premium in the IRR of a CHP plant to reflect the greater risk profile and transaction costs of the CHP plant when compared to the alternative investment. For smaller plant this risk premium will tend to be greater to reflect poor economies of scale and a weaker ability for the investor or host site to manage their energy market risk.

The projected impact on investment in new CHP plant (expressed as the Internal rate of return {IRR}) was modelled using Government projections and included additional benefits that CHP plant receives such as CCL Levy Exemption certificates (until 2023) and enhanced capital allowances (not available to all CHP investors but included anyway).

**Table 4: Effects on CHP plant and separate generation IRRs under the three proposed carbon price scenarios and the current (baseline) case.**

Comparative IRR	CPS on all fuel inputs			
	Baseline	Scenario 1	Scenario 2	Scenario 3
Plant Type				
Large CHP	15.6%	14.8%	12.9%	11.1%
Large CCGT + Boiler (CCL exempt)	16.0%	15.4%	14.1%	12.8%
Delta (Positive = CHP Advantage)	-0.4%	-0.7%	-1.2%	-1.7%
Medium CHP	14.9%	13.8%	11.2%	8.7%
Medium CCGT + Boiler (with CCA)	14.1%	13.6%	12.4%	11.2%
Delta (Positive = CHP Advantage)	0.7%	0.2%	-1.2%	-2.5%
Small CHP	20.7%	19.9%	17.8%	15.8%
Small CCGT + Boiler	13.9%	13.4%	12.2%	11.0%
Delta (Positive = CHP Advantage)	6.8%	6.5%	5.6%	4.7%

The results of the modeling are illustrated in Table 4. This analysis indicates that under the baseline conditions:

- For medium and large plant the baseline conditions indicate that the case for investment in CHP plant is already marginal today. These conditions will not preclude CHP investment but suggest that CHP investment will only occur where site-specific circumstances, such

as regulatory pressures or wider investments on the site, impact upon commercial decision.

- For smaller plant there is a positive case for investment.

These modeling outputs reflect the empirical evidence of the marketplace, with a low general level of activity in the medium and large sector and more buoyant conditions for smaller plant.

Under the various scenarios following the introduction of the CPS element of the CCL:

- For all CHP there is a major deterioration of the absolute IRR from the baseline conditions. The impact is greatest under Scenario 3, where the deterioration ranges from 4.5 percentage points for the large CHP to 6.2 percentage points for the medium CHP.
- For all CHP there is a significant deterioration in the relative IRR as compared to the alternative investment in CCGT and boilers. Impacts are again greatest under Scenario 3, where for a large CHP the CHP investment is weaker than the alternative by 1.7 percentage points, this differential rising to 2.5 percentage points for the medium-sized plant. Whilst the small plant continues to show a positive differential under Scenario 3, this has fallen by 2.1 percentage points from the baseline case.

For all CHP, under all circumstances, the analysis demonstrates a major deterioration of the investment and operating conditions for CHP as a result of the introduction of the CPS tax. It is recognised that the equivalent investment in CCGT and boilers is also impacted by the changes, as would be expected from a tax of this nature. However the relative impact on CHP is much greater, with the consequences that:

- a) the tax has a greater negative impact upon the lower-carbon CHP investment; and
- b) CCGT and boilers will become relatively more attractive as an investment option.

**Table 5** Impact on investment case (absolute IRR) for CHP compared to separate generation under all three carbon price scenarios when CHP is fully exempted from the CPS tax

Comparative IRR	CPS on fuel inputs (CHP exempted)			
	Baseline	Scenario 1	Scenario 2	Scenario 3
Plant Type				
Large CHP	15.6%	15.6%	15.6%	15.6%
Large CCGT + Boiler (CCL exempt)	16.0%	15.4%	14.1%	12.8%
Delta (Positive = CHP Advantage)	-0.4%	0.2%	1.5%	2.8%
Medium CHP	14.9%	14.9%	14.9%	14.9%
Medium CCGT + Boiler (with CCA)	14.1%	13.6%	12.4%	11.2%
Delta (Positive = CHP Advantage)	0.7%	1.3%	2.4%	3.6%
Small CHP	20.7%	20.7%	20.7%	20.7%
Small CCGT + Boiler	13.9%	13.4%	12.2%	11.0%
Delta (Positive = CHP Advantage)	6.8%	7.4%	8.5%	9.7%

Table 5 illustrates the effect of providing a complete exemption from the CPS tax. This analysis demonstrates that:

- All CHP retains the positive IRR at the level of the baseline scenario.

- *There is a progressive improvement in the relative IRR as compared to the alternative investment in CCGT and boilers as the CPS rate of CCL increases. Under Scenario 1 (low CPS rate) there is a modest improvement in the advantage for all scales of CHP of 0.6 percentage points. At higher rates of CPS the advantage for CHP increases, and under Scenario 3 is in the region of the 3 to 4% percentage points advantage in IRR that is typically sought for this scale of plant. For smaller plant the situation is similarly improved.*

**Table 6** Impact on investment case (IRR: percentage point change) for CHP compared to separate generation under all three carbon price scenarios when fuel used for heat from CHP is exempted from the CPS tax

Comparative IRR		CPS on fuel inputs (heat exempted)		
Plant Type	Baseline	Scenario 1	Scenario 2	Scenario 3
Large CHP	15.6%	-0.7%	-2.1%	-3.6%
Large CCGT + Boiler (CCL exempt)	16.0%	-0.6%	-1.9%	-3.3%
Delta (Positive = CHP Advantage)	-0.4%	-0.1%	-0.2%	-0.3%
Medium CHP	14.9%	-0.4%	-1.4%	-2.4%
Medium CCGT + Boiler (with CCA)	14.1%	-0.5%	-1.7%	-2.9%
Delta (Positive = CHP Advantage)	0.7%	0.1%	0.3%	0.5%
Small CHP	20.7%	-0.3%	-1.0%	-1.7%
Small CCGT + Boiler	13.9%	-0.5%	-1.7%	-2.9%
Delta (Positive = CHP Advantage)	6.8%	0.3%	0.7%	1.1%

