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ConocoPhillips European Power Limited (CEPL) welcomes the opportunity to respond to "A call for evidence on the role of gas in the electricity market' published by the Department of Energy and Climate Change (DECC) in May 2012.

CEPL is a subsidiary of Phillips 66 which is one of the world's largest independent downstream companies, operating three segment-leading businesses in Refining and Marketing, Midstream and Chemicals. Our interest in the power generation market is in projects related to our core business assets. This interest has resulted in the construction of the gas-fired Immingham CHP (ICHP) project, one of the largest Combined Heat and Power (CHP) plants in Europe, adjacent to our Humber Oil Refinery. The ICHP project provides steam to Total's Lindsey and Phillips 66's Humber Oil Refineries which together represent approximately 30% of the UK refining capacity. Our investment in the CHP has made Humber refinery one of the top 10% most efficient European refineries, lowering its carbon footprint whilst continuing to provide reliable high grade heat.

We welcome this opportunity to share some of our views on the role of gas in the electricity market and are encouraged that Government has recognised its importance. With the closure of many coal plants in the next few years as a result of the Large Combustion Plant Directive (LCPD) and the Industrial Emissions Directive (IED), gas-fired generation will need to provide the flexibility and security to the system to facilitate the increase in intermittent generation connecting. CHP in particular has shown that it can operate in a more flexible manner than traditional CCGT's and can help meet system peaks rather than using the more costly OCGT. The recent Heat Strategy also published by DECC, highlighted the role of gas-fired CHP in the decarbonisation of industry, particularly those industries that require very high temperatures. CHP has suffered in the past from an unpredictable regulatory framework with many policy decisions not taking into consideration the impact and cost on this technology. We urge any new policy decisions take into consideration the benefits that CHP can offer and work to correct the current market failures.

We would be happy to provide further comment and clarification as necessary.

Kind regards,

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INTRODUCTION

Following the demerger of the ConocoPhillips group in May 2012, Phillips 66 no longer has any upstream gas assets and as such we will be responding to the gas call for evidence from our position as a downstream refining and marketing company and operator of Immingham CHP (ICHP).

CEPL has been concerned for a while that the Government's ambition to reduce UK carbon emissions and the consequent targets for renewable generation were having a negative effect on investment in new generation capacity. The current combination of policy options has caused uncertainty in the market and has failed to provide adequate market signals to create the amount of flexible generation which is able to respond to the intermittency of a largely wind-driven, renewable generation portfolio and an inflexible nuclear fleet. In addition to this lack of investment, a large number of coal plants are likely to close in response to environmental policies and current low prices are encouraging companies to mothball plant that it is uneconomic to run, which will lead to a likely substantial lowering of generating capacity margin in the near future.

Currently we see regulatory uncertainty as being the biggest barrier to investment decisions. The proposal to introduce Carbon Price Support (CPS) on all fuels used for CHP caused shock waves in the industry, which was later reversed, but then the announcement came that CHP Levy Exemption Certificates (LEC's) were to be removed from 1st April 2013. The latter decision was made with no apparent cost benefit analysis, impact assessment or consultation. No replacement has been announced and the result is that output from CHP will continue to fall at an accelerated rate, not increase as the Government forecasts. There is also uncertainty on how the Electricity Market Reform (EMR) will impact and influence the current and planned projects. If investors cannot foresee what will happen to the power market, and the impact of the economics on their specific project is not clear, then they will not invest. In comparison the benefit of CHP has been recognised elsewhere in Europe. For example, Germany has substantially increased its support for CHP and hence its ability to support German industry and jobs.

Until recently natural gas appears to have been viewed as a transitional fuel to facilitate increasing renewable generation in the system. It has become apparent that this view has been challenged with the increased likelihood that not all planned nuclear projects will go ahead and with the loss of the flexible coal plant. It appears that the benefit of gas fired plant is being recognised. Natural gas currently meets the Government's top three objectives of reduced emissions, security of supply and affordability and Government should recognise and reward efficient technologies such as CHP.

GAS STRATEGY QUESTIONS

a) What are the main strengths and weaknesses of gas generation in helping deliver a secure, affordable route to decarbonisation through to 2020 and then by 2050?

As highlighted by the Secretary of State for Energy and Climate Change, Edward Davey 'gas-fired generation will have a very important role to play, even as the UK moves towards its legally binding carbon reduction targets. Modern, efficient gas-fired plant emits half the greenhouse gas emissions of coal while also providing a flexible energy source that can help balance the grid.'

We see the advantages of natural gas being as follows:

Natural Gas produces approximately 50% less $C0_2$ emissions then unabated coal when burned for power generation. Natural gas has a higher conversion efficiency, which means it loses less energy than other fossil fuels when producing electricity or heat. The most efficient use of gas in generation and heat is CHP, which is also widely acknowledged as the only realistic means of significantly reducing carbon for many industries, particularly those who require very high temperatures, as highlighted in the recent Heat Strategy published by the Department of Energy and Climate Change (DECC).

Natural gas is abundant and remains a highly important indigenous resource in Europe and can be easily stored and transported. Globally there are enough proven reserves to meet more than 60 years of demand at today's consumption rates. Worldwide potential from 'unconventional' sources of natural gas, such as shale and coal bed methane, could extend current production by a century or more.

The technology for using natural gas is advanced, rapidly deployable and affordable. The average gas-fired power plant, ignoring the permitting and planning concerns, takes as little as three years to build. Current delays and impacts on this timeframe are largely due to problems with obtaining planning permission for gas and electricity capacity and the associated connections.

Large scale gas-fired CHP can provide fast flexible peaking, which will be increasingly attractive as more intermittent generation connects to the system. For instance ICHP has some of the most efficient peaking capacity in the UK (approximately 120MW in 15mins with efficiency in the high 30%). It is also one of the lowest cost forms of carbon abatement currently available to government as (Figure 1) below highlights.

Figure 1 – Cost of Carbon Abatement for different types of generation

CHP Emission Saving vs. UK Power Energy Mix	tonnes	816,409
Emissions from 800MW plant equivalent to 800MW plant	tonnes	3,209,664
Percentage of Emissions to by replaced by zero carbon generation to equal CHP saving		25%
Generation to be replaced by zero carbon generation	MWh	1,782,553

Cost of Equivalent Carbon Abatement vs. UK Power Mix

	Capacity Required (MW)	Load Factor *	Generation (MWh)	ROC Price (£/Mwh)	Number of ROCs	LEC Price (£/Mwh)	Cost to Government (£)	Carbon Abatement Cost (£/te)
Offshore Wind	661	31%	1,782,553	50.00	2.0	5.00	187,168,025	229.26
Onshore Wind	771	26%	1,782,553	50.00	1.0	5.00	98,040,394	120.09
Dedicated Biomass	203	100%	1,782,553	50.00	1.5	5.00	142,604,209	174.67
Biomass Co-firing	203	100%	1,782,553	50.00	1.0	5.00	98,040,394	120.09
CHP	800	100%	7,008,000			5.00	35,040,000	42.92

CHP Emission Saving vs. UK Power	tonnes	316,943
Emissions from 800MW plant equivalent	tonnes	2,710,197
Percentage of Emissions to by replaced		12%
Generation to be replaced by zero carbon	MWh	819,547

Cost of Equivalent Carbon Abatement vs. CCGT

	Capacity Required (MW)	Load Factor *	Generation (MWh)	ROC Price (£/Mwh)	Number of ROCs	LEC Price (£/Mwh)	Cost to Government (£)	Carbon Abatement Cost (£/te)
Offshore Wind	304	31%	819,547	50.00	2.0	5.00	86,052,400	105.40
Onshore Wind	354	26%	819,547	50.00	1.0	5.00	45,075,067	55.21
Dedicated Biomass	94	100%	819,547	50.00	1.5	5.00	65,563,733	80.31
Biomass Co-firing	94	100%	819,547	50.00	1.0	5.00	45,075,067	55.21
CHP	800	100%	7,008,000			5.00	35,040,000	42.92