Table 6 illustrates the effect where the fuel consumed for the production of heat is exempted from the CPS tax. This analysis demonstrates that:

- *The IRR for all CHP deteriorates with the introduction of the CPS tax, with the greatest impact demonstrated at the highest rate of CPS under Scenario 3. The rate of deterioration for CHP is consistent with the rate of deterioration for the equivalent investment in CCGT and boiler plant.*
- *For all CHP under all scenarios there is minimal change in the relative IRR as compared to the alternative investment in CCGT and boilers as the CPS rate of CCL increases. There is a small deterioration in the situation for the largest plant, with the disadvantage for CHP rising from 0.4 percentage points under the baseline to 0.7 percentage points under Scenario 3. For the medium plant the advantage improves from 0.7 percentage points to 1.2 under Scenario 3, and for the smaller plant the advantage increases by 1.1 percentage points over the same range.*

**4.C2: Is there a case for providing additional or more preferential treatment for CHP? If so, what is the best way of achieving this?**

The CHPA is concerned that the structure of this question implies that the Government's proposals provide additional or more preferential treatment for CHP. As a result there is a risk that other stakeholders responding to the consultation are likely to respond 'no' to this question due to the manner in which it is framed. The proposals will penalise CHP compared to the status quo and create the perverse outcome that CHP operators may pay government for each tonne of carbon saved!

As stated in Q4.C1, the CHPA believes that CHP merits additional support and that this could be provided through a full exemption from the CPS for all good quality CHP plant. **As an absolute minimum CHP should not be penalised compared to the current situation and this outcome is achieved by exempting the fuel used for heat generation from the CPS tax.** Such an exemption will ensure that CHP is not disadvantaged through the new mechanism.

If the CPS tax were levied on all input fuel the result would be to halt new investment in CHP. Existing CHP may stop operating and declassify as CHP. Declassification would arise as there would be no advantage to operate as a good quality CHP rather than an autogenerator. In these circumstances, CHP operators may stop registering for the CHPQA (to save administrative costs) as it will yield little or no benefit. As a result, the emissions savings delivered by those CHP plant could no longer be counted by Government and reported emissions for the UK may rise as a result. The recorded installed capacity for CHP plant in the UK would also fall.

Working with members, the CHPA has carried out extensive fiscal analysis of the impacts of the CPS on CHP plant. Headline details of this analysis are presented in Annex 1.

**4.C3: Do you agree that tax relief should be considered for power stations with CCS? If so, what are the practical issues in designing a relief; what operational standards should a CCS plant meet in order to be eligible; and how might these issues differ for demonstration projects?**

The CHPA advocates that CCS power stations should be exempted from the CPS tax relief based on the amount of carbon they abate. For CCS with CHP, the additional carbon abatement from supplying carbon free heat should be included within the calculation to ensure that CCS CHP is treated equitably within the mechanism. The CHPQA may be used to achieve this.

**Imports and exports****4. D1: What impact would the Government's proposals have on electricity generators and suppliers that export or import electricity?**

For power imports and exports, the proposals will create an unfair competitive advantage to power inputs irrespective of the carbon intensity of the source. There will be an unfair disadvantage to fossil fuel generated power exported from the UK.

As generation in Northern Ireland operates in the All Ireland market it is unclear how the CPS will interact with this market, but costs for power in Eire may increase as a result.

**4.D2: What impact might the proposals have on trading arrangements for electricity?**

Nil response

#### 4.D3: What impact might the proposals have on electricity generation, trading and supply in the single electricity market in Northern Ireland and Ireland?

##### Carbon price support mechanism

See Q4. D1

#### 4.E1: How should the carbon price support rates be set in order to increase certainty for investors, in particular over the medium and long term?

The CPS rates will provide little or no certainty for investors as its impact and will diminish in an unpredictable way over time (due to increasing low carbon penetration starting from as early as 2018). As the carbon price pass-through is expected to start to diminish 5 years after the introduction of the policy, the potential for it providing a medium to long term signal seems very limited.

For CHP operators it is not the carbon price but mechanism that will provide uncertainty. The risk of future changes in the CPS rate or mechanism by subsequent Parliaments remains a very significant risk for the CPS policy.

#### 4.E2: Which mechanism, or alternative approach, would you most support and why?

As stated Q3.A1 it is unclear as to what value the CPS brings in delivering low-carbon generation within the context of the wider reforms proposed. In the interest of simplification for both Government and the industry the CHPA would prefer for all low carbon generation incentives to be explicit through one mechanism which could also ensure transparency.

The CfD FIT alone could deliver low carbon generation and the CfD mechanism costs consumers only on delivery of new low carbon generation. **The CPS, however, adds in consumer cost but provides no guarantee of delivery of new low carbon generation** particularly during a time of fragile economic recovery. Consumers are required to pay a premium for power but that premium may not achieve any new investment. The proposal, therefore, represents a high risk for consumers and it is questionable whether it is a good use of their money.

If CPS were to be implemented, it should only be on fossil fuels used for power generation not on fossil fuel used for heat generation.

The most appropriate mechanism is a rate set based on a carbon market index over a specific period. Once set the legislation should prohibit future government intervention in the tax-inclusive EUA price.