* Based on average of last 5 years as per DUKES 7.4 as per notes 7.87/88

The analysis (Fig 1) calculates the emissions savings from an example 800MW CHP versus a) the carbon intensity of the UK Power Energy mix, b) the alternative investment option of a CCGT and standalone boiler. The equivalent emissions savings are then calculated for each other technology type analysed to highlight the cost of those emissions savings to the UK were they to be realised. For simplicity it is assumed that CHP and biomass generation have a 100% load factor to reflect the nature of baseload operation.

The analysis focuses on the key benefits and assumes that CHP still receives LECs. From April 2013 the CHP carbon abatement cost will be zero, as CHP LECs will no longer exist and as such CHP will no longer be rewarded for the carbon it saves. It should be noted that the analysis does not include indirect carbon benefits from pass-through of EUA and CPS which, given the introduction of the UK Carbon Price Floor, will equate to an additional benefit to renewable and biomass plant, of approximately £30/te. These indirect benefits are based on the UK Carbon price floor for 2013 of £16/te and marginal pass-through of a 49% HHV efficient CCGT. A CHP does not have these benefits at is will receive no EUA allocation but will need to purchase EUAs and pay CPS on fuel used for electricity generation, in fact CHP is actually further disadvantaged relative to CCGT due to its lower electrical efficiencies despite its higher overall thermal efficiency.

The current weaknesses we can identify are through current market failures

The last few years has seen a plethora of new policy consultations from many different departments on the carbon market, electricity market, gas and electricity pricing and connections, and security of supply. We would encourage that a more joined up vision is required for the role that gas generation and, in particular CHP can provide in order to decarbonise not just the power sector, but also the heat sector.

The gas and electricity system currently hinders the rate at which plants can connect. These systems need to be reinforced and available to meet and support the demand. It is pointless having a capacity mechanism that attracts new investment in gas generation if the gas system cannot support it. Under the Planning Act, National Grid (NG) has indicated that it believes that the new obligations may extend the average gas plant build to approximately 7 years from project start to finish. Policy needs to recognise this

extended timeline for new generation build and plan appropriately. We have attached Appendix 1 which is a summary of the developmental timescales of new and existing plant as evidence of the current connection timescales.

The gas and electricity systems need to be planned together and interact so that policies that are put in place for one commodity can be supported and implemented by the other. This is particularly important when one or both of the systems may be subject to supply constraints. The policies put in place need to be tested under times of system stress to ensure that there is not a catastrophic impact on either system.

An example of this being that the capacity mechanism may penalise a generator for not providing the expected power, so a CCGT may continue to operate even if the gas system is under stress and was calling for load shedding. If the CCGT's continue to be unable to respond to the increasing gas shortage in this example, it will result in NG having to declare an emergency to allow it to reduce the load in the areas impacted to stop the loss of supply to domestic customers. In this example it appears foolhardy to cause a gas emergency that could take many weeks to restore supplies to customers, for the sake of a short term voltage reduction.

Carbon capture and storage has been identified as a means to decarbonise the electricity system in the longer term. CCS, along with new nuclear and offshore wind each have their own constraints which includes the timescales for delivery, supply chain, uncertainty of costs and the demonstration of the technology. CCS for gas is not a practical proposition for gas plant within the next ten years and as such Government should look to other more practical short term solutions such as CHP. The geographical advantage of CHP host heat customers, if clustered close together, could enable CCS projects in the future, investment in which would otherwise have been prohibitive on an individual site basis.

Gas, and therefore gas prices, we believe in the future will become more dependent on the global market as the UK becomes more dependent on imports. The impact of unconventional sources of gas is unknown within Europe and as such gas should be used in the most efficient way possible such as CHP. The current market failures do not reward CHP for its carbon saving. CHP will only be built in preference to CCGT if these market failures are corrected.

b) What role can gas fired generation play in the future and what level of gas generation capacity is desired?