The stated intent of the proposal is to provide greater stability and certainty over the carbon price. The only method of achieving this is through a mechanism which explicitly links the support rate and the emissions price achieved in the market. By setting the rate over an annual index the Government would avoid setting a rate in a manner which lacks transparency or which is tied to the price at one point in time. Rather than allowing different companies to hedge using a timing of their choice, any mechanism will force a large number of buyers onto the market at a known time and could potentially distort the market. Although this will be a natural consequence of any support mechanism linked to the market price, the longer the time period over which the index is set the less the market will be impacted.

Ideally the rate should be tied to an emissions price at or close to the time of delivery. This avoids tying up capital holding EUAs for long periods of time and closer matches the EUAs purchased at the index to the number of EUAs required by a generator. One method could be setting the support rate monthly, based on the average index for the previous month. We assume that the UK EUA auctions will be the index used to set the reference price. As such

auctions should be held on a regular (e.g. weekly) basis rather than the current irregular sales of large volumes so as to tie purchases closer to time of delivery of power.

#### **4.E3: What impact would the proposals have on your carbon trading arrangements?**

The proposal will significantly impact hedging strategies for all companies impacted by the carbon price support rate. As the support rate is relative to a defined EU ETS price, to maintain certainty over carbon price achieved it will be necessary to source credits at the time the price is defined. To source credits at any time before or after the price is defined would create uncertainty over the total price achieved, as the total carbon price will be EUA price plus carbon support price.

Additionally, the price support mechanism may impact the instruments used to hedge carbon, adding extra cost to generators. Generators may need to use options or similar to hedge the risk from shifts in the carbon price from below to above the support price level (or vice versa).

For example, where a power producer hedges power and fuel three years forward they would assume a total carbon price at the level defined in legislation rather than at current market rates (where this is lower) and not enter into carbon hedges. To keep the hedged revenue certain carbon credits would then be purchased at the time the reference price for the legislation is set, and any deviation in price achieved in the market from the reference price would be an additional cost or revenue to the company. However, if the reference carbon price was above the support level set in legislation, but the forward price at the time of the forward power sales hedging was below this support level, the spark or dark spread locked in will be lower than expected and potentially negative unless the generator had used options to hedge this risk.

#### **Future price of carbon**

##### **4.F1: Should the Government target a certain carbon price a) for 2020 and b) for 2030? If so, at what level?**

For CHP operators the target price is less relevant than the difference between the EUA price and the target price as this represents CPS tax. As the future EUA price is unknown and difficult to forecast, the target price is irrelevant. The reason the absolute CPS tax value is important to CHP operators is that it is this value that will be used to compare with the counterfactual investment cost - i.e. the CCL liabilities of a boiler and generation from the grid. The risk of the EUA price being low and, therefore, the CPS price being higher than forecast, creates a significant investment risk for CHP and will discourage investment in CHP. As noted earlier, this risk can be avoided through exempting the fossil fuel used for the generation in a CHP plant from the CPS tax.

The low level of carbon pass-through anticipated in 2030 will limit the impact of any carbon price on the wholesale electricity market in 2030.

##### **4.F2: What is the most appropriate carbon price for the UK to meet its emissions reduction targets in the power generation sector? How would this be affected by changes in the structure of the electricity market?**

See Q4. F1

##### **4.F3: When would be the most appropriate time for introducing a carbon price support mechanism and what would be the most appropriate level?**

The introduction of the CPS tax before new low carbon investment can be generating represents a windfall to existing generators. It is not anticipated that significant new nuclear will be in place before 2020 hence the proposals risk a windfall to existing plant supported under the renewables obligation and existing nuclear. If the CPS were applied from 2018, however, when new low

carbon generation may come on stream, then impacts of the CPS will be diminished due to decreasing periods when fossil fuel generation operates at the margin

### **Electricity investment**

#### **5.B1: What impact would you expect the carbon price support mechanism to have on investment in low-carbon electricity generation?**

The introduction of the CPS tax before new low carbon investment can be generating represents a windfall to existing generators. It is not anticipated that significant new nuclear will be in place before 2020 hence the proposals risk a windfall to existing plant supported under the renewables obligation and existing nuclear. If the CPS were applied from 2018, however, when new low carbon generation may come on stream, then impacts of the CPS will be diminished due to decreasing periods when fossil fuel generation operates at the margin

#### **5.B2: What other impacts would you expect carbon price support to have on investment decisions in the electricity market?**

The proposals will halt investment in CHP and will incentivise CHP to consider declassifying as CHP as well as increasing the use of gas fired boilers thus increasing CO<sub>2</sub> emissions.

#### **5.B3: How should carbon price support be structured to support investment in electricity generation whilst limiting impacts on the wholesale electricity price?**

The aim of carbon price support is to increase the cost of wholesale power generated through fossil fired generation. If the CPS fails to raise the wholesale price the policy cannot provide value to potential investors in new low carbon generation and, therefore, would not be working.

As noted earlier, the CHPA is not persuaded that the proposals will, on their own, bring forward any new low carbon generation (nuclear, CCS, renewables) and that with the CFD FiT in place, the CPS will have no impact on these investment decisions either.

### **Existing low-carbon generators**

#### **5.C1: Can you provide an assessment of the impact of the proposals on your generation portfolio and overall profitability?**

The reform of the carbon price floor as proposed will create a punitive and disproportionate impact on CHP plant as all the fuel (not only fuel used to generate power) will be subject to the new carbon price support tax. Under these conditions the effective level of tax per unit of power generated could be up to twice that paid by the equivalent gas-fired power station despite the CHP plant saving carbon. The impact of the proposals would be to cause:

1. existing CHP plant to stop operating in CHP mode
2. CHP plant to declassify from the CHP Quality Assurance Programme (CHPQA)
3. a halt new investment in CHP

The result would be an increase in actual and reported CO<sub>2</sub> emissions from CHP sectors across the UK

#### **5.C2: What would be the implications of supporting the carbon price for existing electricity generators and how should the Government take this into account?**

The proposals will provide a significant windfall to existing low carbon generators - the Government has not published the costs of this but it appears to be a poor use of consumers' money.

Using DECC projections from 2013 for existing nuclear output, which reflects plant closures going forwards and the level of Renewable output achieved in 2013 going forwards, it was assumed that the marginal plant is a 50% CCGT to derive the value of CPS passed through to existing Low

Carbon generation. No impacts from interconnectors have been included (hence with these assumptions this is an underestimation)

The estimated impact from CPS to existing Renewable and Nuclear generators in 2020 cumulative first 10 yr impact of CPS, assuming full pass-through of CPS is set out below:

- Under Scenario 1: in 2020 - £150MM. The cumulative impact - £0.9BN (2013-22)
- Under Scenario 2: in 2020 - £500MM. The cumulative impact - £3.0BN (2013-22)
- Under Scenario 3: in 2020 - £850MM. The cumulative impact - £5.4BN (2013-22)

### **Electricity price impacts**

#### **5.D1: How do you currently manage fluctuations in the wholesale electricity price?**

The CHPA cannot comment of the trading strategies of CHP operators.

#### **5.D2: What difference will supporting the carbon price make to your business?**

The CHP industry will suffer significant harm as a result of these proposals as CHP will become significantly less attractive when compared to separate generation of heat and power. The CHPA is not opposed to a mechanism to support the carbon price but the one proposed will harm the CHP manufacturing, installation and maintenance industries. Furthermore, the industries that are served by CHP plant, many of which are in carbon leakage sectors, will also suffer directly as a result of the proposals. If, as proposed, CHP operators will pay the CPS tax on fuel used for heat production this will increase the heat cost and, for industry, costs of production. Much of the UK's industry that is subject to carbon leakage is currently supplied by CHP plant and the increase in costs will make these UK industries less competitive compared to EU and international counterparts. This cost increase will be particularly pronounced in sectors with CCAs and in CCL exempt sectors.

#### **5.D3: As an electricity generator or supplier, how much of the cost of the carbon price support would you pass on to consumers?**

CHP plant large enough to access the wholesale market should be able to pass-through the carbon price to the power market but only on the power they generate at the rate paid by a power only generator. As the proposal is to include fuel used for heat generation, CHP plants will, in effect, pay about twice the tax per unit of power generated and, therefore, will be unable to pass the full cost of the tax onto the electricity market. The cost of CHP heat will increase as a result and, at the point that this additional costs makes a CHP more costly to operate than a boiler the operator will cease running the CHP plant with a consequential increase in emissions as a result.

#### **5.D4: As a business, how much of the cost of energy bills do you pass on to customers?**

CHP plant large enough to access the wholesale market should be able to pass-through the carbon price to the power market but only on the power they generate at the rate paid by a power only generator. As the proposal is to include fuel used for heat generation, CHP plants will, in effect, pay about twice the tax per unit of power generated and, therefore, will be unable to pass the full cost of the tax onto the electricity market. The cost of CHP heat will increase as a result and, at the point that this additional costs makes a CHP more costly to operate than a boiler the operator will cease running the CHP plant with a consequential increase in emissions as a result.

### 5.D5: How might your company or sector be affected and would there be any impact on your profit margins?

The reform of the carbon price floor as proposed will create a punitive and disproportionate impact on CHP plant as all the fuel (not only fuel used to generate power) will be subject to the new carbon price support tax. Under these conditions the effective level of tax per unit of power generated could be up to twice that paid by the equivalent gas-fired power station despite the CHP plant saving carbon. The impact of the proposals would be to cause:

1. existing CHP plant to stop operating in CHP mode
2. CHP plant to declassify from the CHP Quality Assurance Programme (CHPQA)
3. a halt new investment in CHP

The result would be an increase in actual and reported CO<sub>2</sub> emissions from CHP sectors across the UK

As long as new gas fired power stations and boilers continue to be consented and installed, investment in new gas-fired CHP plant will yield emissions savings over its entire life compared to those boilers and power stations. **Investment in new CHP plant is, therefore, a valuable tool for government in reducing UK emissions.**

The projected impact on investment in new CHP plant (expressed as the Internal Rate of Return {IRR}) was modelled using Government projections and included additional benefits that CHP plant receives such as CCL Levy Exemption certificates (until 2023) and Enhanced Capital Allowances (not available to all CHP investors but included anyway).

For an investment to be made in a CHP plant, that investment will need to demonstrate that:

- a) the investment delivers an IRR better than, or commensurate with, other calls on the capital of that investor; and
- b) the investment delivers a superior IRR than the alternative investment in a boiler plant and CCGT. Typically an investor will seek a 3 to 4 percentage points premium in the IRR of a CHP plant to reflect the greater risk profile and transaction costs of the CHP plant when compared to the alternative investment. For smaller plant this risk premium will tend to be greater to reflect poor economies of scale and a weaker ability for the investor or host site to manage their energy market risk.

The results of the modeling are illustrated in Table 7.

This analysis indicates that under the baseline conditions:

- For medium and large plant the baseline conditions indicate that the case for investment in CHP plant is already marginal today. These conditions will not preclude CHP investment but suggest that CHP investment will only occur where site-specific circumstances, such as regulatory pressures or wider investments on the site, impact upon commercial decision.
- For smaller plant there is a positive case for investment.

These modeling outputs reflect the empirical evidence of the marketplace, with a low general level of activity in the medium and large sector and more buoyant conditions for smaller plant.