Gas is increasingly necessary given the lack of enthusiasm for nuclear and the increased cost for this technology and the declining numbers of coal plants. It has been widely recognised within the industry and by Government committees, including the Climate Change Committee (CCC), that gas has a substantial contribution to make in lowering the cost of meeting our carbon targets. Gas generation capacity is needed for diversity and security of supply within the merit order, particularly with the uncertainty over nuclear.

Gas CHP is one of the lowest cost forms of carbon abatement currently available to Government and will remain so for a considerable time. We believe existing and new gas plant can provide a significant proportion of the flexible generation at a relatively low cost. It will also be required for system stability, providing ancillary services such as frequency response and reserve. Gas, unlike coal can provide this flexibility in a quick and efficient manner. For coal to be able to provide the same amount of flexibility, it would need to be kept 'warm' (on standby) to be able to react in periods of system stress which has environmental and financial cost implications

Renewable energy is not an alternative for large energy intensive energy users. The investment costs and logistical issues rule out such technologies. A biomass fuelled CHP, to replicate the size if Immingham CHP which provides steam and power to the adjacent Humber Oil and Lindsey Oil Refineries as well as power to the grid, would require an

investment of approx £4.5 Bn and a storage facility 41 meters high with a footprint equivalent in size to 20 football pitches.

Gas generation is a facilitator of intermittent and inflexible low carbon generation. The level of gas generation required needs to be at least equivalent to the volume of such intermittent sources.

c) What are the key factors driving the economics of investing in new gas-fired power generation and how are these factors likely to change?

The key requirement is long term stable investment signals and a reduction of regulatory risk and uncertainty. A concern will be that current baseload plant may be called upon on fewer days. This will cause high prices for short periods which will be politically unacceptable. This will also have a major impact on financing of projects. Investors will worry about future negative spreads when fossil fuels are not at the margin. Oxera has recently published a report in response to a request from the Independent Generators Group (IGG) on the impact this will have on finance decisions (sent as an attachment to this response for information). Oxera's conclusion indicated that a project's need to recover costs over a shorter time frame caused considerable issues for stability of cash flow and hence the ability to raise finance for new investment.

Current low prices are not encouraging investment in new generating plant and there is a worry that, by waiting for these market signals before investment decisions, it will be too late to avoid the forecasted supply constraint.

In relation of large scale CHP, the removal of Levy Exemption Certificates (LEC's) that mitigated the market failure that CHP faces (as CHP is not as electrically efficient as CCGT despite its high thermal efficiency) is a major setback for CHP projects, both incumbent and proposed. Gas CHP development is inextricably linked to the host it provides energy for, particularly in relation to heat. This is a key risk and, as a result, a financial barrier to investment decisions. Another economic driver would be that many of the companies that are making these investment decisions are international and are competing for finance with other projects on an international scale, so any policy decision needs to ensure that UK can remain competitive with international markets.

d) What barriers do investors face in building new gas generation plants in the UK? What are the key regulatory uncertainties that may prevent debt and equity investors making a final investment decision in gas generation and supply infrastructure?

The UK Government, unlike many of our European neighbours, has not made clear its intentions to support CHP. Policy has not recognised and rewarded the thermal efficiency of gas-fired CHP in comparison to producing heat and power separately by boilers and CCGT's.

The assumptions and modeling that Government are using to make policy decisions on gas and electricity prices are not based on underlying market fundamentals. The price projections contained in the GGS document are out of alignment with the current forward curves, electricity price 50% higher, gas price 25% higher, 2012 dirty spark spread from chart data £30/Mwh versus current £4/Mwh. Investors do not invest on the back of Government projections, but Government builds policy on them. It would be beneficial for Government to refine and update projections so as to more accurately understand the market in which investors are operating and therefore design policy appropriately. The greater the certainty of revenues that can be offered to investors, the lower the project cost of capital. If investors cannot foresee what will happen to the power market, and the impact of the economics on their specific project is not clear, then they will not invest.

An area of concern is the layering of costs to industry, additional to those being borne by European competitors. At the levels suggested in the Carbon Price Support consultation, by 2030 UK industry might be paying carbon costs in electricity prices several times greater than the rest of Europe.

Returns for gas plant need to recognise lower load factors going forward as well as the increased capital and operating costs and decreased reliability expected from gas plant going forward as it will be required to be more flexible.

e) Are there any other policy issues that need to be addressed beyond the Government's proposals for the capacity mechanism and the EPS?

In the recent Heat Strategy, the document highlighted the technical potential of 24 GWe of CHP by 2020. Currently the installed 5.9 GWe of CHP reduces 13 million tonnes of carbon, so, on a like-for-like, basis if there was support to build all the technically feasible plant, then the carbon savings could be 52 million tonnes. However, this potential CHP plant will only be built if it is able to compete on a level playing field with CCGT. CHP, by definition, is in both the heat and power market. As previously mentioned there is a 'cost' to supplying the electricity market in terms of electrical efficiency and no reward to the CHP plant for the carbon it saves due to its thermal efficiency. In the same way as CCGT, CHP developers will receive no beneficial EUA allocation from 2013 and they will pay Carbon Price Support (CPS) on the fuel used in the generation of electricity. It is therefore not surprising that, given the higher capital and operating cost of CHP, it is not achieving its potential. There is no prospect in large scale investment given the current regulatory background and the Government estimate of approximately 12 GWe of CHP capacity by 2020 cannot be supported without a replacement incentive mechanism for LECs.

In order to ensure that CHPs maximize their heat to power ratio, commensurate with maximising the amount of carbon saved, it is best to address the market failure for electrical dispatch via power exports. It is simplest to provide incentives on power export as there is already high (fiscal) standard of real measurement. CHPs compete against CCGTs in the merit order, if the effective spark spread for a given CCGT based on its incremental carbon costs is better than CHP, it will dispatch in advance of CHP in the merit order. As CHP has a lower electrical efficiency than CCGT (despite having higher overall thermal efficiency) without the benefit of a variable cost incentive such as LECs, its load factor and therefore carbon savings will fall. That is why we expect the output and load factor of existing CHP plant and hence the carbon savings to fall from April 2013.

A Contract for Difference Feed-In Tariff (CfD FiT) is not appropriate for large scale gas CHP. Unlike nuclear and wind generators, CHP is not a fixed cost based plant. Decisions to dispatch are driven by fuel costs, water costs, EUA & CPS carbon costs and host demand. Thus a CfD FiT against the power price or the spark spread would not provide a secure income stream, as the fuel and other variable costs of operating are uncertain, as is the actual quantity of output requiring a hedge. In fact a CfD FiT could represent considerable levels of additional risk and complexity for a CHP developer and does nothing to rectify the disadvantage of CHP against CCGT within the merit order.

A Premium Feed-In Tariff (PFiT) does ensure that an investor can see that CHP will provide a better return than their base case economics (a boiler + power imports). A PFiT does not disrupt the market as the CHP investor is open to the same market signals as other participants but it does correct the failure of the market to recognise the carbon savings CHP provides by introducing a competitive uplift versus less thermally efficient forms of generation, thereby ensuring that CHP will always dispatch ahead of less thermally efficient and more carbon intensive plant.

Independent generators are the most vulnerable to a poorly functioning market as they must use or sell their output. Ensuring that market liquidity is unharmed by policy measures is vital to ensuring that all players in the market are encouraged to invest in the power sector and that new entrants are able to compete.

f) Given a continuing role of gas and the potential for increased volatility in gas demand. To what extent is gas supply and related infrastructure a barrier to investment in gas fired generation? What impact will unconventional gas have on the case for investing in gas generation and the supporting infrastructure?

It is not yet clear the full extent of shale gas potential in the UK. If gas proves to be as plentiful and easy to extract as some speculate, then the UK may well see the kind of gas prices collapse that has been observed in the US, thereby increasing the potential for gas fired generation investment.