Under the various scenarios following the introduction of the CPS element of the CCL:

- For all CHP there is a major deterioration of the absolute IRR from the baseline conditions. The impact is greatest under Scenario 3, where the deterioration ranges from 4.5 percentage points for the large CHP to 6.2 percentage points for the medium CHP.
- For all CHP there is a significant deterioration in the relative IRR as compared to the alternative investment in CCGT and boilers. Impacts are again greatest under Scenario 3, where for a large CHP the CHP investment is weaker than the alternative by 1.7

percentage points, this differential rising to 2.5 percentage points for the medium-sized plant. Whilst the small plant continues to show a positive differential under Scenario 3, this has fallen by 2.1 percentage points from the baseline case.

For all CHP, under all circumstances, the analysis demonstrates a major deterioration of the investment conditions for CHP as a result of the introduction of the CPS tax. It is recognised that the equivalent investment in CCGT and boilers is also impacted by the changes, as would be expected from a tax of this nature. However the relative impact on CHP is much greater, with the consequences that:

- c) the tax has a greater negative impact upon the lower-carbon CHP investment; and
- d) CCGT and boilers will become relatively more attractive as an investment option.

**Table 7:** Effects on CHP plant and separate generation IRRs under the three proposed carbon price scenarios and the current (baseline) case.

Comparative IRR	CPS on all fuel inputs			
	Baseline	Scenario 1	Scenario 2	Scenario 3
Plant Type				
Large CHP	15.6%	14.8%	12.9%	11.1%
Large CCGT + Boiler (CCL exempt)	16.0%	15.4%	14.1%	12.8%
Delta (Positive = CHP Advantage)	-0.4%	-0.7%	-1.2%	-1.7%
Medium CHP	14.9%	13.8%	11.2%	8.7%
Medium CCGT + Boiler (with CCA)	14.1%	13.6%	12.4%	11.2%
Delta (Positive = CHP Advantage)	0.7%	0.2%	-1.2%	-2.5%
Small CHP	20.7%	19.9%	17.8%	15.8%
Small CCGT + Boiler	13.9%	13.4%	12.2%	11.0%
Delta (Positive = CHP Advantage)	6.8%	6.5%	5.6%	4.7%

**5.D6: Do you have any comments on the assessment of equality and other impacts in the evidence base of the Impact Assessment, included at Annex D?**

Due to the short timetable for the consultation (effectively 6 weeks due to the Christmas and New Year period), the CHPA has not had sufficient time to investigate the impact assessment in sufficient detail to comment. We are concerned that the impact assessment appears to contain no mention of CHP. Given that our modelling using Government projections indicates significant harm to CHP operators; this appears to be a significant omission by the Government.

## Appendix I

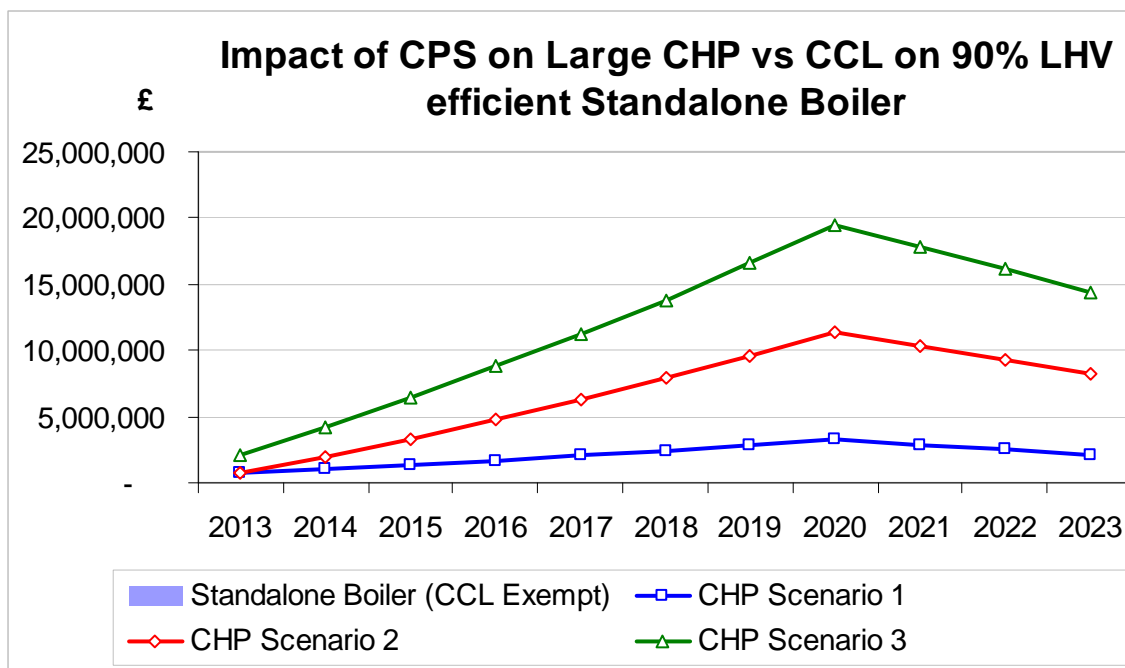
The analysis modelled the impact of the proposed CPS on 3 sample types of CHP plant versus the comparative investment decision of separate generation of Power and Heat:

Large CHP generating 830MW of Power, supplying 300 teph of Steam to a Refinery

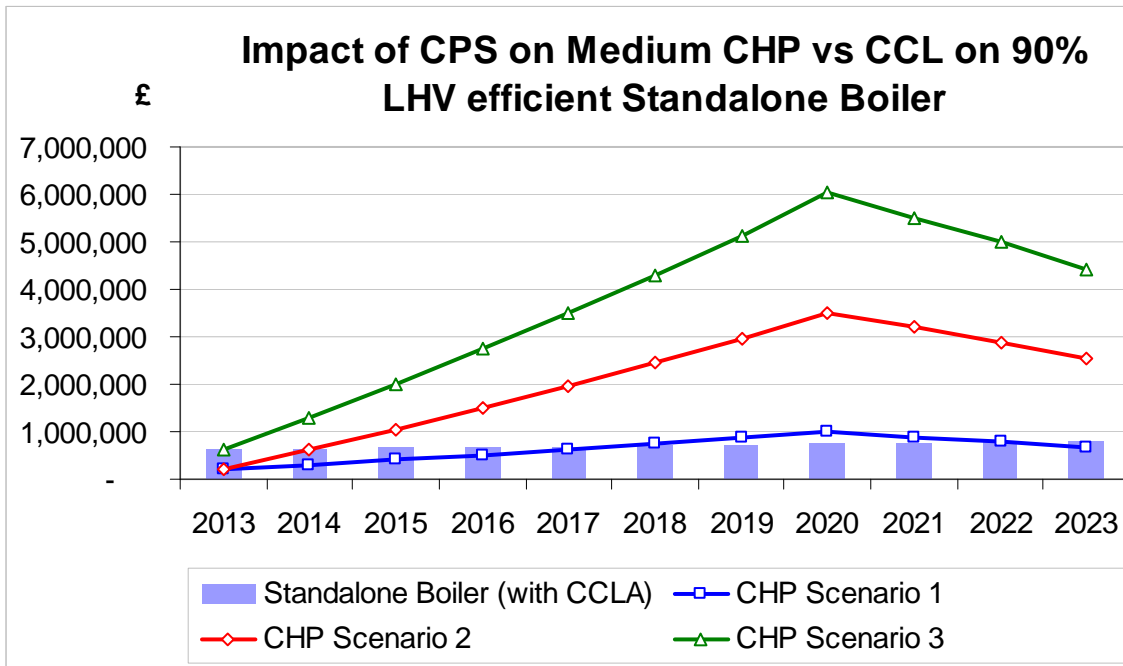
Medium CHP generating 66MW of Power, supplying 95 teph of Steam to a user with a CCLA

Small embedded CHP generating 1MW of Power and 2 teph of Steam.

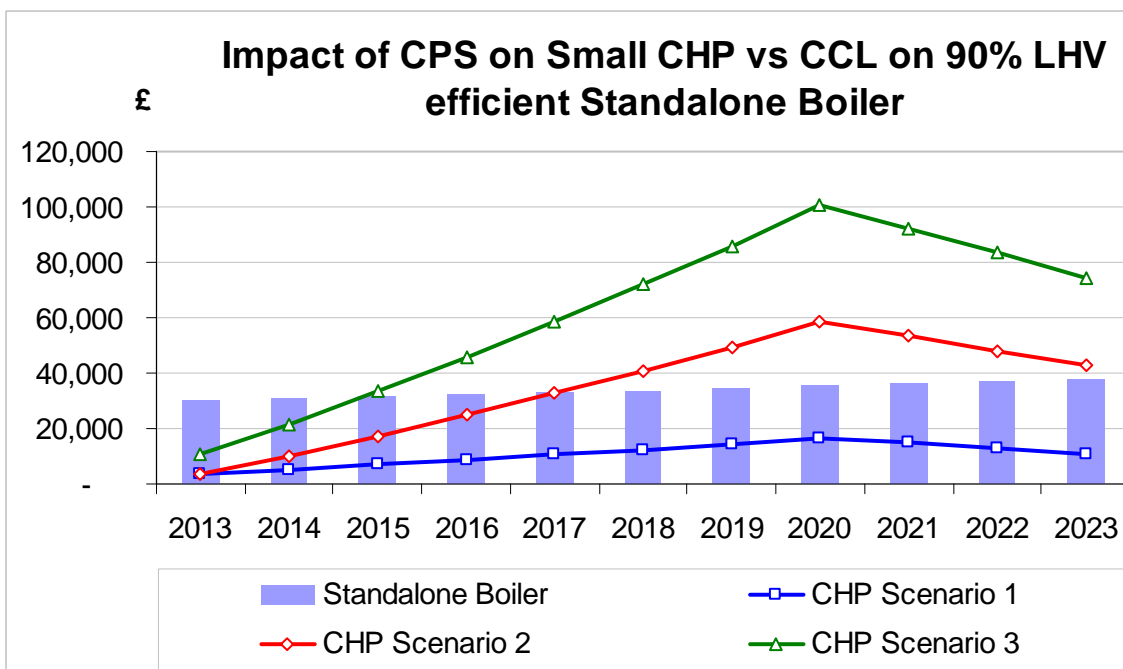
The following charts highlight the increased liability faced by CHP versus separate generation and demonstrate that the statement made in *“Fossil fuel based CHP would still face a significantly lower CCL liability relative to the separate generation of heat and power”* is incorrect. The charts below indicate that under CPS the generation of heat in a CHP will face a greater liability than that from comparative generation in a standalone boiler.



**Figure 1** – The impact of the CPS is that a large CHP supplying heat to a refinery will face a greater liability than that of a boiler which faces a zero liability.



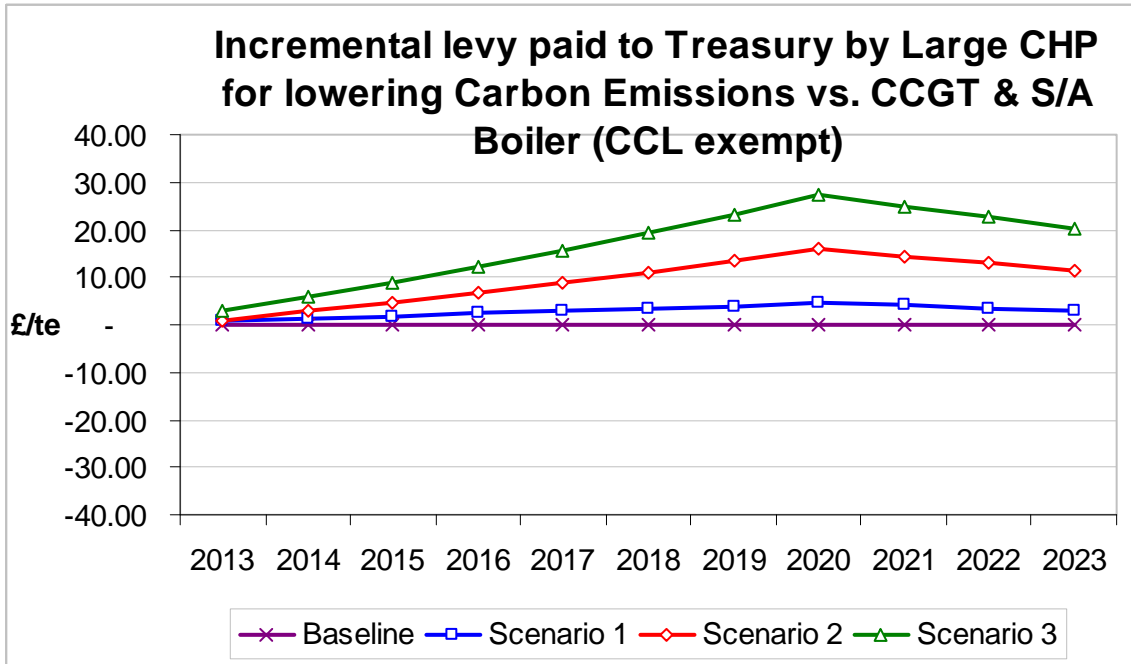
**Figure 2** – The impact of the CPS is that a Medium sized CHP supplying heat to a user with a CCLA will face a greater liability than that of a boiler which receives a 65% CCL discount under most scenarios.



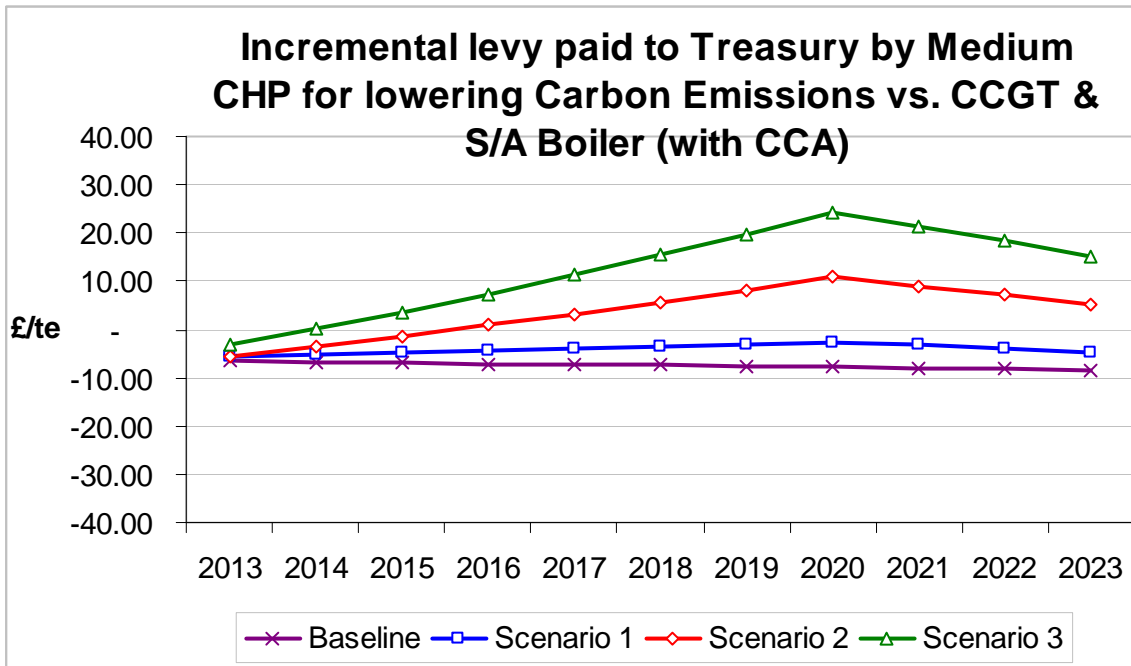
**Figure 3** – The impact of the CPS is that a Small sized CHP supplying heat to a user will face a greater liability than that of a boiler under Scenarios 2 and 3 for most of the time

The subsequent three charts indicate that, when the lines cross above the zero point on the y-axis, the total liability to CHP is greater than that of separate generation and result in CHP paying government for saving emissions.