APPENDIX 1 – Observed Developmental Timescales

Development type	Extension	Extenstion	Extenstion	New Site	New Site	New Site	New Site	New Site	New Site
Power Stations	**Immingham P2**	**Barking**	**Spalding**	**ICHP Phase 1**	**Marchwood**	**Carrington**	**Langage**	**Gateway Energy Centre**	**Abernedd Power**
Owner	Conoco Phillips	Thames Power /SSE/EDF	Intergen	Conoco Phillips	ESBI and SSE	ESBI (85%)	Centrica	intergen	SSE
Plant size (MW)	450	470	900	760	842	860	895	900	450
Location	Humberside	Barking	South Lincolnshire	N-E Lincolnshire	Southampton	Manchester	Plymouth	Essex	Port Talbot, Wales
Initial Developer	ConocoPhillips		Intergen	ConocoPhillips			Wainstones power sub. of NRG	Intergen	BP
s.36 Application	11-Nov-05	23-Aug-06	31-Mar-09	15-Nov-00	18-Oct-01	15-Aug-07	01-Jun-98	26-Feb-10	04-Sep-08
s.36 granted	01-Aug-06	19-Dec-07	11-Nov-10	11-Jul-01	28-Nov-02	30-Jul-08	15-Nov-00	04-Aug-11	23-Feb-11
Start of construction	15-Mar-07		01-Jan-12	01-Mar-02	01-Feb-07	01-Feb-12	01-Sep-06	01-Jan-12	
End of construction	01-Dec-09		01-Oct-14					01-Oct-14	
C.O.D	01-Jan-10		01-Jan-15	04-Oct-04	10-Dec-09	01-Aug-14	01-Mar-10	01-Jan-15	
Status	**Completed**	**OH**	**OH**	**Completed**	**Completed**	**Site works**	**Completed**	**OH**	**OH**
Design and internal development (Assumed)	24	24	24	24	24	24	24	25	24
Planning duration (months)	8.6	15.9	19.4	7.8	13.3	11.5	29.5	17.2	29.7
Project Construction (months)	33.6		36.0	31.2	34.3	30.0	42.0	36.0	
Total (months)	73.7		93.1	70.7	121.8	107.6	165.1	83.2	
plus development period	6.1		7.8	5.9	10.2	9.0	13.8	6.9	

Development type	Existing site	Existing site	Existing site	Existing site	Existing site	Existing site	Existing site
Power Stations	**Great Yarmouth**	**Uskmouth/ Severn Power**	**Medway/Isle of Grain**	**Drakelow**	**West Burton**	**Willington C**	**Pembroke**
Owner	RWE	Dong	E.ON UK	E.ON UK	EDF	RWE	RWE
Plant size (MW)	400	820	1275 CHP	1200	1300	2000	2000
Location	Norfolk	Newport, South Wales	Thames	Staffordshire	Nottinghamshire	South Derbyshire	Wales
Initial Developer	BP	Carron energy					
s.36 Application	19-Jun-98	19-May-06	12-Dec-05	06-Sep-05	18-Jan-06	08-Dec-09	06-Jan-05
s.36 granted		17-Aug-07	31-Oct-06	16-Oct-07	30-Oct-07	04-Mar-11	05-Feb-09
Start of construction	01-Dec-98	01-Aug-08	01-May-07		01-May-08		15-May-09
End of construction	01-Oct-00	01-Nov-10	31-Mar-11				
C.O.D	01-Sep-02	10-Feb-11	25-Jul-11	31-Oct-14	01-Jan-12		01-Dec-12
Status	**Completed**	**Completed**	**Completed**	**NIC**	**UC**	**NIC**	**UC**
Design and internal development (Assumed)	24	24	24	24	24	24	24
Planning duration (months)		15.0	10.6	25.3	21.4	14.8	49.0
Project Construction (months)	45.0	30.3	50.8		44.1		42.6
Total (months)	74.5	80.8	91.4	133.9	95.5		118.9
plus development period	6.2	6.7	7.6	11.2	8.0		9.9