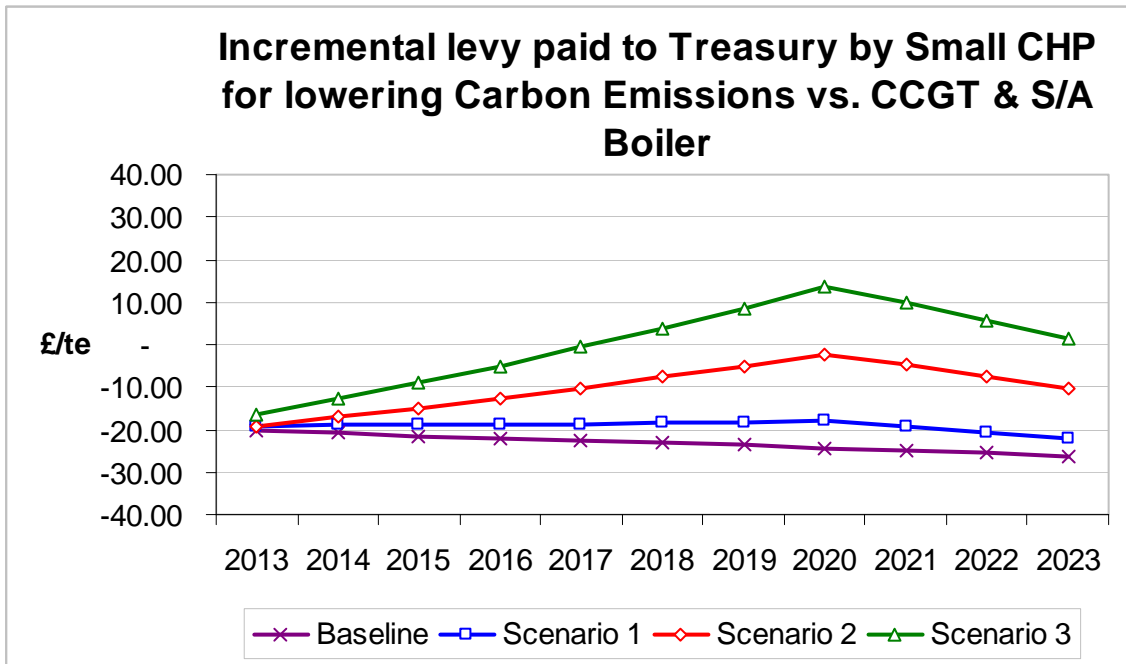
For the Large CHP this occurs under all scenarios from implementation, For Medium CHP this occurs under scenario 2 from 2016 and under scenario 3 from 2014. For the Small CHP this occurs only under scenario 3 from 2018.



**Figure 4** Incremental levy paid by large CHP for lowering carbon emissions compared to separate generation



**Figure 5** Incremental levy paid by medium CHP for lowering carbon emissions compared to separate generation

**Figure 6**

Tables 8 and 9 below highlight the impact on IRR from CPS to CHP and its competition (Fig.7) and that by exempting heat CHP can move back to a position of equilibrium (Fig 8), annex III proposes how this could be achieved simply.

**Table 8**

IRR Impact vs. Baseline Plant Type	CPS on all fuel inputs		
	Scenario 1	Scenario 2	Scenario 3
Large CHP	-0.8%	-2.7%	-4.5%
Large CCGT + Boiler (CCL exempt)	-0.6%	-1.9%	-3.3%
Medium CHP	-1.1%	-3.6%	-6.2%
Medium CCGT + Boiler (with CCA)	-0.5%	-1.7%	-2.9%
Small CHP	-0.8%	-2.9%	-5.0%
Small CCGT + Boiler	-0.5%	-1.7%	-2.9%

**Table 9**

IRR Impact vs. Baseline Plant Type	CPS on fuel inputs (heat exempted)		
	Scenario 1	Scenario 2	Scenario 3
Large CHP	-0.7%	-2.1%	-3.6%
Large CCGT + Boiler (CCL exempt)	-0.6%	-1.9%	-3.3%
Medium CHP	-0.4%	-1.4%	-2.4%
Medium CCGT + Boiler (with CCA)	-0.5%	-1.7%	-2.9%
Small CHP	-0.3%	-1.0%	-1.7%
Small CCGT + Boiler	-0.5%	-1.7%	-2.9%

## Appendix II

As a minimum the CHPA believe that CHP should be exempted from the fuel it uses to generate heat so as to retain its current competitive position versus the separate generation of heat and power. This can be achieved by a simple calculation using the existing CHPQA process building on a process that is already in place and familiar to suppliers, with no additional material cost or administrative burden to both government and industry.

The CHPQA calculation already identifies Qualifying Heat Output (QHO), Total Fuel Inputs (TFI) and Qualifying Fuel Inputs (QFI). Assuming that the operator qualifies as 100% Good Quality CHP, QFI and TFI are the same number. Taking QHO and dividing by the efficiency delivered from a standalone boiler would give Fuel used in the generation of heat, which would then be deducted from QFI to ascertain the fuel inputs subject to CPS. See the worked examples below:

### Example 1

TFI	100MW
QFI	100MW
QHO	30MW

Fuel used in the generation of Heat (HFI) = QHO / Standalone Boiler Efficiency

$$\begin{aligned} \text{HFI} &= 30 / 0.85 \\ \text{HFI} &= 35\text{MW} \end{aligned}$$

$$\begin{aligned} \text{TFI subject to CPS} &= \text{QFI} - \text{HFI} \\ \text{TFI subject to CPS} &= 100 - 35 \\ \text{TFI subject to CPS} &= 65\text{MW} \end{aligned}$$

If the CHP operator is partially qualified then QFI would be lower than TFI the calculation would be as per example II below

### Example 2

TFI	100MW
QFI	80MW
QHO	20MW

$$\begin{aligned} \text{HFI} &= 20 / 0.85 \\ \text{HFI} &= 24\text{MW} \end{aligned}$$

$$\begin{aligned} \text{TFI subject to CPS} &= \text{QFI} - \text{HFI} + \text{TFI} - \text{QFI} \\ \text{TFI subject to CPS} &= 80 - 24 + 100 - 80 \\ \text{TFI subject to CPS} &= 76\text{MW} \end{aligned}$$

A simple amendment to the CHPQA certificate could identify the volume calculated above and the PP11 CCL exemption form could be amended to provide the supplier with the proportion of input fuel subject to CPS.